

SULTANATE OF OMAN



الشركة العُمانية لنقل الكهرباء ش.م.ع.م
OMAN ELECTRICITY TRANSMISSION COMPANY S.A.O.C



GRID CODE REVIEW PANEL
مجلس مراجعة قواعد الشبكة

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The Grid Code

Preface

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This document is the Grid Code referred to in the Sector Law [(Articles 22 & 23)] and the Transmission and Dispatch Licence granted by the Regulatory Authority to the Oman Electricity Transmission Company SAOC ("OETC") under that Law. It contains rules in relation to the planning, development, Connection to, Operation and maintenance of and changes to OETC's Transmission System.

The Grid Code applies to all entities that are connected to and/or use the Transmission System. However, individual parts of the Grid Code may be applicable to only some parties who have acceded to the Grid Code as a whole. Each constituent part of the Grid Code specifies which Person it applies to.

Terms and expressions used in the Grid Code are defined either in the relevant section of the Grid Code entitled "Abbreviations and Definitions" or, in some cases, in individual Grid Code sections.

The Grid Code contains the following constituent parts;

- General Conditions;
- Data Transfer Code;
- Alerts Summary Code;
- Planning Code;
- Connection Conditions Code;
- Operating Codes;
 - OC1 Demand Forecasting;
 - OC2 Operational Planning;
 - OC3 Operating Margin;
 - OC4 Demand Control;
 - OC5 Notice of Operations & Incidents, & Significant Incident Reporting;
 - OC6 Safety Coordination;
 - OC7 Contingency Planning;
 - OC8 Numbering and Nomenclature of HV Plant;
 - OC9 Operational Tests & Site Investigations;
- Scheduling and Dispatch Codes;
 - SDC1 Generation and Desalination Scheduling;
 - SDC2 Generation and Desalination Dispatch;
 - SDC3 Frequency Control;
- Ancillary Services Code;
- Metering and Data Exchange Code;
- Abbreviations and Definitions;



This Grid Code shall not constitute a contract between any of the parties to it. All Licensees (including OETC, Licensed Generators, Licensed Generators/Desalinators, Licensed Distribution System Operators and RAEC when connected to the Transmission System) will be party to it as will other parties Connected to the Transmission System. Some of these parties may have contractual obligations, created by separate documents (including Connection Agreements), to each other to comply with the Grid Code.

Nothing in this Grid Code shall entitle any party to it or any other person to any contractual or other general Law right or remedy of whatsoever kind and howsoever arising in respect of this Grid Code. Each party's liability to each other party shall be limited to one (1) Omani Rial.

However, nothing in this Grid Code (including this paragraph) shall affect any legal right or remedy that may exist between any two parties to this Grid Code under any such separate agreement between or any duty arising under the terms of any Licence granted pursuant to the [title of Sector Law] or pursuant to that Law. In particular, nothing in this Grid Code shall preclude the Regulatory Authority from taking such enforcement action in relation to it, the Sector Law or any Licence granted there under as it sees fit.

Each party to this Grid Code shall at all times deal with all other parties in good faith. All parties to the Grid Code shall at all times perform all of their obligations in accordance with Good Industry Practice.



General Conditions

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General Conditions

GC.1 Introduction

The individual sections of the Grid Code contain the rules and provisions relating specifically to that individual section of the Grid Code. There are also provisions of a more general application, which need to be included in the Grid Code to allow the various sections of the Grid Code to work together. Such provisions are included in these General Conditions.

GC.2 Objective

The objectives of the General Conditions are as follows

- To ensure, insofar as it is possible, that the various sections of the Grid Code work together for the benefit of OETC and all Users; and
- To provide a set of principles governing the status and development of the Grid Code and related issues as approved by the Regulatory Authority.

GC.3 Scope of Grid Code and General Conditions

The General Conditions apply to OETC and to all Parties to the Grid Code.

GC.4 Grid Code Review Panel

OETC shall establish and maintain the Grid Code Review Panel, which shall be a standing body, constituted;

- to generally review, discuss and develop the Grid Code and its implementation;
- to review and discuss suggestions for amendments to the Grid Code which OETC, the Regulatory Authority or any User may wish to submit to OETC for consideration from time to time;
- to discuss what changes are necessary to the Grid Code arising out of any unforeseen circumstances referred to it by OETC;
- to review existing Oman Electrical Standards relevant to OETC's Transmission System and make recommendations to the Regulatory Authority concerning modifications to existing Oman Electrical Standards or proposals for new Oman Electrical Standards relevant to OETC's Transmission System;
- to publish recommendations and ensure that User consultation upon such recommendations has occurred through Members; and
- Issue guidance in relation to the Grid Code and its implementation, performance and interpretation when asked to by a User.

The Grid Code Review Panel shall be governed by a constitution (given as Appendix A) which defines its scope, Membership, duties, and rules of conduct, operation and further development of the Grid Code as approved by the Regulatory Authority.

The Panel shall consist of;

- a chairman and up to 2 persons appointed by OETC;
- a person appointed by the Regulatory Authority;
- a person appointed by PWP;
- a person appointed by PAEW;
- 2 persons representing all Power Producers that each have Production Facilities with a total Registered Capacity in excess of 100 MW;



- 2 persons representing all Power Producers that each having Centrally Dispatched Production Facilities with a total Registered Capacity of 100 MW or less;
- 1 person representing each Licensed Distributor;
- 1 person representing Internally Interconnected Parties;
- 1 person representing International Interconnected Parties; and
- 1 person representing RAEC.

GC.5 Grid Code Revisions

All revisions to the Grid Code must be reviewed by the Grid Code Review Panel prior to application to the Regulatory Authority by the Chairman. All proposed revisions from Users, the Regulatory Authority or OETC shall be brought before the Grid Code Review Panel by the Chairman for consideration. The Chairman will advise the Grid Code Review Panel, all Users, and the Regulatory Authority of all proposed revisions to the Grid Code with notice of no less than 20 Business Days in advance of the next scheduled meeting of the Grid Code Review Panel.

Following review of a proposed revision by the Grid Code Review Panel, the Chairman will apply to the Regulatory Authority for revision of the Grid Code based on the Grid Code Review Panel recommendation. The Chairman, in applying to the Regulatory Authority, shall also notify each User of the proposed revision and other views expressed by the Grid Code Review Panel and Users so that each User may consider making representations directly to the Regulatory Authority regarding the proposed revision.

The Regulatory Authority 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.

Having been so directed by the Regulatory Authority that the revision shall be made, the Chairman shall notify each User of the revision at least 10 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 Regulatory Authority.

GC.6 Derogations

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 OETC and the Regulatory Authority and shall make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable. Non-compliance may result;

- with reference to Plant Connected to the Transmission System and is caused solely or mainly as a result of a revision to the Grid Code; and
- with reference to Plant which is Connected, approved to Connect or for which approval to Connect to the Transmission System is being sought.

When a User believes either that it would be unreasonable (including on the grounds of 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 Regulatory Authority a request for derogation from such provision and shall provide OETC and PWP with a copy of such application.

If OETC finds that it is, or will be, unable to comply with any provision of the Grid Code at any time, then it shall make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.



In the case where OETC requests derogation, OETC shall submit the information set out in paragraph GC.6.1 to the Regulatory Authority.

GC.6.1 Requests for Derogation

A request for derogation from any provision of the Grid Code shall contain;

- (a) The reference number and the date of the Grid Code provision against which the non-compliance or predicted non-compliance was identified;
- (b) The detail of the Plant in respect of which derogation is sought and, if relevant, the nature and extent of non-compliance;
- (c) The provision of the Grid Code with which the User is, or will be, unable to comply;
- (d) The reason for the non-compliance; and
- (e) The date by which compliance could be achieved (if remedy of the non-compliance is possible).

On receipt of any request for derogation, the Regulatory Authority shall promptly consider such a request. Provided that the Regulatory Authority considers that the grounds for the derogation are reasonable, the Regulatory Authority shall grant such derogation unless the derogation would, or is likely to;

- Have a material adverse impact on the security and/or stability of the Total System; or
- Impose unreasonable costs on the Operation of the Total System or on other Users.

In its consideration of a derogation request by a User, the Regulatory Authority may contact the relevant User and/or OETC to obtain clarification of the request or to discuss changes to the request.

Derogations from any provision of the Grid Code shall contain;

- (a) The reference number and the date of the Grid Code provision against which the derogation applies;
- (b) The detail of the Plant in respect of which a derogation applies and, if relevant, the nature and extent to which the derogation applies including alternative compliance provisions;
- (c) The identification of the provision with which the derogation applies;
- (d) The reason for the non-compliance requiring derogation; and
- (e) The date by which the derogation shall expire.

To the extent of any derogation granted in accordance with this paragraph GC.6.1, OETC and/or the User (as the case may be) shall be relieved from any 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 alternative provisions identified in the derogation.

OETC shall;

- (a) Keep a register of all derogations which have been granted, identifying the name of the person and User in respect of whom the derogation has been granted, the relevant provision of the Grid Code and the period of the derogation; and
- (b) On request from any User, provide a copy of such register of derogations to such User.

The Regulatory Authority may initiate at the request of OETC or Users a review of any existing derogations, and any derogations under consideration where a relevant and material change in circumstance has occurred.



GC.7 Unforeseen Circumstances

If circumstances arise which the provisions of the Grid Code have not foreseen, OETC shall to the extent reasonably practicable in the circumstances, consult all affected Users in an effort to reach agreement as to what should be done and submit a proposal to the Grid Code Review Panel for consideration.

If OETC and affected Users are not able to agree, OETC will take any action necessary to ensure that it meets its License conditions wherever practical taking into account the views expressed by the Users.

Thereafter, OETC shall refer the matter relating to the unforeseen circumstances and any such determinations to the Grid Code Review Panel with a proposal for consideration.

GC.8 Hierarchy

In the event of any irreconcilable conflict between the provisions of the Grid Code and any contract, agreement, or arrangement between OETC and a User;

- (a) If the contract agreement or arrangement exists at the date this Grid Code first comes into force, it shall, unless and to the extent (1) specifically provided for in the Grid Code or in the contract agreement or arrangement or (2) that the User has agreed to comply with the Grid Code, prevail over this Grid Code for two years from the date upon which this Grid Code is first in effect; and
- (b) In all other cases, the provisions of the Grid Code shall prevail unless the Grid Code expressly provides otherwise.

GC.9 Illegality and Partial Invalidity

If any provision of the Grid Code should be found to be unlawful or wholly or partially invalid for any reason, the validity of all remaining provisions of the Grid Code shall not be affected.

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 minimum modification as may be;

- (a) necessary to make it valid and effective; and
- (b) most closely achieves the result of the original wording,

but without affecting the meaning or validity of any other provision of the Grid Code. OETC shall prepare a proposal to correct the default for consideration by the Grid Code Review Panel.

GC.10 Time of Effectiveness

This Grid Code shall have effect, as regards a new User, at the time at which its Connection Agreement comes into effect.

GC.11 Code Notices

Any notice to be given under the Grid Code shall be in writing and shall be duly given if signed by or on behalf of a Person duly authorised to do so by the party giving the notice and delivered by hand at, or sent by post, or facsimile transmission or e-mail to the relevant address, facsimile number or e-mail address last established pursuant to these General Conditions.

OETC shall maintain a list of contact details for itself and all Users containing the telephone, facsimile, e-mail and postal addresses for all Users. OETC shall provide these details to any User in respect of any other User as soon as practicable after receiving a request.



Both OETC and all Users shall be entitled to amend in any respect their contact details previously supplied and OETC shall keep the list up to date accordingly.

Any notice required to be given by this Grid Code shall be deemed to have been given or received;

- if sent by hand, at the time of delivery;
- if sent by post, from and to any address within Oman, 4 Business Days after posting unless otherwise proven; or
- if sent by facsimile, subject to confirmation of uninterrupted transmission report, or by e-mail, one hour after being sent, provided that any transmission sent after 14:00 hours on any day shall be deemed to have been received at 8:00 hours on the following Business Day unless the contrary is shown to be the case.

GC.12 Code Disputes

If any dispute arises between Users or between OETC and any User in relation to this Grid Code, either party may by notice to the other seek to resolve the dispute by negotiation in good faith.

If the parties fail to resolve any dispute by such negotiations within 14 days of the giving of a notice under the previous paragraph then;

- (a) Either party shall be entitled by written notice to the other to require the dispute to be referred to a meeting of Members of the boards of directors of the parties or, if no such directors are present in Oman, the most senior executive of each party present in Oman;
- (b) If either party exercises its right under the sub-clause 12(a) each party shall procure that the relevant senior executives consider the matter in dispute and meet with senior executives of the other party within 14 days of receipt of the written notice of referral to attempt to reach agreement on the matter in question; or
- (c) If the parties fail to resolve any dispute which has been referred to directors/senior executives under the sub-clause 12(a), either party may refer the matter to the Regulatory Authority for determination as the Regulatory Authority sees fit. All parties shall be bound by any decision of the Regulatory Authority. If it sees fit the Regulatory Authority may;
determine the dispute itself; or
Refer the dispute for determination by arbitration.

If the dispute is referred by the Regulatory Authority to arbitration, the Regulatory Authority shall serve a written notice on the parties to the dispute to that effect and the Rules of Conciliation and Arbitration of the International Chamber of Commerce (the "ICC Rules") shall govern such arbitration save to the extent that the same are inconsistent with the express provisions of the Grid Code.

Any arbitration conducted in accordance with the preceding paragraph shall be conducted;

- (a) in the city of Muscat in Oman;
- (b) in English; and
- (c) by a panel comprising an odd number of arbitrators provided that (i) there shall be not fewer than three arbitrators (ii) each of the parties to the dispute shall appoint an arbitrator and (iii) the Regulatory Authority shall appoint one arbitrator if there is an even number of parties to the dispute (in which case, the Regulatory Authority's appointee shall act as chairman of the panel) or two arbitrators if there



is an uneven number of parties to the dispute are (in which case the Regulatory Authority shall nominate one of its appointees to act as chairman of the panel).

Where the Grid Code provides that any dispute or difference of the parties in relation to a particular matter should be referred to an expert for resolution, such difference or dispute may not be referred to arbitration unless and until such expert determination has been sought and obtained.

The Regulatory Authority shall have the right to require that all disputes which are referred to it in accordance with paragraph GC12(c) above and are related, whether between the same parties or not, shall be consolidated and determined together either by the Regulatory Authority or by any arbitrator to which the Regulatory Authority has referred any dispute.

Any arbitral award shall be final and binding on the parties.

GC.13 Code Confidentiality

Several parts of the Grid Code specify the extent of confidentiality, which applies to data supplied by Users to OETC. Unless otherwise specifically stated in the Grid Code, OETC shall be at liberty to share all data with Users likely to be affected by the matters concerned and with the PWP. In all cases, OETC is at liberty, and may be required, to share the data with the Regulatory Authority.

GC.14 Interim Transitional Provisions

It is known (as at the date that this Grid Code is first established) that a contract has been awarded for the design, construction and commissioning of a new load dispatch centre. This event may give rise to the need for changes to the Grid Code.

As soon as practicable, OETC will propose changes to the Grid Code which it considers necessary or expedient in order to take account of the relevant circumstances referred to above. Whilst the rules for changes to the Grid Code described elsewhere in this Grid Code shall apply to these proposals for changes OETC, PWP, and all Users shall co-operate fully with a view to agreeing the necessary changes. No such Person shall be entitled to prevent the implementation of any change which is necessary or expedient and approved by the Regulatory Authority.

GC.15 Interpretation

In this Grid Code, unless the context otherwise requires;

- references to "this Grid Code" or "the Grid Code" are reference to the whole of the Grid Code, including any schedules or other documents attached to any part of the Grid Code;
- the singular includes the plural and vice versa;
- any one gender includes the others;
- references to Code sections, paragraphs, clauses or schedules are to Code sections, paragraphs, clauses or schedules of this Grid Code;
- code, paragraph and schedule headings are for convenience of reference only and do not form part of and shall neither affect nor be used in the construction of this Grid Code;
- reference to any law, regulation made under any law, standard, secondary legislation, contract, agreement or other legal document shall be to that item as amended, modified or replaced from time to time. In particular, any reference to any licence shall be to that licence as amended, modified or replaced from time to time and to any rule, document, decision or arrangement promulgated or established under that Licence;



- references to the consent or approval of the Regulatory Authority shall be references to the approval or consent of the Regulatory Authority in writing, which may be given subject to such conditions as may be determined by the Regulatory Authority, as that consent or approval may be amended, modified, supplemented or replaced from time to time and to any proper order, instruction or requirement or decision of the Regulatory Authority given, made or issued under it;
- all references to specific dates or periods of time shall be calculated according to the Gregorian calendar and all references to specific dates shall be to the day commencing on such date at 00:00 hours;
- where a word or expression is defined in this Grid Code, cognate words and expressions shall be construed accordingly;
- references to "person" or "persons" include individuals, firms, companies, government agencies, committees, departments, ministries and other incorporate and unincorporated bodies as well as to individuals with a separate legal personality or not;
- the words "include", "including" and "in particular" shall be construed as being by way of illustration or emphasis and shall not limit or prejudice the generality of any foregoing words; and
- Terms and expressions defined in the [insert title of Sector Law] shall have the same meanings in this Grid Code. In particular, the following words and expressions shall have the meanings ascribed to them in that Sector Law.



Appendix A Constitution Of The Grid Code Review Panel

1. Definitions and Interpretation

1.1 The following words and expressions shall have the following meanings in this Constitution;

"**Chairman**" means the person appointed by OETC under Clause 6 of this Constitution to act as the chairperson of the Panel;

"**Constitution**" means the constitution and rules of the Panel as set out herein and as may be amended from time to time with the approval of the Regulatory Authority;

"**Grid Code**" means the Grid Code drawn up pursuant to Condition 3 of OETC's Transmission Licence;

"**Licence**" has the meaning given it in the Sector Law;

"**Member**" means a person appointed to act as a representative of the persons or groups referred to in Clause 3 on the Panel;

"**Panel**" means the Grid Code Review Panel established by the OETC in accordance with the Grid Code (section GC.4) and governed by this Constitution;

"**Secretary**" means the person appointed by OETC pursuant to Clause 7 and named as such;

"**Sector Law**" means Sultani Decree No. [/2003] promulgating the law governing the privatisations and regulation of the electricity sector in Oman;

"**OETC**" means the Oman Electricity Transmission Company in its capacity as holder of a Transmission Licence;

"**Transmission Licence**" means a Licence to transmit electricity granted pursuant to the Sector Law;

1.2 Except as otherwise provided herein and unless the context otherwise admits, words and expressions used herein shall have the meanings given to them in the Grid Code.

1.3 Words importing the singular only also include the plural and vice versa where the context requires. Words importing the masculine only also include the feminine.

1.4 Headings and titles shall not be taken into consideration in the interpretation or construction of the words and expressions used herein.

1.5 Unless otherwise stated, any reference to a Clause is a reference to a Clause of this Constitution.

2. Principal objects

2.1 The Panel has been established by OETC to further the objectives set out below and such other objectives as the Regulatory Authority may stipulate from time to time;

- (a) to generally review, discuss and develop the Grid Code and its implementation;
- (b) to review and discuss suggestions for amendments to the Grid Code which OETC, the Regulatory Authority or any User may wish to submit to OETC for consideration from time to time;
- (c) to discuss what changes are necessary to the Grid Code arising out of any unforeseen circumstances referred to it by OETC;
- (d) to review existing Oman Electrical Standards relevant to OETC's Transmission System and make recommendations to the Regulatory Authority concerning



modifications to existing Oman Electrical Standards or proposals for new Oman Electrical Standards relevant to OETC's Transmission System;

- (e) to determine which contractors should be approved to work on OETC's Transmission System;
- (f) to approve equipment that may be used on or form part of OETC's Transmission System;
- (g) to publish recommendations and ensure that User consultation upon such recommendations has occurred through Members; and
- (h) issue guidance in relation to the Grid Code and its implementation, performance and interpretation when asked to by a User.

3. Membership and Appointment

3.1 The Panel shall comprise;

- (a) the Chairman and up to 2 persons appointed by OETC;
- (b) a person appointed by the Regulatory Authority;
- (c) a person appointed by PWP;
- (d) a person appointed by PAEW;
- (e) 2 persons representing all Power Producers that each have Production Facilities with a total Registered Capacity in excess of 100 MW;
- (f) 2 persons representing all Power Producers that each have Centrally Dispatched Production Facilities with a total Registered Capacity of 100 MW or less;
- (g) 1 person representing each Licensed Distributor;
- (h) 1 person representing Internally Interconnected Parties;
- (i) 1 person representing International Interconnected Parties; and
- (j) 1 person representing RAEC.

3.2 Each person appointed as specified at Clause 3.1 shall be a Member of the Panel. If at any time any of the persons or groups identified at Clauses 3.1(a) to (j) are unable to agree on a representative to act as their Member, the Chairman shall contact (insofar as he is reasonably able) the person(s) or group(s) unable to agree and seek to encourage appointment or, as appropriate, unanimous agreement between relevant persons as to their prospective Member. If no such agreement is reached at least 21 Business Days prior to the next meeting of the Panel (or the first meeting of the Panel, as the case may be) the Chairman shall request the Regulatory Authority to make such appointment and the Regulatory Authority shall have the right, until the relevant person or group of persons has decided upon an appointment and notified the Regulatory Authority and the Chairman accordingly, to appoint a Member or Members on behalf of that person or group of persons, and to remove (if appropriate) any person so appointed by it.

3.3 No person other than an individual shall be appointed a Member or his alternate.

3.4 After the Panel has been established for one year;

- (a) each Member shall retire automatically at the beginning of the meeting of the Panel held on the first Business Day in the month of February each year (or if no meeting is held on such day, at the meeting which is held on the date falling closest after that day) but shall be eligible for re-appointment.



- (b) Each person or group of persons entitled to appoint a Member (or a person within such group of persons) may, by notice in writing to the Chairman, indicate its wish to re-appoint the retiring Member or to appoint a new person as a Member in his place.
- (c) The relevant person(s) must deliver such notifications for re-appointment or appointment to the Chairman at least 21 Business Days in advance of the relevant meeting of the Panel or group(s) entitled to appoint a Member. A notification for re-appointment in respect of an existing Member shall be deemed to be given if no notification is delivered to the Chairman at least 21 Business Days in advance of the relevant meeting of the Panel.
- (d) If only one notification is received for the re-appointment of a Member or appointment of a new person as a Member (or if all notifications received are unanimous), the person named in the notification(s) will become the Member with effect from the beginning of the relevant meeting of the Panel. If the notifications are not unanimous, the provisions of Clause 3.2 of this Appendix A shall govern the appointment of the Member.
- (e) These provisions shall apply equally to persons or groups of persons entitled to appoint more than one Member, with any necessary changes to reflect that more than one Member is involved.

4. Alternates

- 4.1 Each Member (and the Chairman) shall have the power to appoint any individual to act as his alternate and remove (at his discretion) any alternate Member or Chairman (as the case may be) so appointed. Any appointment or removal of an alternate Member or Chairman shall be effected by notice in writing executed by the appointor and delivered to the Secretary or tendered at a meeting of the Panel.
- 4.2 If his appointor so requests, an alternate Member or Chairman (as the case may be) shall be entitled to receive notice of all meetings of the Panel or of sub-committees or working groups of which his appointor is a Member. He shall also be entitled to attend and vote as a Member or Chairman (as the case may be) at any such meeting at which the Member or Chairman (as the case may be) appointing him is not personally present and at any such meeting to exercise and discharge all the functions, powers and duties of his appointor as a Member or Chairman (as the case may be) and for the purpose of the proceedings at the meeting the provisions of this Constitution shall apply as if he were a Member or Chairman (as the case may be).
- 4.3 Every person acting as an alternate Member or Chairman (as the case may be) shall have one vote for each Member or Chairman (as the case may be) for whom he acts as alternate, in addition to his own vote if he is also a Member or Chairman (as the case may be). Execution by an alternate Member or Chairman (as the case may be) of any resolution of the Panel shall, unless the notice of his appointment provides to the contrary, be as effective as execution by his appointor.
- 4.4 An alternate Member or Chairman (as the case may be) shall ipso facto cease to be an alternate Member or Chairman (as the case may be) if his appointor ceases for any reason to be a Member or Chairman (as the case may be).
- 4.5 References in this Constitution to a Member or Chairman (as the case may be) shall, unless the context otherwise requires, include his duly appointed alternate.

5. Representation and voting

- 5.1 The Chairman and each other Member shall be entitled to attend and be heard at every meeting of the Panel. One adviser (or such greater number as the Chairman shall permit) shall be entitled to attend any meeting of the Panel with each Member



- and shall be entitled to speak at any meeting but shall not be entitled to vote on any issue.
- 5.2 Each Member (including the Chairman) shall be entitled to cast one vote. In the event of an equality of votes, the Chairman shall have a second or casting vote.
- 6. The Chairman**
- 6.1 Upon retirement or removal by OETC of the first and each successive Chairman, OETC shall appoint a person to act as Chairman.
- 6.2 OETC may at any time remove the Chairman from office.
- 6.3 The Chairman shall preside at every meeting of the Panel at which he is present. If the Chairman is unable to be present at a meeting, he may appoint an alternate pursuant to Clause 4.1 of this Appendix A to act as Chairman. If neither the Chairman nor any other person appointed to act as Chairman is present within half an hour after the time appointed for holding the meeting, the Members present appointed by OETC, may appoint one of their number to be Chairman of the meeting.
- 6.4 The Chairman, or the person appointed to act as Chairman by the Chairman shall be entitled to cast one vote. Where a Member is acting in the capacity of both Member and Chairman, he shall be entitled to cast one vote as Chairman, in addition to his one vote as Member.
- 7. The Secretary**
- 7.1 OETC shall have power to appoint and dismiss a Secretary and such other staff for the Panel as it may deem necessary. The Secretary may, but need not be, a Member, but shall not be a Member by virtue only of being Secretary. The Secretary shall have the right to speak at, but, unless a Member, no right to cast a vote at any meeting.
- 7.2 The Secretary's duties shall be to attend to the day to day operation of the Panel and, in particular, to;
- i) attend to the requisition of meetings and to serve all requisite notices;
 - ii) maintain a register of names and addresses of Members and the Chairman and such alternates as may be appointed from time to time;
 - iii) maintain a register of names and addresses of persons in each of the groups of persons described in sub-clauses 3.1(a) to (j) of this Appendix A; and
 - iv) keep minutes of all meetings.
- 7.3 The Secretary shall make available the register of names and addresses referred to in sub-clauses 7.2(ii) and (iii) above, to Licensed Distributors, Distribution System Users and/or the Regulatory Authority for inspection within a reasonable period of being requested to do so.
- 7.4 If the office of a Member is vacated the Secretary shall notify (insofar as he is reasonably able) the group or person whom the Member represented and they shall appoint a new Member as provided in Clause 3 of this Appendix A.
- 8. Meetings**
- 8.1 Subject always to the direction of OETC and the Regulatory Authority, the Panel meetings shall operate as follows:
- (a) the Panel shall meet on the first Monday in the months of May, August, November and February and as necessary for the transaction of business whenever convened by the Chairman at such times as may be determined by the Regulatory Authority, and in any event shall meet not less than 4 times each year; If the first Monday of that month



happens to be a holiday, then alternate date will be communicated by the Chairman of the Panel.

- (b) notwithstanding the right of the Chairman to call a meeting of the Panel whenever appropriate, the Chairman shall call a meeting when requested by a notice in writing to do so by two or more Members;
- (c) unless agreed by all Members, not less than 14 Business Days prior written notice shall be given to all Members of all meetings of the Panel;
- (d) the quorum of Members required for the Panel meetings shall not be less than 7 of the Members;
- (e) if within an hour of the time appointed for a meeting of the Panel a quorum is not present, the meeting shall stand adjourned for at least 2 Business Days. The re-adjourned meeting shall be deemed quorate and its proceedings valid notwithstanding there being fewer than seven Members present; and
- (f) subject to sub-paragraphs (d) and (e) above the following circumstances shall not (of themselves) invalidate proceedings of the Panel;
 - i) vacancies amongst the Panel;
 - ii) any defects in the appointment of Members; orthe accidental omission to give notice of a Meeting to, or the non-receipt of notice of a meeting by a person entitled to receive notice.

9. Grid Code Revisions

- 9.1 All proposed revisions to the Grid Code must be reviewed by the Panel prior to their implementation. All revisions proposed by Users, the Regulatory Authority or OETC should be brought before the Panel by the Chairman for consideration. The Chairman will advise the Panel, Users, and the Regulatory Authority of all proposed revisions to the Grid Code with notice of no less than 20 Business Days in advance of the next scheduled meeting of the Panel
- 9.2 Following review of a proposed revision by the Panel, the Chairman will, if appropriate, apply to the Regulatory Authority to approve the revision of the Grid Code based on the Panel recommendation. The Chairman, in applying to the Regulatory Authority, shall also notify each User of the proposed revision and other views expressed by the Panel and Users so that each User may consider making representations directly to the Regulatory Authority regarding the proposed revision.
- 9.3 The Regulatory Authority 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.
- 9.4 If the Panel is directed by the Regulatory Authority that the revision shall be made, the Chairman shall notify each User of the revision at least 10 Business Days prior to the revision taking effect, and the revision shall take effect (and the 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 Regulatory Authority.

10. Resolutions

- 10.1 A resolution of the Panel shall be passed by a simple majority of votes cast.
- 10.2 A resolution in writing signed by all Members shall be as valid and effective as if it had been passed at a meeting of the Panel duly convened and held. One or more counterparts may produce written resolutions.
- 10.3 A meeting of the Panel may consist of a conference between Members who are not all in one place but who are able (directly or by telephonic communication) to speak to



each of the others and to be heard by each of the others simultaneously. The word "meeting" shall be construed accordingly.

11. Minutes

- 11.1 The Secretary shall circulate copies of the minutes of each meeting of the Panel to each Member as soon as practicable (and in any event within 15 Business Days) after the relevant meeting has been held.
- 11.2 Each Member shall notify the Secretary of his approval or disapproval of the minutes of each meeting within 15 Business Days of receipt of the minutes. A Member who fails to do so will be deemed to have approved the minutes. The approval or disapproval of the minutes aforesaid will not affect the validity of decisions taken by the Panel at the meeting to which the minutes relate.
- 11.3 If the Secretary receives any comments on the minutes, the Secretary shall circulate revised minutes as soon as practicable following the expiry of the period referred to in Clause 11.2 of this Appendix A, incorporating those comments which are of a typographical nature and indicating, where necessary, that Members disagree with certain aspects of the minutes. The Secretary shall then incorporate those aspects of the minutes upon which there is disagreement, into the agenda for the next following meeting of the Panel, as the first item for discussion, and, if possible, resolution.

12. Guidance from the Panel

- 12.1 The Panel may at any time, and from time to time, issue guidance in relation to the Grid Code and its implementation, performance and interpretation, and it may establish subcommittees and working groups to carry out such work.

13. Sub-committees and working groups

- 13.1 The Panel may establish such sub-committees from time to time consisting of such persons as it considers desirable. Each sub-committee shall be subject to such written terms of reference and shall be subject to such procedures as the Panel may determine. The meetings of sub-committees shall so far as possible be arranged so that the minutes of such meetings can be presented to the Members in sufficient time for consideration before the next following meeting of the Panel.
- 13.2 The Panel may further establish working groups to advise it on any matter from time to time. Such working groups may consist of Members and/or others as the Panel may determine for the purpose.
- 13.3 Resolutions of sub-committees and working groups shall not have binding effect unless approved by resolution of the Panel.

14. Removal of Members and Chairman and vacation of office

- 14.1 The office of a Member shall be vacated if;
 - (a) he resigns his office by notice delivered to the Secretary;
 - (b) he becomes bankrupt or compounds with his creditors generally;
 - (c) he becomes of unsound mind or a patient for any purpose of any statute relating to mental health; or



- (d) he or his alternate fails to attend more than three consecutive meetings of the Panel without submitting an explanation to the Chairman which is reasonably acceptable to the Chairman.
- 14.2 Further, any person or persons entitled to appoint a Member or the Chairman, as the case may be, pursuant to Clause 3 may at any time remove that Member or the Chairman, as the case may be, from office and appoint another person to be a Member or the Chairman, as the case may be, in its place. A person or persons will only have the right to remove from office the Member or the Chairman, as the case may be, that it or they have appointed, and will have no right to remove from office any Member or the Chairman, as the case may be, appointed by another person. Whenever any individual Member or the Chairman changes, the person or group of persons entitled to appoint that Member or the Chairman shall notify the Secretary in writing within seven days of the change taking effect.
- 15. Members on the panel's responsibilities and protections**
- 15.1 In the exercise of its powers and the performance of its duties and responsibilities, the Panel shall have due regard for the need to promote the attainment of the principal objects of the Panel set out in Clause 2 of this Appendix A.
- 15.2 In the exercise of its powers and the performance of its duties and responsibilities as a Member, a Member shall represent the interests of that person or persons by whom he is for the time being appointed pursuant to Clause 3, provided that such obligation of representation shall at all times be subordinate to the obligations of the Member as a Member of the Panel set out in Clause 15.1 of this Appendix A.
- 15.3 The Panel, each Member and the Secretary;
- i) shall be entitled to rely upon any communication or document reasonably believed by it or him to be genuine and correct and to have been communicated or signed by the person by whom it purports to be communicated or signed; and
 - ii) may in relation to any act, matter or thing contemplated by this Constitution act on the opinion or advice of, or any information from, any chartered engineer, lawyer, or expert in any other field, and shall not be liable for the consequences of so acting.
- 15.4 The Panel shall enjoy no status, immunity or privilege of the Sultanate of Oman. However, Members shall not be personally liable in respect of the performance of the functions of the Grid Code Review Panel.
- 16. Group representatives' addresses**
- 16.1 Each Member shall from time to time communicate his address to the Secretary and all notices sent to such address shall be considered as having been duly given to such Member.
- 17. Confidentiality**
- 17.1 Each Member shall keep confidential all information, which that Member might reasonably be expected to understand to be confidential.

The Grid Code

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The Grid Code

Preface

Issued April 2010

This document is the Grid Code referred to in the Sector Law [(Articles 22 & 23)] and the Transmission and Dispatch Licence granted by the Regulatory Authority to the Oman Electricity Transmission Company SAOC ("OETC") under that Law. It contains rules in relation to the planning, development, Connection to, Operation and maintenance of and changes to OETC's Transmission System.

The Grid Code applies to all entities that are connected to and/or use the Transmission System. However, individual parts of the Grid Code may be applicable to only some parties who have acceded to the Grid Code as a whole. Each constituent part of the Grid Code specifies which Person it applies to.

Terms and expressions used in the Grid Code are defined either in the relevant section of the Grid Code entitled "Abbreviations and Definitions" or, in some cases, in individual Grid Code sections.

The Grid Code contains the following constituent parts;

- General Conditions;
- Data Transfer Code;
- Alerts Summary Code;
- Planning Code;
- Connection Conditions Code;
- Operating Codes;
 - OC1 Demand Forecasting;
 - OC2 Operational Planning;
 - OC3 Operating Margin;
 - OC4 Demand Control;
 - OC5 Notice of Operations & Incidents, & Significant Incident Reporting;
 - OC6 Safety Coordination;
 - OC7 Contingency Planning;
 - OC8 Numbering and Nomenclature of HV Plant;
 - OC9 Operational Tests & Site Investigations;
- Scheduling and Dispatch Codes;
 - SDC1 Generation and Desalination Scheduling;
 - SDC2 Generation and Desalination Dispatch;
 - SDC3 Frequency Control;
- Ancillary Services Code;
- Metering and Data Exchange Code;
- Abbreviations and Definitions;



This Grid Code shall not constitute a contract between any of the parties to it. All Licensees (including OETC, Licensed Generators, Licensed Generators/Desalinators, Licensed Distribution System Operators and RAEC when connected to the Transmission System) will be party to it as will other parties Connected to the Transmission System. Some of these parties may have contractual obligations, created by separate documents (including Connection Agreements), to each other to comply with the Grid Code.

Nothing in this Grid Code shall entitle any party to it or any other person to any contractual or other general Law right or remedy of whatsoever kind and howsoever arising in respect of this Grid Code. Each party's liability to each other party shall be limited to one (1) Omani Rial.

However, nothing in this Grid Code (including this paragraph) shall affect any legal right or remedy that may exist between any two parties to this Grid Code under any such separate agreement between or any duty arising under the terms of any Licence granted pursuant to the [title of Sector Law] or pursuant to that Law. In particular, nothing in this Grid Code shall preclude the Regulatory Authority from taking such enforcement action in relation to it, the Sector Law or any Licence granted there under as it sees fit.

Each party to this Grid Code shall at all times deal with all other parties in good faith. All parties to the Grid Code shall at all times perform all of their obligations in accordance with Good Industry Practice.



General Conditions

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General Conditions

GC.1 Introduction

The individual sections of the Grid Code contain the rules and provisions relating specifically to that individual section of the Grid Code. There are also provisions of a more general application, which need to be included in the Grid Code to allow the various sections of the Grid Code to work together. Such provisions are included in these General Conditions.

GC.2 Objective

The objectives of the General Conditions are as follows

- To ensure, insofar as it is possible, that the various sections of the Grid Code work together for the benefit of OETC and all Users; and
- To provide a set of principles governing the status and development of the Grid Code and related issues as approved by the Regulatory Authority.

GC.3 Scope of Grid Code and General Conditions

The General Conditions apply to OETC and to all Parties to the Grid Code.

GC.4 Grid Code Review Panel

OETC shall establish and maintain the Grid Code Review Panel, which shall be a standing body, constituted;

- to generally review, discuss and develop the Grid Code and its implementation;
- to review and discuss suggestions for amendments to the Grid Code which OETC, the Regulatory Authority or any User may wish to submit to OETC for consideration from time to time;
- to discuss what changes are necessary to the Grid Code arising out of any unforeseen circumstances referred to it by OETC;
- to review existing Oman Electrical Standards relevant to OETC's Transmission System and make recommendations to the Regulatory Authority concerning modifications to existing Oman Electrical Standards or proposals for new Oman Electrical Standards relevant to OETC's Transmission System;
- to publish recommendations and ensure that User consultation upon such recommendations has occurred through Members; and
- Issue guidance in relation to the Grid Code and its implementation, performance and interpretation when asked to by a User.

The Grid Code Review Panel shall be governed by a constitution (given as Appendix A) which defines its scope, Membership, duties, and rules of conduct, operation and further development of the Grid Code as approved by the Regulatory Authority.

The Panel shall consist of;

- a chairman and up to 2 persons appointed by OETC;
- a person appointed by the Regulatory Authority;
- a person appointed by PWP;
- a person appointed by PAEW;
- 2 persons representing all Power Producers that each have Production Facilities with a total Registered Capacity in excess of 100 MW;



- 2 persons representing all Power Producers that each having Centrally Dispatched Production Facilities with a total Registered Capacity of 100 MW or less;
- 1 person representing each Licensed Distributor;
- 1 person representing Internally Interconnected Parties;
- 1 person representing International Interconnected Parties; and
- 1 person representing RAEC.

GC.5 Grid Code Revisions

All revisions to the Grid Code must be reviewed by the Grid Code Review Panel prior to application to the Regulatory Authority by the Chairman. All proposed revisions from Users, the Regulatory Authority or OETC shall be brought before the Grid Code Review Panel by the Chairman for consideration. The Chairman will advise the Grid Code Review Panel, all Users, and the Regulatory Authority of all proposed revisions to the Grid Code with notice of no less than 20 Business Days in advance of the next scheduled meeting of the Grid Code Review Panel.

Following review of a proposed revision by the Grid Code Review Panel, the Chairman will apply to the Regulatory Authority for revision of the Grid Code based on the Grid Code Review Panel recommendation. The Chairman, in applying to the Regulatory Authority, shall also notify each User of the proposed revision and other views expressed by the Grid Code Review Panel and Users so that each User may consider making representations directly to the Regulatory Authority regarding the proposed revision.

The Regulatory Authority 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.

Having been so directed by the Regulatory Authority that the revision shall be made, the Chairman shall notify each User of the revision at least 10 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 Regulatory Authority.

GC.6 Derogations

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 OETC and the Regulatory Authority and shall make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable. Non-compliance may result;

- with reference to Plant Connected to the Transmission System and is caused solely or mainly as a result of a revision to the Grid Code; and
- with reference to Plant which is Connected, approved to Connect or for which approval to Connect to the Transmission System is being sought.

When a User believes either that it would be unreasonable (including on the grounds of 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 Regulatory Authority a request for derogation from such provision and shall provide OETC and PWP with a copy of such application.

If OETC finds that it is, or will be, unable to comply with any provision of the Grid Code at any time, then it shall make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.



In the case where OETC requests derogation, OETC shall submit the information set out in paragraph GC.6.1 to the Regulatory Authority.

GC.6.1 Requests for Derogation

A request for derogation from any provision of the Grid Code shall contain;

- (a) The reference number and the date of the Grid Code provision against which the non-compliance or predicted non-compliance was identified;
- (b) The detail of the Plant in respect of which derogation is sought and, if relevant, the nature and extent of non-compliance;
- (c) The provision of the Grid Code with which the User is, or will be, unable to comply;
- (d) The reason for the non-compliance; and
- (e) The date by which compliance could be achieved (if remedy of the non-compliance is possible).

On receipt of any request for derogation, the Regulatory Authority shall promptly consider such a request. Provided that the Regulatory Authority considers that the grounds for the derogation are reasonable, the Regulatory Authority shall grant such derogation unless the derogation would, or is likely to;

- Have a material adverse impact on the security and/or stability of the Total System; or
- Impose unreasonable costs on the Operation of the Total System or on other Users.

In its consideration of a derogation request by a User, the Regulatory Authority may contact the relevant User and/or OETC to obtain clarification of the request or to discuss changes to the request.

Derogations from any provision of the Grid Code shall contain;

- (a) The reference number and the date of the Grid Code provision against which the derogation applies;
- (b) The detail of the Plant in respect of which a derogation applies and, if relevant, the nature and extent to which the derogation applies including alternative compliance provisions;
- (c) The identification of the provision with which the derogation applies;
- (d) The reason for the non-compliance requiring derogation; and
- (e) The date by which the derogation shall expire.

To the extent of any derogation granted in accordance with this paragraph GC.6.1, OETC and/or the User (as the case may be) shall be relieved from any 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 alternative provisions identified in the derogation.

OETC shall;

- (a) Keep a register of all derogations which have been granted, identifying the name of the person and User in respect of whom the derogation has been granted, the relevant provision of the Grid Code and the period of the derogation; and
- (b) On request from any User, provide a copy of such register of derogations to such User.

The Regulatory Authority may initiate at the request of OETC or Users a review of any existing derogations, and any derogations under consideration where a relevant and material change in circumstance has occurred.



GC.7 Unforeseen Circumstances

If circumstances arise which the provisions of the Grid Code have not foreseen, OETC shall to the extent reasonably practicable in the circumstances, consult all affected Users in an effort to reach agreement as to what should be done and submit a proposal to the Grid Code Review Panel for consideration.

If OETC and affected Users are not able to agree, OETC will take any action necessary to ensure that it meets its License conditions wherever practical taking into account the views expressed by the Users.

Thereafter, OETC shall refer the matter relating to the unforeseen circumstances and any such determinations to the Grid Code Review Panel with a proposal for consideration.

GC.8 Hierarchy

In the event of any irreconcilable conflict between the provisions of the Grid Code and any contract, agreement, or arrangement between OETC and a User;

- (a) If the contract agreement or arrangement exists at the date this Grid Code first comes into force, it shall, unless and to the extent (1) specifically provided for in the Grid Code or in the contract agreement or arrangement or (2) that the User has agreed to comply with the Grid Code, prevail over this Grid Code for two years from the date upon which this Grid Code is first in effect; and
- (b) In all other cases, the provisions of the Grid Code shall prevail unless the Grid Code expressly provides otherwise.

GC.9 Illegality and Partial Invalidity

If any provision of the Grid Code should be found to be unlawful or wholly or partially invalid for any reason, the validity of all remaining provisions of the Grid Code shall not be affected.

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 minimum modification as may be;

- (a) necessary to make it valid and effective; and
- (b) most closely achieves the result of the original wording,

but without affecting the meaning or validity of any other provision of the Grid Code. OETC shall prepare a proposal to correct the default for consideration by the Grid Code Review Panel.

GC.10 Time of Effectiveness

This Grid Code shall have effect, as regards a new User, at the time at which its Connection Agreement comes into effect.

GC.11 Code Notices

Any notice to be given under the Grid Code shall be in writing and shall be duly given if signed by or on behalf of a Person duly authorised to do so by the party giving the notice and delivered by hand at, or sent by post, or facsimile transmission or e-mail to the relevant address, facsimile number or e-mail address last established pursuant to these General Conditions.

OETC shall maintain a list of contact details for itself and all Users containing the telephone, facsimile, e-mail and postal addresses for all Users. OETC shall provide these details to any User in respect of any other User as soon as practicable after receiving a request.



Both OETC and all Users shall be entitled to amend in any respect their contact details previously supplied and OETC shall keep the list up to date accordingly.

Any notice required to be given by this Grid Code shall be deemed to have been given or received;

- if sent by hand, at the time of delivery;
- if sent by post, from and to any address within Oman, 4 Business Days after posting unless otherwise proven; or
- if sent by facsimile, subject to confirmation of uninterrupted transmission report, or by e-mail, one hour after being sent, provided that any transmission sent after 14:00 hours on any day shall be deemed to have been received at 8:00 hours on the following Business Day unless the contrary is shown to be the case.

GC.12 Code Disputes

If any dispute arises between Users or between OETC and any User in relation to this Grid Code, either party may by notice to the other seek to resolve the dispute by negotiation in good faith.

If the parties fail to resolve any dispute by such negotiations within 14 days of the giving of a notice under the previous paragraph then;

- (a) Either party shall be entitled by written notice to the other to require the dispute to be referred to a meeting of Members of the boards of directors of the parties or, if no such directors are present in Oman, the most senior executive of each party present in Oman;
- (b) If either party exercises its right under the sub-clause 12(a) each party shall procure that the relevant senior executives consider the matter in dispute and meet with senior executives of the other party within 14 days of receipt of the written notice of referral to attempt to reach agreement on the matter in question; or
- (c) If the parties fail to resolve any dispute which has been referred to directors/senior executives under the sub-clause 12(a), either party may refer the matter to the Regulatory Authority for determination as the Regulatory Authority sees fit. All parties shall be bound by any decision of the Regulatory Authority. If it sees fit the Regulatory Authority may;
determine the dispute itself; or
Refer the dispute for determination by arbitration.

If the dispute is referred by the Regulatory Authority to arbitration, the Regulatory Authority shall serve a written notice on the parties to the dispute to that effect and the Rules of Conciliation and Arbitration of the International Chamber of Commerce (the "ICC Rules") shall govern such arbitration save to the extent that the same are inconsistent with the express provisions of the Grid Code.

Any arbitration conducted in accordance with the preceding paragraph shall be conducted;

- (a) in the city of Muscat in Oman;
- (b) in English; and
- (c) by a panel comprising an odd number of arbitrators provided that (i) there shall be not fewer than three arbitrators (ii) each of the parties to the dispute shall appoint an arbitrator and (iii) the Regulatory Authority shall appoint one arbitrator if there is an even number of parties to the dispute (in which case, the Regulatory Authority's appointee shall act as chairman of the panel) or two arbitrators if there



is an uneven number of parties to the dispute are (in which case the Regulatory Authority shall nominate one of its appointees to act as chairman of the panel).

Where the Grid Code provides that any dispute or difference of the parties in relation to a particular matter should be referred to an expert for resolution, such difference or dispute may not be referred to arbitration unless and until such expert determination has been sought and obtained.

The Regulatory Authority shall have the right to require that all disputes which are referred to it in accordance with paragraph GC12(c) above and are related, whether between the same parties or not, shall be consolidated and determined together either by the Regulatory Authority or by any arbitrator to which the Regulatory Authority has referred any dispute.

Any arbitral award shall be final and binding on the parties.

GC.13 Code Confidentiality

Several parts of the Grid Code specify the extent of confidentiality, which applies to data supplied by Users to OETC. Unless otherwise specifically stated in the Grid Code, OETC shall be at liberty to share all data with Users likely to be affected by the matters concerned and with the PWP. In all cases, OETC is at liberty, and may be required, to share the data with the Regulatory Authority.

GC.14 Interim Transitional Provisions

It is known (as at the date that this Grid Code is first established) that a contract has been awarded for the design, construction and commissioning of a new load dispatch centre. This event may give rise to the need for changes to the Grid Code.

As soon as practicable, OETC will propose changes to the Grid Code which it considers necessary or expedient in order to take account of the relevant circumstances referred to above. Whilst the rules for changes to the Grid Code described elsewhere in this Grid Code shall apply to these proposals for changes OETC, PWP, and all Users shall co-operate fully with a view to agreeing the necessary changes. No such Person shall be entitled to prevent the implementation of any change which is necessary or expedient and approved by the Regulatory Authority.

GC.15 Interpretation

In this Grid Code, unless the context otherwise requires;

- references to "this Grid Code" or "the Grid Code" are reference to the whole of the Grid Code, including any schedules or other documents attached to any part of the Grid Code;
- the singular includes the plural and vice versa;
- any one gender includes the others;
- references to Code sections, paragraphs, clauses or schedules are to Code sections, paragraphs, clauses or schedules of this Grid Code;
- code, paragraph and schedule headings are for convenience of reference only and do not form part of and shall neither affect nor be used in the construction of this Grid Code;
- reference to any law, regulation made under any law, standard, secondary legislation, contract, agreement or other legal document shall be to that item as amended, modified or replaced from time to time. In particular, any reference to any licence shall be to that licence as amended, modified or replaced from time to time and to any rule, document, decision or arrangement promulgated or established under that Licence;



- references to the consent or approval of the Regulatory Authority shall be references to the approval or consent of the Regulatory Authority in writing, which may be given subject to such conditions as may be determined by the Regulatory Authority, as that consent or approval may be amended, modified, supplemented or replaced from time to time and to any proper order, instruction or requirement or decision of the Regulatory Authority given, made or issued under it;
- all references to specific dates or periods of time shall be calculated according to the Gregorian calendar and all references to specific dates shall be to the day commencing on such date at 00:00 hours;
- where a word or expression is defined in this Grid Code, cognate words and expressions shall be construed accordingly;
- references to "person" or "persons" include individuals, firms, companies, government agencies, committees, departments, ministries and other incorporate and unincorporated bodies as well as to individuals with a separate legal personality or not;
- the words "include", "including" and "in particular" shall be construed as being by way of illustration or emphasis and shall not limit or prejudice the generality of any foregoing words; and
- Terms and expressions defined in the [insert title of Sector Law] shall have the same meanings in this Grid Code. In particular, the following words and expressions shall have the meanings ascribed to them in that Sector Law.



Appendix A Constitution Of The Grid Code Review Panel

1. Definitions and Interpretation

1.1 The following words and expressions shall have the following meanings in this Constitution;

"**Chairman**" means the person appointed by OETC under Clause 6 of this Constitution to act as the chairperson of the Panel;

"**Constitution**" means the constitution and rules of the Panel as set out herein and as may be amended from time to time with the approval of the Regulatory Authority;

"**Grid Code**" means the Grid Code drawn up pursuant to Condition 3 of OETC's Transmission Licence;

"**Licence**" has the meaning given it in the Sector Law;

"**Member**" means a person appointed to act as a representative of the persons or groups referred to in Clause 3 on the Panel;

"**Panel**" means the Grid Code Review Panel established by the OETC in accordance with the Grid Code (section GC.4) and governed by this Constitution;

"**Secretary**" means the person appointed by OETC pursuant to Clause 7 and named as such;

"**Sector Law**" means Sultani Decree No. [/2003] promulgating the law governing the privatisations and regulation of the electricity sector in Oman;

"**OETC**" means the Oman Electricity Transmission Company in its capacity as holder of a Transmission Licence;

"**Transmission Licence**" means a Licence to transmit electricity granted pursuant to the Sector Law;

1.2 Except as otherwise provided herein and unless the context otherwise admits, words and expressions used herein shall have the meanings given to them in the Grid Code.

1.3 Words importing the singular only also include the plural and vice versa where the context requires. Words importing the masculine only also include the feminine.

1.4 Headings and titles shall not be taken into consideration in the interpretation or construction of the words and expressions used herein.

1.5 Unless otherwise stated, any reference to a Clause is a reference to a Clause of this Constitution.

2. Principal objects

2.1 The Panel has been established by OETC to further the objectives set out below and such other objectives as the Regulatory Authority may stipulate from time to time;

- (a) to generally review, discuss and develop the Grid Code and its implementation;
- (b) to review and discuss suggestions for amendments to the Grid Code which OETC, the Regulatory Authority or any User may wish to submit to OETC for consideration from time to time;
- (c) to discuss what changes are necessary to the Grid Code arising out of any unforeseen circumstances referred to it by OETC;
- (d) to review existing Oman Electrical Standards relevant to OETC's Transmission System and make recommendations to the Regulatory Authority concerning



modifications to existing Oman Electrical Standards or proposals for new Oman Electrical Standards relevant to OETC's Transmission System;

- (e) to determine which contractors should be approved to work on OETC's Transmission System;
- (f) to approve equipment that may be used on or form part of OETC's Transmission System;
- (g) to publish recommendations and ensure that User consultation upon such recommendations has occurred through Members; and
- (h) issue guidance in relation to the Grid Code and its implementation, performance and interpretation when asked to by a User.

3. Membership and Appointment

3.1 The Panel shall comprise;

- (a) the Chairman and up to 2 persons appointed by OETC;
- (b) a person appointed by the Regulatory Authority;
- (c) a person appointed by PWP;
- (d) a person appointed by PAEW;
- (e) 2 persons representing all Power Producers that each have Production Facilities with a total Registered Capacity in excess of 100 MW;
- (f) 2 persons representing all Power Producers that each have Centrally Dispatched Production Facilities with a total Registered Capacity of 100 MW or less;
- (g) 1 person representing each Licensed Distributor;
- (h) 1 person representing Internally Interconnected Parties;
- (i) 1 person representing International Interconnected Parties; and
- (j) 1 person representing RAEC.

3.2 Each person appointed as specified at Clause 3.1 shall be a Member of the Panel. If at any time any of the persons or groups identified at Clauses 3.1(a) to (j) are unable to agree on a representative to act as their Member, the Chairman shall contact (insofar as he is reasonably able) the person(s) or group(s) unable to agree and seek to encourage appointment or, as appropriate, unanimous agreement between relevant persons as to their prospective Member. If no such agreement is reached at least 21 Business Days prior to the next meeting of the Panel (or the first meeting of the Panel, as the case may be) the Chairman shall request the Regulatory Authority to make such appointment and the Regulatory Authority shall have the right, until the relevant person or group of persons has decided upon an appointment and notified the Regulatory Authority and the Chairman accordingly, to appoint a Member or Members on behalf of that person or group of persons, and to remove (if appropriate) any person so appointed by it.

3.3 No person other than an individual shall be appointed a Member or his alternate.

3.4 After the Panel has been established for one year;

- (a) each Member shall retire automatically at the beginning of the meeting of the Panel held on the first Business Day in the month of February each year (or if no meeting is held on such day, at the meeting which is held on the date falling closest after that day) but shall be eligible for re-appointment.



- (b) Each person or group of persons entitled to appoint a Member (or a person within such group of persons) may, by notice in writing to the Chairman, indicate its wish to re-appoint the retiring Member or to appoint a new person as a Member in his place.
 - (c) The relevant person(s) must deliver such notifications for re-appointment or appointment to the Chairman at least 21 Business Days in advance of the relevant meeting of the Panel or group(s) entitled to appoint a Member. A notification for re-appointment in respect of an existing Member shall be deemed to be given if no notification is delivered to the Chairman at least 21 Business Days in advance of the relevant meeting of the Panel.
 - (d) If only one notification is received for the re-appointment of a Member or appointment of a new person as a Member (or if all notifications received are unanimous), the person named in the notifications(s) will become the Member with effect from the beginning of the relevant meeting of the Panel. If the notifications are not unanimous, the provisions of Clause 3.2 of this Appendix A shall govern the appointment of the Member.
 - (e) These provisions shall apply equally to persons or groups of persons entitled to appoint more than one Member, with any necessary changes to reflect that more than one Member is involved.
- 4. Alternates**
- 4.1 Each Member (and the Chairman) shall have the power to appoint any individual to act as his alternate and remove (at his discretion) any alternate Member or Chairman (as the case may be) so appointed. Any appointment or removal of an alternate Member or Chairman shall be effected by notice in writing executed by the appointor and delivered to the Secretary or tendered at a meeting of the Panel.
 - 4.2 If his appointor so requests, an alternate Member or Chairman (as the case may be) shall be entitled to receive notice of all meetings of the Panel or of sub-committees or working groups of which his appointor is a Member. He shall also be entitled to attend and vote as a Member or Chairman (as the case may be) at any such meeting at which the Member or Chairman (as the case may be) appointing him is not personally present and at any such meeting to exercise and discharge all the functions, powers and duties of his appointor as a Member or Chairman (as the case may be) and for the purpose of the proceedings at the meeting the provisions of this Constitution shall apply as if he were a Member or Chairman (as the case may be).
 - 4.3 Every person acting as an alternate Member or Chairman (as the case may be) shall have one vote for each Member or Chairman (as the case may be) for whom he acts as alternate, in addition to his own vote if he is also a Member or Chairman (as the case may be). Execution by an alternate Member or Chairman (as the case may be) of any resolution of the Panel shall, unless the notice of his appointment provides to the contrary, be as effective as execution by his appointor.
 - 4.4 An alternate Member or Chairman (as the case may be) shall ipso facto cease to be an alternate Member or Chairman (as the case may be) if his appointor ceases for any reason to be a Member or Chairman (as the case may be).
 - 4.5 References in this Constitution to a Member or Chairman (as the case may be) shall, unless the context otherwise requires, include his duly appointed alternate.
- 5. Representation and voting**
- 5.1 The Chairman and each other Member shall be entitled to attend and be heard at every meeting of the Panel. One adviser (or such greater number as the Chairman shall permit) shall be entitled to attend any meeting of the Panel with each Member



- and shall be entitled to speak at any meeting but shall not be entitled to vote on any issue.
- 5.2 Each Member (including the Chairman) shall be entitled to cast one vote. In the event of an equality of votes, the Chairman shall have a second or casting vote.
- 6. The Chairman**
- 6.1 Upon retirement or removal by OETC of the first and each successive Chairman, OETC shall appoint a person to act as Chairman.
- 6.2 OETC may at any time remove the Chairman from office.
- 6.3 The Chairman shall preside at every meeting of the Panel at which he is present. If the Chairman is unable to be present at a meeting, he may appoint an alternate pursuant to Clause 4.1 of this Appendix A to act as Chairman. If neither the Chairman nor any other person appointed to act as Chairman is present within half an hour after the time appointed for holding the meeting, the Members present appointed by OETC, may appoint one of their number to be Chairman of the meeting.
- 6.4 The Chairman, or the person appointed to act as Chairman by the Chairman shall be entitled to cast one vote. Where a Member is acting in the capacity of both Member and Chairman, he shall be entitled to cast one vote as Chairman, in addition to his one vote as Member.
- 7. The Secretary**
- 7.1 OETC shall have power to appoint and dismiss a Secretary and such other staff for the Panel as it may deem necessary. The Secretary may, but need not be, a Member, but shall not be a Member by virtue only of being Secretary. The Secretary shall have the right to speak at, but, unless a Member, no right to cast a vote at any meeting.
- 7.2 The Secretary's duties shall be to attend to the day to day operation of the Panel and, in particular, to;
- i) attend to the requisition of meetings and to serve all requisite notices;
 - ii) maintain a register of names and addresses of Members and the Chairman and such alternates as may be appointed from time to time;
 - iii) maintain a register of names and addresses of persons in each of the groups of persons described in sub-clauses 3.1(a) to (j) of this Appendix A; and
 - iv) keep minutes of all meetings.
- 7.3 The Secretary shall make available the register of names and addresses referred to in sub-clauses 7.2(ii) and (iii) above, to Licensed Distributors, Distribution System Users and/or the Regulatory Authority for inspection within a reasonable period of being requested to do so.
- 7.4 If the office of a Member is vacated the Secretary shall notify (insofar as he is reasonably able) the group or person whom the Member represented and they shall appoint a new Member as provided in Clause 3 of this Appendix A.
- 8. Meetings**
- 8.1 Subject always to the direction of OETC and the Regulatory Authority, the Panel meetings shall operate as follows:
- (a) the Panel shall meet on the first Monday in the months of May, August, November and February and as necessary for the transaction of business whenever convened by the Chairman at such times as may be determined by the Regulatory Authority, and in any event shall meet not less than 4 times each year; If the first Monday of that month



happens to be a holiday, then alternate date will be communicated by the Chairman of the Panel.

- (b) notwithstanding the right of the Chairman to call a meeting of the Panel whenever appropriate, the Chairman shall call a meeting when requested by a notice in writing to do so by two or more Members;
- (c) unless agreed by all Members, not less than 14 Business Days prior written notice shall be given to all Members of all meetings of the Panel;
- (d) the quorum of Members required for the Panel meetings shall not be less than 7 of the Members;
- (e) if within an hour of the time appointed for a meeting of the Panel a quorum is not present, the meeting shall stand adjourned for at least 2 Business Days. The re-adjourned meeting shall be deemed quorate and its proceedings valid notwithstanding there being fewer than seven Members present; and
- (f) subject to sub-paragraphs (d) and (e) above the following circumstances shall not (of themselves) invalidate proceedings of the Panel;
 - i) vacancies amongst the Panel;
 - ii) any defects in the appointment of Members; orthe accidental omission to give notice of a Meeting to, or the non-receipt of notice of a meeting by a person entitled to receive notice.

9. Grid Code Revisions

- 9.1 All proposed revisions to the Grid Code must be reviewed by the Panel prior to their implementation. All revisions proposed by Users, the Regulatory Authority or OETC should be brought before the Panel by the Chairman for consideration. The Chairman will advise the Panel, Users, and the Regulatory Authority of all proposed revisions to the Grid Code with notice of no less than 20 Business Days in advance of the next scheduled meeting of the Panel
- 9.2 Following review of a proposed revision by the Panel, the Chairman will, if appropriate, apply to the Regulatory Authority to approve the revision of the Grid Code based on the Panel recommendation. The Chairman, in applying to the Regulatory Authority, shall also notify each User of the proposed revision and other views expressed by the Panel and Users so that each User may consider making representations directly to the Regulatory Authority regarding the proposed revision.
- 9.3 The Regulatory Authority 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.
- 9.4 If the Panel is directed by the Regulatory Authority that the revision shall be made, the Chairman shall notify each User of the revision at least 10 Business Days prior to the revision taking effect, and the revision shall take effect (and the 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 Regulatory Authority.

10. Resolutions

- 10.1 A resolution of the Panel shall be passed by a simple majority of votes cast.
- 10.2 A resolution in writing signed by all Members shall be as valid and effective as if it had been passed at a meeting of the Panel duly convened and held. One or more counterparts may produce written resolutions.
- 10.3 A meeting of the Panel may consist of a conference between Members who are not all in one place but who are able (directly or by telephonic communication) to speak to



each of the others and to be heard by each of the others simultaneously. The word "meeting" shall be construed accordingly.

11. Minutes

- 11.1 The Secretary shall circulate copies of the minutes of each meeting of the Panel to each Member as soon as practicable (and in any event within 15 Business Days) after the relevant meeting has been held.
- 11.2 Each Member shall notify the Secretary of his approval or disapproval of the minutes of each meeting within 15 Business Days of receipt of the minutes. A Member who fails to do so will be deemed to have approved the minutes. The approval or disapproval of the minutes aforesaid will not affect the validity of decisions taken by the Panel at the meeting to which the minutes relate.
- 11.3 If the Secretary receives any comments on the minutes, the Secretary shall circulate revised minutes as soon as practicable following the expiry of the period referred to in Clause 11.2 of this Appendix A, incorporating those comments which are of a typographical nature and indicating, where necessary, that Members disagree with certain aspects of the minutes. The Secretary shall then incorporate those aspects of the minutes upon which there is disagreement, into the agenda for the next following meeting of the Panel, as the first item for discussion, and, if possible, resolution.

12. Guidance from the Panel

- 12.1 The Panel may at any time, and from time to time, issue guidance in relation to the Grid Code and its implementation, performance and interpretation, and it may establish subcommittees and working groups to carry out such work.

13. Sub-committees and working groups

- 13.1 The Panel may establish such sub-committees from time to time consisting of such persons as it considers desirable. Each sub-committee shall be subject to such written terms of reference and shall be subject to such procedures as the Panel may determine. The meetings of sub-committees shall so far as possible be arranged so that the minutes of such meetings can be presented to the Members in sufficient time for consideration before the next following meeting of the Panel.
- 13.2 The Panel may further establish working groups to advise it on any matter from time to time. Such working groups may consist of Members and/or others as the Panel may determine for the purpose.
- 13.3 Resolutions of sub-committees and working groups shall not have binding effect unless approved by resolution of the Panel.

14. Removal of Members and Chairman and vacation of office

- 14.1 The office of a Member shall be vacated if;
 - (a) he resigns his office by notice delivered to the Secretary;
 - (b) he becomes bankrupt or compounds with his creditors generally;
 - (c) he becomes of unsound mind or a patient for any purpose of any statute relating to mental health; or



- (d) he or his alternate fails to attend more than three consecutive meetings of the Panel without submitting an explanation to the Chairman which is reasonably acceptable to the Chairman.
- 14.2 Further, any person or persons entitled to appoint a Member or the Chairman, as the case may be, pursuant to Clause 3 may at any time remove that Member or the Chairman, as the case may be, from office and appoint another person to be a Member or the Chairman, as the case may be, in its place. A person or persons will only have the right to remove from office the Member or the Chairman, as the case may be, that it or they have appointed, and will have no right to remove from office any Member or the Chairman, as the case may be, appointed by another person. Whenever any individual Member or the Chairman changes, the person or group of persons entitled to appoint that Member or the Chairman shall notify the Secretary in writing within seven days of the change taking effect.
- 15. Members on the panel's responsibilities and protections**
- 15.1 In the exercise of its powers and the performance of its duties and responsibilities, the Panel shall have due regard for the need to promote the attainment of the principal objects of the Panel set out in Clause 2 of this Appendix A.
- 15.2 In the exercise of its powers and the performance of its duties and responsibilities as a Member, a Member shall represent the interests of that person or persons by whom he is for the time being appointed pursuant to Clause 3, provided that such obligation of representation shall at all times be subordinate to the obligations of the Member as a Member of the Panel set out in Clause 15.1 of this Appendix A.
- 15.3 The Panel, each Member and the Secretary;
- i) shall be entitled to rely upon any communication or document reasonably believed by it or him to be genuine and correct and to have been communicated or signed by the person by whom it purports to be communicated or signed; and
 - ii) may in relation to any act, matter or thing contemplated by this Constitution act on the opinion or advice of, or any information from, any chartered engineer, lawyer, or expert in any other field, and shall not be liable for the consequences of so acting.
- 15.4 The Panel shall enjoy no status, immunity or privilege of the Sultanate of Oman. However, Members shall not be personally liable in respect of the performance of the functions of the Grid Code Review Panel.
- 16. Group representatives' addresses**
- 16.1 Each Member shall from time to time communicate his address to the Secretary and all notices sent to such address shall be considered as having been duly given to such Member.
- 17. Confidentiality**
- 17.1 Each Member shall keep confidential all information, which that Member might reasonably be expected to understand to be confidential.



Data Transfer Code

Issued April 2010

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Data Transfer Code

DTC.1 Introduction

The Data Transfer Code provides a unified listing of all data that Users are required by the Grid Code to provide to OETC and that OETC is required to provide to Users.

In the event of inconsistencies between this DTC and other sections of the Grid Code the provisions in individual sections of the Grid Code shall prevail.

The relevant section of the Grid Code, under which any item of data is required, specifies the procedures, timing, and routing for the supply of that data and the updating and recording of temporary or permanent changes to that data.

DTC.2 Objective

The objectives of the DTC are as follows;

- to list and collate all requirements in respect of data to be provided by each category of User to OETC under the Grid Code;
- to list requirements in respect of all the data to be provided by OETC to each category of User under the Grid Code; and
- to provide an overview of the data requirements of certain sections of the Grid Code.

DTC.3 Scope

In addition to OETC, the DTC applies to;

- Power Producers;
- Licensed Distributors;
- Licensed Suppliers;
- Directly Connected Consumers;
- International Interconnected Parties
- Internally Interconnected Parties;
- PWP; and
- PAEW.



DTC.4 Data categories

The DTC groups data into a number of categories;

- **Standard Planning Data:** is that data listed in Appendix B to the Planning Code required for the purpose of determining any requirements to reinforce the Transmission System;
- **Detailed Planning Data:** is that data listed in Appendix C to the Planning Code required of carry out detailed stability studies as necessary;
- **System data:** is that data listed in Appendix D to the Planning Code required to enable Users to conduct their own studies as necessary;
- **Operational data:** is data related to Operating Code (OC) and Scheduling and Despatch Code (SDC) of the Grid Code. Within the DTC, Operational Data is sub-categorised according to the relevant Operating Code, namely OC1, OC2 or SDC, and;
- **Metering and Data Exchange Code data:** is that data listed in Appendix E Metering data.

DTC.5 Procedures and responsibilities

DTC.5.1. Responsibility for submission and updating of data

Users shall record, exchange and record data listed in the DTC in accordance with the provisions of relevant sections of the Grid Code.

DTC.5.2. Methods of submitting data

The data schedules to the DTC are structured, where possible, to serve as standard formats for submission of data to OETC and from OETC to Users. Unless agreed with OETC, all data provided by Users to OETC and by OETC to Users shall be provided in accordance with the DTC schedule formats where such formats are given.

Data submitted to OETC must include the name of the User representative submitting each schedule of data. The data is preferred in electronic format and may be submitted via a computer link if such a data link exists between a User and OETC or utilising a data transfer media, such as floppy diskette, magnetic tape, CD ROM etc after obtaining the prior written consent from OETC. If electronic means are not available, subject to OETC's prior agreement, data to be provided to OETC on a daily basis may be submitted by fax.

DTC.5.3. Changes to Users' data

All Users must notify OETC promptly of any change to an item of data that is registered with OETC in accordance with the relevant section of the Grid Code.

DTC.5.4. Data not supplied

Users and OETC are obliged to provide data as set out in and in accordance with the individual sections of the Grid Code. If a User fails to supply OETC with data required by a section of the Grid Code, OETC shall use its best estimate of the required data. OETC will advise a User in writing of any estimated data it intends to use concerning a User's Plant in the event that a User has not provided the required data.



If OETC fails to provide data required by a section of the Grid Code, the User to whom that data ought to have been supplied will use an estimate of the data not provided by OETC when, in that User's view, it is necessary to do so. A User will advise OETC in writing of any estimated data it intends to use in the event of data not being supplied.

OETC and User estimates of data not supplied will, in each case, be based upon data supplied previously for the same Plant or upon corresponding data for similar Plant or upon such other information as OETC or a User, as the case may be, deems appropriate.

Corrections to estimates of data not supplied shall be made by OETC or the User post event, where the data affects Operating Parameters,



DTC.6 Grid Code data exchanged between OETC and Users

Table 6.1 provides details of Schedules A to N of the DTC. OETC is a party to each Schedule, PWP is the recipient of the data in Schedules A to E and G and I

Table 6.1:

Schedule	Data type	Comprising	User	Grid Code section
A	Genset And Desalination Unit technical data.	Genset, Desalination Unit and Production Facility fixed Operating Parameters.	PP	PC SDC1
B	Generation/Operational Planning data.	Genset Operating Parameters required for Operational Planning.	PP	OC 2 SDC1
C	Scheduling And Despatch data.	Operating Parameters required for Scheduling and Despatch.	PP	SDC1
D	Generation Schedule data.	Data required for the preparation of the Generation Schedule.	PP	OC 1 & 2 SDC1 & 2
E	Genset and Desalination Unit Outage data	Genset and Production Facility equipment Outage planning data.	PP	OC 2
F	User System data.	Electrical parameters relating to Plant Connected to OETC Transmission System	PP, LD, DCC, OCP	PC
G	Load characteristics data	The estimated parameters of Loads in respect of harmonic content, sensitivity etc.	LD, DCC, OCP	PC
H	User Demand profiles & Active Energy data.	Data related to Demand profiles.	LD, DCC, OCP	PC OC1
I	Connection Point data.	Data related to Demand and Demand transfer capability.	PP, LD, DCC, OCP	PC OC 1
J	Demand Control data.	Data related Demand Control.	LD, LS, DCC, OCP	OC 1
K	Fault infeed data.	Data related to short circuit contribution to OETC Transmission System.	LD, DCC, OCP	PC
L	OETC data to Users	All relevant data	PP, LD, DCC, OCP	PC OC1, 2 & 6
M	Metering data	All relevant data	PP, LD, DCC, OCP	MDEC

**Key to Users**

	User
PWP	Power and Water Procurer
PP	Power Producers with Generating and Desalination Plant
LD	Licensed Distributors
LS	Licensed Suppliers
DCC	Directly Connected Consumers
OCP	Other Connected Parties: Users Connected to the Transmission System excluding PP, LD, LS, and DCC

Abbreviations used in all schedules:

MDEC	Metering and Data Exchange Code
OC	Operating Codes
PC B	Planning Code - Appendix B Standard Planning Data
PC C	Planning Code - Appendix C Detailed Planning Data
PC D	Planning Code - Appendix D System Data
SDC	Scheduling and Dispatch Codes

Notes:

- 1 The data marked with "+" is required with an application for a Connection Agreement (to facilitate an early assessment by OETC of the need for more detailed studies).



Schedule A: Genset And Desalination Unit technical data

The following details are required from each User with existing or proposed CDGensets, Directly Connected, or to be Directly Connected, to the Transmission System and/or with existing, or proposed Embedded CDGensets.

Production Facility name:.....

Ref.	Data description	Units	Grid Code	Genset/ Desalination Unit/ Production Facility (PF) data					
				FY0	FY1	FY2	FY3	FY4	FY5
1. Production Facility Demand:									
Demand associated with the Production Facility supplied through Transmission System or in addition to Demand supplied through Genset unit transformer;									
1.1	Maximum Demand that could occur;	MW Mvar	PC C+						
1.2	Demand at the time of peak OETC Demand;	MW Mvar	PC C						
1.3	Demand at the time of minimum OETC Demand;	MW Mvar	PC C						
2. CDGenset Demand		Units	Grid Code	U1	U2	U3	U4	U5	PF
Demand supplied through unit transformer when CDGenset is at Rated MW output		MW Mvar	PC C+						

Provide details of point of Connection to the Transmission System of each CDGenset (in terms of geographical and electrical location and System voltage) (PC B +)

Unit 1

Unit 2

etc



	Units	Grid Code	U1	U2	U3	U4	U5	PF
3. CDGenset performance and parameters:								
General								
3.1.2	Type of CDGenset (e.g. Steam Turbine Genset, Gas Turbine Genset, Cogeneration, etc);		PC C +					
3.2.1	Rated terminal voltage;	kV	PC B					
3.3.4	Registered Capacity;	MW	PC B SDC 1					
3.4.8	Rated Active Power;	MW	PC B/C+					
3.5.9	Rated VA;	MVA	PC B/ C +					
3.6.5	System constrained Capacity (for Embedded CDGensets only);	MW	PC B					
3.7.7	Minimum Generation;	MW	PC B/C					
3.8.6	Active Power obtained in excess of Registered Capacity;	MW	PC B					
3.9.3	Expected running regime(s);		PC B					
3.10	Generator Performance Chart at stator terminals;	Chart						
3.11	Short circuit ratio;		PC B/C+					
3.12	Genset inertia constant; (alternator plus prime mover);	MWs/ MVA	PC B +					
3.13	Rated field current at rated MW and Mvar output and at rated terminal voltage;	A	PC C					
3.14	Field current open circuit saturation curve test certificate); 120% rated terminal voltage; 110% rated terminal voltage; 100% rated terminal voltage; 90% rated terminal voltage; 80% rated terminal voltage; 70% rated terminal voltage; 60% rated terminal voltage; 50% rated terminal voltage;	A A A A A A A A	PC C					
4. Impedances								
4.1.1	Direct axis synchronous reactance;	% on MVA	PC C					
4.2.2	Direct axis transient reactance;	% on MVA	PC B +					
4.3.3	Direct axis sub-transient; reactance;	% on MVA	PC C					



		Units	Grid Code	U1	U2	U3	U4	U5	PF
4.4	Quadrature axis synchronous reactance;	% on MVA	PC C						
4.5	Quadrature axis sub-transient reactance;	% on MVA	PC C						
4.6	Stator leakage reactance;	% on MVA	PC C						
4.7	Armature winding direct-current resistance;	% on MVA	PC C						
5. Time constants:									
5.1	Direct axis short-circuit transient time constant;	s	PC C						
5.2	Direct axis short-circuit sub-transient time constant;	s	PC C						
5.3	Quadrature axis short-circuit sub-transient time constant;	s	PC C						
5.4	Stator time constant;	s	PC C						
6. Generator transformer:									
6.1	Rated VA;	MVA	PC B +						
6.2	Rated voltage ratio;		PC C+						
6.3	Winding arrangement;		PC C						
6.4	Vector group;		PC C						
6.5	Positive sequence resistance;								
	- @ maximum tap;	% on MVA	PC B/C						
	- @ minimum tap;	% on MVA	PC C						
	- @ nominal tap;	% on MVA	PC B/C						
6.6	Positive sequence reactance;								
	- @ maximum tap;	% on MVA	PC B/C+						
	- @ minimum tap;	% on MVA	PC C +						
	- @ nominal tap;	% on MVA	PC B/C+						
6.7	Zero phase sequence reactance;	% on MVA	PC C						
6.8	Tap changer range;	±%	PC C						
6.9	Tap changer step size;	±%	PC C						
6.10	Tap changer type; (i.e. on-load or off-circuit);	On/ Off	PC C						
7. Excitation control system parameters:									
7.1	Exciter category (e.g. rotating or static);	Text	PC C +						



		Units	Grid Code	U1	U2	U3	U4	U5	PF
7.2	Details of excitation system described in block diagram showing transfer functions of individual elements (including PSS if fitted);	Diagram	PC C						
7.3	Rated field voltage;	V	PC C						
7.4	Generator no-load field voltage;	V	PC C						
7.5	Excitation system on-load; positive ceiling voltage;	V	PC C						
7.6	Excitation system no-load negative ceiling voltage;	V	PC C						
7.7	Power system stabiliser fitted?	Yes /No	PC C +						
7.8	Details of over excitation limiter described in block diagram; showing transfer functions of individual elements;	Diagram	PC C						
7.9	Details of under excitation limiter described in block diagram showing transfer functions of individual elements;	Diagram	PC C						
8. Governor parameters (All Gensets):									
	Governor system block diagram showing transfer function of individual elements;	Diagram	PC C						
9. Prime mover parameters (Steam Turbines Genset):									
	Prime mover system block diagram showing transfer function of individual elements and controllers;	Diagram	PC C						
10. Prime mover parameters (Gas Turbines Genset):									
	Prime mover system block diagram showing transfer function of individual elements and controllers;	Diagram	PC C						
11. Desalination Unit parameters:									
	Registered Capacity;	Mlgpd							
	Desalination Unit auxiliary Power;	MW							



		Units	Grid Code	U1	U2	U3	U4	U5	PF
12. Genset flexibility performance:									
Details required with respect to Gensets;									
12.1	Rate of loading following a weekend (72 hour) shut- down (CDGenset and Production Facility);	MW/ Min	PC C						
12.2	Rate of loading following an overnight (8 hour) shut- down (CDGenset and Production Facility);	MW/ Min	PC C						
12.3	Block load following Synchronising;	MW	PC C						
12.4	Rate of De-loading from Rated MW;	MW/ Min	PC C						
12.5	Regulating range;	MW	PC C						
12.6	Load rejection capability while still Synchronised and able to Supply Load;	MW	PC C						

Note: The data marked with "+" is required with an application for a Connection Agreement (to facilitate an early assessment by OETC of the need for more detailed studies).



	Data description	Units	Data category	CDGenset, Desalination Unit and Production Facility (PF) data						
				U 1	U 2	U 3	U 4	U 5	U 6	PF
2. Scheduling And Despatch parameters:										
2.1	CDGenset inflexibility description; Start date; End date; Active Power;	Text date/ time date/ time MW	SDC 1 SDC 1 SDC 1							
2.2	CDGenset synchronising intervals; Hot time interval; Off-load time interval;	hrs hrs	SDC 1 SDC 1							
2.3	Desalination Unit start-up intervals; Hot time interval; Off-load time interval;	hrs hrs	SDC 1 SDC 1							
2.4	Genset De-synchronising intervals;	hrs	SDC 1							
2.5	Desalination Unit shutdown intervals;	hrs	SDC 1							
2.6	CDGenset basic data; Minimum Generation; Minimum shutdown;	MW hrs	SDC 1 SDC 1							
2.7	Desalination Unit basic data; Minimum production; Maximum production;	m3/h m3/h	SDC 1 SDC 1							
2.8	Genset two shifting limitation;		SDC 1							
2.9	Genset minimum on time;	hrs	SDC 1							
2.10	Genset Synchronising Generation;	MW	SDC 1							
2.11	Genset Synchronising groups;		SDC 1							
2.12	Genset Loading Rates with breakpoints;	MW/ min	SDC 1							
2.13	Genset De-loading Rates with breakpoints;	MW/ min	SDC 1							
2.14	Genset Loading Rates covering the range from Minimum Generation to Available Capacity;	MW/ min	SDC 1							
2.15	Genset De-loading Rates covering the range from Available Capacity to Minimum Generation;	MW/ min	SDC 1							



Schedule D: Generation Schedule data

Production Facility name:.....

The following details are required from each User in respect of each CDGenset.

	Data description	Units	Data category	CDGenset and Production Facility (PF) data								
				U 1	U 2	U 3	U 4	U 5	U 6	PF		
Programming phase:												
	Generation Schedule and Desalination Schedule for Operation of Production Facility on an hourly and Connection Point basis for the period of 1 to 8 weeks ahead by 10:00 hours each Saturday;	MW	OC2									
Control Phase:												
	Details of any differences to Generation Schedule submitted under Programming Phase for the unexpired part of the period;	MW	SDC 1 SDC 2									
Post Control Phase:												
	Details of hourly Active Power and Reactive Power output sent out to the Transmission System by its CDGensets;	MW MVA _r	OC1									
	Details of hourly Active Power and Reactive Power output sent out to the Transmission System by its CDGensets during the previous day;	MW MVA _r	OC1									



Schedule E: Genset Outage data

Production Facility name:.....

The following details are required from each User in respect of each CDGenset.

	Data description	Units	Time covered	Update time	Data category
1. Provisional Outage Programme:					
1.1	CDGensets concerned;	ID	Year 2 to 3	End of January	OC2
1.2	Active Power not Available as a result of Outage;	MW	Year 2 to 3	End of January	OC2
1.3	Remaining Active Power of the Genset;	MW	Year 2 to 3	End of January	OC2
1.4	Duration of Outage;	Weeks	Year 2 to 3	End of January	OC2
1.5	Start date and time or a range of start dates and times;	Date hrs	Year 2 to 3	End of January	OC2
1.6	Flexible Outage or Inflexible Outage;	Flexible/ Inflexible	Year 2 to 3	End of January	OC2
1.7	Flexible Outage; Period for which the Outage could be deferred (not less than 30 days in length); Period for which the Outage could be advanced (not less than 10 days in length);	Days	Year 2 to 3	End of January	OC2
		Days	Year 2 to 3	End of January	OC2
	OETC issue Proposed System Outage Schedule to Users;		Year 2 to 3	End of July	OC2
	Agreement on Proposed System Outage Schedule;	Text	Year 2 to 3	End of September	OC2



2. Final Outage Programme:					
2.1	Gensets concerned;		Year 2 to 3	End of January	OC2
2.2	Active Power not Available as a result of Outage;	MW	Year 1 to 2	End of January	OC2
2.3	Remaining Active Power of the Genset;	MW	Year 1 to 2	End of January	OC2
2.4	Duration of Outage;	Weeks	Year 1 to 2	End of January	OC2
2.5	Start date and time or a range of start dates and Times;	Date hrs	Year 1 to 2	End of January	OC2
2.6	Flexible Outage or Inflexible Outage;	Flexible/ Inflexible	Year 1 to 2	End of January	OC2
2.7	Flexible Outage; Period for which the Outage could be deferred (not less than 30 days in length); Period for which the Outage could be advanced (not less than 10 days in length);	Days	Year 1 to 2	End of January	OC2
		Days	Year 1 to 2	End of January	OC2
	OETC issue draft Final Outage Programme to Users;		Year 1 to 2	End of June	OC2
	OETC issue Final Outage Programme to Users;	Text	Year 1 to 2	End of Sept	OC2
3. Short Term Planned Outage:					
3.1	Gensets concerned;	ID	Year 0	7 Days before	OC2
3.2	Active Power not Available as a result of Outage;	MW	Year 0	7 Days before	OC2
3.3	Remaining Active Power of the Genset;	MW	Year 0	7 Days before	OC2
3.4	Duration of Outage;	Weeks	Year 0	7 Days before	OC2
3.5	Start date and time or a range of start dates and times;	Date hrs	Year 0	7 Days before	OC2

Schedule F: User System data

The following current and forecast details that relate to the Connection Site containing the Connection Point are required from each User on its User System.

	Data description	Units	Data category
1. Single line diagram:			
	Single line diagram showing all existing and proposed HV equipment and Connections together with equipment ratings and any third party Embedded within its User System;	Drawing	PC B PC C
2. Reactive compensation equipment:			
	For all reactive compensation equipment Connected to the User System at 11 kV and above, other than Power Factor correction equipment associated directly with a Consumer Plant, the following details;		
2.1	Type of equipment (e.g. fixed or variable);	Text	PC B
2.2	Capacitive rating;	MVA _r	PC B
2.3	Inductive rating;	MVA _r	PC B
2.4	Operating range;	MVA _r	PC B
2.5	Details of any automatic control logic to enable operating characteristics to be determined;	Text and/or Diagrams	PC B
2.6	Point of Connection to the User System in terms of electrical location and System voltage;	Text	PC B
3. Switchgear:			
	For all switchgear (i.e. circuit breakers, switch disconnectors and isolators) on all circuits Directly Connected to the Connection Point including those at Production Facilities;		
3.1	Rated voltage;	kV	PC B
3.2	Operating voltage;	kV	PC B
3.3	Rated short-circuit breaking current; Single phase; Three phase;	kA kA	PC B PC B
3.4	Rated load breaking current; Single phase; Three phase;	kA kA	PC B PC B
3.5	Rated peak short-circuit making current; Single phase; Three phase;	kA kA	PC B PC B



	Data description	Units	Data category
4. User HV Connecting System data:			
Circuit Parameters (for all circuits);			
For all Systems at 11 kV and above Connecting the User System to the Transmission System, the following details are required relating to that HV Connection Point;			
4.1	Rated voltage;	kV	PC B
4.2	Operating voltage;	kV	PC B
4.3	Positive phase sequence; Resistance; Reactance; Susceptance;	% on 100 % on 100 % on 100	PC B PC B PC B
4.4	Zero phase sequence; Resistance; Reactance; Susceptance;	% on 100 % on 100 % on 100	PC B PC B PC B
5. Interconnecting transformers:			
For transformers between the Transmission System and the User System, the following data is required;			
5.1	Rated Power;	MVA	PC B PC C
5.2	Rated voltage ratio; (i.e. primary/secondary/tertiary);		PC B PC C
5.3	Winding arrangement;		PC B PC C
5.4	Vector group;		PC B PC C
5.5	Positive sequence resistance; @ maximum tap; @ minimum tap; @ nominal tap;	% on MVA % on MVA % on MVA	PC C PC C PC C
5.6	Positive sequence reactance; @ maximum tap; @ minimum tap; @ nominal tap;	% on MVA % on MVA % on MVA	PC C PC C PC C
5.7	Zero phase sequence reactance;	% on MVA	PC C



	Data description	Units	Data category
5.8	Tap changer type (e.g. on-load or off-load);	On/Off	PC B PC C
5.9	Tap changer range;		PC B PC C
5.10	Tap changer step size;		PC B PC C
5.11	Impedance value (if not directly earthed);		PC C
6. HV motor drives:			
Following details are required for each HV motor drive connected to the User System;			
6.1	Rated VA;	MVA	PC C
6.2	Rated Active Power;	MW	PC C
6.3	Full Load current;	kA	PC C
6.4	Means of starting;	Text	PC C
6.5	Starting current;	kA	PC C
6.6	Motor torque/speed characteristics;		PC C
6.7	Drive torque/speed characteristics;		PC C
6.8	Motor plus drive inertia constant;		PC C
7. User Protection data:			
Following details relates only to protection equipment which can trip, inter-trip or close any Connection Point circuit breaker or any OETC circuit breaker;			
7.1	A full description including estimated settings, for all relays and Protection systems installed or to be installed on the User System;	Text	PC C
7.2	A full description of any auto-reclose facilities installed on the User System, including type and time delays;	Text	PC C
7.3	A full description including estimated settings, for all relays and Protection systems installed or to be installed on the Genset, Genset transformer, Production Facility transformer and their associated connections;	Text	PC C
7.4	For Genset having or intended to have a circuit breaker at the Genset terminal voltage, clearance times for electrical faults within the Genset zone;	ms	PC C
7.5	The most probable fault clearance time for electrical faults on any part of the User System Directly Connected to the Transmission System;	ms	PC C



	Data description	Units	Data category
8. Transient over-voltage assessment data:			
When requested by OETC, each User is required to submit data with respect to the Connection Site as follows (undertaking insulation co-ordination studies);			
8.1	Busbar layout, including dimensions and geometry together with electrical parameters of any associated current transformers, voltage transformers, wall bushings, and support insulators;	Diagram	PC C
8.2	Physical and electrical parameters of lines, cables, transformers, reactors and shunt compensator equipment Connected at that busbar or by lines or cables to that busbar (for the purpose of calculating surge impedances);	Text	PC C
8.3	Specification details of connected directly or by lines and cables to the busbar including basic insulation levels;	Text	PC C
8.4	Characteristics of over-voltage protection at the busbar and at the termination of lines and cables connected at the busbar;	Text	PC C
8.5	The following Genset or Production Facility transformer data is required; three or five limb cores or single phase units to be specified, and operating peak flux density at nominal voltage;	Text	PC C



Schedule H: User Demand profiles and Active Energy data

The following information is required from each User who is Directly Connected to the Transmission System with Demand.

Data description	FY 0	FY 1	FY 2	FY 3	FY 4	FY 5	Update time	Data category
Forecast daily Demand profiles in respect of each User System (summated over all Connection Points for a Licensed Distributor and at the Connection Point for Non Embedded Consumers);	1. Day of User maximum Demand (MW) at annual maximum Demand Conditions; 2. Day of peak OETC Demand (MW) at annual maximum Demand Conditions; 3. Day of minimum OETC Demand (MW) at Average Conditions;						End of January	PC B OC1
00:00 – 01:00 01:00 – 02:00 02:00 – 03:00 03:00 – 04:00 04:00 – 05:00 05:00 – 06:00 06:00 – 07:00 07:00 – 08:00 08:00 – 09:00 09:00 – 10:00 10:00 – 11:00 11:00 – 12:00 12:00 – 13:00 13:00 – 14:00 14:00 – 15:00 15:00 – 16:00 16:00 – 17:00 17:00 – 18:00 18:00 – 19:00 19:00 – 20:00 20:00 – 21:00: 21:00 – 22:00 22:00 – 23:00 23:00 – 24:00								



Schedule J: Demand Control data

The following information is required from each User;

	Data description	Units	Time covered	Update time	Data category
1.Programming Phase: (applicable to Licensed Distributors & Directly Connected Consumers)					
Demand Control which may result in a Demand change of 1 MW or more on an hourly and Connection Point basis;					
1.1	Demand profile MW;	Weeks 1 to 8		10:00 Saturday	OC1
1.2	Duration of proposed Demand Control hrs;	Weeks 1 to 8		10:00 Saturday	OC1
2. Control Phase: (applicable to Licensed Distributors & Directly Connected Consumers)					
2.1	Demand Control which may result in a Demand change of 1 MW or more averaged over any hour on any Connection Point which is planned after 10:00 hours;	MW	Now to 7 Days	Immediate	OC1
2.2	Any changes to planned Demand Control notified to OETC prior to 10:00 hours;	hours	Now to 7 Days	Immediate	OC1
3. Post Control Phase:					
Demand reduction achieved on previous calendar day of 1 MW or more averaged over any Connection Point, on an hourly and Connection Point basis;					
3.1	Active Power profiles;	MW	Previous Day	06:00 Daily	OC1
3.2	Duration;	hours	Previous Day	06:00 Daily	OC1



Schedule L: Data supplied by OETC to Users

OETC will provide Users and potential Users the following data related to the OETC Transmission System.

Name of Connection Point:.....

	Data description	Data category
1. Operation Diagram:		OCB
1.1	OETC will notify each User no later than the end of October, for the current calendar year and for each of the following 5 calendar years; The date and time of annual peak of OETC Demand at annual maximum Demand conditions;	OC1
1.2	The date and time of annual minimum OETC Demand at average conditions;	OC1
2. Network Data:		
2.1	Transmission System data; including Network topology and ratings of principal items of equipment; Positive, negative and zero sequence data of lines, cables, transformers, etc; CDGenset electrical and mechanical parameters Relay and protection data;	PC D
2.2	Following network data as an equivalent 220kV and 132kV source at the HV point of Connection to the User System;	
2.2.1	Symmetrical three-phase short circuit current infeed at the instant of fault from the Transmission System;	PC D
2.2.2	Symmetrical three-phase short circuit current from the Transmission System after the sub-transient fault current contribution has substantially decayed;	PC D
2.2.3	Zero sequence source resistance and reactance values at the Connection Point, consistent with the maximum infeed below;	PC D
2.2.4	Pre-fault voltage magnitude at which the maximum fault currents were calculated;	PC D
2.2.5	Positive sequence X/R ratio at the instant of fault PC;	PC D
2.2.6	Appropriate interconnection transformer data;	PC D
3	Names of Safety Coordinators;	OC6
4.1	Provisional Outage programme showing the CDGensets expected to be withdrawn from service during each week of Years 2 and 3 for Planned Outages;	OC2
4.2	Draft Final Outage programme showing the CDGensets expected to be withdrawn from service during each week of year 1 for Planned Outages;	OC2



Schedule M: Metering Data

The Metering Registration System forms the Metering database and holds Metering data relating to Metering Systems defined by the Metering and Data Exchange Code.

Timing: All data shall be submitted promptly after Connection or any other event that causes a change to the data.

Abbreviations:

MO Meter Owner

PO Plant Owner

	Data	Responsible party	Data category
1	Connection and Metering Point reference details for both Delivery Point and Actual Metering Point:		
1.1	Location and reference details;	PO	MDEC
1.2	Participant details at the Connection Point;	PO	MDEC
1.3	Site identification nomenclature;	PO	MDEC
1.4	Meter Owner;	PO	MDEC
1.5	Loss compensation calculation details where Actual Metering Point and Delivery Point differ;	PO	MDEC
2	Main and Check Meter installation details;		
2.1	Meter serial numbers;	MO	MDEC
2.2	Metering installation identification name;	MO	MDEC
2.3	Meter types and models;	MO	MDEC
2.4	Instrument transformer serial numbers;	PO	MDEC
2.5	Instrument transformer ratios;	PO	MDEC
2.6	Test and calibration programme details; test results and reference test certificates for Meters and Measurement Transformers;	MO	MDEC
2.7	Asset management plan and testing schedule;	MO	MDEC
2.8	Calibration tables, where applied to achieve Meter installation accuracy;	MO	MDEC



2.9	Meter summation scheme values and multipliers;	MO	MDEC
2.10	Data register coding details;	PO MO	MDEC
3	Data communication details (when communication systems are used):		
3.1	Telephone number for access to data;	PO MO	MDEC
3.2	Communication equipment type and serial numbers;	MO	MDEC
3.3	Communication protocol details or references;	MO	MDEC
3.4	Data conversion details;	MO	MDEC
3.5	User identifications and access rights;	MO	MDEC
4	Data validation and substitution processes agreed between affected parties, including:		
4.1	Algorithm;	MO	MDEC
4.2	Data comparison technique;	MO	MDEC
4.3	Processing and alarms (i.e. voltage source limits, phase-angle limits);	MO	MDEC
4.4	Check Metering compensation details;	MO	MDEC



Data Transfer Code

Issued April 2010

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Data Transfer Code

DTC.1 Introduction

The Data Transfer Code provides a unified listing of all data that Users are required by the Grid Code to provide to OETC and that OETC is required to provide to Users.

In the event of inconsistencies between this DTC and other sections of the Grid Code the provisions in individual sections of the Grid Code shall prevail.

The relevant section of the Grid Code, under which any item of data is required, specifies the procedures, timing, and routing for the supply of that data and the updating and recording of temporary or permanent changes to that data.

DTC.2 Objective

The objectives of the DTC are as follows;

- to list and collate all requirements in respect of data to be provided by each category of User to OETC under the Grid Code;
- to list requirements in respect of all the data to be provided by OETC to each category of User under the Grid Code; and
- to provide an overview of the data requirements of certain sections of the Grid Code.

DTC.3 Scope

In addition to OETC, the DTC applies to;

- Power Producers;
- Licensed Distributors;
- Licensed Suppliers;
- Directly Connected Consumers;
- International Interconnected Parties
- Internally Interconnected Parties;
- PWP; and
- PAEW.



DTC.4 Data categories

The DTC groups data into a number of categories;

- **Standard Planning Data:** is that data listed in Appendix B to the Planning Code required for the purpose of determining any requirements to reinforce the Transmission System;
- **Detailed Planning Data:** is that data listed in Appendix C to the Planning Code required of carry out detailed stability studies as necessary;
- **System data:** is that data listed in Appendix D to the Planning Code required to enable Users to conduct their own studies as necessary;
- **Operational data:** is data related to Operating Code (OC) and Scheduling and Despatch Code (SDC) of the Grid Code. Within the DTC, Operational Data is sub-categorised according to the relevant Operating Code, namely OC1, OC2 or SDC, and;
- **Metering and Data Exchange Code data:** is that data listed in Appendix E Metering data.

DTC.5 Procedures and responsibilities

DTC.5.1. Responsibility for submission and updating of data

Users shall record, exchange and record data listed in the DTC in accordance with the provisions of relevant sections of the Grid Code.

DTC.5.2. Methods of submitting data

The data schedules to the DTC are structured, where possible, to serve as standard formats for submission of data to OETC and from OETC to Users. Unless agreed with OETC, all data provided by Users to OETC and by OETC to Users shall be provided in accordance with the DTC schedule formats where such formats are given.

Data submitted to OETC must include the name of the User representative submitting each schedule of data. The data is preferred in electronic format and may be submitted via a computer link if such a data link exists between a User and OETC or utilising a data transfer media, such as floppy diskette, magnetic tape, CD ROM etc after obtaining the prior written consent from OETC. If electronic means are not available, subject to OETC's prior agreement, data to be provided to OETC on a daily basis may be submitted by fax.

DTC.5.3. Changes to Users' data

All Users must notify OETC promptly of any change to an item of data that is registered with OETC in accordance with the relevant section of the Grid Code.

DTC.5.4. Data not supplied

Users and OETC are obliged to provide data as set out in and in accordance with the individual sections of the Grid Code. If a User fails to supply OETC with data required by a section of the Grid Code, OETC shall use its best estimate of the required data. OETC will advise a User in writing of any estimated data it intends to use concerning a User's Plant in the event that a User has not provided the required data.



If OETC fails to provide data required by a section of the Grid Code, the User to whom that data ought to have been supplied will use an estimate of the data not provided by OETC when, in that User's view, it is necessary to do so. A User will advise OETC in writing of any estimated data it intends to use in the event of data not being supplied.

OETC and User estimates of data not supplied will, in each case, be based upon data supplied previously for the same Plant or upon corresponding data for similar Plant or upon such other information as OETC or a User, as the case may be, deems appropriate.

Corrections to estimates of data not supplied shall be made by OETC or the User post event, where the data affects Operating Parameters,



DTC.6 Grid Code data exchanged between OETC and Users

Table 6.1 provides details of Schedules A to N of the DTC. OETC is a party to each Schedule, PWP is the recipient of the data in Schedules A to E and G and I

Table 6.1:

Schedule	Data type	Comprising	User	Grid Code section
A	Genset And Desalination Unit technical data.	Genset, Desalination Unit and Production Facility fixed Operating Parameters.	PP	PC SDC1
B	Generation/Operational Planning data.	Genset Operating Parameters required for Operational Planning.	PP	OC 2 SDC1
C	Scheduling And Despatch data.	Operating Parameters required for Scheduling and Despatch.	PP	SDC1
D	Generation Schedule data.	Data required for the preparation of the Generation Schedule.	PP	OC 1 & 2 SDC1 & 2
E	Genset and Desalination Unit Outage data	Genset and Production Facility equipment Outage planning data.	PP	OC 2
F	User System data.	Electrical parameters relating to Plant Connected to OETC Transmission System	PP, LD, DCC, OCP	PC
G	Load characteristics data	The estimated parameters of Loads in respect of harmonic content, sensitivity etc.	LD, DCC, OCP	PC
H	User Demand profiles & Active Energy data.	Data related to Demand profiles.	LD, DCC, OCP	PC OC1
I	Connection Point data.	Data related to Demand and Demand transfer capability.	PP, LD, DCC, OCP	PC OC 1
J	Demand Control data.	Data related Demand Control.	LD, LS, DCC, OCP	OC 1
K	Fault infeed data.	Data related to short circuit contribution to OETC Transmission System.	LD, DCC, OCP	PC
L	OETC data to Users	All relevant data	PP, LD, DCC, OCP	PC OC1, 2 & 6
M	Metering data	All relevant data	PP, LD, DCC, OCP	MDEC

**Key to Users**

	User
PWP	Power and Water Procurer
PP	Power Producers with Generating and Desalination Plant
LD	Licensed Distributors
LS	Licensed Suppliers
DCC	Directly Connected Consumers
OCP	Other Connected Parties: Users Connected to the Transmission System excluding PP, LD, LS, and DCC

Abbreviations used in all schedules:

MDEC	Metering and Data Exchange Code
OC	Operating Codes
PC B	Planning Code - Appendix B Standard Planning Data
PC C	Planning Code - Appendix C Detailed Planning Data
PC D	Planning Code - Appendix D System Data
SDC	Scheduling and Dispatch Codes

Notes:

- 1 The data marked with "+" is required with an application for a Connection Agreement (to facilitate an early assessment by OETC of the need for more detailed studies).



Schedule A: Genset And Desalination Unit technical data

The following details are required from each User with existing or proposed CDGensets, Directly Connected, or to be Directly Connected, to the Transmission System and/or with existing, or proposed Embedded CDGensets.

Production Facility name:.....

Ref.	Data description	Units	Grid Code	Genset/ Desalination Unit/ Production Facility (PF) data					
				FY0	FY1	FY2	FY3	FY4	FY5
1. Production Facility Demand:									
Demand associated with the Production Facility supplied through Transmission System or in addition to Demand supplied through Genset unit transformer;									
1.1	Maximum Demand that could occur;	MW Mvar	PC C+						
1.2	Demand at the time of peak OETC Demand;	MW Mvar	PC C						
1.3	Demand at the time of minimum OETC Demand;	MW Mvar	PC C						
2. CDGenset Demand		Units	Grid Code	U1	U2	U3	U4	U5	PF
Demand supplied through unit transformer when CDGenset is at Rated MW output		MW Mvar	PC C+						

Provide details of point of Connection to the Transmission System of each CDGenset (in terms of geographical and electrical location and System voltage) (PC B +)

Unit 1

Unit 2

etc



	Units	Grid Code	U1	U2	U3	U4	U5	PF
3. CDGenset performance and parameters:								
General								
3.1.2	Type of CDGenset (e.g. Steam Turbine Genset, Gas Turbine Genset, Cogeneration, etc);		PC C +					
3.2.1	Rated terminal voltage;	kV	PC B					
3.3.4	Registered Capacity;	MW	PC B SDC 1					
3.4.8	Rated Active Power;	MW	PC B/C+					
3.5.9	Rated VA;	MVA	PC B/ C +					
3.6.5	System constrained Capacity (for Embedded CDGensets only);	MW	PC B					
3.7.7	Minimum Generation;	MW	PC B/C					
3.8.6	Active Power obtained in excess of Registered Capacity;	MW	PC B					
3.9.3	Expected running regime(s);		PC B					
3.10	Generator Performance Chart at stator terminals;	Chart						
3.11	Short circuit ratio;		PC B/C+					
3.12	Genset inertia constant; (alternator plus prime mover);	MWs/ MVA	PC B +					
3.13	Rated field current at rated MW and Mvar output and at rated terminal voltage;	A	PC C					
3.14	Field current open circuit saturation curve test certificate); 120% rated terminal voltage; 110% rated terminal voltage; 100% rated terminal voltage; 90% rated terminal voltage; 80% rated terminal voltage; 70% rated terminal voltage; 60% rated terminal voltage; 50% rated terminal voltage;	A A A A A A A A	PC C					
4. Impedances								
4.1.1	Direct axis synchronous reactance;	% on MVA	PC C					
4.2.2	Direct axis transient reactance;	% on MVA	PC B +					
4.3.3	Direct axis sub-transient; reactance;	% on MVA	PC C					



		Units	Grid Code	U1	U2	U3	U4	U5	PF
4.4	Quadrature axis synchronous reactance;	% on MVA	PC C						
4.5	Quadrature axis sub-transient reactance;	% on MVA	PC C						
4.6	Stator leakage reactance;	% on MVA	PC C						
4.7	Armature winding direct-current resistance;	% on MVA	PC C						
5. Time constants:									
5.1	Direct axis short-circuit transient time constant;	s	PC C						
5.2	Direct axis short-circuit sub-transient time constant;	s	PC C						
5.3	Quadrature axis short-circuit sub-transient time constant;	s	PC C						
5.4	Stator time constant;	s	PC C						
6. Generator transformer:									
6.1	Rated VA;	MVA	PC B +						
6.2	Rated voltage ratio;		PC C+						
6.3	Winding arrangement;		PC C						
6.4	Vector group;		PC C						
6.5	Positive sequence resistance;								
	- @ maximum tap;	% on MVA	PC B/C						
	- @ minimum tap;	% on MVA	PC C						
	- @ nominal tap;	% on MVA	PC B/C						
6.6	Positive sequence reactance;								
	- @ maximum tap;	% on MVA	PC B/C+						
	- @ minimum tap;	% on MVA	PC C +						
	- @ nominal tap;	% on MVA	PC B/C+						
6.7	Zero phase sequence reactance;	% on MVA	PC C						
6.8	Tap changer range;	±%	PC C						
6.9	Tap changer step size;	±%	PC C						
6.10	Tap changer type; (i.e. on-load or off-circuit);	On/ Off	PC C						
7. Excitation control system parameters:									
7.1	Exciter category (e.g. rotating or static);	Text	PC C +						

		Units	Grid Code	U1	U2	U3	U4	U5	PF
7.2.2	Details of excitation system described in block diagram showing transfer functions of individual elements (including PSS if fitted);	Diagram	PC C						
7.3.3	Rated field voltage;	V	PC C						
7.4.4	Generator no-load field voltage;	V	PC C						
7.5.5	Excitation system on-load; positive ceiling voltage;	V	PC C						
7.6.6	Excitation system no-load negative ceiling voltage;	V	PC C						
7.7.7	Power system stabiliser fitted?	Yes /No	PC C +						
7.8.8	Details of over excitation limiter described in block diagram; showing transfer functions of individual elements;	Diagram	PC C						
7.9.9	Details of under excitation limiter described in block diagram showing transfer functions of individual elements;	Diagram	PC C						
8. Governor parameters (All Gensets):									
	Governor system block diagram showing transfer function of individual elements;	Diagram	PC C						
9. Prime mover parameters (Steam Turbines Genset):									
	Prime mover system block diagram showing transfer function of individual elements and controllers;	Diagram	PC C						
10. Prime mover parameters (Gas Turbines Genset):									
	Prime mover system block diagram showing transfer function of individual elements and controllers;	Diagram	PC C						
11. Desalination Unit parameters:									
	Registered Capacity;	Ml/gpd							
	Desalination Unit auxiliary Power;	MW							



		Units	Grid Code	U1	U2	U3	U4	U5	PF
12. Genset flexibility performance:									
Details required with respect to Gensets;									
12.1	Rate of loading following a weekend (72 hour) shut- down (CDGenset and Production Facility);	MW/ Min	PC C						
12.2	Rate of loading following an overnight (8 hour) shut- down (CDGenset and Production Facility);	MW/ Min	PC C						
12.3	Block load following Synchronising;	MW	PC C						
12.4	Rate of De-loading from Rated MW;	MW/ Min	PC C						
12.5	Regulating range;	MW	PC C						
12.6	Load rejection capability while still Synchronised and able to Supply Load;	MW	PC C						

Note: The data marked with "+" is required with an application for a Connection Agreement (to facilitate an early assessment by OETC of the need for more detailed studies).



Schedule B: Generation/Operational Planning data

Production Facility name:.....

The following details are required from each User in respect of each CDGenset and Desalination Unit.

	Data description	Units	Data category	CDGenset, Desalination Unit and Production Facility (PF) data						
				U 1	U 2	U 3	U 4	U 5	U 6	PF
1.	Steam Turbine Gensets:									
1.1	Minimum notice required to synchronise under following conditions; Hot start; Warm start; Cold start;	Min Min Min) OC2) SDC1)							
1.2	Minimum time between synchronising different CDGensets at a Production Facility;	Min) OC2) SDC1							
1.3	Minimum block Load requirement on synchronising;	MW) OC2) SDC1							
1.4	Maximum CDGenset loading rates from synchronising under following conditions; Hot start; Warm start; Cold start;	Min /MW) OC2) SDC1							
1.5	Maximum CDGenset de-loading rate;	MW/ Min) OC2) SDC1							
1.6	Minimum interval between de-synchronising and synchronising a CDGenset (off Load time);	Min) OC2) SDC1							
1.7	Maximum allowable starts per Operational Year from; Hot; Warm; Cold;	No. No. No.) OC2) SDC1							



	Data description	Units	Data category	CDGenset, Desalination Unit and Production Facility (PF) data						
				U 1	U 2	U 3	U 4	U 5	U 6	PF
2. Scheduling And Despatch parameters:										
2.1	CDGenset inflexibility description; Start date; End date; Active Power;	Text date/ time date/ time MW	SDC 1 SDC 1 SDC 1							
2.2	CDGenset synchronising intervals; Hot time interval; Off-load time interval;	hrs hrs	SDC 1 SDC 1							
2.3	Desalination Unit start-up intervals; Hot time interval; Off-load time interval;	hrs hrs	SDC 1 SDC 1							
2.4	Genset De-synchronising intervals;	hrs	SDC 1							
2.5	Desalination Unit shutdown intervals;	hrs	SDC 1							
2.6	CDGenset basic data; Minimum Generation; Minimum shutdown;	MW hrs	SDC 1 SDC 1							
2.7	Desalination Unit basic data; Minimum production; Maximum production;	m3/h m3/h	SDC 1 SDC 1							
2.8	Genset two shifting limitation;		SDC 1							
2.9	Genset minimum on time;	hrs	SDC 1							
2.10	Genset Synchronising Generation;	MW	SDC 1							
2.11	Genset Synchronising groups;		SDC 1							
2.12	Genset Loading Rates with breakpoints;	MW/ min	SDC 1							
2.13	Genset De-loading Rates with breakpoints;	MW/ min	SDC 1							
2.14	Genset Loading Rates covering the range from Minimum Generation to Available Capacity;	MW/ min	SDC 1							
2.15	Genset De-loading Rates covering the range from Available Capacity to Minimum Generation;	MW/ min	SDC 1							



Schedule E: Genset Outage data

Production Facility name:.....:

The following details are required from each User in respect of each CDGenset.

	Data description	Units	Time covered	Update time	Data category
1. Provisional Outage Programme:					
1.1	CDGensets concerned;	ID	Year 2 to 3	End of January	OC2
1.2	Active Power not Available as a result of Outage;	MW	Year 2 to 3	End of January	OC2
1.3	Remaining Active Power of the Genset;	MW	Year 2 to 3	End of January	OC2
1.4	Duration of Outage;	Weeks	Year 2 to 3	End of January	OC2
1.5	Start date and time or a range of start dates and times;	Date hrs	Year 2 to 3	End of January	OC2
1.6	Flexible Outage or Inflexible Outage;	Flexible/ Inflexible	Year 2 to 3	End of January	OC2
1.7	Flexible Outage; Period for which the Outage could be deferred (not less than 30 days in length); Period for which the Outage could be advanced (not less than 10 days in length);	Days	Year 2 to 3	End of January	OC2
		Days	Year 2 to 3	End of January	OC2
	OETC issue Proposed System Outage Schedule to Users;		Year 2 to 3	End of July	OC2
	Agreement on Proposed System Outage Schedule;	Text	Year 2 to 3	End of September	OC2



2. Final Outage Programme:					
2.1	Gensets concerned;		Year 2 to 3	End of January	OC2
2.2	Active Power not Available as a result of Outage;	MW	Year 1 to 2	End of January	OC2
2.3	Remaining Active Power of the Genset;	MW	Year 1 to 2	End of January	OC2
2.4	Duration of Outage;	Weeks	Year 1 to 2	End of January	OC2
2.5	Start date and time or a range of start dates and Times;	Date hrs	Year 1 to 2	End of January	OC2
2.6	Flexible Outage or Inflexible Outage;	Flexible/ Inflexible	Year 1 to 2	End of January	OC2
2.7	Flexible Outage; Period for which the Outage could be deferred (not less than 30 days in length); Period for which the Outage could be advanced (not less than 10 days in length);	Days	Year 1 to 2	End of January	OC2
		Days	Year 1 to 2	End of January	OC2
	OETC issue draft Final Outage Programme to Users;		Year 1 to 2	End of June	OC2
	OETC issue Final Outage Programme to Users;	Text	Year 1 to 2	End of Sept	OC2
3. Short Term Planned Outage:					
3.1	Gensets concerned;	ID	Year 0	7 Days before	OC2
3.2	Active Power not Available as a result of Outage;	MW	Year 0	7 Days before	OC2
3.3	Remaining Active Power of the Genset;	MW	Year 0	7 Days before	OC2
3.4	Duration of Outage;	Weeks	Year 0	7 Days before	OC2
3.5	Start date and time or a range of start dates and times;	Date hrs	Year 0	7 Days before	OC2

Schedule F: User System data

The following current and forecast details that relate to the Connection Site containing the Connection Point are required from each User on its User System.

	Data description	Units	Data category
1. Single line diagram:			
	Single line diagram showing all existing and proposed HV equipment and Connections together with equipment ratings and any third party Embedded within its User System;	Drawing	PC B PC C
2. Reactive compensation equipment:			
	For all reactive compensation equipment Connected to the User System at 11 kV and above, other than Power Factor correction equipment associated directly with a Consumer Plant, the following details;		
2.1	Type of equipment (e.g. fixed or variable);	Text	PC B
2.2	Capacitive rating;	MVA _r	PC B
2.3	Inductive rating;	MVA _r	PC B
2.4	Operating range;	MVA _r	PC B
2.5	Details of any automatic control logic to enable operating characteristics to be determined;	Text and/or Diagrams	PC B
2.6	Point of Connection to the User System in terms of electrical location and System voltage;	Text	PC B
3. Switchgear:			
	For all switchgear (i.e. circuit breakers, switch disconnectors and isolators) on all circuits Directly Connected to the Connection Point including those at Production Facilities;		
3.1	Rated voltage;	kV	PC B
3.2	Operating voltage;	kV	PC B
3.3	Rated short-circuit breaking current; Single phase; Three phase;	kA kA	PC B PC B
3.4	Rated load breaking current; Single phase; Three phase;	kA kA	PC B PC B
3.5	Rated peak short-circuit making current; Single phase; Three phase;	kA kA	PC B PC B



	Data description	Units	Data category
4. User HV Connecting System data:			
Circuit Parameters (for all circuits);			
For all Systems at 11 kV and above Connecting the User System to the Transmission System, the following details are required relating to that HV Connection Point;			
4.1	Rated voltage;	kV	PC B
4.2	Operating voltage;	kV	PC B
4.3	Positive phase sequence; Resistance; Reactance; Susceptance;	% on 100 % on 100 % on 100	PC B PC B PC B
4.4	Zero phase sequence; Resistance; Reactance; Susceptance;	% on 100 % on 100 % on 100	PC B PC B PC B
5. Interconnecting transformers:			
For transformers between the Transmission System and the User System, the following data is required;			
5.1	Rated Power;	MVA	PC B PC C
5.2	Rated voltage ratio; (i.e. primary/secondary/tertiary);		PC B PC C
5.3	Winding arrangement;		PC B PC C
5.4	Vector group;		PC B PC C
5.5	Positive sequence resistance; @ maximum tap; @ minimum tap; @ nominal tap;	% on MVA % on MVA % on MVA	PC C PC C PC C
5.6	Positive sequence reactance; @ maximum tap; @ minimum tap; @ nominal tap;	% on MVA % on MVA % on MVA	PC C PC C PC C
5.7	Zero phase sequence reactance;	% on MVA	PC C

	Data description	Units	Data category
5.8	Tap changer type (e.g. on-load or off-load);	On/Off	PC B PC C
5.9	Tap changer range;		PC B PC C
5.10	Tap changer step size;		PC B PC C
5.11	Impedance value (if not directly earthed);		PC C
6. HV motor drives:			
Following details are required for each HV motor drive connected to the User System;			
6.1	Rated VA;	MVA	PC C
6.2	Rated Active Power;	MW	PC C
6.3	Full Load current;	kA	PC C
6.4	Means of starting;	Text	PC C
6.5	Starting current;	kA	PC C
6.6	Motor torque/speed characteristics;		PC C
6.7	Drive torque/speed characteristics;		PC C
6.8	Motor plus drive inertia constant;		PC C
7. User Protection data:			
Following details relates only to protection equipment which can trip, inter-trip or close any Connection Point circuit breaker or any OETC circuit breaker;			
7.1	A full description including estimated settings, for all relays and Protection systems installed or to be installed on the User System;	Text	PC C
7.2	A full description of any auto-reclose facilities installed on the User System, including type and time delays;	Text	PC C
7.3	A full description including estimated settings, for all relays and Protection systems installed or to be installed on the Genset, Genset transformer, Production Facility transformer and their associated connections;	Text	PC C
7.4	For Genset having or intended to have a circuit breaker at the Genset terminal voltage, clearance times for electrical faults within the Genset zone;	ms	PC C
7.5	The most probable fault clearance time for electrical faults on any part of the User System Directly Connected to the Transmission System;	ms	PC C



	Data description	Units	Data category
8. Transient over-voltage assessment data:			
When requested by OETC, each User is required to submit data with respect to the Connection Site as follows (undertaking insulation co-ordination studies);			
8.1	Busbar layout, including dimensions and geometry together with electrical parameters of any associated current transformers, voltage transformers, wall bushings, and support insulators;	Diagram	PC C
8.2	Physical and electrical parameters of lines, cables, transformers, reactors and shunt compensator equipment Connected at that busbar or by lines or cables to that busbar (for the purpose of calculating surge impedances);	Text	PC C
8.3	Specification details of connected directly or by lines and cables to the busbar including basic insulation levels;	Text	PC C
8.4	Characteristics of over-voltage protection at the busbar and at the termination of lines and cables connected at the busbar;	Text	PC C
8.5	The following Genset or Production Facility transformer data is required; three or five limb cores or single phase units to be specified, and operating peak flux density at nominal voltage;	Text	PC C



Schedule H: User Demand profiles and Active Energy data

The following information is required from each User who is Directly Connected to the Transmission System with Demand.

Data description	FY 0	FY 1	FY 2	FY 3	FY 4	FY 5	Update time	Data category
Forecast daily Demand profiles in respect of each User System (summated over all Connection Points for a Licensed Distributor and at the Connection Point for Non Embedded Consumers);	1. Day of User maximum Demand (MW) at annual maximum Demand Conditions; 2. Day of peak OETC Demand (MW) at annual maximum Demand Conditions; 3. Day of minimum OETC Demand (MW) at Average Conditions;						End of January	PC B OC1
00:00 – 01:00								
01:00 – 02:00								
02:00 – 03:00								
03:00 – 04:00								
04:00 – 05:00								
05:00 – 06:00								
06:00 – 07:00								
07:00 – 08:00								
08:00 – 09:00								
09:00 – 10:00								
10:00 – 11:00								
11:00 – 12:00								
12:00 – 13:00								
13:00 – 14:00								
14:00 – 15:00								
15:00 – 16:00								
16:00 – 17:00								
17:00 – 18:00								
18:00 – 19:00								
19:00 – 20:00								
20:00 – 21:00:								
21:00 – 22:00								
22:00 – 23:00								
23:00 – 24:00								



Schedule J: Demand Control data

The following information is required from each User;

	Data description	Units	Time covered	Update time	Data category
1.Programming Phase: (applicable to Licensed Distributors & Directly Connected Consumers)					
Demand Control which may result in a Demand change of 1 MW or more on an hourly and Connection Point basis;					
1.1	Demand profile MW;	Weeks 1 to 8		10:00 Saturday	OC1
1.2	Duration of proposed Demand Control hrs;	Weeks 1 to 8		10:00 Saturday	OC1
2. Control Phase: (applicable to Licensed Distributors & Directly Connected Consumers)					
2.1	Demand Control which may result in a Demand change of 1 MW or more averaged over any hour on any Connection Point which is planned after 10:00 hours;	MW	Now to 7 Days	Immediate	OC1
2.2	Any changes to planned Demand Control notified to OETC prior to 10:00 hours;	hours	Now to 7 Days	Immediate	OC1
3. Post Control Phase:					
Demand reduction achieved on previous calendar day of 1 MW or more averaged over any Connection Point, on an hourly and Connection Point basis;					
3.1	Active Power profiles;	MW	Previous Day	06:00 Daily	OC1
3.2	Duration;	hours	Previous Day	06:00 Daily	OC1



Schedule K: Fault infeed data

The following information is required from each User who is Connected to the Transmission System via a Connection Point and the User System contains CDGenset(s) and/or motor loads.

Short circuit Infeed to OETC Transmission System from a User System at a Connection Point

Name of Connection Point:.....

	Data description	Units	FY 0	FY 1	FY 2	FY 3	FY 4	FY 5	Data category
1	Symmetrical three-phase short circuit current infeed; At instant of fault; After sub-transient fault current contribution has substantially decayed;	kA kA							PC B
2	Zero sequence source impedance values as seen from the Connection Point consistent with the maximum infeed above; Resistance (R); Reactance (X);	% on 100 % on 100							PC B
3	Positive sequence X/R ratio at instance of fault;								PC B



Schedule L: Data supplied by OETC to Users

OETC will provide Users and potential Users the following data related to the OETC Transmission System.

Name of Connection Point:.....

	Data description	Data category
1. Operation Diagram:		OCB
1.1	OETC will notify each User no later than the end of October, for the current calendar year and for each of the following 5 calendar years; The date and time of annual peak of OETC Demand at annual maximum Demand conditions;	OC1
1.2	The date and time of annual minimum OETC Demand at average conditions;	OC1
2. Network Data:		
2.1	Transmission System data; including Network topology and ratings of principal items of equipment; Positive, negative and zero sequence data of lines, cables, transformers, etc; CDGenset electrical and mechanical parameters Relay and protection data;	PC D
2.2	Following network data as an equivalent 220kV and 132kV source at the HV point of Connection to the User System;	
2.2.1	Symmetrical three-phase short circuit current infeed at the instant of fault from the Transmission System;	PC D
2.2.2	Symmetrical three-phase short circuit current from the Transmission System after the sub-transient fault current contribution has substantially decayed;	PC D
2.2.3	Zero sequence source resistance and reactance values at the Connection Point, consistent with the maximum infeed below;	PC D
2.2.4	Pre-fault voltage magnitude at which the maximum fault currents were calculated;	PC D
2.2.5	Positive sequence X/R ratio at the instant of fault PC;	PC D
2.2.6	Appropriate interconnection transformer data;	PC D
3	Names of Safety Coordinators;	OC6
4.1	Provisional Outage programme showing the CDGensets expected to be withdrawn from service during each week of Years 2 and 3 for Planned Outages;	OC2
4.2	Draft Final Outage programme showing the CDGensets expected to be withdrawn from service during each week of year 1 for Planned Outages;	OC2



Schedule M: Metering Data

The Metering Registration System forms the Metering database and holds Metering data relating to Metering Systems defined by the Metering and Data Exchange Code.

Timing: All data shall be submitted promptly after Connection or any other event that causes a change to the data.

Abbreviations:

MO Meter Owner

PO Plant Owner

	Data	Responsible party	Data category
1	Connection and Metering Point reference details for both Delivery Point and Actual Metering Point:		
1.1	Location and reference details;	PO	MDEC
1.2	Participant details at the Connection Point;	PO	MDEC
1.3	Site identification nomenclature;	PO	MDEC
1.4	Meter Owner;	PO	MDEC
1.5	Loss compensation calculation details where Actual Metering Point and Delivery Point differ;	PO	MDEC
2	Main and Check Meter installation details;		
2.1	Meter serial numbers;	MO	MDEC
2.2	Metering installation identification name;	MO	MDEC
2.3	Meter types and models;	MO	MDEC
2.4	Instrument transformer serial numbers;	PO	MDEC
2.5	Instrument transformer ratios;	PO	MDEC
2.6	Test and calibration programme details; test results and reference test certificates for Meters and Measurement Transformers;	MO	MDEC
2.7	Asset management plan and testing schedule;	MO	MDEC
2.8	Calibration tables, where applied to achieve Meter installation accuracy;	MO	MDEC



2.9	Meter summation scheme values and multipliers;	MO	MDEC
2.10	Data register coding details;	PO MO	MDEC
3	Data communication details (when communication systems are used):		
3.1	Telephone number for access to data;	PO MO	MDEC
3.2	Communication equipment type and serial numbers;	MO	MDEC
3.3	Communication protocol details or references;	MO	MDEC
3.4	Data conversion details;	MO	MDEC
3.5	User identifications and access rights;	MO	MDEC
4	Data validation and substitution processes agreed between affected parties, including:		
4.1	Algorithm;	MO	MDEC
4.2	Data comparison technique;	MO	MDEC
4.3	Processing and alarms (i.e. voltage source limits, phase-angle limits);	MO	MDEC
4.4	Check Metering compensation details;	MO	MDEC

Alerts Summary Code

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Alerts Summary Code

Alerts.1 Introduction

The Alerts Summary Code (Alerts Code) provides a unified reference of all Alerts and warnings contained in the Grid Code. The Alerts Code lists actions that OETC may take to warn or Alert Users in abnormal or Emergency Conditions and describes instructions to Users concerning immediate action or preparation for possible future action.

This Alerts Code is a summary of the requirements of the Grid Code. Individual sections of the Grid Code should be consulted on the detailed requirements of each warning and Alert. In the event of inconsistencies between this Alerts Code and other sections of the Grid Code the provisions in individual sections of the Grid Code shall prevail.

The relevant section of the Grid Code, under which any warning or Alert may be required, specifies the procedures, timing, possible actions and form of instruction for the instruction of that warning or Alert.

Alerts.2 Objectives

The objectives of the Alerts Code are as follows;

- to list the warnings and Alerts that may be issued by OETC to enable the safe Operation of the Total System in abnormal situations; and
- to identify the potential responses and actions that may need to be taken by Users on receipt of such warnings and Alerts.

Alerts.3 Scope

In addition to OETC, the Alerts Code applies to;

- Power Producers;
- Licensed Distributors;
- Licensed Suppliers;
- Directly Connected Consumers;
- International Interconnected Parties;
- Internally Interconnected Parties; and
- PWP (for information).

Alerts.4 Alert categories

This Alerts Code is concerned only with instructions associated with abnormal or Emergency Conditions. It does not refer to or include instructions given in the normal course of planning and operating the Total System or Despatch. These are detailed in the individual sections of the Grid Code.

**Table 1 General Alerts**

OETC shall issue an Alert whenever it becomes aware of any factors likely to give rise to a significant Disturbance or unusual operating conditions.			
Grid Code Reference OC5			
	Circumstances of issue	Recipients of Alert	Action to be taken by Users
1	Whenever OETC becomes aware of any factors likely to give rise to a significant Disturbance or unusual operating conditions.	All Users who may be adversely affected by the significant Disturbance or unusual operating conditions.	Acknowledge receipt of Alert by facsimile or other agreed electronic means.
2	The following conditions are those that as a minimum may give rise to an Alert;		Take any necessary preparatory steps consistent with overall System requirements to safeguard their Systems for the event.
	<ol style="list-style-type: none"> 1. Outage of any transmission components or generation units which cause either substantial reduction in system security or violate (n-1) criteria to a supply point.; 2. Outages or risks associated with 66kV or 33kV equipment, which may have substantial impact on total system load or system operations. In such circumstances the relevant distribution or generation companies should send alert to OETC and other users who are likely to be affected 3. Outages or risks associated with generation plant, which may have substantial impact on the generation capability of the plant or system operations. In such circumstances the relevant distribution or generation companies should send alert to OETC, PAEW Water Department (if applicable) and other users who are likely to be affected 4. Condition where the Operating Margin is below the agreed standard; 5. The Voltage or Frequency going outside operational limits; 6. Important events (e.g., National Day celebrations); 7. Major testing; 8. Accidents. 		Report any resulting events in accordance with the procedures set down in Code OC5.



3	An Alert shall take the following form;	
	<p>“This is an Alert timed at (xx:xx) hours; A Disturbance caused by is probable at (yy:yy) hours; The likely effect of the Disturbance is (.....); The Disturbance is likely to last (zz:zz) hrs; This Alert shall be considered to be automatically cancelled if the Alert is not renewed within 2 hours of the time of issue.”</p>	

**Table 2 Alert Warnings**

OETC will issue an Alert warning In the event of Incidents, such as a Total System Shutdown, a Partial System Shutdown or a System Separation.			
Grid Code Reference OC7			
	Circumstances of issue	Recipients of Alert	Action to be taken by Users
1	In the event of Incidents, such as a Total System Shutdown, a Partial System Shutdown or a System Separation.	All Users	Acknowledge receipt of Alert by facsimile or other agreed electronic means.
2	The form of the Alert Warning will be;		Each User shall follow OETC's instructions during an Incident and restoration process.
	<ul style="list-style-type: none"> ▪ “This is an Alert timed at (xx:xx) hours; ▪ There is a (Partial System Shutdown) at (aaaaa); ▪ A System Normalisation; Procedure is being implemented; ▪ Standby for further instructions”. 		Users shall ensure that its personnel are familiar with, and adequately trained to be able to implement the System Normalisation Procedures prepared by OETC.

**Table 3 Demand Control Warnings**

All Warnings in this table will be issued only by OETC			
Grid Code Reference OC4			
	Circumstances of issue	Recipients of Warning	Action to be taken by Users
1	Demand Control Imminent Warning		
1.1	When OETC expects to issue an instruction requiring Emergency Manual Demand Shedding within the following 30 minutes.	Licensed Distributors, Directly Connected Consumers, and Users.	Acknowledge receipt of warning by facsimile or other agreed electronic means. Prepare to implement instruction requiring Emergency Manual Demand Shedding within the following 30 minutes.
1.2	A Demand Control Imminent Warning will automatically lapse if not reissued by OETC within 2 hours of the time of issue.		
1.3	The form of a Demand Control Imminent Warning will be;		
1.4	<ul style="list-style-type: none"> ▪ “This is Demand Control Imminent Warning timed at (xx:xx) hours; ▪ This warning applies to (<i>include name of Users and area/substations affected</i>); ▪ Prepare for Emergency Manual Demand Shedding of (XX) MW within the next 30 minutes; ▪ Do not shed Demand until instructed; ▪ Standby for further instructions”. 		

**Table 3 (continued)**

	Circumstances of issue	Recipients of Warning	Action to be taken by Users
2	Demand Control Red Warning		
2.1	When OETC expects to instruct Emergency Manual Demand Shedding or Planned Rota Demand Shedding on the day ahead.	Licensed Distributors, Directly Connected Consumers, Users, and	Acknowledge receipt of warning by facsimile or other agreed electronic means
2.2	A Demand Control Red Warning will be issued by 16:00 hours on the day ahead.	Power Producers with CDGensets that may be affected by such instructions.	Prepare to implement instruction requiring Emergency Manual Demand Shedding during the day ahead.
2.3	A Demand Control Red Warning will specify the period during which Demand Shedding may be required, the part of the Transmission System to which it may apply, the percentage of Demand reduction that may be required and any other matters.		
2.4	The form of a Demand Control Red Warning will be;		
2.5	<ul style="list-style-type: none"> ▪ “This is Demand Control Red Warning timed at (xx:xx) hrs; ▪ This warning applies to (<i>include name of Users and area/ substations affected</i>) to implement (<i>Emergency Manual Demand Shedding or Planned Rota Demand Shedding</i>) tomorrow; ▪ The amount of Demand to be shed will be (<i>specify amount and duration of demand to be shed</i>); ▪ Do not shed Demand until instructed “. 		

**Table 4 Special instructions**

OETC may issue special instructions in respect of a Schedule Day at any time during the period beginning immediately after the issue of the Generation Schedule and Desalination Schedule.			
Grid Code Reference SDC2			
	Circumstances of issue	Recipients of special instructions	Action to be taken by Users
1	OETC may issue a list of special instructions in respect of a Schedule Day at any time during the period beginning immediately after the issue of the Generation Schedule and Desalination Schedule. OETC will issue special instructions directly to the Users at each Control Centre in relation to required actions and Demand Control.	Licensed Distributors Users Directly Connected Consumers Internally Interconnected Parties.	Note and acknowledge receipt of special instructions by facsimile or other agreed electronic means. Prepare to implement as instructed.
2	Special instructions may include;		
	<ul style="list-style-type: none"> • Requirements for Demand reduction, de-energisation or restoration; • Instructions to effect a Demand transfer between Connection Points; • Instructions to switch in a Demand Intertrip Scheme. 		



Planning Code

Issued April 2010

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Planning Code

PC.1 Introduction

This Code sets out the roles and responsibilities of OETC, PWP and Users regarding the data to be exchanged and the procedures to be followed between parties for the development of the Transmission System, the preparation of the Five Year Statement and to facilitate Users in the planning and development of their own Systems. The development of the Total System includes reinforcements/extensions to the Transmission System and Connections to New Capacity and to new supply requests. The planning processes shall be carried out annually, covering the succeeding five Operational Years and should provide sufficient lead times to facilitate;

- any necessary planning or consent work; and
- detailed engineering design/construction work to be completed by OETC and existing or potential Users of the Total System.

Operational planning to optimise plant and equipment Outages to ensure a secure and efficient System is covered in the Operating Code OC2, Operational Planning.

Security and reliability issues are covered in the Connection Conditions and in the Operating Codes OC2 and OC3.

PC.2 Objective

The objectives of the Planning Code are to define the roles and responsibilities of OETC, PWP and Users to enable;

- the exchange of information and interaction between OETC, PWP and Users concerning any proposed development of User Systems that are to be Directly Connected to the Transmission System, or that may impact on the performance of the Transmission System;
- any proposed development by a User that may impact on the performance of the Transmission System to be carried out in a manner that will allow OETC to meet its obligations as defined in the Transmission Licence;
- the supply of information to allow PWP and OETC to undertake their planning duties as set down in their Licences and the Sector Law; and
- the supply of information to allow PWP to meet its Licence requirements to plan adequate Capacity to meet forecast Demand and the Generation Security Planning Standard.



PC.3 Scope

In addition to OETC and PWP, the Planning Code applies to the following Users;

- Power Producers;
- Licensed Distributors;
- Licensed Suppliers;
- Directly Connected Consumers;
- International Interconnected Parties;
- Internally Interconnected Parties; and
- RAEC if Connected to the Total System.

PC.4 Planning Procedures

PC.4.1 Planning Overview

Development of the Transmission System, involving its reinforcement or extension, may arise for a number of reasons including, but not limited to;

- (a) 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; and
- (c) the cumulative effect of a number of such developments referred to in (a) and (b) by one or more Users.

Accordingly, the reinforcement or extension of the Transmission System may involve work;

- (a) at a substation at a Connection Site where User's Plant is Connected to the Transmission System;
- (b) on transmission lines or other facilities which join that Connection Site to the remainder of the Transmission System; and
- (c) on transmission lines or other Plant at or between locations remote from that Connection Site.

OETC's Licence requires it to produce an annual statement (The Five Year Statement) setting out for each of the five succeeding Operational Years, guidance to PWP and other Users to assess the opportunities for Connecting to and using the Transmission System.

Appendix A shows an information flow chart and timetable for the planning process.

PC.4.2 Data requirements

PC.4.2.1 Planning Data

For the purposes of the Planning Code, data is considered in two parts, Standard Planning Data and Detailed Planning Data.

PC.4.2.2 Standard Planning Data

Standard Planning Data covers basic Demand data from Licensed Suppliers and Licensed Distributors and basic Genset data from Power Producers that allows OETC to carry out Load flow and short circuit studies to determine any requirements to reinforce the



Transmission System and allow preliminary assessment of the need for stability studies. These data requirements are given in Appendix B.

PC.4.2.3 Detailed Planning Data

Detailed Planning Data covers additional data to allow detailed stability studies to be carried out as necessary. These data requirements are given in Appendix C.

PC.4.2.4 Planning Data Quality Levels

When evaluating proposed Connections, data is considered at three levels;

a) Preliminary Project Planning Data

At the time the User applies for a Connection Agreement but before an offer is made and accepted by the applicant User, the data relating to the proposed User development will be considered as Preliminary Project Planning Data. These data will be treated as confidential within the scope of the provisions relating to confidentiality in the Connection Agreement.

Preliminary Project Planning Data will normally only contain the Standard Planning Data unless the Detailed Planning Data is required in advance of the normal timescale to enable OETC to carry out additional detailed system studies.

b) Committed Project Planning Data

Once the offer for a Connection Agreement is accepted, the data relating to the User development already submitted as Preliminary Project Planning Data, and the subsequent data required by OETC which may be all or part of the data contained in Appendix C, will become Committed Project Planning Data. These data, together with the other data held by OETC relating to the Transmission System will form the background against which new applications by any User will be considered and against which planning of the Transmission System will be undertaken.

c) Connected Planning Data

When any estimated values assumed for planning purposes are confirmed or replaced by validated actual values. These data are then termed Connected Planning Data.

PC.4.3 Data Timing

To enable the Five Year Statement to be prepared, each User is required to submit to OETC the Standard Planning Data and the Detailed Planning Data as listed in Appendices B and C. These data should be submitted before the end of September each year and should cover each of the five succeeding Operational Years (and in certain instances, the current Operational Years also). The timetable is shown in Appendix A.

Where, from the date of one submission to another, there is no change in the data (or in some of the data) to be submitted, a User may submit a written statement stating that there has been no change from the data (or in some of the data) submitted previously and only detail the changes to data.

By end October of each Operational Year PWP shall provide OETC with a forecast Demand for Total System for the five succeeding Operational Years.

PC.4.4 System Data

To enable Users to assess their Systems in relation to short circuit currents OETC will provide short circuit infeeds under maximum Capacity conditions for each Connection Point. OETC will make available to any User on request, the system data as listed in Appendix D.



The data will be available at the end of December each year and will cover the two succeeding years.

PC.4.5 The Five Year Statement

OETC shall, in accordance with the Transmission and Despatch License, prepare a statement, on an annual basis, in a form approved by the Regulatory Authority, showing, in respect of each of the five succeeding Operational Years, circuit Capacity, forecast power flows and Loading on each part of the Transmission System and fault levels for each transmission node, together with;

- (a) information on the status of Transmission Capacity and the anticipated future requirements of Transmission Capacity, including (a) new Load and (b) new Capacity;
- (b) a commentary prepared by OETC indicating its views as to those parts of the Transmission System most suited to new Connections, including for new Capacity;
- (c) information on what constraints are foreseen;
- (d) information relating to progress made with current investments;
- (e) information contained in Appendix D1; and
- (f) such other matters as shall be specified in directions issued by the Regulatory Authority.

The Five Year Statement will be produced and issued by the end of March each year.



PC.5 Applications for Connection

OETC will provide to PWP by the end of March details of suitable locations for the Connection of new Capacity together with estimate costs of Connection (including System reinforcement) for each Connection option

This Planning Code applies to all proposed developments on User Systems.

Users and prospective Users of the Transmission System will be able to assess opportunities for Connecting to, and using, the Transmission System, through;

- OETC's Five Year Statement;
- OETC's annual report; and
- published Transmission Use of System Charges.

PC.5.1 Application for Connection

Users wishing to establish a new Connection Site or modify an existing Connection Site shall make an application to OETC for a Connection Agreement. The application shall include;

- a description (termed the User development) of the Plant to be Connected to the Transmission System or the modification relating to User Plant already Connected to the Transmission System;
- the relevant Standard Planning Data listed in Appendix B; and
- the desired completion date of the proposed User development.

Appendix A – A3 summarises the time scales for the actions relating to an application for a Connection. OETC will make an offer of a Connection Agreement within 9 weeks of receiving an adequately completed application by a User.

Any offer of a Connection Agreement made by OETC will state that the applicant User must accept within the period stated in the offer that will be at least 14 weeks, after which the offer automatically lapses. Acceptance of the offer commits the OETC works relating to that User development and binds both parties to the terms of the offer.

Within 4 weeks of acceptance of the offer, or such longer period that OETC may agree, the User shall supply the Detailed Planning Data pertaining to the User development as listed in Appendix C.

PC.5.2 Complex Connections

The magnitude and complexity of any Transmission System extension or reinforcement will vary according to the nature, location and timing of the proposed User development and it may be necessary for OETC to carry out additional, more extensive system studies (than are normally required) to evaluate more fully the impact of the proposed User development on the Transmission System.

Where OETC judges that such additional more detailed analysis is required, OETC will indicate to the User the areas that require more detailed analysis and the cost of additional studies necessary. User shall state whether or not it wishes OETC to undertake the work necessary to proceed and confirm that the User is prepared to pay for this additional work. The Regulatory Authority may consent to a timescale longer than the 14 weeks normally allowed on application from either OETC or the User.



PC.6 Data Confidentiality

Committed Project Planning Data and Connected Planning Data, together with the other data held by OETC relating to the Transmission System, will form the background against which new applications by any User will be considered and against which planning of the Transmission System will be undertaken. Accordingly, data will not be treated as confidential to the extent that OETC;

- is obliged to use it in the preparation of the Five Year Statement;
- is obliged to use it when considering and/or advising on applications by other Users if the data is relevant to that other application; and
- is obliged to use it for OETC operational planning purposes.

All other data will be treated as confidential.

PC.7 Planning Standards

In the planning and development of the Transmission System, OETC shall apply the Transmission Security Standards as determined in accordance with Condition 28 of Transmission License.

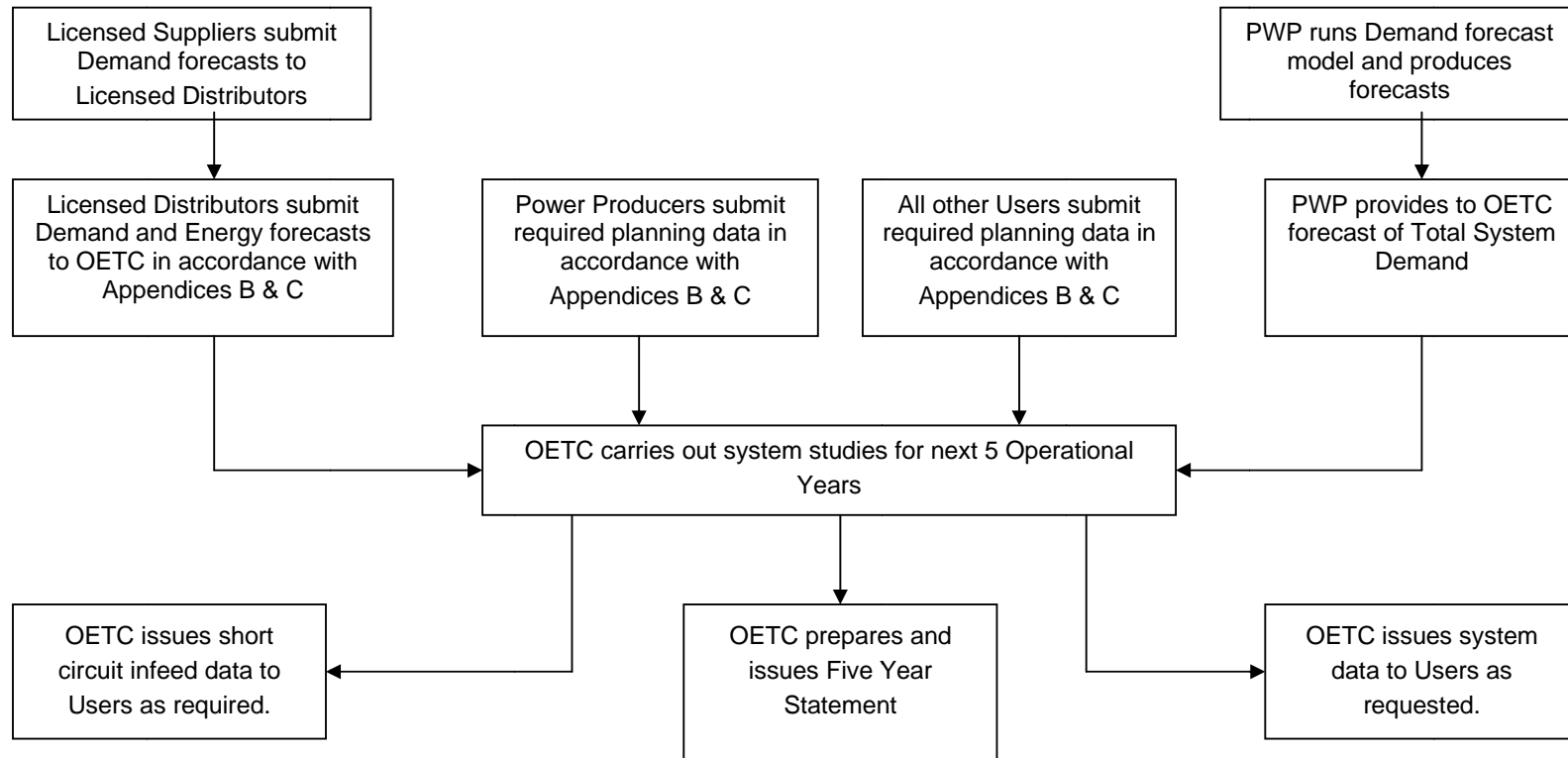


Appendix A Transmission Planning Procedures

A.1 Transmission Planning Flow Chart

Note: The flow chart is a summary only and reference should be made to the Planning Code for full details

Data will be submitted for each of the next five Operational Years





A.2 TIMETABLE FOR MAIN ACTIONS FOR TRANSMISSION PLANNING & FIVE YEAR STATEMENT

(Note that following data are summaries only and reference should be made to Planning Code for full details.)

Year 0	Data to be provided for Operational Years 1, 2, 3, 4 & 5
By end September	Each User to provide data to OETC as listed in Appendices B & C of the Planning Code.
By end October	PWP provide to OETC forecast of Total System demand for each of the five Operational Years.
By end December	OETC provides to Users short circuit infeeds at each Connection Point under maximum Capacity conditions to enable them to assess their networks in relation to short circuit currents.
	OETC will make available to any User, on request, the System data as listed in Appendix D.
By end March	OETC provides the Five Year Statement to PWP, Power Producers and makes available to potential Power Producers
	OETC to provide to PWP details of suitable locations for Connection of new Capacity together with estimate costs of Connection (including System reinforcement) for each Connection option
	OETC to provide to PWP a statement on the adequacy of the OETC network to meet the System Demand and Capacity requirements from considerations of power flows and voltage control. The statement will detail any needs for reinforcement of the network.



A.3 TIMESCALE CHART FOR APPLICATIONS FOR CONNECTION

Time intervals		Action
Start	T = 0	User applies for new Connection or modification to an existing Connection
Offer	T + 9 weeks	OETC to make an offer of a Connection Agreement
Accept	T + 14 weeks (minimum)	User must accept offer or offer lapses
Data	Accept time + 4 weeks	User shall supply the Detailed Planning Data pertaining to the User development as listed in Appendix C



Appendix B Standard Planning Data

B.1 Demand and Active Energy Data

B.1.1 Introduction

Each User that is Directly Connected to the Transmission System and has Demand shall provide OETC with the Demand data. Data shall be supplied for each of the next five Operational Years by;

- each Licensed Distributor/Licensed Supplier in relation to Demand and Active Energy requirements on its Distribution System;
- each Directly Connected Consumer in relation to its Demand and Active Energy requirements; and
- each Power Producer in relation to the Demand of each Production Facility Directly Connected to the Transmission System.

The data provided should be that remaining after any deductions considered appropriate by the User to take account of the output profile of all Embedded non-CDGensets

B.1.2 User Total System Demand (Active Power) and Active Energy

(i) System Demand (Active Power)

Forecast hourly Demand (Active Power) (MW) profiles for each User System (summed over all Connection Points from the Transmission System for each User System) shall be provided for;

- (a) the day of maximum Demand on each User System giving the values of Demand (Active Power) that could be imposed on the Transmission System;
- (b) the day, that will be specified by OETC, of the forecast maximum Demand (Active Power) on the Transmission System; and
- (c) the day, that will be specified by OETC, of the forecast minimum Demand (Active Power) on the Transmission System.

(ii) System Active Energy

Forecast annual Active Energy (MWh) for each User System shall be provided and be subdivided into the following categories of Consumer;

- Residential;
- Commercial;
- Industrial;
- Agriculture and Fisheries;
- Hotels and Tourism;
- Government;
- any other identifiable categories of Consumers; and
- User System losses.

B.1.3 Connection Point Demand (Active and Reactive Power)

Forecast Demand (Active Power) and Power Factor (or Reactive Power) at each Connection Point shall be provided for;



- (a) the day that in the Users opinion, maximum Demand at the Connection Point could be imposed on the Transmission System;
- (b) the day, that will be specified by OETC, of the forecast maximum Demand on the Transmission System; and
- (c) the day, that will be specified by OETC, of the forecast minimum Demand (Active Power) on the Transmission System.

The above Demand data shall be in the form of;

- one set of Demand data where the User System is Connected to the Transmission System via a busbar arrangement which is not normally operated in separate sections; and
- separate sets of Demand data where the User System is Connected to the Transmission System via busbar arrangements which are, or are expected to be, operated in separate sections.

The above Demand data shall;

- be that remaining after any deductions considered appropriate by the User to take account of the output of all Embedded non CDGensets;
- include the net User System reactive Demand but exclude any reactive compensation equipment; and
- be based on average conditions.

B.1.4 General Demand Data

The following information will be required only infrequently and shall be provided when requested by OETC;

- details of any individual Loads which have characteristics significantly different from the typical range of domestic, commercial or industrial Loads, including Loads which may cause flicker in the System;
- the sensitivity of the Demand (Active and Reactive Power) to variation in voltage and frequency at the Connection Point at the time of the peak Demand;
- the average and maximum phase unbalance which the User would expect its Demand to impose on the Transmission System;
- the maximum harmonic content which the User would expect its Demand to impose on the Transmission System; and
- details of all Loads which may cause Demand fluctuations greater than 1MW at the Connection Point.

B.2 Genset Data

B.2.1 Introduction

Each Power Producer or potential Power Producer with CDGensets Directly Connected, or to be Directly Connected, to the Transmission System and/or with existing, or proposed, large Embedded CDGensets, shall provide OETC and PWP with data relating to each CDGenset as specified in B.2.2 and B.2.3.

Each Power Producer or potential Power Producer with small Embedded Gensets shall provide the following information only for each Genset;



- Registered Capacity (MW);
- Available Capacity (MW) on a monthly basis; and
- Name plate data for all equipment.

Data shall be supplied for each of the next five Operational Years.

B.2.2 Production Facility Performance Data

The following data items are required with respect to each CDGenset at each Production Facility;

- Registered Capacity (MW) under reference conditions supported by correction curves showing changes in;
 - Output versus heat rate;
 - heat rate versus ambient air temperature;
- heat rate versus ambient air pressure;
- Available Capacity (MW) on a monthly basis;
- System constrained Capacity (MW) i.e. any known constraint placed on the Capacity of the Embedded CDGenset due to the Distribution System to which it is Connected;
- Minimum Generation (MW);
- Active Power capable of being obtained from CDGensets in excess of their Registered Capacity;
- Generator Performance Chart at the CDGenset stator terminals;
- type of CDGenset, eg steam turbine, gas turbine , cogeneration (specify by type), etc.;
- expected running regime(s) at each Production Facility;
- Minimum time that Genset must be Synchronised to the Transmission System;
- Minimum Shutdown Time; and
- time between start up of different CDGensets at each Production Facility.

B.2.3 Rated Parameters Data

The following information is required also with an application for a Connection Agreement to facilitate an early assessment by OETC of the need for more detailed studies. Any changes to these data should be sent to OETC as part of the planning process.

The Connection Point to the Transmission System expressed in terms of geographical and electrical location and System voltage, supported by diagrams.

For all CDGensets;

- rated MVA;
- rated MW;
- direct axis transient reactance;
- exciter category, for example whether rotating exciter or static exciter;
- Power system stabiliser fitted or not;
- short circuit ratio; and
- inertia constant (alternator plus prime mover) MWsec/MVA.



For each Generator transformer;

- rated MVA;
- positive sequence reactance (at maximum and nominal tap);
- type of tap changer; and
- tap range and step size.

B.3 User System Data

B.3.1 Introduction

Each User shall provide OETC with data of its User System which relating to each Connection Site and/or which may have an Operational Effect on the performance of the Transmission System.

All data must include the effect of any third party Connected to its User System.

B.3.2 Single Line Diagram

Each User shall provide OETC with a single line diagram showing all HV equipment and Connections together with equipment ratings and nomenclature for such equipment.

B.3.3 Reactive Compensation Equipment

The following information shall be provided for all reactive compensation equipment Connected to the User System at 11kV and above, other than Power Factor correction equipment associated directly with Consumer Plant;

- type of equipment (e.g. fixed or variable, capacitive or inductive);
- rating or operating range in Mvar;
- operating characteristics or details of any automatic control logic that enable operating characteristics to be determined;
- the Connection Point to the User System in terms of electrical location and System voltage; and
- total harmonic distortion at the Connection Point.

B.3.4 Short Circuit Contribution to Transmission System

All Users, other than Power Producers, that have Genset(s) and/or motor Loads Connected to their Systems shall provide to OETC sufficient data for OETC to model the short circuit infeed to the Transmission System. The User is required to provide data calculated in accordance with Good Industry Practice.

The data should be provided for the condition of maximum infeed from that User System with all Gensets Synchronised and all HV motors Connected to that User System. The User should ensure that the System Connections reflect credible System operating arrangements.

The following data shall be provided;

- symmetrical three-phase short circuit current infeed at the instant of fault;
- symmetrical three-phase short circuit current after the sub-transient fault current contribution has substantially delayed);
- the zero sequence source resistance and reactance values of the User System as seen from the Connection Point, consistent with the maximum infeed above; and
- the positive sequence X/R ratio at an instant of fault.



B.3.5 Demand Transfer Capability

Where the Demand from one User could be supplied from more than one Connection Point, the User may request OETC to take this into account in designing the Connection Site. In these cases the following information must be supplied;

- the alternative Connection Point(s);
- the Demand which may be transferred under the loss of the most critical circuit from or to each alternative Connection Point (to the nearest 1MW/1Mvar); and
- the arrangements for transfer (e.g. manual or automatic) together with the time required to effect transfer.

B.3.6 Switchgear

The following information must be provided for all switchgear (including circuit breakers, switch disconnectors and isolators) on all circuits Connected to the Connection Point including those at Production Facilities;

- rated voltage (kV);
- operating voltage (kV);
- rated current (A);
- rated short-circuit breaking current, 3-phase (kA) and 1-phase (kA);
- rated Load-breaking current, 3-phase (kA) and 1-phase (kA); and
- rated peak short-circuit making current, 3-phase (kA) and 1-phase (kA).

B.3.7 Name Plate Data

Name plate data for all equipment.

B.3.8 Circuit Parameters (for all circuits)

The following data shall be provided for each circuit;

- rated voltage (kV);
- operating voltage (kV);
- positive phase sequence resistance, reactance and susceptance;
- zero phase sequence resistance, reactance and susceptance; and
- circuit rating (A).

For underground cable or overhead line;

- cable size (mm) and length
- conductor size(mm) and length; and
- number of cables/conductors per phase.

B.3.9 Interconnecting Transformers

The following data shall be provided for each transformer between the Transmission System and the User System;

- transformer rating and impedance voltage;
- winding arrangement and vector group; and
- tap changing facilities and tapping range.



Appendix C Detailed Planning Data

Some of the data items below will have been provided previously under Appendix B to facilitate an preliminary assessment by OETC to determine whether detailed stability studies will be required (before an offer of terms for a Connection Agreement can be made). Those data items have been repeated here for completeness and the data need not be resubmitted unless the values, known or estimated, have changed. Data provided under this Appendix must be copied to PWP.

C.1 Genset Data

Each Power Producer or potential Power Producer with CDGensets Directly Connected, or to be Directly Connected, to the Transmission System and/or with existing, or proposed, large Embedded Gensets, shall provide OETC and PWP with data relating to each CDGenset

All Genset data shall be provided at reference site conditions.

C.1.1 Demand

For each CDGenset which has an associated Genset transformer, the value of the Demand supplied through this transformer when the CDGenset is at Capacity output shall be provided.

Where the Production Facility has Demand in addition to that supplied through the Genset transformer and which is supplied from either the Transmission System or the Power Producer User System, the Power Producer shall supply forecasts for each Production Facility of;

- the maximum Demand that could be imposed on the Transmission System;
- the Demand at the time of the peak Demand on the Transmission System; and
- the Demand at the time of minimum Demand on the Transmission System.

C.1.2 Synchronous Machine and Associated Control System Data

The following CDGenset and Production Facility data should be supplied for each CDGenset;

d) Genset Parameters

1. rated terminal volts (kV);
2. rated MVA;
3. rated MW;
4. Maximum Generation MW;
5. Minimum Generation MW;
6. short circuit ratio;
7. direct axis synchronous reactance;
8. direct axis transient reactance;
9. direct axis sub-transient reactance;
10. direct axis transient time constant;



11. direct axis sub-transient time constant;
12. quadrature axis synchronous reactance;
13. quadrature axis sub-transient reactance;
14. quadrature axis sub-transient time constant;
15. stator time constant;
16. stator leakage reactance;
17. armature winding direct-current resistance;
18. Genset inertia constant (MWsec/MVA);
19. rated field current (amps) at rated MW and Mvar output and at rated terminal voltage; and
20. field current (amps) open circuit stator curve for CDGenset terminal voltages ranging from 50% to 120% of rated value in 10% steps as derived from the manufacturers test certificates.

e) Genset Transformer Parameters

- rated MVA;
- rated voltage ratio;
- winding arrangement and vector group;
- positive sequence resistance and reactance (at max, min and nominal tap);
- zero phase sequence reactance;
- tap changer range and step size; and
- tap changer type: on load or off circuit.

f) Excitation Control System Parameters

Excitation system (including power system stabiliser if fitted) transfer function block diagram showing gains, time constants, limits, rates of change etc of individual elements including details of;

- rated field voltage;
- CDGenset no-load field voltage;
- excitation system positive ceiling voltage;
- excitation system negative ceiling voltage;
- over-excitation limiter; and
- under-excitation limiter.

C.1.3 Governor and Associated Prime Mover Parameters

a) Governor Parameters – All Gensets

Governor system transfer function block diagram showing gains, time constants, limits, rates of change etc of individual elements including details of;

- Filters;
- converters; and



- overall average gain (MW/Hz).

b) Prime Movers Parameters – Steam Turbines Gensets

Prime mover system transfer function block diagram showing gains, time constants, limits, rates of change etc of individual elements and controllers with parameters expressed in terms of the electrical CDGenset rated MW including details of;

- Boilers;
- HP turbine;
- HP turbine power fraction;;
- HP steam extraction range (expressed in terms of the boiler rated output);
- HP steam extraction valves;
- LP turbine;and
- LP turbine power fraction.

c) Prime Mover Parameters – Gas Turbines Gensets

Prime mover system transfer function block diagram showing gains, time constants, limits, rates of change etc of individual elements and controllers including details of;

- inlet guide vanes;
- compressor;
- fuel valve;
- combustion chamber; and
- power turbine.

C.1.4 Production Facility Flexibility Performance

The following data shall be provided for each CDGenset and Production Facility;

- rate of Loading from Cold shutdown (CDGenset and Production Facility);
- rate of Loading from Warm shutdown (CDGenset and Production Facility);
- block Load following synchronising;
- rate of Deloading from normal rated MW;
- regulating range;
- Load rejection capability while still Synchronised and able to supply Load;
- minimum time that Genset must be Synchroised to the Transmission System; and
- Minimum Shut Down Time

C.2 User System Data

C.2.1 Introduction

Each User, whether Connected Directly to the Transmission System through an existing Connection Point or seeking such a Direct Connection, shall provide OETC with data on its User System associated with the Connection Site containing the existing and proposed Connection Points.



C.2.2 User System Layout

Each User shall provide a single line diagram showing both the existing and proposed arrangement(s) of all Load current carrying Plant relating to existing and proposed Connection Points.

The single line diagram shall include;

- busbar layout(s);
- electrical circuitry (ie overhead lines, underground cables, power transformers and similar equipment);
- phasing arrangements;
- Earthing arrangements;
- switching facilities;
- CTs and VTs;
- operating voltages; and
- numbering and nomenclature.

C.2.3 HV Motor Drives

For those Users' Systems that contain HV motors, the User shall provide the following data for each HV motor;

- rated voltage kV;
- rated MVA;
- rated MW;
- full Load current A;
- means of starting and magnitude of starting current;
- motor torque/speed characteristic;
- drive torque/speed characteristic; and
- motor plus drive inertia constant.

C.2.4 Interconnection Transformers

The following data shall be provided for each transformer Connecting the User System to the Transmission System;

- rated MVA;
- rated voltage ratio;
- winding arrangement and vector group;
- positive sequence resistance and reactance (max, min and nominal tap);
- zero sequence reactance;
- tap changer range and step size;
- tap changer type: on Load or off Load;
- Earthing method: direct, resistance or reactance; and
- Transformer cooling arrangements.



C.3 Transient Over-voltage Assessment Data

OETC will need to undertake insulation co-ordination studies and may need to conduct transient overvoltage assessments. OETC may request additional data from Users for this purpose. When requested by OETC, each User shall provide the following data for specified Connection Sites;

- busbar layout including dimensions and geometry together with electrical parameters of any associated current transformers, voltage transformers, wall bushings, and support insulators;
- physical and electrical parameters of lines, cables, transformers, reactors and shunt compensator equipment Connected at that busbar or by lines or cables to that busbar; this information is required for the purpose of calculating surge impedances;
- specification details of all Plant Connected Directly or by lines and cables to the busbar including insulation levels;
- characteristics of overvoltage protection at the busbar and at the termination of lines and cables connected at the busbar;
- for each CDGenset or Production Facility transformer, data concerning transformer construction, i.e., three or five limb cores or single phase units, and operating peak flux density at nominal voltage; and
- any other information that OETC may reasonably request for the purposes of system analysis.

C.4 User Protection Data

The following information is required for all Protection equipment that can trip, inter-trip or close any circuit breaker at a Connection Point or any OETC circuit breaker;

- a full description, including estimated or actual settings, for all Protection systems and relays installed or to be installed on the User System;
- a full description of any auto-reclose facility installed or to be installed on the User System, including type, time delays and initiating functions;
- a full description, including actual or estimated settings, for all relays and Protection systems installed, or to be installed on Gensets, Genset transformers, Production facility transformers and their associated Connections;
- for those CDGensets having (or intended to have) a circuit breaker at the Genset terminal voltage, the clearance times for electrical faults within the CDGenset Protection zone; and
- the most probable fault clearance times for electrical faults on each part of the User System Directly Connected to the Transmission System.



Appendix D Transmission System Data

D.1 System Model

For modelling purposes, OETC, on request, will provide Users and potential Users, with a full listing of submitted and registered data relating to the Transmission System.

D.2 Short Circuit Calculations

To those Users who need to model the Transmission System for the purpose of short circuit calculations, OETC will provide the following System data. It will be calculated in accordance with Good Industry Practice, as an equivalent 220 kV or 132 kV source at the HV point of Connection to the User System.

- symmetrical three-phase short circuit current infeed from the Transmission System at the instant of fault based on sub-transient impedance of CDGensets;
- symmetrical three-phase short circuit current infeed from the Transmission System based on transient impedance of CDGensets, i.e., after the sub-transient fault current contribution has substantially decayed;
- the zero sequence source resistance and reactance values at the Connection Point, consistent with the maximum infeed;
- the pre-fault voltage magnitude at which the maximum fault currents were calculated;
- the positive sequence X/R ratio at the instant of fault;
- appropriate interconnection transformer data, as requested;
- Any other data requested as considered reasonable.



Connection Conditions Code

Issued April 2010

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Connection Conditions Code

CC.1 Introduction

The Connection Conditions Code specifies the minimum technical, design and operational criteria that must be complied with by Users Connected or seeking to be Connected to the Transmission System, and the minimum technical, design and operational criteria, which must be complied with by OETC. These criteria are required for the protection of the Transmission System and Users' Plant Directly Connected to the Transmission System, and to enable OETC to comply with its Licence.

If a User considers that it is unable to meet any of the conditions, they should seek derogation from the Regulatory Authority.

Each User will have a ECA/ECUOSA with OETC that is specific to that User's Connection to the Transmission System. Where there is any possible conflict, these Connection Conditions take precedence.

CC.2 Objective

The objective of the Connection Conditions Code is to ensure that by specifying minimum technical, design and operational criteria the basic rules for Connection to the Transmission System and to a User's System are similar for all Users of an equivalent category and will enable OETC to comply with the Sector Law and its Licence obligations in a non-discriminatory way.

CC.3 Scope

The Connection Conditions Code applies to OETC and to Users, including;

- Power Producers Directly Connected to the Transmission System;
- Potential Power Producers seeking to be Directly Connected to the Transmission System;
- Power Producers with large Embedded CDGensets;
- Licensed Distributors;
- Licensed Suppliers;
- Directly Connected Consumers;
- PWP (in its role in procuring New Capacity);
- Internally Interconnected Parties;
- International Interconnected Parties; and
- RAEC if Connected to the Total System.

CC.4 Procedure

The ECA/ECUOSAs contain provisions relating to the procedure for Connection to the Transmission System or, in the case of Embedded CDGensets, include provisions relating to certain conditions to be complied with by Users prior to OETC notifying the User that it has the right to become operational.



CC.5 Connection

The provisions relating to Connecting to the Transmission System are contained in each ECA/ECUOSA with a User and include provisions relating to the submission of information and reports relating to compliance with the relevant Connection Conditions for that User, Safety Rules, commissioning programmes, Operation Diagrams and approval to Connect.

Prior to the Completion Date under the ECA/ECUOSA, the following information is to be submitted by the User;

- (a) updated Planning Code data with any estimated values assumed for planning purposes confirmed or, where practical, replaced by validated actual values and by updated estimates for the future and by updated forecasts for items such as Demand;
- (b) details of the Protection arrangements and settings;
- (c) copies of all Safety Rules and Local Safety Instructions applicable at Users' sites which shall be used at the OETC/User interface;
- (d) information to enable OETC to prepare Site Responsibility Schedules on the basis of the provisions set out in Appendix A;
- (e) an Operation Diagram for all HV Plant on the User side of the Connection Point;
- (f) the proposed name of the User site (which shall not be the same as, or confusingly similar to, the name of any OETC site or of any other User site);
- (g) a list of Safety Coordinators;
- (h) a list of the telephone numbers for joint System Incidents at which senior management representatives nominated for the purpose can be contacted and confirmation that they are fully authorised to make binding decisions on behalf of the User;
- (i) a list of managers who have been duly authorised to sign Site Responsibility Schedules on behalf of the User;
- (j) information to enable OETC to prepare Site Common Drawings; and
- (k) Metering System Registration Data.

CC.6 Technical, design and operational criteria

CC.6.1 Transmission System performance characteristics

OETC shall ensure that the Transmission System complies with the following technical, design and operational criteria in relation to the part of the Transmission System at the Connection Site with a User.

CC.6.1.1 Frequency deviations

During normal operating conditions, the nominal System Frequency of the Transmission System shall be 50.00 Hz and will be controlled normally between 49.95Hz and 50.05Hz. During exceptional steady state conditions, Frequency deviations will not exceed 49.90Hz to 50.1Hz unless Disturbed circumstances prevail.

Under Disturbed conditions, System Frequency could rise transiently to 51.50 Hz or fall to 48.00 Hz.



CC.6.1.2 Voltage variations

- (a) The voltage on the 220kV and 132kV parts of the Transmission System at each Connection Site with a User will remain within the limits of a minimum voltage of -10.0% and a maximum voltage of +10.0%.
- (b) The voltage on the 66kV, 33kV and 11kV sides of Transmission transformers at Connection Sites with Users will normally remain within the limits +/-6.0% of the nominal value unless abnormal conditions prevail.

During some System Disturbances such as where short circuits occur, the voltage may collapse transiently to zero at the point of fault until the fault is cleared.

CC.6.1.3 Voltage waveform quality

All Plant Connected to the Transmission System, and that part of the Transmission System at each Connection Site, should be capable of withstanding the following distortions of the voltage waveform in respect of harmonic content and phase unbalance.

CC.6.1.3.1 Harmonic distortion

The maximum total levels of harmonic distortion on the Transmission System at 220kV and 132kV, from all sources under both normal, Planned Outage and Forced Outage conditions, (unless abnormal conditions prevail) shall not exceed a total harmonic distortion of 2.0% with no individual harmonic greater than 1.5.0%.

CC.6.1.3.2 Phase unbalance

Under Planned Outage conditions, the maximum negative phase sequence component of the phase voltage on the Transmission System should remain below 1.0% unless abnormal conditions prevail.

Under Planned Outage conditions infrequent short duration peaks with a maximum value of 2.0% are permitted for phase unbalance, subject to the prior agreement of OETC under the ECA/ECUOSA.

CC.6.1.4 Voltage fluctuations

Voltage fluctuations arising from a fluctuating Load Directly Connected to the Transmission System at the Connection Point to the Transmission System shall not exceed 1.0% of the voltage level for step changes that may occur repetitively. Any large voltage excursions other than step changes may be allowed up to a level of 3.0% provided that this does not constitute a risk to the Transmission System or to the System of any User.

CC.6.1.5 Flicker Severity:

The level of voltage fluctuations at a Connection Point shall be within the limits defined in IEC 61000-3-7, with a Flicker Severity (Short Term) of 0.8 Unit and Flicker Severity (Long Term) of 0.6 Unit.

CC.6.2 Plant relating to User/OETC Connection Site

The following requirements apply to Plant at User/OETC Connection Points. Each User must ensure that its Plant comply with these conditions.



CC.6.2.1 General requirements

The design of Connections between any CDGenset and the System of a Licensed Transmission System Operator or Licensed Distribution System Operator shall be consistent with the Licence requirements of the Licensed Transmission System Operator or Licensed Distribution System Operator. Under fault conditions the rated Frequency component of voltage could fall transiently to zero on one or more phases or rise to 140.0% phase-to-earth voltage. The voltage rise would last only for the time that the fault conditions exist. The fault conditions referred to here are those existing when the type of fault is single or two phase-to-earth.

All User Plant associated with the Connection to the Transmission System shall comply with the following standards, as applicable. (in the following order of precedence);

- (a) Safety Rules;
- (b) Omani Electrical Standards, which are such national standards as may be approved by and amended by the Grid Code Review Panel from time to time or which are imposed under the Sector Law;
- (c) the standards and recommendations of the International Standards Organisation and the International Electrotechnical Commission; and
- (d) national standards and codes which are accepted internationally.

In the event that any standard or specification with which a User's Plant is required to comply under CC.6 is amended, OETC, after having consulted with the affected Users will bring the issue to the Grid Code Review panel for consideration. Following the review, the Grid Code Review Panel shall make a recommendation to the Regulatory Authority as to what action should be taken, if any, regarding compliance.

Where OETC determines that in order to ensure safe and co-ordinated Operation of a User's Plant with the Transmission System, there is a requirement for supplemental specifications and/or standards to apply to the design of a User's Plant, OETC shall notify the User and the User shall comply with the additional requirements. On request from the User, OETC shall provide reasonable evidence as necessary to demonstrate the need for the supplemental specifications and/or standards. If a User is still not satisfied, the User may refer the issue to the Grid Code Review Panel for review

Power Producers shall provide on-load tap-changing (OLTC) facilities for all Genset transformers if requested by OETC. Demand Users shall provide OLTC facilities for all transformers Connected to the Transmission System if requested by OETC. All Users shall liaise with OETC on the design specification for the performance of the tap-changing facility.

All Users shall ensure that the Power Factor of Demand at the Connection Point never falls outside the limits of 0.95 lagging and 0.95 leading. If the Power Factor falls outside these limits then the Users shall take all necessary steps to add reactive compensation capability to rectify the situation.

It is recommended that Users take precautions against Disturbances on the Transmission System including Protection against;

- (a) load unbalance (negative sequence) protection
- (b) over/under voltage
- (c) over/under Frequency
- (d) any combination of (b) and (c) that may result in overfluxing
- (e) automatic reclosing (either single or three phase)

Users may consult OETC with respect to Protection adequacy.



CC.6.2.2 Power Producer/OETC Connection Points

CC.6.2.2.1 Short circuit levels

Each Connection between a CDGenset and the Transmission System must be controlled by a circuit breaker capable of interrupting the maximum short circuit current at the Connection Point as determined by OETC.

CC.6.2.2.2 Genset and Production Facility Protection arrangements

Protection of CDGenset and their Connections to the Transmission System must meet the minimum requirements given below. These are necessary to reduce to a practical minimum the impact on the Transmission System of faults on circuits owned by Power Producers.

CC.6.2.2.3 Fault clearance times

The fault clearance times for faults cleared by Main Protection on the Power Producers' equipment Directly Connected to the Transmission System and for faults on the Transmission System Directly Connected to the Power Producers' equipment, from fault inception to the circuit breaker arc extinction, shall not be longer than 120 ms for Plant Connected to the 132kV or 220 kV Systems

Slower fault clearance times may be specified for faults on the Transmission System, subject to written agreement by OETC. Slower fault clearance times for faults Production Facilities may be agreed in accordance with the terms of the ECA/ECUOSA but only if System requirements, in OETC's view, permit. The probability that the fault clearance times derived in accordance with the ECA/ECUOSA shall be exceeded by any given fault must be less than 2.0%.

The Power Producers shall provide Back-Up Protection to cover the possible failure of the Main Protection systems. OETC shall also provide Back-Up Protection and these Back-Up Protections shall be coordinated so as to provide discrimination and protect equipment from damage.

CC.6.2.2.4 Protection requirements

(a) Protection of interconnecting Connections

The requirements for the provision of Protection equipment for interconnecting Connections (i.e. the primary conductors from the current transformer accommodation on the circuit side of the circuit breaker to the Connection Point) shall be specified in the ECA/ECUOSA.

(b) Circuit-breaker fail Protection

When a CDGenset is Connected to the Transmission System at 220kV or 132kV and a circuit breaker is provided by the Power Producer or OETC, circuit breaker fail Protection shall be provided by the Power Producer or OETC on this circuit breaker. In the event, following operation of a Protection system, of a failure to interrupt fault current by these circuit-breakers within the fault current interruption time, the circuit breaker fail Protection is required to initiate tripping of all the necessary electrically adjacent circuit-breakers so as to interrupt the fault current within the next 200 ms.

(c) Loss of Excitation

The Power Producers must provide Protection to detect loss of excitation on a CDGenset and initiate a CDGenset trip.

(d) Pole-Slipping Protection

Where System requirements dictate, OETC shall specify in the ECA/ECUOSA a requirement for Power Producers to fit pole-slipping Protection to their CDGensets.



(e) Work on Protection Equipment

No busbar Protection, circuit-breaker fail Protection relays, AC or DC wiring (other than power supplies or DC tripping associated with the CDGenset itself) may be worked upon or altered by Power Producer personnel in the absence of a representative of OETC.

(f) Relay Settings

Protection and relay settings shall be coordinated across the Connection Point in accordance with the ECA/ECUOSA to ensure effective disconnection of faulty Plant.

CC.6.2.3 Licensed Distributors and Directly Connected Consumers/OETC Connection Points

CC.6.2.3.1 Protection arrangements

Protection of Distribution Systems of Licensed Distributors and Directly Connected Consumers must meet the minimum requirements referred to below.

CC.6.2.3.2 Fault clearance times

The fault clearance times for faults on the System of a Licensed Distribution System Operator and Directly Connected Consumers' equipment Connected to the Transmission System, and for faults on the Transmission System Directly Connected to the Licensed Distributors' or Directly Connected Consumers equipment, from fault inception to the circuit breaker arc extinction, shall be set out in each ECA/ECUOSA.

The times specified in accordance with the ECA/ECUOSA shall not be longer than 120ms for Plant Connected to the 132kV or 220 kV Systems.

Slower fault clearance times may be specified in accordance with the ECA/ECUOSA for faults on the Transmission System. Slower fault clearance times for faults on the Licensed Distributors' and Directly Connected Consumers' Plant may be agreed in accordance with the terms of the ECA/ECUOSA but only if System requirements permit. The probability that the fault clearance times stated in accordance with the ECA/ECUOSA shall be exceeded by any given fault must be less than 2.0%.

The Licensed Distributors or Directly Connected Consumers shall provide Back-Up Protection to cover the possible failure of the Main Protection systems. OETC shall also provide Back-Up Protection, which shall result in a fault clearance time slower than that specified for the Licensed Distributors' or Directly Connected Consumers' Back-Up Protection so as to provide discrimination. The Back-Up Protection to be provided by the Licensed Distributors or Directly Connected Consumers shall have fault clearance times not slower than 300ms for faults on the Licensed Distributors' or Directly Connected Consumers' Plant Connected with the Transmission System at 220kV or 132kV,

CC.6.2.3.3 Fault disconnection facilities

Where a OETC circuit breaker is not provided at the User Connection voltage, the User must provide OETC with the means of tripping all the User circuit breakers necessary to isolate faults or System abnormalities on the Transmission System. In these circumstances, the User Protection shall also provide signals to trip the appropriate OETC circuit breakers for faults on the User System. These tripping facilities shall be in accordance with the requirements specified in the ECA/ECUOSA.

CC.6.2.3.4 Automatic switching equipment

Where automatic reclosure of OETC circuit breakers is required following faults on the User System, automatic switching equipment shall be provided in accordance with the requirements specified in the ECA/ECUOSA.



CC.6.2.3.5 Relay settings

Protection and relay settings shall be coordinated across the Connection Point in accordance with the ECA/ECUOSA to ensure effective disconnection of faulty Plant.

CC.6.2.3.6 Work on Protection equipment

Where OETC owns the busbar at the Connection Point, no busbar Protection, AC or DC wiring (other than power supplies or DC tripping associated with the Licensed Distributors' or Directly Connected Consumers' Plant) may be worked upon or altered by the Licensed Distributors' or Directly Connected Consumers' personnel in the absence of a representative of OETC.

CC.6.2.3.7 Neutral earthing

At nominal System voltages of 132kV and above the higher voltage windings of three phase transformers and transformer banks Connected to the Transmission System must be star connected with the star point suitable for Connection to earth.

CC.6.2.3.8 Frequency sensitive relays

As required under the Operating Code, each Licensed Distributor shall make arrangements that shall facilitate automatic under-frequency de-energisation of Demand. Grid Code OC4 specifies the manner in which Demand subject to under-frequency de-energisation shall be split into discrete MW blocks with associated under-frequency relay settings. Technical requirements relating to under-frequency relays are listed in Appendix E.

CC.6.3 CDGenset requirements

This section sets out the technical and design criteria and performance requirements that each Power Producer must ensure are complied with in relation to its CDGensets.

CC.6.3.1 Plant performance requirements

All CDGensets must be capable of contributing to Primary Control by supplying Active Power (MW) at any point between the limits 0.80 Power Factor lagging and 0.95 Power Factor leading at the CDGensets' terminals. The short circuit ratio of CDGensets shall be not less than 0.5. A CDGenset must be capable of continuously supplying its rated Active Power output within the System Frequency range 49.50 to 50.50Hz. Any decrease of Active Power output occurring in the Frequency range 49.50 to 48.00Hz should not be more than pro-rata with Frequency. CDGensets must remain synchronised to the Transmission System at Total System Frequencies within the range 48.00Hz to 51.50Hz.

The Active Power output under steady state conditions of any CDGenset Directly Connected to the Transmission System should not be affected by voltage changes in the normal operating range. The Reactive Power output under steady state conditions should be fully Available within the range of Transmission System voltages within the ranges specified in CC.6.1.2.

It is an essential requirement that the Transmission System must incorporate a Black Start Capability. This shall be achieved by agreeing a Black Start Capability at a number of strategically located Production Facilities. For each Production Facility OETC shall state in the ECA/ECUOSA whether or not a Black Start Capability is required.



CC.6.3.2 Control arrangements

Each CDGenset must be capable of contributing to Primary Response by supplying Active Power according to its Primary Response capabilities as set out in the PPA or PWPA or the ECA/ECUOSA.

The capability for contributing to Secondary Response shall be as set out in the PPA or PWPA or the ECA/ECUOSA. OETC shall determine the required participation.

Each CDGenset must be capable of supporting voltage regulation at the interconnection point by continuous modulation of Reactive Power supplied.

CC.6.3.2.1 Turbine control system

Each Genset must be fitted with a fast acting Turbine Speed Controller. The turbine speed control principle shall be in such a way that the CDGenset Active Power output shall vary with rotational speed according to a proportional droop characteristic.

Superimposed load control loops shall have no negative impact on the steady state and transient performance of the Turbine Speed Control.

The Turbine Speed Controller shall be sufficiently damped for both isolated and interconnected Operation modes. Under all Operation conditions, the damping coefficient of the Turbine Speed Controller shall be above 0.25 for speed droop settings above 3.0% for Gas Turbines Gensets and 5.0% for Steam Turbines Gensets.

Under all System operating conditions, the CDGenset speed shall not exceed 106.0%. For Genset oscillations with frequencies below 2 Hz, the Turbine Controller shall have no negative effect on Genset oscillation damping.

The Turbine Speed Controller and any other superimposed control loop (load control, gas turbine temperature limiting control, etc.) shall contribute to the Primary Control as set out in the PPA /PWPA or the Connection Conditions Code.

Where a CDGenset becomes isolated from the rest of the Total System but is still supplying Consumers, the Turbine Speed Controller must also be able to control System Frequency below 52.00Hz unless this causes the CDGenset to operate below its designed minimum operating level when it is possible that it may trip after a time.

All Steam Turbine Gensets must be fitted with a Turbine Speed Controller which is designed and operated to the requirements of IEC 600.

All Gas Turbine Gensets must be fitted with a Turbine Speed Controller capable of a power related speed droop characteristic of between 3.0% and 5.0%.

CC.6.3.2.2 Automatic Voltage Regulator

A continuous Automatic Voltage Regulator (AVR) acting on the excitation system is required to provide constant terminal voltage of the Genset without instability over the entire operating range of the Genset.

Control performance of the voltage control loop shall be such that under isolated operating conditions the damping coefficient shall be above 0.25 for the entire operating range.

The AVR shall have no negative impact on Genset oscillation damping.

The specific requirements for AVR facilities, including power system stabilisers where these are necessary for System reasons, shall be specified in the PPA/PWPA or the ECA/ECUOSA. Operation of such control facilities shall be in accordance with the Scheduling and Dispatch Code.



CC.6.3.2.3 Dispatch inaccuracies

The standard deviation of Load error at steady state Load over a 60-minute period must not exceed 2.5 percent of the Dispatch Instructions.

CC.6.3.3 Negative phase sequence loadings

Each CDGenset shall be required to withstand, without tripping, the negative phase sequence loading incurred by clearance of a close-up phase-to-phase fault, by Back-Up Protection on the Transmission System or Distribution System in which it is Embedded.

CC.6.3.4 Neutral earthing

At nominal System voltages of 132kV and above the higher voltage windings of a transformer of a CDGenset must be star connected with the star point suitable for Connection to earth.

CC.6.3.5 Frequency sensitive relays

The System Frequency could rise to 51.50Hz or fall to 47.5Hz and CDGenset must continue to operate within this Frequency range unless OETC has agreed to any frequency-level relays and/or rate-of-change-of-frequency relays which shall trip such CDGenset within this Frequency range, under the ECA/ECUOSA.

Power Producers shall be responsible for protecting all their CDGensets against damage should Frequency excursions outside the range 51.5Hz to 47.5Hz ever occur. Should such excursions occur, it is up to the Power Producers to decide whether to disconnect his Plant for reasons of safety of Plant and/or Persons.

CC.6.4 Communications equipment

In order to ensure control of the Transmission System, telecommunications between Users and OETC must, if required by OETC, be established in accordance with the requirements set down below.

CC.6.4.1 Control telephony

Control telephony is the method by which a User operator and OETC control engineers speak to one another for the purposes of control of the Total System in both normal and emergency operating conditions (all communications being confirmed either by fax or by other electronic means). Control telephony provides secure point-to-point telephony for routine control calls, priority control calls and emergency control calls.

OETC shall install control telephony at the User location where the User telephony equipment is not capable of providing the required facilities or is otherwise incompatible with the OETC control telephony. Details of and relating to the control telephony required are contained in the ECA/ECUOSA.

CC.6.4.2 Operational Metering

OETC shall provide supervisory control and data acquisition (SCADA) Outstation interface equipment at each Connection Site. The User shall provide such voltage, current, frequency, Active Power and Reactive Power measurement outputs and Plant status indications and alarms to the OETC SCADA Outstation interface equipment as required by OETC in accordance with the terms of the ECA/ECUOSA.

Active Power and Reactive Power measurements, circuit breaker and disconnect status indications from Gensets and Genset transformer tap positions must each be provided to OETC on an individual Genset basis. In addition, measured or derived Active Power output on each fuel, from CDGensets that can continuously fire on more than one fuel simultaneously must be provided.



The general requirements for connection of such signals to the OETC SCADA system are set out in Appendix D.

Metering System requirements shall be provided in accordance with MDEC.

CC.6.4.3 Facsimile machines

Each User and OETC shall provide a facsimile machine or machines;

- (a) in the case of Power Producers, at each Production Facility;
- (b) in the case of OETC and Licensed Distributors, at the respective Control Centre(s); and
- (c) in the case of Directly Connected Consumers at the Control Centre.

Each User shall, prior to Connection to the System of the User Plant notify OETC of its telephone number or numbers, and shall notify OETC of any changes.

Prior to Connection to the System of the User Plant OETC shall notify each User of the telephone number or numbers of its facsimile machine or machines and shall notify any changes.

CC.6.4.4 Busbar voltage

OETC shall provide to each Power Producer with voltage signals at a Connection Point to enable the Power Producers to synchronise the CDGensets to the Transmission System.

CC.6.5 System monitoring

Some monitoring equipment is installed on the Transmission System to enable OETC to monitor the System dynamic performance. Further such equipment will be installed in future. To allow the monitoring of individual CDGenset, OETC requires voltage and current signals from the secondary windings of CDGenset circuit current transformers and voltage transformers. They shall be provided by the User with the installation of the monitoring equipment being dealt with in the PPA/PWPA.

CC.7 Site related conditions

In the absence of agreement between the parties to the contrary, construction, commissioning, control, Operation and maintenance responsibilities follow ownership.

CC.7.1 Responsibilities for Safety

Any User entering and working on its Plant on a OETC site will work to the "MEW Safety Rules (Electrical and Mechanical) Second Edition issued 1989 and amended in 1995", (and any future revisions of these rules) unless otherwise agreed in writing.

OETC entering and working on its Plant on a User site shall work to the User Safety Rules. Until receipt of such notice, the "MEW Safety Rules (Electrical and Mechanical) Second Edition, issued 1989 and amended in 1995" will apply.

A User may apply to OETC for permission to work according to that Users own Safety Rules when working on its Plant on OETC sites. If OETC is of the opinion that the User Safety Rules provide for a level of safety commensurate with that of the OETC Safety Rules, it shall notify the User, in writing, that the User may use its own Safety Rules.

OETC may apply to a User for permission to work according to OETC Safety Rules when working on its Plant on that User sites. If the User is of the opinion that OETC Safety Rules provide for a level of safety commensurate with that of that User Safety Rules, it shall notify OETC, in writing, that OETC may use its own Safety Rules. Until receipt of such notice, the OETC Safety Rules will apply.



CC.7.2 Connection Site Schedules

A set of Connection Site schedules shall be prepared identifying the equipment and ownerships at the Connection Site, the Connection Points and the responsibilities for safety, control and maintenance.

The responsibilities for safety, control and maintenance shall be included in a Site Responsibility Schedule to inform site staff and OETC of agreed responsibilities for Plant at the operational interface.

Appendix A sets down the requirements for Connection Site Schedules. The attachment to Appendix A provides a format to be used in the preparation of Site Responsibility Schedules.

CC.7.3 Operation and Gas (SF₆) Zone Diagrams

CC.7.3.1 Operation Diagrams

An Operation Diagram shall be prepared for each Connection Site at which a Connection Point exists using, where appropriate, the graphical symbols shown in Appendix B. The Operation Diagram shall include all HV Plant and the Connections to all external circuits and incorporate numbering, nomenclature and labelling, as set out in the Operating Code OC 8. At those Connection Sites where SF₆ gas-insulated metal enclosed switchgear and/or other SF₆ gas-insulated HV Plant is installed, those items must be depicted within an area delineated by a chain dotted line which intersects SF₆ gas-zone boundaries. The nomenclature used shall conform to that used on the relevant Connection Site and circuit. The Operation Diagram (and the list of technical details) is intended to provide an accurate record of the layout and circuit interconnections, ratings and numbering and nomenclature of HV Plant and related Plant.

CC.7.3.2 Gas (SF₆) Zone Diagrams

An SF₆ Gas Zone Diagram shall be prepared for each Connection Site at which a Connection Point exists where SF₆ gas-insulated switchgear and/or other SF₆ gas-insulated HV Plant is utilised. They shall use, where appropriate, the graphical symbols shown in Appendix B. The nomenclature used shall conform to that used in the relevant Connection Site and circuit.

CC.7.3.3 Preparation of Operation and Gas (SF₆) Zone Diagrams for User Sites

In the case of a User site, the User shall prepare and submit to OETC, an Operation Diagram for all HV Plant on the User side of the Connection Point and OETC shall provide the User with an Operation Diagram for all HV Plant on the OETC side of the Connection Point.

The User shall then prepare, produce and distribute, using the information submitted on the User Operation Diagram and the OETC Operation Diagram, a composite Operation Diagram for the complete Connection Site.

CC.7.3.4 Preparation of Operation and Gas (SF₆) Zone Diagrams for OETC Sites

In the case of a OETC site, the User shall prepare and submit to OETC an Operation Diagram for all HV Plant on the User side of the Connection Point. OETC shall then prepare, produce and distribute, using the information submitted on the User Operation Diagram, a composite Operation Diagram for the complete Connection Site.

CC.7.3.4.1 Changes to Operation and Gas (SF₆) Zone Diagrams

When OETC has decided that it wishes to install new HV Plant or it wishes to change the existing numbering or nomenclature of its HV Plant at a OETC site, OETC shall one month prior to the installation or change, send to each such User a revised Operation Diagram of that OETC site, incorporating the new OETC HV Plant to be installed and its numbering and nomenclature or the changes, as the case may be.



When a User has decided that it wishes to install new HV Plant, or it wishes to change the existing numbering or nomenclature of its HV Plant at its User site, the User shall one month prior to the installation or change, send to OETC a revised Operation Diagram of that User site incorporating the new User HV Plant to be installed and its numbering and nomenclature or the changes as the case may be.

CC.7.3.5 Validity

The composite Operation Diagram prepared by OETC or the User shall be the definitive Operation Diagram for all operational and planning activities associated with the Connection Site. If a dispute arises as to the accuracy of the composite Operation Diagram, a meeting shall be held at the Connection Site, as soon as reasonably practicable, between OETC and the User, to endeavour to resolve the matters in dispute.

CC.7.4 Site Common Drawings

Site Common Drawings shall be prepared for each Connection Site and shall include Connection Site layout drawings and electrical layout drawings and they will identify the responsibilities for common services drawings. These items will form part of the ECA/ECUOSA that will also require common Protection/control drawings to be available to all relevant parties,

CC.7.4.1 Preparation of Site Common Drawings for a User Site

In the case of a User site, OETC shall prepare and submit to the User, Site Common Drawings for the OETC side of the Connection Point.

The User shall then prepare, produce and distribute, using the information submitted by OETC, Site Common Drawings for the complete Connection Site.

CC.7.4.2 Preparation of Site Common Drawings for a OETC Site

In the case of a OETC site, the User shall prepare and submit to OETC Site Common Drawings for the User side of the Connection Point.

OETC shall then prepare, produce and distribute, using the information submitted by the User, Site Common Drawings for the complete Connection Site.

CC.7.4.2.1 User changes to Site Common Drawings

When a User becomes aware that it is necessary to change any aspect of the Site Common Drawings at a Connection Site it shall;

- (a) if it is a User site prepare, produce and distribute revised Site Common Drawings for the complete Connection Site; and
- (b) if it is a OETC site prepare and submit to OETC revised Site Common Drawings for the User side of the Connection Point and OETC shall then prepare, produce and distribute, using the information submitted in by the User, revised Site Common Drawings for the complete Connection Site.

If the User change can be dealt with by it notifying OETC in writing of the change and for each party to amend its copy of the Site Common Drawings then the User shall so notify and each party shall so amend.

CC.7.4.2.2 OETC changes to Site Common Drawings

When OETC becomes aware that it is necessary to change any aspect of the Site Common Drawings at a Connection Site it shall;

- (a) if it is a OETC site prepare, produce and distribute revised Site Common Drawings for the complete Connection Site; and



- (b) if it is a User site prepare and submit to the User revised Site Common Drawings for the OETC side of the Connection Point and the User shall then prepare, produce and distribute, using the information submitted in by OETC, revised Site Common Drawings for the complete Connection Site.

If the OETC change can be dealt with by it notifying the User in writing of the change and for each party to amend its copy of the Site Common Drawings then OETC shall so notify and each party shall so amend.

CC.7.4.3 Validity

The Site Common Drawings for the complete Connection Site prepared by the User or OETC, as the case may be, shall be the definitive Site Common Drawings for all operational and planning activities associated with the Connection Site. If a dispute arises as to the accuracy of the Site Common Drawings, a meeting shall be held at the site, as soon as reasonably practicable, between OETC and the User, to endeavour to resolve the matters in dispute.

CC.7.5 Access

The provisions relating to access to OETC sites by Users, and to User sites by OETC, are set out in each ECA/ECUOSA with OETC and each User. In addition to those provisions, where a OETC site contains exposed HV conductors, unaccompanied access shall only be granted to individuals holding appropriate authorisation.

CC.7.6 Maintenance standards

It is a requirement that all User Plant on OETC sites is maintained adequately for the purpose for which it is intended and to ensure that it does not pose a threat to the safety of any of OETC Plant or personnel on the OETC site.

OETC shall have the right to inspect the test results and maintenance records relating to such Plant at any time.

It is a requirement that all OETC Plant on User sites is maintained adequately for the purposes for which it is intended and to ensure that it does not pose a threat to the safety of any of the User Plant or personnel on the User site. Users shall have the right to inspect the test results and maintenance records relating to such Plant, at any time.

CC.7.7 Site operational procedures

OETC and Users with an interface with OETC, must make available staff to take necessary Safety Precautions and carry out operational duties as may be required to enable work/testing to be carried out and for the Operation of Plant Connected to the Total System.



Appendix A Principles and basic procedure to be used in the preparation of Connection Site Schedules

A.1 Principles

At all Complexes the following Connection Site Schedules shall be drawn up in accordance with the Site ECA/ECUOSAs or with such variations as may be agreed between OETC and Users.

- (a) Connection Site details and equipment, including;
 - (i) Connection Site location;
 - (ii) Ownership of assets;
 - (iii) Connection Points;
 - (iv) Site Responsibility Schedule; and
 - (v) Operational Diagram.
- (b) Site Capacity and tariff Metering;
 - (i) Actual Metering Point; and
 - (ii) Electrical Delivery Point.
- (c) Site services;
- (d) Site specific technical conditions; including
 - (i) Special technical facilities;
 - (ii) Protection requirements;
 - (iii) Operational Metering;
 - (iv) Control telephony;
 - (v) Special equipment requirements;
 - (vi) System monitoring inputs; and
 - (vii) Other site services.

Each set of Connection Site Schedules for a Connection Site shall be prepared by OETC in consultation with other Users and be agreed at least 2 weeks prior to the Completion Date under the ECA/ECUOSA for that Connection Site (which may form part of a Complex). Each User shall, in accordance with the timing requirements of the ECA/ECUOSA, provide information to OETC to enable it to prepare the Site Responsibility Schedule.

Each set of Connection Site Schedules shall be subdivided to take account of any separate Connection Sites on that Complex.

Each Site Responsibility Schedule, (a) (iv) above, shall detail for each item of Plant;

- i) Plant ownership;
- ii) Safety (applicable Safety Rules and Control Person or other responsible Person (Safety Coordinator), or such other Person who is responsible for safety);
- iii) Operations (applicable operational procedures and control engineer);
- iv) Responsibility for statutory inspections;
- v) Maintenance and fault investigation;
- vi) Responsibility for site security; and
- vii) Access.



The Site Responsibility Schedule shall be prepared in accordance with the attachment to this Appendix unless otherwise agreed in writing with OETC and shall include, for each Connection Site, lines and cables emanating from the Connection Site.

Every page of each Connection Site Schedule shall bear the date of issue and the issue number.

Following preparation of a set of Connection Site Schedules, OETC shall send it to the Users involved for confirmation of its accuracy.

The Connection Site Schedules shall be signed on behalf of OETC by the representative responsible for the area in which the Complex is situated and on behalf of each User involved by the manager nominated in accordance with A.3 of this Appendix, by way of written confirmation of its accuracy. Once signed, OETC shall distribute two copies, not less than two weeks prior to its implementation date, to each User that is a party on the Connection Site Schedule, accompanied by a note indicating the issue number and the date of implementation.

A.2 Alterations to existing Site Responsibility Schedules

When a User identified on a Connection Site Schedule becomes aware that an alteration is necessary, it must inform OETC immediately and in any event 8 weeks prior to any change taking effect.

Where a User has informed OETC of a change, or OETC proposes a change, OETC shall prepare a revised Connection Site Schedule not less than 8 weeks prior to the change taking effect.

The revised Connection Site Schedule shall be signed and accompanied by a note indicating where the alteration(s) has/have been made, the new issue number and the date of implementation.

When a User identified on a Connection Site Schedule, or OETC, as the case may be, becomes aware that an alteration to the Connection Site Schedule is required urgently to reflect an emergency situation for example, the User shall notify OETC, or OETC shall notify the User, as the case may be, immediately and shall discuss;

- i) what changes are necessary to the Connection Site Schedules;
- ii) whether the Connection Site Schedules are to be modified temporarily or permanently; and
- iii) the distribution of the revised Connection Site Schedules.

OETC shall prepare the revised Connection Site Schedules as soon as possible, and in any event within seven days of it being informed of or knowing the necessary required alteration. The Connection Site Schedules shall be confirmed by Users and signed on behalf of OETC and Users as soon as possible after it has been prepared and sent to Users for confirmation.

A.3 Responsible managers

Each User shall, prior to the Completion Date under each ECA/ECUOSA, Supply to OETC a list of managers who have been duly authorised to sign Connection Site Schedules on behalf of the User and OETC shall, prior to the Completion Date under each ECA/ECUOSA, Supply to that User the name of the manager responsible for the area in which the Complex is situated.



**Attachment to Appendix A
Proforma for Site Responsibility Schedule
for Connection Point**

Connection Site:

Company:

Item of Equipment	Equipment Owner	Safety Rules ¹	Safety Co-ordinator ²	Operational Procedures	Control Responsibility	Party Responsible for Statutory Inspections, Maintenance and Fault Investigations	Security Responsibility	Access ^{3 4}	Comment

Signed on behalf of the OETC

Date

Signed on behalf of each User involved

by way of written confirmation of its accuracy.

¹ PAEW Safety Rules were formerly referred to as the MEW Safety Rules, as changed from time to time in accordance with the Grid Code.

² At all interfaces OETC and the User must co-ordinate activities but the OETC authorized Person has overall responsibility.

³ Access applies to authorised subcontractors of the OETC and the User also.

⁴ Access to the OETC compound is with the OETC's approval, exercised by the site security officer.



Appendix B Symbols for Operation Diagrams



Circuit Breaker



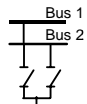
Circuit Breaker



Isolator



Earth Switch



Double Busbar with Selection



2 Winding Transformer



Earthing Resistance



Surge Arrester



Capacitor



A. C. Generator



Motor



Fuse



Automatic Reclose Switch



Cable



Overhead Line



Current Transformer



Voltage Transformer



Appendix C Plant to be included on Operation Diagrams

C.1 Basic principles

- i) Where practicable, all the HV Plant on any Connection Site shall be shown on one Operation Diagram. Provided the clarity of the diagram is not impaired, the layout shall represent as closely as possible the geographical arrangement on the Connection Site.
- ii) Where more than one Operation Diagram is unavoidable, duplication of identical information on more than one Operation Diagram must be avoided.
- iii) The Operation Diagram must show accurately the current status of the Plant e.g. whether commissioned or decommissioned. Where decommissioned, the associated switchbay shall be labelled "spare bay".
- iv) Provision shall be made on the Operation Diagram for signifying approvals, together with provision for details of revisions and dates.
- v) Operation Diagrams shall be prepared in A4 format or such other format as may be agreed with OETC.
- vi) The Operation Diagram should normally be drawn single line. However, where appropriate, detail that applies to individual phases shall be shown. For example, some HV Plant is numbered individually per phase.

C.2 Plant to be shown on Operation Diagram

1. Busbars;
2. Circuit breakers;
3. Disconnectors (isolators);
4. Switch disconnectors (Switching isolators);
5. Bypass facilities;
6. Earthing switches;
7. Maintenance earths;
8. Overhead line entries;
9. Overhead line traps;
10. Cable and cable sealing ends;
11. Capacitor voltage transformers (CVTs);
12. Power line carrier line matching units (LMUs);
13. Gensets;
14. Generator transformers;
15. Genset unit transformers;
16. Station transformers;
17. Static VAr compensators;
18. Series or shunt capacitors;
19. Series or shunt reactors;
20. System transformers including tertiary windings;



21. Earthing and auxiliary transformers;
22. Voltage transformers (VTs) and current transformers (CTs);
23. Surge arrestors/diverters;
24. Neutral earthing arrangements on HV Plant;
25. Fault throwing devices;
26. Phase shifting transformers (quadrature boosters);
27. Arc suppression coils;
28. Wall bushings;
29. Shorting and discharge switches; and
30. SF₆ gas zones.



Appendix D SCADA Outstation interfacing

D.1 Introduction

This Appendix sets out the technical requirements for connections to the OETC SCADA system Outstation in terms of electrical characteristics.

D.2 General requirements

In all cases signals shall be arranged such that the level of electrical interference does not exceed those defined in IEC 870-2-1: "Telecontrol Equipment and Systems - Operating Conditions Power Supply and Electromagnetic Compatibility" and IEC870-3: "Telecontrol Equipment and Systems - Specification for Interfaces (Electrical Characteristics)".

D.2.1 Digital inputs

Digital inputs cover both single and double points for connection to digital input modules on the OETC Outstation equipment. The initiating switch contacts shall be free of potential, whereas the input circuitry of the Outstation is common to the negative 48 volt potential.

D.2.2 Single points

Single point inputs must be used for alarms and where single contact indications are available. The off (contact open or 0) state is considered to be the normal state and the on (contact closed or 1) state the alarm condition.

D.2.3 Double points

Double points are used to indicate primary plant states by the use of complementary inputs for each plant item. Only the "10" and "01" states are considered valid with the "00" and "11" states considered invalid. The "10" state is considered to be the normal or closed state.

D.2.4 Energy Meter inputs

Energy meter input pulses for connection to pulse counting input modules on the OETC Outstation equipment must operate for a minimum of 100ms to indicate a predetermined flow of MWh or Mvarh. The contact must open again for a minimum of 100ms. The normal state of the input must be open.

D.2.5 Analogue inputs

Analogue inputs for connection to analogue input modules on the OETC Outstation equipment must all be electrically isolated with a two wire connection required. Signals shall be in the form of 4-20mA (or other range to be agreed between the User and OETC) for both unidirectional and bi-directional measured values. Signal converters shall be provided as necessary to produce the correct input signals.

D.2.6 Command outputs

All command outputs for connection to command output modules on the OETC Outstation equipment switch both the 0 volts and -48 volts for a period of 2.5 seconds at a maximum current of 1 amp. All outputs shall electrically isolated with a two wire connection to control interposing relays on the plant to be operated.

Appendix E Technical requirements for under-frequency relays for the automatic de-energisation of Supplies at low Frequency

E.1 E.1 Under-frequency relays

The under-frequency relays to be used shall be in accordance with the requirements of the ECA/ECUOSA. Under-frequency relays shall have a frequency setting range of 46.0 to 52.0Hz and be suitable for operation from a nominal AC input of 63.5, 110 or 240V. The following general parameters on the requirements of approved Frequency Relays for automatic installations is given as an indication to the provisions that may be included in a ECA/ECUOSA;

- i) Frequency settings: 46.00 – 52.00Hz in steps of 0.01Hz;
- ii) Measurement period: Within a minimum settings selectable settings range of 3 to 7 cycles;
- iii) Operating time: Between 100 and 160ms dependent on measurement period setting;
- iv) Voltage lock-out: 20 to 90% of nominal voltage;
- v) Facility stages: Five stages of Frequency operation; and
- vi) Output contacts: Two output contacts per stage.

E.2 Under-frequency relay voltage supplies

The voltage supply to the under-frequency relays shall be derived from the System at the supply point concerned so that the Frequency of the under-frequency relays input voltage is the same as that of the primary System. This requires either;

- i) the use of a secure supply obtained from voltage transformers directly associated with the Transmission System interconnection transformer(s) concerned, the supply being obtained where necessary via a suitable automatic voltage selection scheme; or
- ii) the use of the substation 240V phase-to-neutral selected auxiliary supply, provided that this supply is always derived at the supply point concerned and is never derived from a standby supply CDGenset or from another part of the Distribution System.

E.3 Scheme requirements

The tripping facility should be engineered in accordance with the following reliability considerations;

- i) Dependability: Failure to trip at any one particular Demand shedding point shall not harm the overall operation of the scheme. However, many failures would have the effect of reducing the amount of Demand under low frequency control. An overall reasonable minimum requirement for the dependability of the Demand shedding scheme is 96%, i.e., the average probability of failure of each Demand shedding point should be less than 4%. Thus the Demand under low Frequency control shall not be reduced by more than 4% due to relay failure; and
- ii) Outages: Under-frequency Demand shedding schemes shall be engineered such that the amount of Demand under control is as specified by OETC and is not reduced unacceptably during equipment outage or maintenance conditions.



Operating Code OC1 – Demand Forecasting

Issued April 2010

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Operating Code OC1 – Demand Forecasting

OC1.1 Introduction

OC1 outlines the obligations on OETC and Users regarding the preparation of forecasts of both Active Demand and Reactive Demand on the Transmission System. OC1 sets out the timescales within which Users shall provide forecasts of both Active Demand and Reactive Demand to OETC, and the timescales within which OETC shall provide forecasts to Users. The demand forecasts referred to in OC1 are required for certain operational purposes, specifically;

- the **Operational Planning Phase** requires annual forecasts of both Active Demand and Reactive Demand on the Transmission System for each of the succeeding 5 years;
- the **Programming Phase** requires weekly forecasts of both Active Demand and Reactive Demand on the Transmission System for the period 1 to 8 weeks ahead; and
- the **Control Phase** requires daily forecasts of Demand Control data on the Transmission System for the day ahead.

OC1 also deals with the provision of Demand Control data (as described in OC4) in timescales consistent with the Operational Planning Phase, the Programming Phase, and the Control Phase.

OC1.2 Objective

The objectives of OC1 are as follows;

- to specify the requirement for OETC and Users to provide unbiased forecasts of both Active Demand and Reactive Demand on the Transmission System within specified timescales. These forecasts are used by OETC for Operational Planning purposes, and in the Programming Phase, and the Control Phase;
- to describe information to be provided by Users to OETC in the post Control Phase; and
- to describe certain factors to be taken into account by OETC and Users when preparing forecasts of both Active Demand and Reactive Demand on the Transmission System.



OC1.3 Scope

In addition to OETC, OC1 applies to the following Users;

- Licensed Distributors;
- Power Producers;
- Directly Connected Consumers;
- International Interconnected Parties;
- Internally Interconnected Parties;
- PWP; and
- RAEC if Connected to the Total System.

OC1.4 Data required by OETC

OC1.4.1 Operational Planning Phase

No later than the end of October each year, OETC shall notify each User in writing of the forecast information listed below for each of the following 5 Operational Years;

- the date and time of the forecast annual peak Active Demand and Reactive Demand on the Transmission System at annual maximum Demand conditions¹; and
- the date and time of the forecast annual minimum Active Demand and Reactive Demand on the Transmission System at average minimum Demand conditions¹.

By the end of January of each year, each User shall provide to OETC in writing, the forecast information listed below for each of the succeeding 5 Operational Years;

- each Licensed Distributor (summed over all Bulk Supply Points) and each Directly Connected Consumer (at the Connection Point), shall provide forecast profiles of hourly Active Power Demand for the day of that User's maximum Demand and for the day specified by OETC as the day of forecast annual peak Demand. These forecasts to reflect annual maximum Demand conditions;
- each Licensed Distributor (summed over all Bulk Supply Points) and each Directly Connected Consumer (at the Connection Point), shall provide forecasts of their annual Active Demand requirements for Average Conditions subdivided into the following categories of Consumer;
 - residential;
 - commercial;
 - industrial;
 - agriculture and fisheries;
 - hotels and tourism;
 - government; and

¹ There will be a need for OETC to develop forecast methodologies based on normalised demands, e.g. Average Maximum Demand and Average Conditions



- any other identifiable categories of Consumers.
- each Licensed Distributor (summed over all Bulk Supply Points) and Directly Connected Consumer (at the Connection Point), shall provide forecasts of the profile of hourly Active Demand for the day specified by OETC as the day of forecast minimum Demand at average conditions;
- individual Bulk Supply Point Demand (Active Power) and Power Factor at annual maximum Demand conditions for the annual peak hour at the Bulk Supply Point; and
- Individual Bulk Supply Point Demand (Active Power) and Power Factor at Average Conditions at the specified hour at the annual minimum OETC Demand.

User forecasts of both Active Demand and Reactive Demand on the Transmission System provided to OETC in accordance with OC1 must reflect the User's best estimates of its forecast requirements.

In circumstances when the busbar arrangement at a Bulk Supply Point is expected to be operated in separate sections, separate sets of forecast information for each section shall be provided to OETC.

OETC will use the information supplied to it to prepare forecasts of both Active Demand and Reactive Demand on the Transmission System for use in the Operational Planning Phase.

OC1.4.2 Programming Phase

The Users identified below shall provide OETC in writing by 10:00 hours each Saturday forecasts of Demand for Active Power and Reactive Power on the Transmission System for the period of 1 to 8 weeks ahead;

- Licensed Distributors shall supply hourly profiles of Demand for Active Power and Reactive Power at each Bulk Supply Point and the amount and duration of their proposed use of Demand Control which may result in a Demand change of 1 MW or more on an hourly basis at each Bulk Supply Point; and
- each Directly Connected Consumer shall supply hourly MW profiles of Demand for Active Power and Reactive Power at a Connection Point.

OETC will use the information supplied to it in preparing its forecasts of Demand for Active Power and Reactive Power on the Transmission System for the purposes of the Programming Phase.

OC1.4.3 Control Phase

In accordance with SDC1 each Licensed Distributor, User, and Directly Connected Consumer shall notify OETC by 10:00hours each day of any Demand Control procedures that may result in a Demand Change of 1 MW or more averaged over any hour on any Bulk Supply Point of the following day.

OETC will use the information supplied to it when preparing its forecasts of both Active Demand and Reactive Demand on the Transmission System for use in Control Phase studies. OETC shall issue to all Users the forecasts used in the Control Phase by 15:00hours each day.



OC1.4.4 Post Control Phase

The Users identified below will provide OETC in writing by 10:00 hours each day certain information regarding Active Power data and Reactive Power data for the previous day;²

- each Licensed Distributor shall supply hourly MW profiles for each Bulk Supply Point for the previous day showing the amount and duration of Demand reduction achieved from the use of Demand Control of 1 MW or more averaged over any hour on any Bulk Supply Point.
- each Directly Connected Consumer shall supply MW profiles for the previous day in relation to its Demand and Active Energy requirements,
- each Power Producer shall supply details of hourly Active Power and Reactive Power output sent out to the Transmission System by its Gensets during the previous calendar day.

OC1.5 OETC forecasts

OETC is responsible for the forecasts of both Active Demand and Reactive Demand on the Transmission System used for planning and operational purposes. However, OETC is required by the terms of its Transmission and Dispatch Licence to ensure that the forecasts of Active Demand used in the Operational Planning Phase are consistent with the forecasts of Active Demand prepared and published by the PWP (in its Statement of Future Capacity Requirements).

When preparing forecasts of both Active Demand and Reactive Demand on the Transmission System to be used in the Planning Phase and the Control Phase, OETC shall take account of the following;

- historic Demand data
- Transmission System losses
- weather forecasts and the current and historic weather conditions
- the incidence of major events or activities which are known to OETC in advance
- Generation Schedule and Desalination Schedule
- Demand Control of 1 MW or more proposed to be exercised by Licensed Distributors and of which OETC has been informed
- other information supplied by Users.

² Users are only required to supply the data in 1.4.4 until OETC can obtain it from the SCADA system, The Grid Code Review panel will then need to review this paragraph.



Operating Code OC2 – Operational Planning

Issued April 2010

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Operating Code OC2 – Operational Planning

OC2.1 Introduction

Operating Code OC2, Operational Planning is concerned with the;

- provision of data by Users to OETC for Operational Planning purposes
- procedures relating to the coordination of Outages for construction, repair and maintenance of Plant on the Transmission System.

Code OC2 covers planning procedures through various timescales for matching Capacity with forecast Demand plus Operating Margin on the Total System. The procedures coordinate Outages of CDGensets and Outages of and constraints on parts of the Transmission System and of the Distribution System to achieve, so far as possible, the Transmission Security Standards.

The Code sets out the data required by OETC from Power Producers in order to conduct the Operational Planning process, and the procedures to be adopted by OETC in the planning and coordination of Outages of CDGensets and of the Transmission System.

OC2.2 Objective

The objective of this code is to ensure, as far as possible, that OETC co-ordinates and approves Outages of CDGensets, taking into account Demand forecasts, desalination requirements, Transmission System Outages and Distribution System Outages in order to minimise the overall costs of Total System Operation and in order to ensure that forecast Demand plus the Operating Margin is met in accordance with the Transmission Security Standards.

OC2.3 Scope

In addition to OETC and PWP, OC2 applies to;

- Power Producers;
- Licensed Distributors;
- Directly Connected Consumers;
- International Interconnected Parties;
- Internally Interconnected Parties;
- PAEW; and
- RAEC if Connected to the Total System.

OC2.4 Procedures

The procedures in this code cover details of the data required and the time at which the data needs to be provided to OETC to allow co-ordination of Outages. An overall timetable for the Operational Planning process is presented in Appendix A.

OC2.5 Planning of CDGenset Outages

The procedure set out below is to be followed in each Operational Year.

OETC will indicate to each Production Facility criteria on which the Proposed Station Outage Schedules should be submitted. The format of the submission is shown in Appendix B.

OC2.5.1 Planning for Operational Year 2

(i) By the end of January

Each Power Producer will provide to OETC and PWP a Proposed Station Outage Schedule for Operational Year 2 in writing, which will contain the following information in relation to each proposed Planned Outage;

- (a) identity of the CDGensets concerned
- (b) MW concerned (ie MW which will not be Available as a result of the Outage and that which will, notwithstanding the Outage, still be Available,)
- (c) required duration of Outage
- (d) preferred start date and start time or range of start dates and start times
- (e) whether the Outage is a Flexible Outage or an Inflexible Outage, provided that the Power Producer must not declare an Outage to be an Inflexible Outage unless prudent operating practice would not permit the Outage to be declared as a Flexible Outage
- (f) If it is a Flexible Outage, if;
 - the period for which the Outage could be deferred at the request of OETC, which period shall not be less than 30 days in length;
 - the period for which the Outage could be advanced at the request of OETC, which period shall be not less than 10 days in length.

In relation to sub-paragraph (e) above, the Power Producer must provide OETC with such evidence as it may reasonably require in order to substantiate the declaration as an Inflexible Outage and, if the Power Producer fails to establish to OETC's reasonable satisfaction that the Outage is required to be an Inflexible Outage, the Outage shall be deemed to have been submitted as a Flexible Outage with an attendant Flexible Outage period of 10 days for advancement and 30 days for deferral.

(ii) Between the end of January and the end of July

For each week of Operational Year 2, OETC will forecast the maximum Capacity that may be required from CDGensets, taking into account insofar as OETC may consider appropriate;

- Demand forecasts
- OETC estimate of Demand Control
- the Operating Margin as set by OETC
- Transmission System and Distribution System constraints
- Transmission System and Distribution System Outages
- Transmission System losses



During this period OETC may, as appropriate, contact each User which has supplied information to seek clarification of information received or such additional relevant information as is reasonable.

OETC will on the basis of (i) the maximum Generating Capacity required each week (ii) the Proposed Station Outage Schedules and (iii) the total Available Capacity develop a Proposed System Outage Schedule.

(iii) By the end of July

OETC will, having taken into account the information notified to it and, having discussed it with Users and PWP, if appropriate, provide PWP, each Power Producer and User in writing with the Proposed System Outage Schedule showing the CDGensets that may be potentially withdrawn from service during each week of Operational Year 2 for a Planned Outage and showing the Flexible Outage periods, by way of amendment to, or confirmation of, the suggested Proposed Station Outage Schedule submitted by the Power Producers.

The Proposed System Outage Schedule may have deviations from the Proposed Station Outage Schedules as Flexible Outages and Inflexible Outages may have been moved to co-ordinate all Outage proposals received by OETC, or for reasons relating to the proper Operation of the Transmission System. OETC will give priority to facilitate proposed Inflexible Outages.

In addition, where in the opinion of OETC the Transmission Security Standards could not otherwise be met, OETC may request Users;

- to re-designate an Inflexible Outage proposed by the Power Producer to be a Flexible Outage
- to exclude a Flexible Outage or an Inflexible Outage from the Proposed System Outage Schedule.

(iv) By the end of August

Where a Power Producer, a User or PWP objects to the Proposed System Outage Schedule, it may contact OETC to explain its concerns. OETC, PWP, and that Power Producer or User will then discuss the problem and seek to resolve it.

OETC may need to convene meetings with PWP, other Power Producers or Users and joint meetings of the parties to resolve the problem. PWP, Power Producers or Users that notify OETC of objections may request that such a meeting be convened and OETC will give due and reasonable consideration to such request.

In the event of the above discussions not producing agreement, OETC will determine the Proposed System Outage Schedule by the end of September. However, the affected party, if dissatisfied, may raise the issue as a point of principle with the Regulatory Authority without prejudice to the OETC decision.

OC2.5.2 Planning for Operational Year 1

The Proposed System Outage Schedule will form the basis for developing the Final System Outage Schedule when on the first of April; Operational Year 2 becomes Operational Year 1.

(i) By the end of January

Each Power Producer shall provide OETC and PWP with its suggested Final Station Outage Schedule in writing (showing any amendments to the Proposed System Outage Schedule).

The Final Station Outage Schedule provided by the Power Producer will reflect only changes to the Proposed System Outage Schedule if the Power Producer has had to respond to changed circumstances. The Power Producer will have to provide sufficient evidence of such changed circumstances.

The Final Station Outage Schedule will contain the following information in relation to each proposed Planned Outage;

- (a) identity of the CDGensets concerned
- (b) MW concerned (ie MW which will not be Available as a result of the Outage and that which will, notwithstanding the Outage, still be Available,)
- (c) whether the Outage is a Flexible Outage or an Inflexible Outage
- (d) start date and start time
- (e) if it is a Flexible Outage;
 - the period for which the Outage could be deferred at the request of OETC, which period shall be not less than 30 days in length
 - the period for which the Outage could be advanced at the request of OETC, which period shall be not less than 10 days in length.

The Power Producer must provide OETC with such evidence as it may reasonably require in order to substantiate the declaration as an Inflexible Outage and, if the Power Producer fails to establish to OETC's reasonable satisfaction that the Outage is required to be an Inflexible Outage, the Outage shall be deemed to have been submitted as a Flexible Outage with an attendant Flexible Outage period of 10 days for advancement and 30 days for deferment.

(ii) By the end of June

OETC will have considered the Final Station Outage Schedule taking into account the following factors insofar as OETC may consider appropriate;

- Demand forecasts
- OETC estimate of Demand Control
- the Operating Margin as set by OETC
- Transmission System and Distribution System constraints
- Transmission System and Distribution System Outages
- Transmission System losses

OETC will provide to PWP, each Power Producer and User a draft Final System Outage Schedule in writing, showing the CDGensets which it is proposed to be withdrawn from service during each week of Operational Year 1 for a Planned Outage and showing Flexible Outage periods, by way of amendment to, or confirmation of, the Final Station Outage Schedule submitted by the Power Producer.



The draft Final System Outage Schedule may differ from the Final Station Outage Schedule as follows;

- Flexible Outages (and associated Flexible Outage periods) may have been moved to co-ordinate all Outage proposals received by OETC or generally for reasons relating to the Operation of the Transmission System; or
- a Flexible Outage may have been re-designated as an Inflexible Outage.

In addition, where in the opinion of OETC the Transmission Security Standards could not otherwise be met, OETC may, by giving to the Power Producer and PWP a written notice request;

- that a Flexible Outage or an Inflexible Outage which was shown in the Proposed System Outage Schedule or is newly requested by the Power Producer be excluded from the Final System Outage Schedule; or
- that an Inflexible Outage which was shown in the Proposed System Outage Schedule, be re-designated as a Flexible Outage, or that its start date be moved.

(iii) By the end of July

Where a Power Producer, a User or PWP objects to the Final System Outage Schedule, it may contact OETC to explain its concerns. OETC, PWP, and that Power Producer or User will then discuss the problem and seek to resolve it.

OETC may need to convene meetings with PWP, other Power Producers or Users and joint meetings of the parties to resolve the problem. PWP, Power Producers or Users that notify OETC of objections may request that such a meeting be convened and OETC will give due and reasonable consideration to such request.

In the event of the above discussions not producing agreement, OETC will determine the Proposed System Outage Schedule by the end of September. However, the affected party, if dissatisfied, may raise the issue as a point of principle with the Regulatory Authority without prejudice to the OETC decision.

(iv) By the end of September

OETC will have considered the Final System Outage Schedule in the light of the factors set out in subsection OC2.5.2 (ii) (including the requirement for the Operating Margin to be met, and in particular during the period of Minimum Demand) together with any issues agreed with Power Producers in subsection OC2.5.2 (iii).

OETC shall issue to each Power Producer, User and PWP the Final System Outage Schedule showing

- (a) the CDGensets that will be withdrawn from service during each week of Operational Year 1 for a Planned Outage, and
- (b) the Flexible Outage periods.

OC2.5.3 Planning for Operational Year 0

Throughout each Operational Year and from end of January of the preceding Operational Year OETC will monitor the Operating Margin continuously in the light of any movement of Planned Outages, the incidence of Outages other than Planned Outages and the requirement for Operating Margin including at times of Minimum Demand and taking into account the following factors insofar as OETC may consider appropriate the factors specified in subsection OC2.5.1 (ii), namely;



- Demand forecasts;
- OETC estimate of Demand Control;
- the Operating Margin as set by OETC;
- System and Distribution System constraints;
- Transmission System and Distribution System Outages; and
- Transmission System losses.

(i) Flexible Outage movements

In the case of a Flexible Outage, OETC may, upon giving a Power Producer and PWP written notice of not less than 7 days require the start date or start time of the Flexible Outage to be advanced or deferred within the Flexible Outage period the Power Producer will take that Outage in accordance with the revised timing set out in that notice.

(ii) Amendments to Planned Outages

In the cases of;

- a Flexible Outage which OETC would like to move outside the Flexible Outage period
- a Flexible Outage which OETC would like to move within the Flexible Outage Period at less than seven days notice
- an Inflexible Outage which OETC would like to move.

OETC may, upon giving a Power Producer and PWP written notice, request that the start date or start time of a Planned Outage be advanced or deferred.

If the Power Producer agrees to such advancement or deferral, or OETC and the Power Producer agree to some other advancement or deferral, the Power Producer will take the Outage in accordance with OETC's requirements.

If there is no agreement, then the Outage will not be taken by the Power Producer.

(iii) CDGenset substitution

A Power Producer may, on reasonable grounds, by notice submitted to OETC in writing and PWP at any time during Operational Year 0, request that a CDGenset for which there is a Flexible Outage, as specified in the Final System Outage Programme, remain in service and that one of the other CDGensets at the same Production Facility (having substantially the same Capacity and Operating Parameters) be permitted to be taken out of service during the period for which such Flexible Outage has been Planned. OETC shall not unreasonably withhold its consent to such substitution and, if OETC does consent, the Final System Outage Programme shall be amended and the Power Producer shall be entitled to take the Outage accordingly.

(iv) Short Notice Outages

At any time in Operational Year 0, a Power Producer may request from OETC, a Short Notice Outage, by giving not less than 48 hours notice before the earliest start date. The request notice must contain the following information;

- identity of the CDGenset(s) concerned;



- full details of the problem and the effect of the Short Notice Outage on the Operating Parameters and the equipment which is affected;
- the expected date and start time of the Short Notice Outage;
- the estimated date and time on which the CDGenset and/or Desalination Unit and/or the Plant is expected to return to commercial Operation; and
- full details of any restrictions or risk of trip of a CDGenset and/or the Plant caused by the problem associated with the Short Notice Outage.

On receipt of a request notice for a Short Notice Outage, OETC shall consider the request and shall having discussed the position with the Power Producer (and Users in the case of an Embedded CDGenset), reply in writing indicating;

- acceptance of the request, confirming the requested start time and duration of the Short Notice Outage;
- proposals for the advancement or deferment of the Short Notice Outage if taken, indicating alternative start time and duration; or
- rejection of the request.

If OETC has accepted the request, the Short Notice Outage, if taken, must be taken by the Power Producer in accordance with OETC's requirements.

If OETC has indicated an alternative start time and/or duration, OETC and the Power Producer must discuss the alternative and any other options which may arise during the discussions. If agreement is reached, then the Short Notice Outage, if taken, must be taken by the Power Producer in accordance with OETC's requirements.

If OETC refuses the request or if agreement is not reached then the Short Notice Outage may not be taken by the Power Producer.

If, in respect of a particular CDGenset, OETC has rejected requests on two successive occasions, which were not less than 7 days apart, OETC may not reject a third request. However, OETC may require that such Outage, if it is to be during the Summer Period, be deferred if, in OETC's reasonable opinion, were the Short Notice Outage not to be deferred;

- the Transmission Security Standards might not be met; or
- there would otherwise be insufficient Generating Capacity to meet forecast Demand and the Operating Margin.

Any such deferral shall be for so long as the above circumstances exist, but shall not be beyond the end of the month following the end of the Summer Period.



In the event that a Short Notice Outage is scheduled pursuant to this subsection, OETC shall by notice in writing and copy to PWP confirm the details thereof within one day after the details of the Short Notice Outage have been settled. Such notice shall contain the following information;

- the identity and Capacity of the CDGenset(s) concerned;
- full details of the problem;
- maximum allowed duration of the Outage; and
- the start date and start time.

OC2.5.4 Forced Outages

In the event that a CDGenset suffers a Forced Outage, the relevant Power Producer shall immediately inform OETC (copied to PWP) by written notice and giving the Power Producer's best estimate of the date and time by which the CDGenset is likely to have been repaired and restored to its full level of availability.

A Power Producer shall following a Forced Outage and within 24hours of the commencement of the Outage, provide OETC with written notice of information and any updates to information as OETC may reasonably require, all copied to PWP. The Power Producer shall use all reasonable endeavours to ensure that the CDGenset is repaired and restored to its full level of availability as soon as possible and in accordance with Good Industry Practice.

OC2.5.5 Release of CDGensets

Power Producers may only undertake Planned Outages with OETC agreement in accordance with Outage programmes produced pursuant to this Operational Planning Code.

CDGensets must not be withdrawn for a Planned Outage or a Short Notice Outage without OETC's formal permission for such release according to the procedures set out below.

OETC's formal permission shall specify;

- the identity of the CDGenset and Capacity concerned (i.e. Capacity which will not be Available as a result of the Outage and that which will, notwithstanding the Outage, still be Available, if any);
- the duration of the Outage; and
- the start date and start time.

OETC may withhold its permission for the release of a CDGenset for a Planned Outage or a Short Notice Outage where such Outage has previously been planned in accordance with this Operational Planning Code where, in OETC's reasonable opinion (were such Outage not to be deferred);

- the Transmission Security Standards could not be met; or
- there would be insufficient Capacity to meet forecast Demand and the Operating Margin.

OETC may require the Power Producer to continue to defer such Outage for so long as the above circumstances exist.



OC2.5.6 Return to service and overruns

In relation to a Planned Outage, not later than 7 days before the expiry of the Flexible Outage period or the Inflexible Outage period, the Power Producer must notify OETC and PWP either that its CDGenset is returning to service;

- (a) earlier than expected;
- (b) at the time and date expected;
- (c) later than expected; and
- (d) upon return, if it is expected to be fully Available.

Where a CDGenset is not expected to be fully Available upon its return to service, the Power Producer shall state the Active Power level at which the CDGenset is expected to be Available. In the case of a CDGenset that is capable of firing both on natural gas and on fuel oil, the Availability must be stated for each fuel.

In the case of a return from a Planned Outage earlier than expected, notice of return to service must be given as far as possible in advance of return but in any event not later than 7 days before the expiry of the Planned Outage period.

In the case of a return from a Planned Outage later than expected, notice of return to service must be given not later than 7 days before the expiry of the Planned Outage period and shall state the reason for the delay in the return of the CDGenset to service and the Power Producer's best estimate of the date and time at which the CDGenset will return to service.

A Power Producer must use all reasonable endeavours to ensure that, in respect of each Planned Outage of the its CDGensets, the Outage as included in the Final System Outage Schedule (or as moved in accordance with this code) is followed.

Before returning from any Outage other than a Planned Outage, a Power Producer must inform OETC and PWP, as far in advance as reasonably possible that its CDGenset is returning to service. The Power Producer must, in addition, provide an Availability Notice in accordance with the Scheduling and Dispatch Code 1 on the day prior to the Schedule Day on which the CDGenset is to return to service.

If at any time during an Outage the Power Producer becomes aware that its CDGenset will not be Available by the expiry of the period specified for the duration of the Outage in the Final System Outage Programme or as otherwise notified in the case of Outages other than Planned Outages, the Power Producer shall notify OETC and PWP immediately in writing stating the reason for the delay and the Power Producer's best estimate of the date and time by which the CDGenset will actually have been maintained, repaired or restored to be Available in accordance with the Scheduling and Dispatch Code.

OC2.6 Planning of Transmission System Outages

The procedures set out below are to be followed in each Operational Year.

Transmission System Outages required in Operational Year 2 will be those resulting from construction or replacement works and will take due account of known requirements and the Proposed System Outage Schedule.

Transmission System Outages required in Operational Years 1 and 0 will, in addition, take into account Transmission System Outages required as a result of maintenance.

OC2.6.1 Planning for Operational Year 2

OETC shall plan Transmission System Outages required in Operational Year 2 as a result of construction or replacement works taking due account of known requirements and the Proposed System Outage Schedule.

(i) By the end of July

OETC will have drawn up for OETC internal use, a draft Transmission System Outage Plan covering the period Operational Year 2. OETC will notify PWP in writing of the complete plan, and will notify each User in writing of those aspects of the draft plan which may operationally affect such User including, in particular, proposed start dates and end dates of relevant Outages of the Transmission System. OETC will indicate to PWP and Power Producers where a need may exist to place restrictions on the Scheduling and Dispatch of CDGensets to allow the security of the Transmission System to be maintained within the Transmission Security Standards.

OC2.6.2 Planning for Operational Year 1

The plan produced pursuant to subsection OC2.6.1 will become the draft Transmission System Outage Plan for Operational Year 1 when on the first of April Operational Year 2 becomes Operational Year 1. OETC shall update the draft Transmission System Outage Plan and shall, in addition, take into account Outages required as a result of maintenance work.

(i) By the end of July

OETC will update the draft Transmission System Outage Plan for Operational Year 1 and will inform PWP in writing of the complete plan and will inform each User of any potential restrictions that may affect it and of any general implications for the Transmission System.

(ii) By the end of August

Where a User objects to the proposed restrictions or impact notified to it under subsection OC2.6.2 (i) above, equivalent provisions to those set out in subsection OC2.5.1 (iv) will apply, namely: the User shall contact OETC to explain its concerns. OETC, the User and any other affected party including PWP will then discuss the problem and seek to resolve it.

In the event of the above discussions not producing agreement, OETC will determine the requirements of the Transmission System Outage Schedule by the end of September. However, the affected party, if dissatisfied, may raise the issue as a point of principle with the Regulatory Authority without prejudice to the OETC decision.

(iii) By the end of September

OETC will issue the final Transmission System Outage Plan for Operational Year 1.

OETC will notify PWP in writing of the complete plan and each User in writing of those aspects of the plan which may operationally affect such User including, in particular, proposed start dates and end dates of relevant Outages of the Transmission System. OETC will also indicate where a need exists to use intertripping, emergency switching, emergency Demand management or other measures including restrictions on the Scheduling of CDGensets to allow the security of the Transmission System to be maintained within the Transmission Security Standards.



OC2.6.3 Operational Year 0 through to the Programming Phase

The Transmission System Outage Plan for Operational Year 1 issued under subsection OC2.6.2 (iii) shall become the final plan for Operational Year 0 when on the first of April Operational Year 1 becomes Operational Year 0.

OC2.6.4 Programming Phase

(i) By 11:00 hours each Wednesday

OETC shall update the Transmission System Outage Plan for the following one-week period beginning on the Friday.

OETC will notify PWP in writing of the complete plan and each User in writing of those aspects of the plan that may operationally affect such User including in particular proposed start dates and end dates of relevant Transmission System Outages. OETC will also indicate where a need exists to use intertripping, emergency switching, emergency Demand management or other measures including restrictions on the Dispatch of CDGensets to allow the security of the Transmission System to be maintained within the Transmission Security Standards.

When during the Programming Phase, OETC become aware of the possible need for manual Demand shedding, advance warning shall be given to the potentially affected parties and preliminary manual Demand shedding programmes prepared in accordance with the procedures of OC4.6.

(ii) During the Programming Phase

Each User and OETC will inform each other immediately and confirm in writing, copied to PWP if there is any unavoidable requirement to depart from the Outages and actions determined and notified under this subsection.

OC2.7 Data requirements

Each Power Producer shall submit in writing to OETC by the end of January for each Operational Year in respect of each CDGenset;

- the Generator Performance Chart; and
- the Operating Parameters to be applied from the beginning of January onwards.

The submissions shall be in the format indicated in Appendix C and Appendix D (copied to PWP). The data shall be reconfirmed annually even where it has already been provided or specified under a PPA.

OETC shall use the Operating Parameters for Operational Planning purposes only and not for Scheduling and Dispatch. These data will however, form the basis for Operating Parameters that Power Producers will submit/update within the Scheduling and Dispatch Codes.

In the case of a CDGenset which is capable of firing on two different fuels, the Power Producer must submit to OETC (copied to PWP), by separate written notifications, the Operating Parameters in respect of each fuel, each clearly marked to indicate for which fuel it applies.

The Generator Performance Charts must be submitted for each CDGenset separately showing output at the Genset terminals under reference conditions. They shall include the details shown in Appendix D.



The Generator Performance Chart shall be supported by correction curves or formulas to enable OETC to assess the variation in performance over expected ambient temperatures and for other parameters that could affect the output of the CDGenset from reference conditions.

For each Production Facility with both Desalination Units and CDGensets, Power Producers shall submit in writing to OETC and PWP the combination of Desalination Units and CDGensets that could be running for any given combination of Capacity and Desalinated water outputs.



Appendix A Timetable For Main Actions: OC2 – Operational Planning

(Note: The following are summaries only and reference should be made to OC2 for full details.)

(Months refer to month end)

In Operational year 0	January	Feb	Mar	Apr	May	Jun	July	Aug	Sept
Planning for Operational Year 2									
Each Power Producer will provide OETC and PWP in writing with -	Proposed Station Outage Schedule for Op Yr 2 ⁽¹⁾								
OETC will provide -	Forecast of maximum Capacity required from each Genset for each week of Op Yr 2 ⁽²⁾								
OETC will prepare and send to PWP and affected Users draft Transmission System Outage plan									
OETC will provide PWP, each Power Producer and Other Users in writing with -							Proposed System Outage Schedule for each week of Op Yr 2		
PWP, Power Producers and Other Users will raise any objections to Proposed System Outage Schedule								Any objections to be raised and resolved with OETC	
OETC will determine -									Proposed System Outage Schedule No.1



In Operational year 0	January	Feb	Mar	Apr	May	Jun	July	Aug	Sept
Planning for Operational Year 1 - Proposed System Outage Schedule No.1 forms basis for OP 1 planning									
Each Power Producer will provide OETC & PWP in writing with -	Final Station Outage Schedule for Op Yr 1 ⁽³⁾								
OETC will provide PWP, each Power Producer and Other Users in writing with -						Draft Final System Outage Schedule for each week of Op Yr 1 ⁽²⁾⁽⁴⁾			
PWP, Power Producers and Other Users will raise any objections to Draft Final System Outage Schedule							Any objections to be raised and resolved with OETC (as in OC2.5.1)		
OETC, after considerations, will issue schedule -									Final System Outage Schedu



In Operational year 0	January	Feb	Mar	Apr	May	Jun	July	Aug	Sept
Planning for Operational Year 1 - Transmission System Outage plan									
OETC will update draft Transmission System Outage plan							Send to PWP and affected Users		
PWP and Other Users will raise any objections to Draft Transmission System Outage Plan								Any objections to be raised and resolved with OETC	
OETC, after considerations, will issue plan									Final Transmission System Outage Plan

Abbreviations:

Op Yr 1 – Operational Year 1

Op Yr 2 – Operational Year 2

**Notes:**

The following notes are summaries only of actions and reference should be made to OC2 for full details

1	Data from Power Producers will include	Identity of CDGenset/Desalination Unit MW Available/not Available Required duration of outage Preferred start date/time or range Flexible/Inflexible outage If flexible, scope for change Proposed timing of Winter downtime
2	OETC forecast will be based on	Demands forecasts OETC estimate of Demand Management Operating Margins as set by OETC Transmission & Distribution System constraints Transmission & Distribution System outages Transmission System losses Forecast imports/exports from Internally/International Connected Parties
3	The Final Station Outage Schedule produced by Power Producers will reflect changes to Proposed Station Outage Schedule only if Power Producer has had to respond to changed circumstances for which sufficient evidence must be provided	



4	Draft Final System Outage Schedule may differ from Final Station Outage Schedule due to;	<p>Flexible outages may have moved to coordinate all outage proposals</p> <p>A flexible outage may have been re-designated as an inflexible outage</p> <p>Timing of a Winter outage may have changed</p>
	In addition, where in the opinion of OETC, the License requirements could not be met OETC may provide to PWP and the Power Producer a written request that;	<p>A flexible or an inflexible outage originally shown may be excluded from the Final System Outage Schedule.</p> <p>An inflexible outage in the Proposed System Outage Schedule may be re-designated as flexible or its start date moved.</p>



Appendix B Format for Submission of Proposed Station Outage Schedules from Power Producers

To OETC CONTROL CENTRE		Fax No:	Copy to PPW	Fax No
FROM:	PRODUCTION FACILITY			
PROPOSED STATION OUTAGE SCHEDULE FOR		YEAR	Date sent:	

CDGenset No	Registered Capacity MW	Unavailable Capacity MW	Outage duration	Preferred start date or range of start dates	Flexible outage or not	If outage flexible. Period outage could be	
						deferred	advanced
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Appendix C Operating Parameters

The following parameters are required for each CDGenset

Registered Capacity under reference conditions supported by correction curves showing changes in;

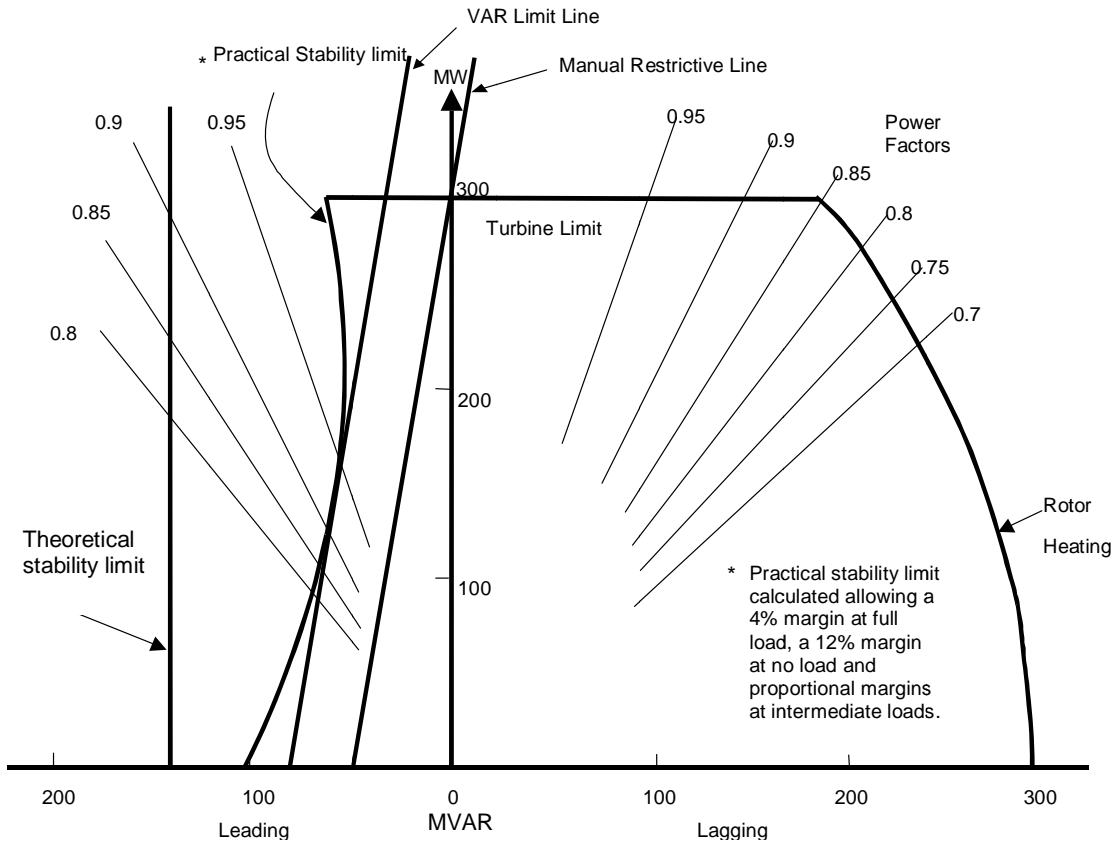
- Output versus heat rate;
- Output and heat rate versus ambient air temperature; and
- Output and heat rate versus ambient air pressure;

For each CDGenset;

- (a) the minimum notice required to synchronise the CDGenset or a CCGT Module from a condition of De-synchronisation;
- (b) the minimum time between synchronising different CDGensets or CCGT Module in a Production Facility;
- (c) the minimum CDGenset Active Power requirements on synchronising, expressed as a block Load in the case of a Gas Turbine Genset or a Steam Turbine Genset;
- (d) maximum CDGenset, or CCGT Module, loading rates from synchronisation for the following conditions;
 - Hot;
 - Warm; and
 - Cold;
- (e) maximum CDGenset, or in the case of a CCGT Module, deloading rates;
- (f) minimum time off load;
- (g) maximum CDGenset, or in the case of a CCGT Module, time to Synchronise for the following conditions;
 - Hot;
 - Warm;
 - Cold;
- (h) Primary Response, MW in 5 Seconds;
- (i) Secondary Response, MW in 30 Seconds;
- (j) Tertiary Reserve, Time to reach Available Capacity from minimum load;
- (k) Tertiary Reserve, Time to reach Available Capacity from 80% of Capacity;



Appendix D Typical Generator Performance Chart





Operating Code OC3 – Operating Margin

Issued April 2010

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Operating Code OC3 – Operating Margin

OC3.1 Introduction

Operating Code OC3, Operating margin sets out the types of reserves making up the Operating Margin that OETC may use in the Control Phase.

The Operating Margin is the amount of reserve (provided by Production Facilities or by Demand Control) available over and above that required to meet the expected Demand. It is required to limit and then correct Frequency deviations that may occur due to an imbalance between total Generation Capacity output and Demand.

OC3.2 Objective

The objectives are to state clearly the types of reserve provided over various timescales that make up the Operating Margin, and to describe the factors which will govern the issue of Dispatch Instructions for reserve.

OC3.3 Scope

In addition to OETC, OC3 applies to;

- Power Producers; and
- Users offering Demand Control as an Ancillary Service.

OC3.4 Operating Margin constituents

The Operating Margin comprises Contingency Reserve plus Operating Reserve.

Contingency Reserve is the margin of Generation Capacity required in the period from 24 hours ahead down to real time over and above the forecast Demand. It is provided by CDGensets that are not required to be Synchronised but which must be held Available to Synchronise within a defined timescale.

Operating Reserve is to provide spare Generation Capacity for Frequency control in real time and is provided by CDGensets that are either Synchronised or can be Synchronised within minutes. Contingency Reserve and Operating Reserve provide against uncertainties in Availability of CDGensets and in Demand forecasts.



OC3.4.1 Operating Reserve

Operating Reserve is the additional Generation Capacity from Synchronised CDGensets or from a reduction in Demand. Operating Reserve must be able to respond in real time Operation to contribute to containing and correcting any fall in the Frequency of the Total System to an acceptable level in the event of a loss of Generation Capacity or mismatch between Generation Capacity and Demand. Operating Reserve also includes CDGensets that may be instructed to Synchronise and Load in the event of low Frequency. The Operating Reserve must be capable of providing response in three phases;

i.) Primary Response.

The automatic increase in Active Power output of a CDGenset or a decrease in the Demand for Active Power in response to a fall in the Frequency of the Total System.

The increase or decrease in Active Power must be in accordance with the provisions of the relevant PPA or Connection Agreement. These will provide that the response will be fully Available within 5 seconds from the time of the Frequency fall.

ii.) Secondary Response

The automatic increase in Active Power output of a CDGenset or a decrease in the Demand for Active Power in response to a fall in the Frequency of the Total System.

The increase or decrease in Active Power must be in accordance with the provisions of the relevant PPA or Connection Agreement. These will provide that the response will be fully Available by 30 seconds from the time of the Frequency fall. After 30 seconds, any additional Active Power should be made Available by Operation in Frequency Sensitive Mode.

iii.) Tertiary Reserve

The component of the Operating Reserve that would be Available as a result of Emergency Instructions to Synchronise and/or Dispatch other CDGensets. The provision of Active Power must be in accordance with the provisions of the relevant PPA or Connection Agreement.

OC3.5 Operating Margin determination

OC3.5.1 Contingency Reserve

OETC shall determine the amount of Contingency Reserve required for each hour up to 24 hours ahead, taking due consideration of relevant factors, including but not limited to the following;

- historical Availability and reliability performance of individual CDGensets
- notified Risk of Trips to the reliability of individual CDGensets
- Demand forecasting uncertainties.

OC3.5.2 Operating Reserve

OETC shall determine the amount of Primary Response, Secondary Response and Tertiary Reserve that must be Available to it from CDGensets at any time to ensure System security. The OETC Operating Reserve policy will take due consideration of relevant factors, including but not limited to the following;



- the magnitude and number of the largest Active Power infeeds from CDGensets, International Interconnections, Internal Interconnections and over single transmission feeders within the Transmission System;
- the predicted Frequency drop following loss of the largest infeed as may be determined through simulation using a dynamic model of the Total System;
- the extent to which Demand Control can be implemented;
- significant events that may justify provision of additional Operating Reserve;
- the cost of providing Operating Reserve at any point in time;
- ambient weather conditions, insofar as they may affect (directly or indirectly) CDGenset and/or Transmission System reliability; and
- agreements in place with International Interconnected Parties.

OETC shall keep records of the Operating Reserve policy and of significant alterations to it as determined by the above and any other factors.

OC3.6 Instruction of Operating Margin

As part of Scheduling, OETC will instruct Power Producers and Users of the extent to which they are obliged to make their Gensets Available to contribute towards Contingency Reserve and Operating Reserve with the required levels of response. Power Producers and Users shall make their Gensets so Available.

OETC may issue Dispatch Instructions, or instruct Users, to require use of Operating Reserve in the case of each CDGenset or Users' Plant, up to the levels reported under OC3.7.

OC3.7 Data requirements

The requirements for Operating Parameters for Operating Margin are given in the Connection Conditions Code (CC, clause 5). This data shall be provided initially during application for a Connection and thereafter must be provided by Power Producers to OETC by 1st January each year. Any short-term changes to this data are required to be notified to OETC as part of the daily reporting under the Scheduling and Dispatch Codes.



Operating Code OC4 – Demand Control

Issued April 2010

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Operating Code OC4 – Demand Control

OC4.1 Introduction

Operating Code OC4 is concerned with Demand Control measures and procedures for implementing such measures. The term “Demand Control” in OC4 refers to measures that allow OETC to secure a reduction in Demand in situations of insufficient Generation Capacity or where severe operating difficulties pose a threat to the stability of the Total System.

OC4 deals with the following aspects of Demand Control;

- Consumer Demand management initiated by OETC;
- Planned manual de-energisation or emergency manual de-energisation of Demand initiated by OETC;
- Consumer Demand management initiated by Licensed Distributors;
- De-energisation of Demand by automatic Demand shedding equipment and automatic relays to preserve Total System security;
- Procedures for issuing and complying with Demand Control instructions; and
- Demand Control Imminent Warnings and Red warnings.

OC4.2 Scope

In addition to OETC, OC4 applies to;

- Power Producers;
- Licensed Distributors;
- Licensed Suppliers;
- Directly Connected Consumers;
- International Interconnected Parties;
- Internally Interconnected Parties;
- PWP (for information exchange); and
- RAEC if Connected to the Total System.

OC4.3 Objective

The objectives of OC4 are as follows;

- to identify different methods of Demand Control and the procedures governing their implementation; and
- to clarify the obligations of OETC, Users and Directly Connected Consumers as regards the development of procedures, and exchange of information, required for the implementation of Demand Control.

OC4 requires OETC to ensure that all parties affected by Demand Control are treated equitably and that Demand Control is used as a last resort and only after all other means of securing System security have been exhausted.



OC4.4 Methods of Demand Control

Demand Control is implemented in a number of ways, including;

- Consumer Demand Side Management agreements;
- Emergency Manual Demand Shedding;
- Planned Rota Demand Shedding; and
- De-energisation of Demand by automatic under-frequency relays.

The obligations of OETC, Users and Directly Connected Consumers in respect of these means of Demand Control are set out below. All plans and implementation of Demand de-energisation shall pay due attention to the need to protect certain classes of Consumers, e.g., hospitals, etc.

(i) Consumer Demand Side Management agreements

Directly Connected Consumer's may enter into Demand Side Management (DSM) agreements with OETC to provide Demand reduction services. The terms of DSM agreements may provide for;

- Directly Connected Consumer's reducing Demand at certain times of the day and at certain periods of the year; and
- Directly Connected Consumer's reducing their Demand at OETC's instruction for an agreed number of occasions in a year.

Directly Connected Consumers with DSM agreements with OETC may remain Connected to the Transmission System at times when other Consumers and Users have been manually de-energised.

Consumers who are not Directly Connected to the Transmission System may have DSM agreements with a Licensed Supplier. As OETC is not a party to DSM agreements between Consumers and Licensed Suppliers such agreements are not subject to the provisions of OC4. However, Licensed Suppliers must notify OETC of all DSM agreements that provide for a reduction of Demand of 1MW or more.

(ii) Emergency Manual Demand Shedding

OETC may implement Emergency Manual Demand Shedding by issuing an instruction to manually de-energise to Licensed Distributors, Users, and Directly Connected Consumers. OETC shall issue such instructions in accordance with plans prepared in paragraph OC4.5 that establish the principles of the amounts and locations of Demand to be manually de-energised at a particular point in time or at specified Frequency levels.

In circumstances where thermal or stability considerations require it to do so OETC may itself manually de-energise Licensed Distributors, Directly Connected Consumers and Users.

Each Licensed Distributor shall implement an instruction to manually de-energise issued by OETC in accordance with the following arrangements;

- (a) each Licensed Distributor shall make arrangements that allow it to comply with an instruction from OETC to manually de-energise Consumers on its Distribution System under Emergency Conditions irrespective of Frequency within 30 minutes. It must be possible to manually de-energise a proportion of Demand as determined by OETC;



- (b) each Licensed Distributor shall implement the instructions of OETC regarding manual de-energisation without delay, and the manual de-energisation must be achieved as soon as possible after the instruction is given by OETC. The instruction may relate to an individual Connection Point and/or groups of Connection Points;
- (c) once manual de-energisation has been applied by a Licensed Distributor in accordance with an instruction from OETC, that Licensed Distributor shall not re-energise the manually de-energised Demand until OETC instructs it to do so and the process of re-energisation must begin within 2 minutes of the instruction being given by OETC; and
- (d) each Licensed Distributor shall provide OETC in writing by the end of October in each calendar year, in respect of the next following Operational Year, on a Connection Point basis, with the following information as set out in Appendix A;
 - its total annual maximum Demand;
 - the percentage value of the total annual maximum Demand that can be manually de-energised within timescales of 5, 10, 15, 20, 25, and 30 minutes, at least 40% of total Demand must disconnectable; and
 - confirm that a minimum of 20% of total Demand can be manually de-energised in the first 5 minutes following instruction from OETC.

OETC will notify a Licensed Distributor who was issued with an instruction requiring manual de-energisation of the events on the Transmission System that necessitated the instruction. In circumstances of protracted shortage of Generation Capacity or where a statutory instruction has been given and when a reduction in Demand is envisaged by OETC to be prolonged, OETC will notify the Licensed Distributor of the expected duration of the de-energisation.

If OETC determines that Emergency Manual Demand Shedding is inadequate, OETC may itself manually de-energise and re-energise a Licensed Distributor as part of a Demand Control requirement under Emergency Conditions.

To ensure Directly Connected Consumers and other Users can implement an instruction from OETC requiring manual de-energisation;

- (a) each Directly Connected Consumer and User shall make arrangements that allow it to comply with an instruction from OETC to manually de-energise under Emergency Conditions irrespective of Frequency within 30 minutes. It must be possible to apply the manual de-energisations to individual Connection Points, as determined by OETC;
- (b) each Directly Connected Consumer and User shall implement the instructions of OETC with regard to manual de-energisation without delay, and the manual de-energisation must be achieved as soon as possible after the instruction being given by OETC. The instruction may relate to an individual Connection Point and/or groups of Connection Points;
- (c) once a manual de-energisation has been applied by a Directly Connected Consumer or User at the instruction of OETC, the Directly Connected Consumer or User shall not re-energise until OETC instructs it to do so and the process of re-energisation must begin within 2 minutes of the instruction being given by OETC; and



- (d) each Directly Connected Consumer and User shall provide OETC in writing by the end of October in each calendar year, in respect of the next Operational Year, on a Connection Point basis, with the following information as set out in Appendix A;
- its total annual maximum Demand;
 - the percentage value of the total annual maximum Demand that can be manually de-energised within timescales of 5, 15, and 30 minutes.

OETC will notify a Directly Connected Consumer or User who has been issued with an instruction requiring manual de-energisation of the events on the Transmission System that necessitated the instruction. In circumstances of protracted shortage of Generation Capacity or where a statutory instruction has been given and when a reduction in Demand is envisaged by OETC to be prolonged, OETC will notify the Directly Connected Consumer or User of the expected duration of the de-energisation.

If OETC determines that Emergency Manual Demand Shedding is inadequate, OETC may itself manually de-energise and re-energise Directly Connected Consumers and Users as part of a Demand Control requirement under Emergency Conditions.

(iii) Planned Rota Demand Shedding

In the event of a sustained period of shortfall in the Generation Capacity and Demand balance, either for the Transmission System as a whole or for significant parts of the System, manual de-energisation of Demand will be implemented on a rota basis.

OETC shall develop Demand shedding rotas in consultation with Licensed Distributors, Directly Connected Consumers and other Users. Planned Rota Demand Shedding shall ensure that Available power is shared among affected parties on an equitable basis; groups of Consumers can be de-energised for periods of up to 1 hour, after which their supplies shall be re-energised and another group of Consumers de-energised.

OETC shall amend any Planned Rota Demand Shedding prior to implementation if, in OETC's opinion, operational considerations require it to do so. OETC shall notify each User of the total amount of Demand that shall be de-energised at different times.



(iv) De-energisation of Demand by automatic under-frequency relays

Automatic Demand de-energisation through under-frequency relay Demand shedding is normally used to address short-term imbalances in the Generation Capacity and Demand situation, and generally following the tripping of an amount of Generation Capacity beyond the planned contingency value. It is a method of safeguarding the stability of the Transmission System when other actions, such as the use of the Operating Margin, have failed to stabilise or hold the Frequency within required Operating Limits.

Each Licensed Distributor shall make arrangements to allow approximately 40% of its annual maximum Demand to be de-energised by automatic under-frequency relays. These arrangements shall allow automatic de-energisation to occur in stages with specified proportions of Demand being de-energised at each level of Frequency. OETC shall determine the proportion of Demand that is required to be de-energised at each stage of falling Frequency and agree with Licensed Distributors those feeders that will be de-energised.

Each Licensed Distributor shall comply with the following;

- (a) the Demand of each Licensed Distributor that is subject to automatic under-frequency de-energisation will be split into discrete MW blocks;
- (b) the number, location, size and the associated under-frequency settings of these blocks, shall be specified by OETC by the end of October in each calendar year following discussion with Licensed Distributors. OETC will review the arrangements for each discrete MW block annually, and prepare a schedule of the agreed arrangements covering all Licensed Distributors;
- (c) the arrangements covering all Licensed Distributors in respect of each discrete MW block will ensure a reasonably uniform de-energisation within each Distribution System across all Connection Points;
- (d) where conditions are such that, following automatic under-frequency Demand de-energisation, and the subsequent Frequency recovery, it is not possible to restore a large proportion of the total Demand so de-energised within a reasonable period of time, OETC may instruct a Licensed Distributor to implement additional Demand de-energisation manually, and restore an equivalent amount of the Demand that had been de-energised automatically. The purpose of such action is to ensure that a subsequent fall in Frequency will again be contained by the Operation of automatic under-frequency Demand de-energisation;
- (e) once an automatic under Frequency Demand de-energisation has taken place, the Licensed Distributor on whose Distribution System it has occurred, will not re-energise until OETC instructs that Licensed Distributor to do so and then only in the amounts of Demand so instructed; and
- (f) following the recovery of Frequency, OETC will issue instructions for the re-energisation of Demand. Re-energisation of Demand by Licensed Distributors must be achieved as soon as possible and the process of re-energisation must begin within 2 minutes of the instruction being given by OETC.

Each Directly Connected Consumer and User shall make arrangements to allow approximately 40% of its annual maximum Demand (subject to discussion with OETC) to be de-energised by automatic under-frequency relays. These arrangements shall allow



automatic de-energisation to occur in a number of stages with specified proportions of Demand being de-energised at each level of Frequency. OETC shall determine the proportion of Demand that is required to be de-energised at each stage of falling Frequency and agree with Directly Connected Consumers and Users those feeders that will be de-energised.

The Demand of each Directly Connected Consumer and User that is subject to automatic under-frequency de-energisation will be split into discrete MW blocks. The number, location, size and the associated under-frequency settings of each blocks, will be specified by OETC by the end of October in each calendar year following discussion with Directly Connected Consumers and Users. OETC will review the arrangements for each discrete MW block annually and prepare a schedule of the agreed arrangements covering all Directly Connected Consumers and Users.

Licensed Distributors, Directly Connected Consumers and Users shall provide OETC with an estimate of the Demand reduction that occurred under automatic under-frequency Demand de-energisation as soon as practical. Usually verbal information is expected within 10 minutes and written confirmation within 1 day.

Licensed Distributors, Directly Connected Consumers and Users shall provide OETC with an estimate of the time at which Demand was restored following an automatic under-frequency Demand de-energisation. The estimate shall be provided to OETC as soon as practical. Usually verbal information is expected within 10 minutes and written confirmation within 1 day.

OC4.5 Procedures for implementing Demand Control

OETC shall prepare procedures for the implementation of the Demand Control measures contained in OC4. The Grid Code Review Panel shall review and approve the procedures proposed by OETC. In drawing up procedures for the implementation of Demand Control measures OETC shall demonstrate that Demand Control will be used as the last option in OETC's plans to maintain the stability of the Transmission System, and will be used in an equitable manner.

When drawing up its proposals for the implementation of Demand Control measures OETC shall consult with all parties to the Grid Code including the PWP.

Where agreement cannot be achieved with a particular Licensed Distributor, Directly Connected Consumer, or User on the implementation of a Demand Control measure, OETC shall, after consulting with the Regulatory Authority, determine the least-worst case for the Licensed Distributor, Directly Connected Consumer, or User concerned taking into account the requirement to maintain the stability and security of the Transmission System.

OC4.6 Warning system

OETC shall issue advance warnings as soon as it considers an Alert will require the implementation of Demand Control measures. A Demand Control warning issued by OETC will state whether Emergency Manual Demand Shedding or Planned Rota Demand Shedding is imminent. Recipients of Demand Control warnings shall take such preparatory action, as they deem necessary in view of the warning. All Demand Control warnings will be of a form determined by OETC and will remain in force from the stated time of commencement until OETC issues notification of their cancellation, amendment or re-issue. The exception is a



Demand Control Imminent Warning that will automatically lapse after 2 hours unless renewed by OETC.

Following the issue of a Demand Control warning, no Demand Control measures shall be implemented unless OETC so issues an instruction.

If a Licensed Distributor or Internally Interconnected Party considers it necessary to apply Demand Control measures to preserve the integrity of its System, it may implement the necessary measures provided the impact upon the integrity of the Total System has been properly assessed. In such situations a Licensed Distributor shall endeavor to discuss the situation with OETC prior to the implementation of Demand Control measures and shall notify OETC as soon as possible

(i) Demand Control Imminent Warning

OETC will issue a Demand Control Imminent Warning to Licensed Distributors, Directly Connected Consumers and Users who may subsequently receive instruction requiring Emergency Manual Demand Shedding.

A Demand Control Imminent Warning need not be preceded by any other warning and will be issued when OETC expects to issue an instruction requiring Emergency Manual Demand Shedding within the following 30 minutes.

A Demand Control Imminent Warning will automatically lapse if not reissued by OETC within 2 hours of the time of issue.

(ii) Red Warning

OETC will issue a Demand Control Red Warning by 16:00 hours on the day ahead to Licensed Distributors, Directly Connected Consumers and Users who may receive instructions on the day ahead concerning Emergency Manual Demand Shedding or Planned Rota Demand Shedding. A Demand Control Red Warning will also be issued to Power Producers with CDGensets that may be affected by such instructions.

A Demand Control Red Warning will specify the period during which Demand shedding may be required and the part of the Transmission System to which it may apply, the percentage of Demand reduction that OETC may require and any other matters.

(iii) Form of warnings

The form of warnings is given in Appendix B.

OC4.7 Post event reporting

Demand Control instructions may be either to de-energise Demand or to restore Demand. Following the issue of a Demand Control instruction by OETC, recipients shall notify OETC in writing (or by electronic media as agreed in writing with OETC) that they complied with OETC's instruction. Telephone communication, which has to be recorded in log book, is sufficient in real time. This has to be confirmed in writing within 1 day. For de-energisations the notification shall include an estimate of the Demand reduction and the time at which the de-energisation occurred. For restorations the notification shall include an estimate of the amount of Demand restored and the time at which the restoration was achieved.



All Users shall provided further details to OETC of the timings, amount of Demand reduction and/or restoration actually achieved. This reporting shall be implemented for each Demand Control instruction and should be completed within 24 hours of the events.

OC4.8 Scheduling and Dispatch during Demand Control

During Demand Control, Scheduling and Dispatch in accordance with the Merit Order may cease and will not be re-implemented until OETC so decides.



Appendix A Emergency Manual Demand Shedding/De-energisation summary sheet

Connection Point (Name)	Annual maximum MW	% of Group Demand De-energisation (Cumulative)						Remarks
		Minutes						
		5	10	15	20	25	30	

Notes: Data to be provided annually by the end of October to cover the following year.



Appendix B Form of warnings

Demand Control Imminent Warning

The form of a Demand Control Imminent Warning will be;

- This is Demand Control Imminent Warning timed at (xx.xx) hours;
- This warning applies to (include name of Users and area/ substations affected);
- Prepare for Emergency Manual Demand Shedding of (XX) MW within the next 30 minutes;
- Do not shed Demand until instructed;
- Standby for further instructions.

Demand Control Red Warning

The form of a Demand Control Red Warning will be;

- This is Demand Control Red Warning timed at (xx.xx) hours;
- This warning applies to (include name of Users and area/ substations affected) to implement (*Emergency Manual Demand Shedding or Planned Rota Demand Shedding*) tomorrow;
- The amount of Demand to be shed will be (*specify amount and duration of demand to be shed*);
- Do not shed Demand until instructed.



Operating Code OC5 – Notice of Operations and Incidents, and Significant Incident Reporting

Issued April 2010

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[OETC](#)



Operating Code OC5 – Notice of Operations and Incidents, and Significant Incident Reporting

OC5.1 Introduction

Operating Code OC5, Notice of Operations and Incidents, and Significant Incident reporting, requires OETC and Users to issue notices of all Operations and Incidents on their respective Systems that have or may have implications for the Transmission System or a User's System.

OETC may determine that an Incident shall be classified as a Significant Incident. OC5 sets out the procedures for reporting and subsequent assessment of Significant Incidents. OC5 requires OETC or a User to prepare;

- a preliminary written Significant Incident report within 1 day of OETC determining an Incident as a Significant Incident; and
- a full written Significant Incident report within 3 Business Days of OETC determining an Incident as a Significant Incident.

In addition, OC5 contains requirements governing the content of Significant Incident reports, the circulation of Significant Incident reports, and their subsequent assessment and review by the Grid Code Review Panel.

OC5.2 Objective

The objectives of OC5 are;

- to specify the obligations on OETC and Users regarding the issue of notices of Operations and Incidents on their respective Systems;
- to ensure notices of Operations and Incidents provide sufficient detail to allow recipients of such notices to fully assess the likely implications and risks and take the necessary actions required to maintain the security and stability of the Transmission System or a User's System;
- to specify the arrangements for reporting Incidents that OETC has determined to be a Significant Incident; and
- to provide for the review of all Significant Incident reports by the Grid Code Review Panel to assess the effectiveness of policies adopted in accordance with this Grid Code.



OC5.3 Scope

In addition to OETC, OC5 applies to;

- Power and Water Producers;
- Licensed Distributors;
- Directly Connected Consumers;
- Internally Interconnected Parties;
- International Interconnected Parties;
- PWP (copy recipient of Significant Incident reports); and
- RAEC if Connected to the Total System.

OC5.4 Notice of Operations

OETC and Users shall issue notices concerning Operations on their respective Systems that have had or may have implications for the Transmission System or a User's System. Where information is requested in writing throughout this Code, facsimile transmission or other electronic means as agreed with OETC in writing may be used. All writing shall be in the English language.

Without limiting the requirements of OC5.4, notifications shall be issued for the following;

- where an Operational Instruction to be issued may have an effect on another Users' System, or Plant;
- where Plant is expected to be operated in excess of its rated capability and may present a hazard to Persons;
- where there is an expectation of abnormal operating conditions;
- where there is increased risk of inadvertent Operation of Protection; and
- in relation to major testing, commissioning and maintenance.

OC5.4.1 Operations on the Transmission System

In the case of an Operation on the Transmission System that will have or has had an Operational Effect on the System of another User, OETC will notify the User whose System will be, is, or has been affected.

OC5.4.2 Operations on a User System

In the case of an Operation on the System of a User that will have or has had an Operational Effect on the Transmission System, the User will notify OETC. Following notification by the User, OETC will notify any other Users whose Systems will be, are, or have been affected.

OC5.4.3 Form of notice of Operations

All operational notifications must be made promptly. Notifications and responses to notifications may be made by telephone but must be confirmed in writing within 30 minutes where practical.

The appropriate party (as described in OC5.4.1 and OC5.4.2) will issue a notification (and respond to any questions asked) of any Operation that has arisen independently of any other Incident or Operation.



The notification will;

- describe the Operation (but is not required to state its cause);
- provide sufficient detail to enable the recipient of the notification to reasonably consider and assess the implications, and risks arising; and
- include the name of the Person reporting the Operation on behalf of OETC or the User.

The recipient of a notification may ask questions to clarify the notification and the provider of the notification will, insofar as it is able, answer any questions raised.

OC5.4.4 Timing

A notification will be given as far in advance as possible. Notification of future Operations shall be given in sufficient time as will reasonably allow the recipient to consider and assess the implications and risks arising from the Operation.

OC5.5 Notification of Incidents

OETC and Users shall issue notifications of Incidents on their respective Systems that have had or may have implications for the Transmission System or a User's System. Where information is requested in writing throughout this Code, facsimile transmission or other electronic means as agreed with OETC in writing may be used. All writing shall be in the English language.

Without limiting the requirements of OC5.5, Incident notifications shall be issued for the following;

- where Plant has been Operated in excess of its rated capability and presented a hazard to Persons;
- the activation of any alarm or indication of any abnormal operating condition;
- adverse weather conditions being experienced;
- breakdown of, faults on or temporary changes in the capabilities of Plant;
- breakdown of or faults on control, communication and Metering equipment; and
- increased risk of inadvertent Operation of Protection.

OC5.5.1 Incidents on the Transmission System

In the case of an Incident on the Transmission System, which has had or may have an Operational Effect on the System of a User, OETC will notify the User whose System will be, is, or has been affected.

OC5.5.2 Incidents on a User System

In the case of an Incident on the System of a User, which has had or may have an Operational Effect on the Transmission System, the User will notify OETC. Following notification by the User, OETC will notify any other Users whose Systems will be, are, or have been affected.

OC5.5.3 Form of notification

Incident notifications must be issued promptly. Notifications and responses to notifications may be made by telephone but must be confirmed in writing within 30 minutes where practical.



The appropriate party (as described in OC5.5.1 and OC5.5.2) will issue a notification (and any response to questions asked) of any Incident that has arisen independently of any other Incident or Operation.

The notification will;

- describe the Incident (but is not required to state its cause);
- be of sufficient detail to enable the recipient of the notification to reasonably consider and assess the implications, and risks arising; and
- include the name of the individual reporting the Incident on behalf of OETC or the User.

The recipient of a notification may ask questions to clarify the notification and the provider of the notification will, insofar as it is able, answer any questions raised.

OC5.5.4 Timing

An Incident notification will be given as soon after the Incident as possible to allow the recipient to consider and assess the implications and risks arising from the Incident.

OC5.6 Significant Incident reporting

OETC may determine that an Incident reported by it or a User shall be classified as a Significant Incident. OETC shall promptly notify all potentially affected Users by telephone that such a determination has been made and that procedures governing Significant Incident reporting are to be followed. OETC shall confirm such notice within 2 hours by facsimile or other electronic means or by communication on recorded telephone. All affected Users shall acknowledge receipt of the notification in writing within 2 hours of receipt. Both the notifying party and the acknowledging party shall record the communication in logbook.

Without limiting this general description, Significant Incidents will include, as a minimum all of the following;

- manual or automatic tripping of System circuits, and Plant where such tripping has resulted in interruption of supply to consumers
- Any multiple tripping or repeated tripping of System Circuits, and plant even where such tripping has not resulted in a loss of demand or generation
- voltage excursions outside normal operating limits;
- frequency excursions outside normal operating limits;
- System instability;
- overloading (i.e., loading in excess of the rated Capacity) of System circuits, and Plant; and
- breaches of Safety Rules or procedures that resulted in danger or injury to members of the public or to OETC or User employees or their representatives.

Notwithstanding the above, OETC may declare any incident to be a Significant Incident where, in its view, that incident has had a significant impact on the normal operation of the System. Timing of Significant Incident reporting

**(i) Preliminary report**

OETC and / or the notified User must produce a preliminary written Significant Incident report within 1 Day of OETC or the User receiving notification that OETC has determined an Incident to be a Significant Incident.

The preliminary written Significant Incident report shall cover in outline terms the matters specified in Appendix A.

(ii) Full report

OETC and / or the notified User must produce a full written Significant Incident report within 3 Business Days of OETC or the User receiving notification that OETC determined an Incident to be a Significant Incident

Explanation: The preliminary & final reports may have to be produced by more than one party. The following notes provided as clarification:

- OETC shall decide which party (parties) shall produce Preliminary Significant Incident Report and notify accordingly. All parties shall send their preliminary reports to OETC within 1 day.
- OETC shall consider all preliminary reports and, if necessary, issue a consolidated preliminary Significant Incident Report.
- OETC shall decide which party (parties) shall produce Final Significant Incident Report and notify accordingly. All parties shall send their Final reports to OETC within 3 business days.
- OETC shall consider all reports and, if necessary, issue a consolidated Final Significant Incident Report
- However, a party which did not receive any notification may also send their report (preliminary or final) to OETC, if they wish to report anything which they consider significant.

OC5.6.2 Written reporting of Significant Incidents by OETC to Users

In the case of an Incident that has been reported by OETC to a User, and subsequently determined by OETC to be a Significant Incident, OETC will provide a full written Significant Incident report to the User and the Regulatory Authority. The User shall not pass the report to other affected Users but;

- if the User is a Licensed Distributor, it may use the information contained therein in preparing a written report to a Power Producer with a CDGenset Connected to its System or to a Licensed Supplier of Consumers Connected to its Licensed Distribution System. The Significant Incident report may be used in connection with the reporting of Significant Incidents under the Distribution Code; and
- if the User is a Power Producer, it may use the information contained therein in preparing a written report to PWP or to another Power Producer with a Genset Connected to its System or to a Licensed Distributor Connected to its System in accordance with requirements for reporting Significant Incidents on its System.



OC5.6.3 Written reporting of Significant Incidents by Users to OETC

In the case of an Incident that has been reported by a User to OETC, and subsequently determined by OETC to be a Significant Incident, the User shall provide a full written Significant Incident report to OETC. OETC will not pass this report to other affected Users but may use the information contained therein in preparing a report to another User in relation to the Significant Incident and in the preparation of a report to the Regulatory Authority.

OC5.6.4 Form of full Significant Incident report

A full Significant Incident report prepared by OETC or a User shall be sent to the User, OETC, PWP and the Regulatory Authority. The full Significant Incident report will contain confirmation of the Significant Incident notification together with full details relating to the Significant Incident. The Significant Incident report shall cover in the necessary detail those matters specified in Appendix A.

OC5.7 Evaluation of Significant Incidents

OETC shall maintain an indexed record of all Significant Incident reports and shall review each report to determine whether there has been any lack of compliance with the Grid Code.

Each month or other period to be agreed with the Grid Code Review Panel, OETC shall produce a summary report of Significant Incidents. The report shall comprise additions to the index of Significant Incident reports since the last summary report together with commentary of the Significant Incidents added to the index. The summary shall draw specific attention to any lack of compliance with the Grid Code and to any areas where there may be a need to modify the Grid Code.

The Grid Code Review Panel shall make recommendations at any time including proposed modifications to the Grid Code arising from its review of Significant Incident reports.

OC5.8 Alerts

Whenever OETC becomes aware of any factors likely to give rise to an Emergency Condition or to unusual Operating conditions, OETC shall send an Alert to all Users who may be adversely affected by such disturbances or unusual Operating conditions.

The Alert will indicate the likely reason for the disturbance, the severity and duration of the disturbance and duration of the Alert period. An Alert shall take the following form;

- Statement "This is an Alert timed at (xx:xx) hours;
- A disturbance caused by (.....), is probable at (yy:yy) hours;
- The likely effect of the disturbance is (.....);
- The disturbance is likely to last (zz:zz) hours;
- This Alert shall be considered cancelled automatically in 2 hours time unless renewed before that time."

The following conditions are those that as a minimum should be considered to give rise to an Alert;

1. Outage of any transmission components or generation units which cause either substantial reduction in system security or violate (n-1) criteria to a supply point.
2. Outages or risks associated with 66kV or 33kV equipment, which may have



substantial impact on total system load or system operations. In such circumstances the relevant distribution or generation companies should send alert to OETC and other users who are likely to be affected

3. Outages or risks associated with generation plant, which may have substantial impact on the generation capability of the plant or system operations. In such circumstances the relevant distribution or generation companies should send alert to OETC, PAEW Water Department (if applicable) and other users who are likely to be affected
4. Condition where the Operating Margin is below the agreed standard;
5. The voltage or Frequency going outside operational limits;
6. Important events (e.g., National Day celebrations);
7. Major testing;
8. Accidents;

The Alert may be delivered by telephone but must be confirmed in writing as soon as practical.

All parties receiving the Alert shall acknowledge receipt in writing and shall report any resulting events in accordance with the procedures set down in this Code OC5.



OC5.9 Operational Logs

Each Control Centre of each User shall maintain an Operational Log of each notice of Operation and/or Incident issued and received and all relevant aspects of Significant Incident reporting. The Operational Log shall record all acknowledgements of notices and any other matters relevant to the Operation of the Transmission System.

Each Operational Log shall record as a minimum the following information;

- each day shall commence on a new page that will be dated;
- each entry shall record the name of the Person giving the instruction, report, or any other information;
- each entry shall record the name of the Person receiving the instruction, report, or any other information;
- each entry shall record the time at which the instruction was given/received;
- each entry shall record the substation name and Plant label or number to which the instruction refers;
- every instruction, etc shall be entered on a new line;
- the isolation of Plant and the connection and disconnections of main earths shall be separately recorded;
- the number and location of temporary earths and their removal shall be recorded either in the Operational Log or in a log under the control of the Safety Coordinator;
- the issuing of Safety Permits and their clearance shall each be separately recorded; and
- the numbers of individual Safety Permits shall be recorded.

OC5.10 Loss of Communication

Normal communications between operational sites shall be by telephone with confirmation by facsimile or other electronic means.

OETC shall prepare an emergency communications plan whereby in the event of failure of normal communication routes, a priority ranked order of alternative routes e.g. the National telephone service, mobile telephones, etc. is agreed in consultation with all Users. The plan shall names of contacts and alternative contact details for each operational group of each User.

OETC will review and update the emergency communications plan each year and circulate the new plan to all Users.



Appendix A Significant Incident Report

Information, if applicable to the Significant Incident and to the relevant User (or OETC, as the case may be) that shall be included in a written Significant Incident report prepared in accordance with OC5.

1. Time and date of Significant Incident;
2. Location;
3. Plant directly involved (not merely affected by the event) including numbers and nomenclature;
4. Description of Significant Incident including probable causes and any damage to Plant;
5. Demand (in MW) and/or Genset output (in MW) interrupted and duration of interruption;
6. Genset – change in Availability;
7. Genset – Frequency response (MW correction versus time achieved subsequent to the Significant Incident);
8. Genset – Mvar performance (change in output subsequent to the Significant Incident);
9. Estimated (or actual) time and date of return to service and/or return to pre-Incident Availability; and
10. Any other relevant material.



Operating Code OC7 – Contingency Planning

Issued April 2010

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Operating Code OC7 – Contingency Planning

OC7.1 Introduction

Operating Code OC7, Contingency Planning, requires OETC to develop a strategy to be implemented in Emergency Conditions such as a Total System Shutdown or Partial System Shutdown and in response to other major System Incidents.

A Total System Shutdown or Partial System Shutdown can have widespread implications for electricity Supply and it is imperative that OETC has arrangements in place to deal with such situations. It is also important that Users are aware of the procedures, and cooperate fully in the implementation of the procedures, through which OETC can return the Transmission System to normal operating conditions.

OC7.2 Objective

The objectives of OC7 are;

- to require OETC to develop a general restoration strategy to adopt in the event of Total System Shutdown or Partial System Shutdown;
- to require OETC to produce and maintain comprehensive System Normalisation Procedures covering Total System Shutdowns and Partial System Shutdowns;
- to provide for the cooperation of Users with the formation and execution of System Normalisation Procedures;
- to provide for the development and implementation of communications between OETC and Users when dealing with a System Incident; and
- to ensure OETC and User personnel who will be involved with the implementation of System Normalisation Procedures, are adequately trained and familiar with the relevant details of the procedures.

OC7.3 Scope

In addition to OETC, OC7 applies to;

- Power Producers;
- Licensed Distributors;
- Directly Connected Consumers;
- International Interconnected Parties; and
- Internally Interconnected Parties.



OC7.4 Terms

For the purposes of this section of the Grid Code, the term;

- **Incident Centre** means a centre established as determined by OETC following a Significant Incident to provide a focal point for communication and the dissemination of information between OETC and senior management representatives of relevant Users;
- **Power Island** means a group of Production Facilities together with complementary local Demand, disconnected from any other power source or the Total System. (A group may only contain a single Production Facility);
- **System Normalisation Strategy** means the strategy setting out the procedures for the restoration of the System following a major Incident;
- **System Incident Communications** procedures are procedures agreed between OETC and Users to ensure secure communications during System Incidents.

OC7.5 System Normalisation strategy

OETC shall develop a System Normalisation Strategy to be implemented in Emergency Conditions such as Total System Shutdown or a Partial System Shutdown and other major System Incidents. The overall objectives of the System Normalisation Strategy shall be as follows;

- restoration of the Transmission System and associated Demand in the shortest possible time, taking into account Production Facilities' capabilities, including Embedded Gensets and Transmission System operational constraints;
- re-synchronisation of parts of the Transmission System which have become out of synchronism with each other; and
- to provide for effective communication routes and arrangements to enable senior management representatives of OETC and Users, who are authorised to make binding decisions on behalf of OETC or a User to communicate with each other during a System Incident.

The System Normalisation Strategy will provide for the detailed implementation of the following;

- notification by OETC to Users that a Total System Shutdown or a Partial System Shutdown exists and that OETC intends to implement a System Normalisation Procedures;
- identification of separate groups of Production Facilities (a group may only contain a single Production Facility) together with complementary local Demand; and
- step by step integration of these Power Islands into larger sub-Systems to return the Transmission System to normal operating conditions.

The System Normalisation Strategy will also provide for the issue of any Dispatch Instructions necessitated by the System conditions prevailing at the time of the System Incident.

OETC will consult with International Interconnected Parties and with Internal Interconnected Parties during the preparation of the System Normalisation Procedures and incorporate their services wherever practicable.



OC7.6 System Normalisation Procedures

In the event of Emergency Conditions such as a Total System Shutdown or Partial System Shutdown of the Transmission System OETC shall issue an Alert as set out in OC7.7.2 to notify Users that it intends to implement System Normalisation Procedures. OETC shall notify Users at the time of a System Incident of the particular System Normalisation Procedure to be implemented for that System Incident.

The System Normalisation Procedures will be developed and maintained by OETC in consultation with other Users as appropriate in accordance with Good Industry Practice.

The System Normalisation Procedures shall be subject to periodic review by the Grid Code Review Panel.

The System Normalisation Procedures shall provide for;

- procedures to establish an Incident Centre immediately following a major System Incident;
- a decision on the location of an Incident Centre; and
- the operational responsibilities and requirements of an Incident Centre, noting that such an Incident Centre will not have any responsibility for the Operation of the Transmission System but will be the focal point for communication and the dissemination of information between OETC and senior management representatives of relevant Users.

The complexities and uncertainties of recovery from a Total System Shutdown or Partial System Shutdown of the Transmission System require the System Normalisation Procedures to be sufficiently flexible so as to accommodate the full range of prevailing CDGenset and Transmission System operational possibilities.

OC7.6.1 User responsibilities

Each User shall follow OETC's instructions during a System Incident and restoration process, subject to safety of personnel, OETC and the User's Plant.

It shall be the responsibility of the User to ensure that any of its personnel who may reasonably be expected to be involved in System Normalisation Procedures 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 notified by OETC.

OC7.6.2 Black Start procedure

The procedure for a Black Start situation will be that specified by OETC at the time of the Black Start situation. Users shall abide by OETC instructions during a Black Start provided that the instructions are to operate within the Operating Parameters of each CDGenset.

OETC may issue instructions to;

- a Production Facility with Black Start capability or to a Licensed Distributor with an Embedded Generator with Black Start capability relating to the commencement of Generation;
- a Licensed Distributor or to a Directly Connected Consumer relating to the restoration of Demand; and
- a Production Facility relating to commencement of Generation when an external power Supply is made available to it.

Black Start instructions shall be implemented in accordance with the following procedures;



- a Production Facility with Black Start capability will start-up as soon as possible and within two hours of an instruction from OETC to initiate start-up. The Production Facility will confirm to OETC when start-up of a CDGenset has been completed;
- following such confirmation, OETC will endeavour to stabilise that CDGenset by instructing a Licensed Distributor to Connect appropriate Demand, following which OETC may instruct the start-up and Synchronisation of the remaining Available CDGensets at that Production Facility and their loading with appropriate Demand to create a Power Island;
- if during this Demand restoration process any CDGenset cannot keep within its safe Operating Parameters because of Demand conditions, the Power Producer shall inform OETC and OETC 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 Power Producer;
- OETC accepts that the decision to keep a CDGenset operating outside its safe Operating Parameters is one for the Power Producer concerned. OETC will accept and respond accordingly to a decision of Power Producer to change Generation output on a CDGenset if it believes it is necessary to do so for safety reasons;
- as part of the Black Start strategy, Licensed Distributors with Embedded Gensets within their Distribution System which have become islanded, may in liaison with OETC sustain and expand these islands. Licensed Distributors will inform OETC of their actions and will not re-Synchronise to the Transmission System without OETC agreement; and
- OETC will instruct a relevant User, where possible, to interconnect Power Islands to achieve larger sub-Systems, and subsequently may instruct the interconnection of these sub-Systems to form an integrated System. This should eventually provide for the return of the Transmission System to normal operating conditions.

Certain Black Start and System restoration procedures already exist within MHEW. Such procedures shall be reviewed by OETC and updated or incorporated into other procedures developed in accordance with this code.

OETC shall inform Users of the end of a Black Start situation and the time at which the Transmission System resumed normal Operation.

All notifications must be made promptly. Notifications and responses may be made by telephone but must be confirmed within 2 hours where practical. Where information is requested in writing throughout this code, facsimile transmission or other electronic means as agreed with OETC in writing may be used. All writing shall be in the English language.

OC7.6.3 Re-Synchronisation procedures

Where there is neither a Total System Shutdown nor a Partial System Shutdown but parts of the Transmission System are out of Synchronism with each other, OETC will instruct Users to regulate Generation output or Demand to enable the separate parts to be re-Synchronised. OETC will inform the relevant Users when re-Synchronisation has taken place.

OETC shall issue whatever revised Despatch Instruction are required to enable re-Synchronisation and to return the Transmission System to normal Operation.

OC7.7 System Incident procedures

OC5 - Operational Event Reporting, Communication and Liaison sets out the procedures for



the exchange of information and follow up reporting between OETC and Users in relation to events that have an impact on the Transmission System. An event may be either an Operation or an Incident. OETC will define certain Incidents as Significant Incidents; other more severe Incidents such as a Partial System Shutdown will be defined as System Incidents.

System Incidents are unpredictable both with respect to timing and the resulting implications. OETC shall establish procedures for determining when an Incident on the Transmission System shall be considered a System Incident and also establish outline procedures for handling System Incidents.

In certain circumstances, OETC may require an Incident Centre to be established to coordinate the response to a System Incident and to avoid placing further stress on existing OETC and User operational control arrangements.

OETC will inform Users promptly that an Incident Centre is to be established and request all relevant Users to implement System Incident communications procedures. OETC will specify the responsibilities and functions of the Incident Centre and the relationship with existing operational and control arrangements.

The Incident Centre established in accordance with OETC's instructions will not have any responsibility for the Operation of the Transmission System but will be the focal point for communication and the dissemination of information between OETC and senior management representatives of relevant Users.

An Incident Centre does not imply a specially built centre for dealing with System Incidents; it is a focal point for communications related to the System Incident. During a System Incident, normal communication channels for operational control communication between OETC and Users will continue to be used.

OETC will decide when conditions no longer justify the need to use the Incident Centre and will inform all relevant Users .

In certain rare situations, Licensed Distributors may declare a System Incident on their Distribution System. The procedures for this are included in the Distribution Code and may not involve OETC directly. OETC shall however be kept informed promptly of such Incidents.

OC7.7.1 System Incident communications

OETC and all Users will maintain lists of telephone contact numbers at which, or through which, senior management representatives nominated for this purpose and who are fully authorised to make binding decisions on behalf of OETC or the relevant User can be contacted day or night.

The lists of telephone contact numbers shall be provided in writing prior to the time that a User Connects to the Transmission System and must be up-dated and circulated to all relevant parties (in writing) whenever the information changes.

Notifications and responses will be made normally by telephone but must be confirmed in writing within 2 hours where practical.

All communications between the senior management representatives of the relevant parties with regard to OETC's role in the System Incident shall be made via the Incident Centre if such a centre has been established.



OC7.7.2 System Alerts/Warnings

In the event of System Incidents, such as Total System Shutdown, a Partial System Shutdown or a System separation, OETC will issue promptly an Alert warning to all Users.

The form of the Alert Warning will be;

- “This is an Alert timed at (xx:xx) hours;
- There is a (*Partial System Shutdown*) at (aaaaa);
- A System Normalisation Procedure is being implemented;
- Standby for further instructions”.



Operating Code OC6 – Safety Coordination

Issued April 2010

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Operating Code OC6 – Safety Coordination

OC6.1 Introduction

OC6 requires OETC (and its agents), PWP (and its agents) and Users (and their agents) to operate in accordance with approved Safety Rules, in order to ensure safe working conditions for personnel working on or in close proximity to Transmission System electrical Plant and for personnel who may have to work or use Transmission System electrical Plant at an Interface.

In the event of a conflict between this Operating Code OC6 - Safety Coordination and any other section of the Grid Code, OC6 shall take precedence.

OC6.2 Objective

The objective of OC6 is to allow work and/or testing on the Transmission System or HV Plant that is Directly Connected to the Transmission System to be carried out safely.

OC6.3 Scope

In addition to OETC, OC6 applies to;

- Power Producers;
- PAEW;
- Licensed Distributors;
- Directly Connected Consumers;
- Internally Interconnected Parties;
- International Interconnected Parties;
- RAEC if Connected to the Total System;
- all contractors/agents working on the Transmission System; and
- PWP.

OC6.4 Terms

The following terms shall have the meaning ascribed to them below for the purposes of OC6;

"Isolation" means the disconnection of Plant from the remainder of the System in which that Plant is situated by either of the following;

- (a) an Isolating Device maintained in an isolating position. The isolating position must be maintained and/or secured by a method that accords with Safety Rules approved by OETC; or
- (b) an adequate physical separation which must be in accordance with, and maintained in accordance with Safety Rules approved by OETC. If it is required by the approved Safety Rules a Caution Notice must be placed at the point of separation.

"Earthing" means a way of providing a connection between conductors and general mass of earth by an Earthing Device which is maintained and/or secured in position in accordance with Safety Rules approved by OETC.

OC6.5 The Safety Rules

Safety procedures for personnel working on or in close proximity to Transmission System Plant are governed by OETC's Safety Rules (and any future revisions of these rules) as detailed in;

- MEW Safety Rules (Electrical and Mechanical) Second Edition, issued 1989, amended 1995.

Safety procedures will normally involve switching out and suitably isolating and earthing electrical Plant to ensure that it cannot be made live before and during work on that Plant.

OETC shall review the Safety Rules every twelve months. The review shall consider any implications arising from but not limited to;

- accidents on OETC or User sites at the interface;
- issues arising from differences between the Safety Rules of OETC and any interfacing User;
- reports from OETC personnel concerning the application of the Safety Rules; and
- any other relevant matter.

OETC shall prepare a report of each review and summarise in the report relevant events considered as part of the review. The report can make recommendations for changes to the Safety Rules, the implementation of the Safety Rules, or amendments to codes of practice to support the Safety Rules. The report shall be presented to the Grid Code Review Panel for its consideration and review.

OC6.6 Safety at the interface

All Users Connecting to the Transmission System must provide OETC with a copy of their Safety Rules. OETC shall ensure the User Safety Rules provide for at least the same degree of safety as the OETC Safety Rules. If OETC is dissatisfied with any aspect of a User's Safety Rules OETC may require, following consultation with the User, all relevant work and procedures to be undertaken according to OETC Safety Rules.

All Users Connecting to the Transmission System must approve Designated Operators that are deemed by the relevant User to be competent to carry out the procedures in the agreed Operational Instructions. The approvals must be in writing and copies must be sent to OETC.

OETC in consultation with Users shall develop for each User site a Site Responsibility Schedule (referred to in Connection Conditions, clause CC.7.2). The Site Responsibility Schedule shall detail the demarcation of responsibility for the safety of OETC personnel and Designated Operators carrying out work or testing at the User's Connection Site and on circuits that cross the User's site at any point.

OETC shall issue operational procedures for each User site. The operational procedures shall include, but are not limited to;

- detailed switching sequences (which meet as a minimum, the requirements of OETC's Safety Rules) to be followed for operational, fault and emergency switching;
- procedures for control and Operations;
- identification of operational boundaries; and



- the identity of OETC representatives (or its agents), PWP (or its agents) and Users (or their agents) who are authorised to attend the Transmission site and/or facility for operational purposes or during emergencies.

OETC and each User will cooperate in developing procedures and agreements on any matters that may be relevant for ensuring overall site safety and, in particular, safety during work or testing at or near to Interface equipment.

In the event of a modification or change in operational practices, which has or may have an operational effect at a User site, OETC and the User shall review the adequacy of overall site safety.

Adequate means of Isolation shall be provided at the interface to allow work to be carried out safely at the interface or either side of the interface by OETC and each User.

Where necessary adequate facilities for earthing Plant shall be provided at either side of the interface to allow work to be carried out safely at the interface or on either side of the interface.



Operating Code OC8 – Numbering and Nomenclature of HV Plant

Issued April 2010

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Operating Code OC8 – Numbering and Nomenclature of High Voltage Plant

OC8.1 Introduction

Operating Code OC8 - Numbering and nomenclature of High Voltage (HV) Plant - sets out the requirements for the numbering and nomenclature of;

- OETC HV Plant on OETC Sites;
- OETC HV Plant on User's Sites; and
- User HV Plant on OETC Sites.

OC8 requires the numbering and nomenclature of Users' HV Plant to be distinguishable and different from the numbering and nomenclature of HV Plant used by OETC.

OC8.2 Objective

The objectives of OC8 are as follows;

- to provide for the application of consistent and distinct numbering and nomenclature of HV Plant to ensure that User's Plant at a Connection Point or a Supply Point cannot be confused with OETC Plant; and
- to reduce the risk of incidents and events attributable to human error regarding the identification of HV Plant.

OC8.3 Scope

In addition to OETC, OC8 applies to the following Users;

- Power Producers;
- Licensed Distributors;
- Directly Connected Consumers;
- Internally Interconnected Parties;
- International Interconnected Parties; and
- RAEC if Connected to the Total System

OC8.4 Terms

For the purposes of this section of the Grid Code, the term;

- **User Site** means a site owned (or occupied pursuant to a lease, licence or other agreement) by a User in which there is a Connection Point; and
- **OETC Site** means a site owned (or occupied pursuant to a lease, licence or other agreement) by OETC in which there may be a Connection Point.

OC8.5 General requirement

Where throughout this code information is requested in writing, facsimile transmission or other electronic means as agreed with OETC in writing may be used. All writing shall be in the English language.

All User's Plant at a Connection Point or a Supply Point shall have numbering and nomenclature that is different and distinct from the numbering and nomenclature used by OETC for its HV Plant at that Connection Point or Supply Point.

To comply with the requirements of OC8, Users shall not install, nor permit the installation of any Plant with numbering or nomenclature that could reasonably be confused with the numbering and nomenclature of the Plant of OETC or any other User at a Connection Point or Supply Point.

OC8.6 Procedure

The numbering and nomenclature of each item of HV Plant shall be included in the Operation Diagram prepared for each OETC Site or User Site. The requirements for an Operation Diagram are set down in the Connection Conditions Code and that code requires that the Operation Diagram shall be updated for every change to Plant or its labelling.

OC8.6.1 OETC HV Plant on a User Site

OETC HV Plant on User Sites shall have numbering and nomenclature in accordance with OETC's Numbering and Nomenclature Policy.

When OETC is to install HV Plant on a User Site, OETC shall notify the relevant User of the numbering and nomenclature to be adopted for that HV Plant at least six months prior to proposed installation.

The notification will be made in writing to the relevant User and will consist of;

- an Operation Diagram incorporating the new OETC HV Plant to be installed;
- OETC's numbering and nomenclature to be adopted for that HV Plant; and
- the proposed date of installation of the HV Plant.

The relevant User will respond in writing to OETC within one month of the receipt of the notification, confirming;

- receipt of the notification;
- that none of the Users HV Plant at the relevant User Site has the same numbering and nomenclature proposed or as used by OETC; and
- that if any of the Users HV Plant at the relevant User Site has the same numbering and nomenclature as that proposed or used by OETC, the numbering and nomenclature of the Users HV Plant at the relevant site will be changed before installation of OETC's HV Plant at the relevant site.

The relevant User shall not install or permit the installation of any HV Plant at a site that has numbering or nomenclature that could be confused with OETC HV Plant which is either already on that User Site or which OETC has notified to that User will be installed on that User Site.

OC8.6.2 User HV Plant on OETC Sites

User HV Plant on OETC Sites shall have numbering and nomenclature in accordance with OETC's Numbering and Nomenclature Policy

When a User is to install HV Plant on a OETC Site, or wishes to replace existing HV Plant on a OETC Site or adopt new numbering and nomenclature for such HV Plant, the User shall notify OETC in writing at least six months prior to proposed installation to provide;

- an Operation Diagram incorporating the new User HV Plant to be installed;
- the details of the HV Plant;
- the proposed numbering and nomenclature to be adopted for that HV Plant; and
- the proposed date of its installation.

OETC will respond in writing to the User within one month of the receipt of the notification and state;

- whether OETC accepts the User proposed numbering and nomenclature; and
- if the numbering and nomenclature proposed by the User are not acceptable, OETC shall give details of the numbering and nomenclature which the User shall adopt for the User's HV Plant.

Users will be provided upon request with details of OETC's current Numbering and Nomenclature Policy in order to assist them in planning the numbering and nomenclature for their HV Plant on OETC Sites.

OC8.6.3 User HV Plant on a OETC installation on a User Site

Where User HV Plant, such as circuit breakers, form part of a OETC installation on a User Site, the User HV Plant shall use numbering and nomenclature in accordance with OETC's Numbering and Nomenclature Policy.

OC8.6.4 Changes to existing numbering or nomenclature

Where OETC has decided that it needs to change the existing numbering or nomenclature of OETC HV Plant on a User Site or of User HV Plant on a OETC Site;

- For OETC HV Plant on a User Site, the provisions of OETC's Numbering and Nomenclature Policy shall apply to such changes of numbering or nomenclature with any necessary amendments to those provisions to reflect that a change is being made; and
- For User HV Plant on an OETC Site, OETC will notify the User of the numbering and nomenclature that the User shall adopt for that HV Plant at least six months prior to the change being needed and the User will respond in writing to OETC within one month of the receipt of the notification, confirming receipt and acceptance of the changes; and
- If the User objects to the changes proposed by OETC;
 - OETC and the User shall consult promptly to reach agreement;
 - If agreement cannot be reached, OETC's Numbering and Nomenclature Policy will be used; and
 - If the disagreement concerns a point of principle, the User may set out the arguments and present them to the Grid Code Review Panel for their consideration. OETC's Numbering and Nomenclature Policy will apply until the disagreement is resolved.

In all cases OETC's notification shall indicate the reason for the proposed change to the existing numbering or nomenclature.



OC8.6.5 Labelling

All HV Plant shall be provided with clear and unambiguous labelling showing the numbering and nomenclature.

OETC and Users are each responsible for the provision and erection of labelling on their own HV Plant.

Where there is a requirement for the numbering and nomenclature of HV Plant to be changed, OETC and Users shall each be responsible for providing and erecting the labels on their own Plant by the required date.



Operating Code OC9 – Operational Tests and Site Investigations

Issued April 2010

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Operating Code OC9 – Operational Tests and Site Investigations

OC9.1 Introduction

Operating Code OC9 sets out the authorization required and the procedures to be followed by OETC, PWP and Users wishing to conduct Operational Tests or Site Investigations involving Plant that is Connected to or part of the Transmission System.

OC9 stipulates that prior authorisation from OETC is required before conducting Operational Tests or Site Investigations.

OC9.2 Objective

The objectives of OC9 are to ensure that Operational Tests and Site Investigations;

- are authorized by OETC and are carried out in accordance with appropriate procedures;
- are carried out in a coordinated manner to avoid unnecessary risk or damage to Plant and to minimise costs to OETC, PWP, and affected Users;
- do not threaten the safety of personnel or the general public;
- do not threaten the security or stability of the Transmission System; and
- are properly evaluated on completion and, where appropriate, subject to certain reporting arrangements.

A further objective of OC9 is to allow sufficient tests to be conducted to enable predictive fault finding.

OC9.3 Scope

In addition to OETC, OC9 applies to;

- Power Producers;
- Licensed Distributors;
- Directly Connected Consumers;
- Internally Interconnected Parties;
- International Interconnected Parties; and
- PWP (with regard to tests carried out under PPAs/PWPAs)

OC9.4 Terms

For the purposes of this section of the Grid Code, the term;

- **“Site Investigation Tests”** are tests conducted in relation to Plant and operational procedures at Production Facilities and User sites or to monitor and assess the characteristics of Plant;
- **“Test Document”** means the document prepared by the Test Panel setting out all aspects for the management and implementation of a test;
- **“Test Panel”** means a panel established to prepare a detailed programme for the conduct of an Operational Test or Site Investigation and to prepare a formal Test Document; and



- **“Test Request”** means a document setting out the detailed proposal for an Operational Test or Site Investigation.

OC9.5 Categories of tests

OC 9 applies to the following categories of tests;

- **Operational tests:**
 - required by OETC;
 - requested by a User; and
 - requested by PWP or a Power Producer to commission or test the compliance of Production Facilities with the requirements of a PPA or PWPA or for other purposes specified in a PPA/PWPA..
- **Site Investigation tests:**
 - in relation to Plant and operational procedures at Production Facilities and User sites; and
 - to monitor and assess the characteristics of Plant for which a User is required to provide or has contracted to provide certain Ancillary Services.
- **Other tests:**
 - required, in certain circumstances, (whether by means of a formal test or verification by inspection) to ascertain whether Operating Parameters and/or Connection Conditions are being complied with in respect of Gensets, Desalination Units and User’s Plant;
 - required, in certain circumstances, to assess whether Operating Margin requirements can be met;
 - required, in certain circumstances, at the request of a User; and
 - other tests and measurements that may have an Operational Effect on the System.

OC9.6 Authorisation and test procedures

OC9.6.1 Test requests

Prior authorisation from OETC is required before conducting an Operational Test, Site Investigation or other test.

PWP or Users seeking to conduct an Operational Test or Site Investigation shall submit a Test Request to OETC giving at least 8 weeks minimum notice before the date of the proposed test. A Test Request shall include a detailed test proposal including;

- a brief description of the proposed test;
- the preferred time or times for the test and the potential duration;
- the reason for the proposed test indicating whether the test is required for compliance with licence conditions, statutory regulations, or Safety Rules. This will assist in determining the priority to be given to the test;
- an indication of any potential adverse effects if the Test is cancelled at short notice or delayed (reasonable detail of such adverse affects to be provided);
- an indication of any Dispatch Instructions required to facilitate the test; and



- details of any operational switching required to facilitate to test.

OETC shall evaluate all Test Requests submitted to it. On receipt of a Test Request OETC shall within 2 weeks either;

- approve the Test Request;
- request any additional information from the test proposer required to evaluate the impact of the Test Request; or
- reject the Test Request application.

OETC shall consider the following factors when evaluating a Test Request;

- the impact of the requested test on Transmission System stability and security;
- the impact of the requested test on Transmission System economics;
- the impact of the requested test on other Users; and
- the effect of the requested test on the continuity and quality of electricity Supply.

If OETC approves a Test Request, it will inform the test proposer accordingly.

If OETC requests additional information from the test proposer to evaluate the impact of a Test Request OETC shall stipulate the time within which the information shall be provided. If the information is not provided in the timescale indicated by OETC the Test Request shall automatically lapse.

If OETC does not approve a Test Request, it will set down its reasons for rejecting a Test Request application and consult with the Test proposer (and the PWP if the proposed Test is in relation to Production Facilities subject to a PPA/PWPA) on any changes to the Test proposal required to secure approval for the Test. The Test proposer may update a Test proposal in accordance with guidance provided by OETC and submit a revised Test Request.

OETC shall not withhold approval of a Test Request unless it considers it has reasonable grounds for doing so. If a User is not satisfied that a Test Request was rejected on reasonable grounds it can refer the matter to the Regulatory Authority for determination.

OETC shall not disclose any information received as part of a Test Request application without the consent of the User who submitted the Test Request if it reasonably believes the information to be commercially sensitive or otherwise potentially sensitive.

OC9.6.2 Test Panel

If a Test Request is approved, OETC shall decide if a Test Panel is required. If OETC decides that a Test Panel is required, the test proposer shall convene a Test Panel. The number of Test Panel members shall be kept to the minimum number of persons compatible with affected User representation.

The Chairman of a Test Panel shall be appointed by the test proposer. As regards other representation;

- OETC shall have a representative on all Test Panels;
- PWP shall have a representative on all Test Panels that are concerned with tests arising from a PPA or PWPA; and
- all directly affected Users shall be represented on the Test Panel.

The duties and responsibilities of the Test Panel are as follows;



- to prepare a detailed programme for the conduct of the test, including the start and end date of the test, and any Dispatch requirements and operational switching required to facilitate the test;
- to identify the detailed management requirements of the test;
- to ensure that all affected parties are properly informed of and have access to all relevant information;
- to schedule the resources required to conduct the test; and
- to prepare a Test Document that shall include all the elements listed above.

The Test Document shall be copied to all members of the Test Panel at least 2 weeks before the start date of the test. Members of the Test Panel may provide comments on the Test Document to the Chairman of the Test Panel no later than 1 week before the scheduled start date of the Test.

The test shall proceed only on the condition that the Test Panel has approved the Test Document. If a member of the Test Panel is not satisfied with the test proceeding and they have fully discussed the issues within the Test Panel, they may make representation to the Regulatory Authority.

Neither OETC nor the PWP shall disclose information provided to a Test Panel without the consent of the person who submitted the information if it reasonably believes the information to be commercially sensitive or otherwise potentially sensitive.

OC9.6.3 Post test reporting requirements

At the conclusion of an Operational Test or Site Investigation the test proposer shall prepare a written report on the test that shall be available within 4 weeks of the conclusion of the Operational Test. The report shall be copied to OETC and the Regulatory Authority in all cases and to the PWP where a Power Producer conducted the test or a test arose from a PPA/PWPA.

The Test Report shall not be submitted to any other person who is not a representative of OETC or the test proposer unless OETC and the test proposer having reasonably considered the confidentiality issues arising, and shall have unanimously approved such submission.

The Test Report shall include a detailed description of the completed Test, the Plant to which the Test relates, together with the results, conclusions and recommendations as they relate to the Test proposer, OETC, PWP where relevant, and operationally affected Users, where applicable.

The Test Panel shall be disbanded after the final test report has been approved.

OC9.7 Operational tests

OETC shall cooperate with the implementation of all Operational Tests.

Where OETC considers the impact of an Operational Test to be significantly greater than originally estimated, OETC may at any time contact the Test proposer (and the PWP where the Test is in relation to a PPA/PWPA) to discuss a revised Test procedure or schedule. OETC shall, where it considers it necessary to do so, cancel, interrupt, or postpone an Operational Test at any time.

If the Test proposer wishes to cancel an Operational Test before commencement of the Test or during the Test, the Test proposer (and the PWP where the Test is in relation to a



PPA/PWPA) must notify OETC immediately and the notice must be confirmed in writing within 1 hour by facsimile or other electronic means. The form and any change to the form of confirmation must have been agreed in writing with OETC.

OC9.7.1 Operational tests required by OETC

OETC, as operator of the Transmission System, may from time to time need to conduct Operational Tests 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.

OETC will endeavour to keep the frequency of occurrence, scope, and impact of Operational Tests to the minimum necessary.

Where OETC intends to carry out an Operational Test and in OETC's reasonable opinion, such a test will or may have an operational effect on a User's System, OETC shall give 8 weeks notice and provide sufficient information to the affected Users to enable the affected Users to assess any risks to their Systems. The information provided by OETC shall include;

- a brief description of the Operational Test;
- the probable effects of the Operational Test; and
- the scheduled time and duration of the Operational Test.

Affected Users may contact OETC to request additional time or information to consider the impact of the Operational Test on their Systems and shall respond to OETC within 2 weeks of receipt of OETC's notice of the test.

OC9.7.2 Operational tests required by Users

Operation of Users' Plant in accordance with Good Industry Practice requires testing to maintain and develop operational procedures, develop and measure Plant performance, comply with statutory or other industry obligations and contracts, and to train staff.

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.

Users shall submit a Test Request to OETC in accordance with the requirements of OC 9.6.1.

OC9.7.3 Operational tests at Production Facilities

The PWP or User shall submit a Test Request to OETC in accordance with the requirements of OC 9.6.1. OETC will incorporate any requirements identified in the Operational Test proposal within the programming phase of Operational Planning OC2 and in accordance with the Scheduling and Dispatch Codes SDC1 and SDC2.

Where an Operational Test requires a Dispatch Instruction that is outside the currently declared Operating Parameters, then OETC may so Dispatch the Genset for the period required for the Operational Test.

However, OETC shall contact the Power Producer and PWP 2 days before the test date and review the Dispatch Instructions contained in the formal Operational Test proposal. The Power Producer and PWP shall confirm their acceptance or rejection of the proposed Dispatch Instructions without undue delay.

On notification of rejection of the proposed Dispatch Instructions, the Power Producer and PWP may enter into discussions with OETC 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.

OETC shall inform other Users of the scheduled time and nature of the test, if in the opinion of OETC those Users will or may be affected by the test.

The Operational Test shall proceed in accordance with normal operational practices but with particularly close communication between the control engineer and the test manager. Where the Operational Test is complex or time consuming, OETC shall provide additional support at the Control Centre, if necessary.

OC9.7.4 Other operational tests

Any Operational Test proposal accompanying a Test Request shall indicate whether Dispatch Instructions and operational switching instructions are required to facilitate the test. OETC will, subject to any amendments it may require to be made, incorporate the Dispatch Instructions and operational switching instructions required to facilitate the test within the programming phase of Operational Planning OC2 and in accordance with the codes SDC1 and SDC2. OETC shall issue Dispatch Instructions for Operational Tests in accordance with the procedures set out in code SDC2.

Where an Operational Test requires a Dispatch Instruction that is outside the currently declared Operating Parameters, then OETC may so Dispatch the Genset for the period required for the Operational Test.

OETC shall inform other Users of the scheduled time and nature of the test, if in the opinion of OETC those Users will or may be affected by the test.

The Operational Test shall proceed in accordance with normal operational practices but with particularly close communication between the control engineer and the test manager. Where the Operational Test is complex or time consuming, OETC shall provide additional support at the Control Centre, if necessary.

OC9.8 Site Investigation tests

OETC may, if it reasonably considers that there may be an issue of non-compliance with an agreement by the User, request PWP to carry out a Site Investigation to acquire or verify information relevant to Users' Plant and/or apparatus design, Operation or Connection requirements under the PPA, PWPA, Grid Code, Connection Agreements and other agreements between Users and OETC or PWP.

OETC or PWP may, having given reasonable notice, send a representative or agent to a User's site in order to investigate any equipment or operational procedure applicable to the User site insofar as the condition of that equipment or operational procedure is relevant to compliance with a PPA, PWPA, the Grid Code, a Connection Agreement, or other relevant agreements.

OC9.9 Other tests

OETC and/or PWP can, at any time, request a test. Where a PWP, PWPA or Agreement exists (with appropriate test procedures) these will form the basis of the test.

Testing (including tests carried out under a PWP, PWPA or any relevant agreement) may involve attendance by PWP, OETC or their representatives at User sites in order to carry out or observe such tests.



Where required a test shall be carried out in accordance with Dispatch Instructions and operational switching instructions issued by OETC or by such alternative procedures as is required or permitted by the Grid Code.

Where a test is required at short notice, OETC shall use reasonable endeavours to accommodate the test in the requested timescale provided that in OETC's reasonable opinion the test would not compromise the security and stability of the Total System, or pose a risk to the safe and secure operation of Plant, or compromise the safety of related personnel and the general public.



Scheduling and Dispatch Code SDC1 - Generation and Desalination Scheduling

Issued April 2010

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Scheduling and Dispatch Code SDC1 - Generation and Desalination Scheduling

SDC1.1. Introduction

The scheduling of CDGensets and Desalination Units depends on the expected level and pattern of Demand on the Total System, the location of Production Facilities Connected to the Total System relative to the locations of Demand centres supplied from the Total System, the running cost of each CDGenset, the Desalination requirements of PAEW, and the flexibility of Operation of CDGensets and Desalination Units

SDC1 sets out the following procedures to facilitate production of a Generation Schedule and Desalination Schedule;

- the submission of a Daily Status Form (and revisions) by Power Producers to OETC and copied to PWP for CDGensets and Desalination Units;
- the submission of System data to OETC by Users with a System Directly Connected to the Transmission System to which CDGensets are Connected;
- the exchange of information on relevant contracts and data between PWP and OETC to allow the production of a Generation Schedule and Desalination Schedule by OETC;
- the issue by OETC to PWP on the day before the next Schedule Day of a Generation Schedule and Desalination Schedule;
- the issue by OETC to Power Producers on the day before the next Schedule Day of statements of probable output requirements from CDGensets and Desalination Units throughout the Schedule Day;
- exchange of Scheduling data with International Interconnected Parties;
- submission of Demand Control data; and
- data exchange with PAEW.

SDC1.2. Objective

The objectives of SDC1 are as follows;

- to specify the data to be provided by Power Producers to enable OETC to prepare the Generation Schedule and Desalination Schedule;
- to specify the data exchange between OETC, PWP, and other Parties necessary for the preparation of the Generation Schedule and Desalination Schedule; and
- to specify the timetable for the preparation and issue of the Generation Schedule and Desalination Schedule and probable output requirements from CDGensets and Desalination Units throughout the Schedule Day.



SDC1.3. Scope

In addition to OETC and PWP, SDC1 applies to the following Users;

- Power Producers;
- Licensed Distributors;
- Directly Connected Consumers;
- Internally Interconnected Parties;
- International Interconnected Parties;
- PAEW; and
- RAEC if Connected to the Total System.

SDC1.4. Procedures

A timetable for the main actions stipulated in this code is provided in Appendix A.

Where information in this code is required to be provided in writing, subject to OETC giving its prior written approval facsimile transmission or other electronic means may be used. All written communication shall be in the English language.

SDC1.4.1. Data provided to OETC and PWP by Power Producers

All declarations made to OETC should be at site Reference Conditions.

(i) Availability Notice

By 10:00 hours each day, each Power Producer shall notify OETC in writing (copied to PWP) of the Availability of each of its CDGensets and Desalination Units by means of an Availability Notice in the Daily Status Form set out in Appendix B to this SDC1. The Availability Notice shall state the Availability of the each CDGenset or Desalination Unit to apply for the following Schedule Day.

Such Availability Notice will replace any previously submitted Availability Notice.

(ii) Operating Parameters

By 10:00 hours each day, each Power Producer shall notify OETC in writing (copied to PWP) of any revisions to the Operating Parameters of each of its CDGensets and Desalination Units to those submitted under a previous declaration. The data shall be submitted in the Daily Status Form set out in Appendix B to this SDC1.

The Operating Parameters shall reasonably reflect the operating characteristics expected on the Schedule Day. In so far as not revised, the previously submitted Operating Parameters will apply.

(iii) Other relevant Scheduling and Dispatch data

By 10:00 hours each day, each Power Producer in respect of each of its CDGensets and Desalination Units declared Available shall notify OETC in writing (copied to PWP) of the following;

- details of any special factors which may have a material effect on the likely output of such CDGenset and/or Desalination Unit;
- any temporary changes and their possible duration, to the Operating Parameters; and
- the data to be provided in SDC1.4.1 (i), (ii) and (iii) shall form the Daily Status Form.

(iv) Redeclarations

If at any time after the submission of the Daily Status Form the Power Producer becomes aware of any change to any of the values in its Availability Notice or Operating Parameters that shall apply to any Operating Parameters before the end of the relevant Schedule Day, it shall promptly notify

OETC in writing (copied to PWP) by submitting a Daily Status Form showing the changed data only and the time submitted.

(v) Failure to submit

Failure to submit a Daily Status Form in accordance with SDC1.4.1 shall result in the following;

- OETC shall endeavour to contact the Power Producer to see if a Daily Status Form was sent and not received. If this is the case the Daily Status Form shall be resent immediately;
- If no Daily Status Form is received by 12:00 hours OETC shall, for the purposes of Scheduling and Dispatch, use the data provided in the previous day's Daily Status Form received from that Power Producer. OETC will send in writing the data so used to the Power Producer, copied to PWP, on a form entitled "Daily Status Form – OETC Assumed Data" within 5 minutes; and
- If no Daily Status Form is received on two or more consecutive days, OETC shall alert PWP who shall notify the Regulatory Authority for persistent offences.

SDC1.4.2. Distribution and User System data provided to OETC

(i) Data provided

By 10:00 hours each day, each User with a System Directly Connected to the Transmission System to which CDGensets are Connected, will submit to OETC in writing confirmation of the following in respect of the next Schedule Day;

- Constraints on its System, which OETC may need to take into account for derivation of the Generation Schedule and Desalination Schedule or Operation of the Total System. In this context, constraints include any restrictions on the Operation of Embedded CDGensets, as a result of the User's System; and
- The requirements for maintaining voltage within prescribed limits and Reactive Power reserves, which OETC may take into account for Total System security reasons.

The form of the submission given in Appendix B, Table 1, will be;

- CDGenset output (Active Power and Reactive Power), in each case a fixed value or an operating range, at the low voltage side of the Generator transformer for identified CDGensets for each hour of the Schedule Day; and
- adjusted in each case for Active Power by the correction factors applicable for those CDGensets to provide output at the Connection Points.

(ii) Failure to submit

Failure to submit the data listed in (i) shall result in the following;

- OETC shall endeavour to contact the User to see if the data was sent and not received. If this is the case the data shall be resent immediately; and
- If in any event the data is not received by 12:00 hours OETC shall use the latest data provided. OETC will send in writing the data so used to the User within 5 minutes.

SDC1.4.3. Directly Connected Consumer data provided to OETC

By 10:00 hours each day each Directly Connected Consumer with a maximum Demand greater than 1 MW will submit to OETC in writing the Consumer's best estimate of its hourly Demand profile by Connection Point for the following Schedule Day. The data should be submitted on the form given in Appendix C, Table 1.

(i) Failure to submit

Failure to submit the data listed in SDC1.4.3 shall result in the following;

- OETC shall endeavour to contact the User to see if the data was sent and not received. If this is the case the data shall be resent immediately; and
- If in any event the data is not received by 12:00 hours OETC shall use the data provided for the corresponding day of the previous week. OETC will send in writing the data so used to the User within 5 minutes.

(ii) Redeclarations

If at any time between the 10:00 hours and the expiry of the next Schedule Day the User becomes aware of any change to the information submitted under SDC1.4.3 or under a previous submission under this SDC1.4.3 that shall apply before the end of the relevant Schedule Day, it shall promptly notify OETC in writing.

SDC1.4.4. Data provided to OETC by Internally Interconnected Parties

(i) Data provided

By 10:00 hours each day, each Internally Interconnected Party with a System Directly Connected to the Total System to which CDGensets that may be Dispatched by OETC are Connected, will submit to OETC in writing confirmation of the following in respect of the next Schedule Day;

- Constraints on its System, which OETC may need to take into account for derivation of the Generation Schedule and Desalination Schedule or Operation of the Transmission System. In this context, constraints include any restrictions on the Operation of Embedded CDGensets as a result of the User's System; and
- The requirements for maintaining voltage within prescribed limits and Reactive Power reserves, which OETC may take into account for Transmission System security reasons.

The form of the submission given in Appendix B, Table 2, will be;

- CDGenset output (Active Power and Reactive Power), in each case a fixed value or an operating range, at the low voltage side of the Generator transformer for identified CDGensets for each hour of the Schedule Day; and
- adjusted in each case for Active Power by the conversion factors applicable for those CDGensets to provide output at the Connection Points.

By 10:00 hours each day, each Internally Interconnected Party with a System Directly Connected to the Total System to which Gensets not dispatched by OETC, are Connected, will submit to OETC in writing its best estimate of its hourly net Demand profile by Connection Point for the following Schedule Day.

(ii) Failure to submit

Failure to submit the data listed in SDC1.4.4 (i) shall result in the following;

- OETC shall endeavour to contact the Internally Interconnected Party to see if the data was sent and not received. If this is the case the data shall be resent immediately; and
- If in any event the data is not received by 12:00 hours OETC shall use the latest data provided. OETC will send in writing the data so used to the User within 5 minutes.



SDC1.4.5. Data provided to OETC by International Interconnected Parties

By 10:00 hours each day, OETC and the International Interconnected Parties shall agree the Active Power and Reactive Power transfers and any required voltage limits for each hour of the next Schedule Day at the Connection Point and both confirm the data in writing.

In the event that agreement has not been obtained by the start of the next Schedule Day, the transfers shall be adjusted to 0 MW and 0 Mvar until agreements are reached.

SDC1.4.6. Data provided to OETC by PAEW

By 10:00 hours each day the PAEW will submit to OETC in writing the following information;

- The total requirement for Desalinated water production for the following Schedule Day from each Production Facility that has Desalination Units.

SDC1.4.7. Data provided to OETC by PWP

PWP shall submit to OETC in writing details relevant to the preparation of the Generation Schedule and Desalination Schedule from each PWPA, PPA or other agreement between PWP and a Power Producer. PWP shall provide such clarification and guidance that it considers will be required by OETC and that it would wish OETC to take into account when preparing the Generation Schedule and Desalination Schedule. OETC may request, and PWP shall provide, any additional information on a relevant agreement required by OETC to comply with the requirements of its statutory obligations, its Transmission and Dispatch Licence, and the Grid Code.

SDC1.4.8. Compilation of the Generation Schedule and Desalination Schedule

(i) Production of schedules

For the following Schedule Day, OETC will compile two Merit Order schedules. Each schedule will list CDGensets and Desalination Units in descending order of incremental cost using information from relevant agreements and guidance on such relevant agreements provided by the PWP, the Operating Parameters supplied by the Power Producers, the requirements of the Grid Code regarding Operating Reserve, Frequency control, Ancillary Services, and other factors listed below. The two schedules to be compiled by OETC are as follows;

- The first schedule will be the 'Unconstrained Schedule', which will be compiled assuming that there were no Transmission System constraints, either through inherent physical limitations on the Total System or because of Outages on the Transmission System;
- The second schedule will be the 'Constrained Schedule' which will be compiled taking into account the inherent physical limitations of the Transmission System and all known Outages and constraints on the Total System and Connected Production Facilities for the Schedule Day.



OETC shall produce the Generation Schedule and Desalination Schedules taking due consideration of the following factors;

- (a) forecast Demand for electricity and the geographical distribution of forecast demand;
- (b) forecast requirements for Desalination production;
- (c) declared CDGenset Active Power capabilities;
- (d) declared CDGenset Ancillary Service capabilities;
- (e) declared Operating Parameters;
- (f) declared CDGenset inflexibilities;
- (g) Licensed Distributor System constraints;
- (h) output of Embedded CDGensets;
- (i) System Operating Reserve requirements;
- (j) Transmission System stability issues;
- (k) System Frequency control;
- (l) Operating Margin;
- (m) Transmission System constraints together with relevant standards and other constraints;
- (n) Transmission System losses;
- (o) relevant information on International Interconnections;
- (p) relevant information on other Users;
- (q) Ancillary Service requirements; and
- (r) other factors as may be reasonably considered by OETC to be relevant.

OETC shall provide copies of the Unconstrained and Constrained Schedules to PWP by 15:00 hours each day. The schedules will be made available to other Users following requests to OETC.

OETC shall issue Provisional Running Orders for each hour of the Schedule Day based upon the Constrained Schedule to each Power Producer for each of its CDGensets and Desalination Units by 16:00 hours on the day preceding the relevant Schedule Day.

The Provisional Running Orders issued to each Power Producer by OETC shall contain information relating to the CDGenset(s) of that Power Producer only and shall indicate, for each of its CDGensets, the planned loading pattern for the Schedule Day.

Provisional Running Orders are indicative only, and are provided as a guide to the expected output requirements from Power Producers and are not Dispatch Instructions.



Appendix A. Timescale diagram for main actions from Scheduling and Dispatch Code 1

(Note that following are summaries only and reference should be made to Scheduling and Dispatch Codes for full details.)

		Operating day 1			
		Data to be provided for Operating day 0			
		By 10:00 hours	By 12:00 hours	By 15:00 hours	By 16:00 hours
All Power Producers notify OETC in writing (copied to PWP) (see note 1)					
	Availability Notice (SDC1 Appendix B, Table 1 & 2)				
	Any revisions to Operating Parameters (SDC1 Appendix B, Table 1 & 2)				
	Details of any special factors likely to affect output of Gensets (SDC1 Appendix B, Table 3)				
	Any temporary changes and duration to registered data (SDC1 Appendix B, Table 3)				
Users with Systems Connected to OETC to which Gensets are Connected notify OETC in writing (see note 1)					
	Constraints in Users System that OETC may need to consider in preparing schedule				
	Voltage & MVar reserve requirements (SDC1 Appendix D, Table 1)				
	Any temporary changes to registered Demand management data				
Directly Connected Consumers with Max Demand > 1MW notify OETC in writing (see note 1)					



Operating day 1				
Data to be provided for Operating day 0				
	By 10:00 hours	By 12:00 hours	By 15:00 hours	By 16:00 hours
	Best estimate of hourly demand profile (SDC1 Appendix C, Table 1)			
Internally Interconnected Parties and International Interconnected Parties notify OETC in writing (see note 1)				
	Best estimate of hourly imports/exports to OETC System (SDC1 Appendix C, Table 2 & 3)			
	Constraints on its System that OETC may need to consider			
	Requirements for voltage control and Mvar reserves (SDC1 Appendix D, Table 2 & 3)			
	Any other information agreed with OETC			
PAEW notify OETC in writing (see note 1)				
	Total requirement for Desalinated water production from each Production Facility			
OETC actions				
		If any party does not submit data, OETC will use the latest data submitted.		



Operating day 1				
Data to be provided for Operating day 0				
	By 10:00 hours	By 12:00 hours	By 15:00 hours	By 16:00 hours
OETC produces the Generation Schedule and Desalination Schedule for day 0 by 15.00 hours after considering -			Forecast demand and geographic demand distribution	
			Declared Genset MW capabilities	
			Declared Water production capabilities	
			Declared Genset Ancillary Service capabilities	
			Declared Operating Parameters	
			Other relevant data	
OETC issues provisional running orders for each Genset & Desalination Unit by 16.00 hours (see note 2)				
				Information only provided to relevant Power Producers

Notes

- 1 If at any time after submission of the Daily Status form, all parties shall promptly inform OETC of any changes to values submitted
- 2 Provisional running orders are indicative only and are not dispatch instructions.



Appendix B. Daily Status Form

(SEE NOTES ON SHEET 5)

Sheet 1 of 5

To OETC CONTROL CENTRE Copy to PWP		Fax No: Fax No	
FROM:	PRODUCTION FACILITY		
Date-Schedule day:			
Today's date:		Time sent:	

TABLE 1 CDGensets

Temperature basis of availability declaration			°C	
Genset No	Registered Capacity MW	Availability Notice MW	Changes to Operating Parameters (Use code from sheet 4 followed by new value)	
			Code	Revised value
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

**TABLE 2 Desalination Units**

Desal Unit No	Registered Capacity Cu mtr/hr	Availability Cu meters/hr	Changes to Operating Parameters (Use code from sheet 4 followed by new value)	
			Code	Revised value
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

**TABLE 3** Detail any special factors or temporary changes that may affect CDGenset or Desalination Unit outputs.

Date-Schedule Day:		
CDGenset/ Desal Unit no.	Description of special factor/temporary change	Expected duration Hours/Mins



TABLE 4

Genset Operating Parameter codes

Item	Performance item	Units	Code
1	Minimum Generation	MW	MG
	At full load		
2	Maximum lagging Mvar	Mvar	Flvarlag
3	Maximum leading Mvar	Mvar	Flvarlead
	At minimum load		
4	Maximum lagging Mvar	Mvar	MIvarlag
5	Maximum leading Mvar	Mvar	MIvarlead
6	Maximum emergency Generation	MW	MEG
7	Minimum on-time	Hours/mins	Minon
8	Minimum off-time	Hours/mins	Minoff
9	Notice to synchronise/start up	Hours/mins	NSS
10	Synchronising block load	MW	SBL
11	Time between starting/ synchronising Gensets	Hours/mins	TbeSynch
12	Time between stopping/ Desynchronising Gensets	Hours/mins	TbeStop
13	Maximum water production	Cu mtr/hr	Max Prod
14	Minimum water production	Cu mtr/hr	MinProd
15	Change to Ancillary Service Capability	■	ASC
16	Governor not in frequency mode	■	NFM
17	Change to Primary Response characteristics	■	PrimResp
18	Change to Secondary Response characteristics	■	SecResp
19	Change to Tertiary Reserve characteristics	■	TertResp
20	Abnormal loading rate	■	ALR
21	Special factor	■	SF
22	Temporary change	■	TC
23	Risk of Trip	■	RoT
24	Restriction of gas supplies	■	GasRes

Note ■ These data should be entered in sheet 1 but detailed in sheet 2
All other data should be entered and data given in sheet 1

**General notes**

Power Producers when making the daily submissions of Availability to OETC and PWP will address the following factors. Most regular issues will be covered by responses in Table 1 using heading codes from Table 4. All other issues will be tabulated on a CDGenset/ Desalination Unit basis in Table 3.

1. CDGenset basic data;
2. Minimum Generation;
3. Maximum Generation and/or Desalination Unit increase in output above declared Availability;
4. CDGenset minimum on time;
5. Minimum shutdown time;
6. CDGenset and/or Desalinating Unit inflexibility (inflexibility description, start date and time, end date and time, MW, m³/h);
7. CDGenset Synchronising intervals (hot time interval, off-load time interval);
8. CDGenset Synchronising output MW;
9. Desalinating Unit startup intervals (hot time interval, off load time interval);
10. CDGenset Desynchronising intervals;
11. Desalinating Unit shut-down intervals;
12. Desalination Unit basic data;
13. Minimum water production;
14. Maximum water production;
15. Constraints on CDGenset output for range of associated Desalination Unit outputs;
16. CDGenset two shifting limitation;
17. CDGenset Synchronising groups;
18. CDGenset run up rates with MW breakpoints;
19. CDGenset run-down rates with MW breakpoints;
20. CDGenset loading rates covering the range from Minimum Generation to declared Registered Capacity; and
21. CDGenset de-loading rates covering the range from declared Registered Capacity to Minimum Generation.



Appendix C. Pro-Forma for Demand and Import/Export profiles

Table 1 Data to be completed by Users including Directly Connected Consumers

To OETC CONTROL CENTRE Copy to PWP		Fax No: Fax No	
FROM:	USER NAME		
Date-Schedule day:			
Today's date:		Time sent:	

Time Hours	Demand MW ⁽¹⁾
01:00	
02:00	
03:00	
04:00	
05:00	
06:00	
07:00	
08:00	
09:00	
10:00	
11:00	
12:00	

Time	Demand MW ⁽¹⁾
13:00	
14:00	
15:00	
16:00	
17:00	
18:00	
19:00	
20:00	
21:00	
22:00	
23:00	
24:00	

Note ⁽¹⁾ Transfers from Oman Transmission System are +ve
Transfers to Oman Transmission System are -ve



Pro-Forma for Demand and Import/Export Profiles

Table 2 Data to be completed by Internally Interconnected Parties

To OETC CONTROL CENTRE Copy to PWP		Fax No: Fax No	
FROM:	NAME OF PARTY		
Date-Schedule day:			
Today's date:		Time sent:	

Time Hours	Transfer MW ⁽¹⁾
01:00	
02:00	
03:00	
04:00	
05:00	
06:00	
07:00	
08:00	
09:00	
10:00	
11:00	
12:00	

Time	Transfer MW ⁽¹⁾
13:00	
14:00	
15:00	
16:00	
17:00	
18:00	
19:00	
20:00	
21:00	
22:00	
23:00	
24:00	

Note ⁽¹⁾ Transfers from Oman Transmission System are +ve
Transfers to Oman Transmission System are -ve



Pro-Forma for Demand and Import/Export Profiles

Table 3 Data to be completed by International Interconnected Parties

To OETC CONTROL CENTRE		Fax No:	
Copy to PWP		Fax No	
FROM:	NAME OF PARTY		
Date-Schedule day:			
Today's date:		Time sent:	

Time Hours	Transfer MW ⁽¹⁾
01:00	
02:00	
03:00	
04:00	
05:00	
06:00	
07:00	
08:00	
09:00	
10:00	
11:00	
12:00	

Time	Transfer MW ⁽¹⁾
13:00	
14:00	
15:00	
16:00	
17:00	
18:00	
19:00	
20:00	
21:00	
22:00	
23:00	
24:00	

Note ⁽¹⁾ Transfers from Oman Transmission System are +ve
 Transfers to Oman Transmission System are -ve



Appendix D. Requirements for voltage control & Reactive Power reserves

Table 1 Data to be completed by Users with Systems Connected to OETC

To OETC CONTROL CENTRE Copy to PWP		Fax No: Fax No	
FROM:	USER NAME		
Date-Schedule day:			
Today's date:		Time sent:	

This table should only be completed where requirements are necessary, otherwise a nil return should be shown. A separate form should be used for each Connection Point.

Connection Point	
Voltage limits	

Time Hours	Voltage target	Mvar
01:00		
02:00		
03:00		
04:00		
05:00		
06:00		
07:00		
08:00		
09:00		
10:00		
11:00		
12:00		

Time Hours	Voltage target	Mvar
13:00		
14:00		
15:00		
16:00		
17:00		
18:00		
19:00		
20:00		
21:00		
22:00		
23:00		
24:00		

Note: Mvar + ve lagging; - ve leading



Requirements for voltage control & Reactive Power reserves

Table 2 Data to be completed by Internally Interconnected Parties

To OETC CONTROL CENTRE Copy to PWP		Fax No: Fax No	
FROM:	NAME OF PARTY		
Date-Schedule day:			
Today's date:		Time sent:	

This table should only be completed where requirements are necessary, otherwise a nil return should be shown. A separate form should be used for each Connection Point.

Connection point	
Voltage limits	

Time Hours	Voltage target	Mvar
01:00		
02:00		
03:00		
04:00		
05:00		
06:00		
07:00		
08:00		
09:00		
10:00		
11:00		
12:00		

Time Hours	Voltage target	Mvar
13:00		
14:00		
15:00		
16:00		
17:00		
18:00		
19:00		
20:00		
21:00		
22:00		
23:00		
24:00		

Note: Mvar + ve lagging; - ve leading



Requirements for voltage control & Reactive Power reserves

Table 3 Data to be completed by International Interconnected Parties

To OETC CONTROL CENTRE Copy to PWP		Fax No: Fax No	
FROM:	NAME OF PARTY		
Date-Schedule day:			
Today's date:		Time sent:	

This table should only be completed where requirements are necessary, otherwise a nil return should be shown. A separate form should be used for each Connection Point.

Connection point	
Voltage limits	

Time Hours	Voltage target	Mvar
01:00		
02:00		
03:00		
04:00		
05:00		
06:00		
07:00		
08:00		
09:00		
10:00		
11:00		
12:00		

Time Hours	Voltage target	Mvar
13:00		
14:00		
15:00		
16:00		
17:00		
18:00		
19:00		
20:00		
21:00		
22:00		
23:00		
24:00		

Note: Mvar + ve lagging; - ve leading



Scheduling and Dispatch Code SDC2 - Generation and Desalination Dispatch

Issued April 2010

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Scheduling and Dispatch Code SDC2 - Generation and Desalination Dispatch

SDC2.1 Introduction

SDC2 sets out the procedures for the issue of Dispatch Instructions by OETC

In the order to meet Demand at minimum cost and with an appropriate margin of reserve, whilst maintaining the security and quality of electricity Supply and provision of Desalinated water and taking account of operational constraints, OETC needs to;

- re-optimize Generation Schedules and Desalination Schedules as required;
- issue instructions to CDGensets and Desalination Units;
- manage power flows with International Interconnected Parties;
- issue instructions to Users with respect to Ancillary Services; and
- exchange information with PWP.

SDC2.2 Objective

The objective of SDC2 is to clarify procedures for the issue of Dispatch Instructions by OETC to;

- meet Demand and Desalinated water requirements at minimum cost, taking account of operational constraints whilst maintaining the integrity of Total System security and the quality of electricity Supply; and
- enable OETC to comply with its statutory obligations, the requirements of its Transmission and Dispatch Licence, and the Grid Code.

SDC2.3 Scope

In addition to OETC, SDC2 applies to;

- Power Producers with CDGensets and Desalination Units;
- Users;
- Directly Connected Consumers;
- International Interconnected Parties;
- Ancillary Service Providers;
- Internally Interconnected Parties;
- RAEC if Connected to the Total System; and
- PWP (for information).



SDC2.4 Procedures

Where information in this Code is required to be provided in writing, subject to OETC giving its prior written approval facsimile transmission or other electronic means may be used. All written communication shall be in the English language.

The format for issuing Dispatch Instructions is given in Appendix A.

SDC2.4.1 Data

OETC shall, when assessing which CDGensets and Desalination Units to Dispatch, review;

the Constrained Schedule;

the declared Availability (Daily Status Form) of each CDGenset and Desalination Unit; and

other relevant data in respect of each CDGenset and Desalination Unit, as determined by OETC.

The Operating Parameters used in the Dispatch phase shall be those used by OETC to compile the Generation Schedule and Desalination Schedule as described in SDC1.4.

In the event that two or more CDGensets have equivalent costs, OETC will first Dispatch the CDGenset that will give the highest reduction in overall Total System costs.

SDC2.4.2 Dispatch Instructions to Power Producers

Dispatch Instructions relating to the Schedule Day shall be issued at any time during the period beginning immediately after the issue of the Generation Schedule and Desalination Schedule in respect of that Schedule Day.

A Dispatch Instruction given by OETC may require a change in the Active Power output of a CDGenset, a change in the Reactive Power output of a CDGenset, a change to the mode of Operation or an instruction to provide an Ancillary Service by a specific CDGenset, or a change in the output of a Desalination Unit.

A Dispatch Instruction given by OETC to a Power Producer shall be given by telephone and will be confirmed in writing within 5 minutes. Each party shall enter all Dispatch Instructions into the respective logs.

A Dispatch Instruction must be either formally acknowledged immediately by the Power Producer in respect of that CDGenset by telephone, or a reason given immediately for non-acceptance. The reason for non-acceptance may only be on safety grounds (relating to Persons or Plant) or because the Dispatch Instruction is not in accordance with the Daily Status Form relevant to the time and period to which the Dispatch Instruction relates.

For a Dispatch Instruction to be valid, it must observe the limits of Availability, Ancillary Service capability and Operational Parameters as properly declared to OETC in accordance with SDC1.

In the event that an unforeseen problem arises in carrying out the Dispatch Instruction, OETC must be notified without delay by telephone.

SDC2.4.3 Generation Synchronising and De-synchronising times

OETC shall determine the required timing of Synchronising and Desynchronising of each CDGenset.

If the Power Producer is unable to meet the Synchronising time, it must inform OETC immediately. If the estimate of the Synchronising time is later than the instructed time by more than 10 minutes, this will constitute a redeclaration of availability by the CDGenset as defined in SDC1.4.1. If the Synchronising time is early by more than one minute, OETC shall keep a record and inform PWP.



When OETC issues a Dispatch Instruction for a CDGenset to a Power Producer not in accordance with the data submitted on Daily Status Form, the Power Producer must immediately contact OETC to indicate the error. OETC will take immediate steps to amend the Dispatch Instruction.

SDC2.4.4 Additional instructions to CDGensets

Additional instructions to CDGensets may include the following;

Reserve

To ensure that an adequate Operating Margin is maintained, Dispatch Instructions may include details of the reserve (in the categories set out in OC3) to be carried on each CDGenset, including notification of the timescale in which that reserve may be transferable into increased CDGenset output.

Reactive Power

To ensure that a satisfactory System voltage profile and that sufficient Reactive Power reserves are maintained, Dispatch Instructions may include, in relation to Reactive Power;

- a). Reactive Power output.** The Reactive Power output from the individual CDGenset onto the Transmission System at the CDGenset's Connection Point namely the HV side of the Generator transformer (or at the Distribution Network Connection Point in the case of Embedded CDGensets). In relation to each CDGenset, where there is no HV indication, OETC and the Power Producer will discuss and agree equivalent Reactive Power levels for the corresponding LV indication.

Where a CDGenset is instructed to a specific Reactive Power output, the Power Producer must achieve that output within a tolerance of ± 5 Mvar (or such other figure as may be agreed with OETC) by either;

- on load tap changing on the Generator transformer; or
- adjusting the CDGenset stator terminal voltage.

Once this has been achieved, the Power Producer will not tap again or adjust terminal voltage again without prior consultation with and the agreement of OETC, on the basis that Reactive Power output will be allowed to vary with Transmission System conditions.

- b). Target voltage levels.** Target voltage levels to be achieved by the CDGenset on the Transmission System at the CDGenset's Connection Point, namely the High Voltage side of the Generator transformer (or on the Distribution System at the Distribution Network Connection Point in the case of Embedded CDGensets). Where a CDGenset is instructed to a specific target voltage, the Power Producer must achieve that target within a tolerance of ± 0.5 kV (or such other figure as may be agreed with OETC) by either;

- on load tap changing on the Generator transformer; or
- adjusting the CDGenset stator terminal voltage.

In relation to each CDGenset, where there is no HV indication, OETC and the Power Producer will discuss and agree equivalent voltage levels for the corresponding LV indication.

Under normal operating conditions, once this target voltage level has been achieved the Power Producer will not tap again or adjust terminal voltage again without prior consultation with, and with the agreement of, OETC.

Under certain circumstances the Power Producer may be instructed to maintain a target voltage until otherwise instructed and this will be achieved by on load tap changing on the Generator transformer or adjusting CDGenset stator terminal voltage without reference to OETC.



Voltages on the 220kV and 132kV parts of the OETC Transmission System at each Connection Point with a User will normally remain within the limits $\pm 10\%$ of the nominal value unless abnormal conditions prevail. Under fault conditions, voltage may collapse transiently to zero at the point of fault until the fault is cleared

- c). **Maximum Reactive Power output ("maximum excitation")** Under certain conditions, such as low System voltage, an instruction to maximum Reactive Power output at instructed Active Power output ("maximum excitation") may be given, and a Power Producer should take appropriate actions to maximise Reactive Power Generation unless constrained by plant operational limits or safety grounds (relating to Persons or Plant).
- d). **Maximum Reactive Power absorption ("minimum excitation")** Under certain conditions, such as high System voltage, an instruction to maximum Reactive Power absorption at instructed Active Power output ("minimum excitation") may be given, and a Power Producer should take appropriate actions to maximise Reactive Power absorption unless constrained by Operating Parameter limits or safety grounds (relating to Persons or Plant).

In addition;

- OETC may issue Dispatch Instructions for Active Power and Reactive Power at any point on or within boundaries of the Generator Performance Chart as modified by any temporary changes submitted in the Daily Status Form. Any failure of a Power Producer to achieve these instructions within the agreed times shall be reported by OETC in writing to PWP as a failure to meet the terms of the PPA;
- The issue of Dispatch Instructions for Active Power at the CDGenset's Connection Point 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 enable an increase in Reactive Power capability;
- The excitation system, unless otherwise agreed with OETC, must be operated only in its constant terminal voltage mode of Operation with Var limiters in service. Any constant Reactive Power output control mode or constant Power Factor output control mode must always be disabled, unless agreed otherwise with OETC. In the event of any change in the System voltage, a Power Producer must not take any action to override automatic Reactive Power response that is produced as a result of constant terminal voltage mode of Operation unless instructed otherwise by OETC or unless immediate action is necessary to comply with stability limits or unless constrained by Operating Parameter limits or safety grounds (relating to Persons or Plant);
- A Dispatch Instruction relating to Reactive Power will be implemented without delay and shall be achieved not later than 2 minutes after the instruction time, or such longer period as OETC may instruct;
- On receiving a new Dispatch Instruction for Active Power, no tap changing or CDGenset terminal voltage adjustment shall be carried out to change the Reactive Power output unless there is a new Dispatch Instruction for Reactive Power;
- Where a Dispatch Instruction to Synchronise is given, or where a CDGenset is Synchronised and a Dispatch Instruction for Active Power is given, a Dispatch Instruction for Reactive Power consistent with the CDGenset relevant Operating Parameters may be given. In the absence of a Dispatch Instruction for Reactive Power with a Dispatch Instruction to Synchronise, the Reactive Power output shall be 0 Mvar; and
- Where a Dispatch Instruction to De-synchronise is given, a Dispatch Instruction for Reactive Power, compatible with shutdown, may be given prior to De-synchronisation being achieved. In the absence of a separate Dispatch Instruction for Reactive Power, it is implicit in the instruction to De-synchronise that Reactive Power output shall be reduced to 0 Mvar by the time of De-synchronisation.



SDC 2.4.5 Frequency Sensitive Mode

OETC may instruct a change to or from the Frequency Sensitive Mode for each CDGenset.

Ancillary Services

When an agreement exists between OETC or PWP and a User for provision of Ancillary Services, other than those covered in this Grid Code, Dispatch Instructions relating to the provision of these services may be issued.

Tests

An instruction may be issued to carry out tests as required under OC9.

SDC2.5 Action required from the Power Producer

Each Power Producer will comply with all Dispatch Instructions correctly given by OETC unless the Power Producer has given notice to OETC under the provisions of the Scheduling and Dispatch Code regarding non-acceptance of Dispatch Instructions.

Each Power Producer must utilise the relevant run-up or run-down rate and loading or deloading rate in accordance with the Operating Parameters.

To preserve Transmission System integrity under Emergency Conditions OETC may issue Emergency Instructions. Such Emergency Instructions will be issued by OETC direct to the Power Producer and may require an action or response that is outside Operating Parameters. The Power Producer will use reasonable endeavours to achieve these Emergency Instructions without prejudice to the safety of the Plant or Persons.

SDC2.6 Synchronisation/De-synchronisation

Power Producers will only Synchronise or De-synchronise CDGensets in response to a Dispatch Instruction from OETC. De-synchronisation may take place without OETC's prior agreement if it occurs automatically as a result of CDGenset or Transmission protection operations or it is done purely on safety grounds.

SDC2.7 Instructions following Operating Parameter changes

If OETC fails to issue a new Dispatch Instruction within 15 minutes of being notified of an Operating Parameter change then the relevant Power Producer shall be entitled to change the Operation of such CDGenset and/or Desalination Unit to bring its Operation within the applicable Availability and/or Operating Parameters until OETC issues a new Dispatch Instruction within the applicable Availability and/or Operating Parameters. Prior to making such a change in Operation, the Power Producer will use reasonable endeavours to advise OETC (by telephone and then confirmed in writing) of its intended action and timing.

SDC2.8 Request for Operation under Risk of Trip

A Power Producer may request OETC agreement for one of the CDGensets and/or Desalination Units at the Production Facilities to be operated under Risk of Trip. OETC's agreement will be dependent on the evaluation by OETC of the risk to the Total System arising from the potential trip of the CDGenset.



SDC2.9 Instructions to Users

Instructions to Users relating to the Schedule Day shall be issued as a list of special actions in respect of that Schedule Day at any time during the period beginning immediately after the issue of the Generation Schedule and Desalination Schedule. OETC will issue instructions directly to the Users at each Control Centre in relation to special actions and Demand Control. instructions may include;

- a requirement for Demand reduction, de-energisation or restoration;
- an instruction to effect a Load transfer between Connection Points; and
- an instruction to switch in a Demand Intertrip Scheme.

SDC2.10 Communications with Users

OETC shall issue Dispatch Instructions to Users by telephone. OETC shall confirm all Dispatch Instructions in writing within 5 minutes. All Users must acknowledge all Dispatch Instructions in writing within 2 minutes of receipt.

Each User must comply without delay with all Dispatch Instructions received by it. In the event of an unforeseen problem arising that prevents the carrying out of a Dispatch Instruction, OETC must be notified by telephone without delay and not later than 5 minutes after receipt of the Dispatch Instruction. OETC shall confirm the notification in writing within 5 minutes of receipt.

Each party shall enter all Dispatch Instruction sent and received and all events into the respective logs.



Appendix A. Dispatch Instructions

1 Format of Dispatch Instruction

OETC shall give Dispatch Instructions to Power Producers and Users by telephone. OETC shall confirm the Dispatch Instruction in writing within 5 minutes

Dispatch Instructions shall be acknowledged by the recipient and confirmation sent to OETC in writing within 5 minutes of receipt.

In all cases, all Dispatch Instructions and events shall be entered into the respective logs by the sender and by the receiver.

A Dispatch Instruction shall include the following information;

- a). an exchange of operator names;
- b). the specific CDGenset and/or Desalination Unit to which the instruction applies;
- c). the output to which it is instructed;
- d). if the start time is different from the time the instruction is issued, the start time will be included;
- e). where specific Generation Set Run-Up Time/ Generation Set Run-Down Time or Generation Set Loading Rate/ Generation Set De-loading Rate are concerned, a specific target time/rate;
- f). the issue time of the instruction.

All Generation Set Run-Up Times/ Generation Set Run-Down Times and Generation Set Loading Rates/ Generation Set Deloading Rates will be assumed to be constant and in accordance with Operating Parameters Each Dispatch Instruction will, wherever possible, be kept simple, drawing as necessary from the following formats.

2 A Dispatch Instruction to increase or decrease output

Any fax, e-mail, or telephone Dispatch Instruction or acknowledgement will follow the form;

“This is Operator A. To whom am I speaking?”

“Operator Z at Production Facility X”

If the time of the instruction is 14:00 hours, the CDGenset is Genset 1 and the output to be achieved is 25MW, the relevant part of the instruction would be.

"Genset 1 to 25MW, instruction timed at 14:00 hours"

If the start time is 1415 hours, the instruction will follow the form;

" Genset 1 to 25MW, start at 14:15' hours, instruction timed at 14:00 hours"

3 CDGenset Synchronising

When issuing instructions, OETC will always have due regard for the time of Notice to Synchronise declared to OETC by the Power Producer.

The instruction will follow the form;

“Genset 1 Synchronise at 16:00 hours, instruction timed at 13:00 hours.”

Unless a loading programme is also given at the same time it will be assumed that the CDGensets are to be brought to Minimum Generation and 0 Mvar output.

OETC will issue a further Dispatch Instruction when the Power Producer reports that the CDGenset has Synchronised.

If it should be necessary for a Dispatch Instruction for a CDGenset to Synchronise to be cancelled before the Genset or CCGT Module is Synchronised, the instruction shall be given by telephone and will be confirmed in writing within 5 minutes and will follow the form;

“Genset 1 cancel Synchronising instruction, instruction timed at 14:00 hours.”

4 CDGenset De-Synchronising

The instruction will follow the form;

“Genset 1 Shutdown instruction timed at 13:00 hours.”

If the instruction De-Synchronising time is for 14:00 hours, it will follow the form;

“Genset 1 Shutdown at 14:00 hours, instruction timed at 13:00 hours.”

Both of the above instructions assume a run-down rate at declared Operating Parameters.

Unless a separate Reactive Power Dispatch Instruction is given, the CDGenset will be brought to 0 Mvar (at the point of synchronism) prior to De-synchronisation.

5 Voltage control instruction

To ensure adequate System voltage profiles and Reactive Power reserves are maintained under normal and fault conditions a range of voltage control instructions will be utilised.

- a) increase/decrease Reactive Power to (XX)Mvar export or import;
- b) Maximum Mvar output (or "maximum excitation");
- c) Maximum Reactive Power absorption (or "minimum excitation");
- d) Increase Generator transformer tap position by (*one*) tap or go to tap position (x)
- e) Achieve a target voltage of (YYkV) and then allow to vary with System conditions;
- f) Maintain a target voltage of (YYkV) until otherwise instructed. Tap change (or adjust CDGenset terminal voltage) as necessary.

6 Frequency control

All Dispatch Instructions will be deemed to refer to target output at the instructed Target Frequency when the CDGenset is in the Frequency Sensitive Mode.

CDGensets are required to operate in Frequency Sensitive Mode in the combinations set out in the relevant PPA/PWPA.

Frequency control instructions may be issued in conjunction with or separate from Dispatch Instruction for Active Power output.

7 Tertiary Reserve

Tertiary Reserve will be specifically instructed as required and will normally be given with the Dispatch Instruction as an additional item in the form, for example;



“Genset I to 40MW and 5MW Tertiary Reserve, instruction timed at 14:00 hours.”

8 Black Start

The instruction will normally follow the form.

“Initiate Black Start procedure, instruction timed at 19:00 hours.”

9 Emergency instruction

All such instructions will be prefixed with the words;

"This is an Emergency Instruction".

It may be in a pre-arranged format and normally would follow the form;

“This is an Emergency Instruction. Reduce output to (X) MW in (Y) minutes, instruction timed at 20:00 hours.”



Scheduling and Dispatch Code SDC3 - Frequency Control

Issued April 2010

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Scheduling and Dispatch Code SDC3 - Frequency Control

SDC3.1 Introduction

To maintain the security and quality of electricity Supply, the Frequency of the Total System must be maintained within specified limits. SCD3 describes Frequency control procedures to allow OETC to meet its License requirement to maintain the Frequency of the Total System and the Electric Time within specified limits.

These procedures include;

- Gensets operating in a Frequency Sensitive Mode;
- Demand Control; and
- Dispatch of Gensets.

SDC3 is complementary to SDC1 and SDC2.

SDC3.2 Objective

The objective of SCD3 is to clarify the Frequency control procedures required by OETC to maintain the security and quality of electricity Supply from the Total System and (as far as possible) to maintain the Electric Time in accordance with the limits specified in this code.

SDC3.3 Scope

In addition to OETC and PWP, SDC3 applies to;

- Power Producers;
- Users;
- Licensed Distributors;
- Directly Connected Consumers;
- Internally Interconnected Parties;
- International Interconnected Parties;
- RAEC if Connected to the Total System; and
- PWP (for information).

SDC3.4 Response from CDGensets

SDC3.4.1 Capability

Each CDGenset must at all times have the capability to operate automatically so as to provide response to changes to System Frequency. This will be provided for and complied with in accordance with the requirements of a relevant PWPA or PPA.

SDC3.4.2 Frequency Sensitive Mode

Frequency Sensitive Mode is the generic description whereby the Active Power output of a Genset will change automatically in response to changes in System Frequency. This also permits the Genset to operate in accordance with an instruction to provide Primary Response and/or Secondary Response. A Power Producer must not countermand a change in the Active Power output of a CDGenset induced by a change in System Frequency that assists recovery to Target Frequency. The only exceptions are where a change in the Active Power output of a CDGenset must be carried out on safety grounds (relating to either Persons or Plant) or to ensure the integrity of the Generating Plant.



SDC3.4.3 OETC Dispatch Instructions

OETC will issue Dispatch Instructions to regulate the Frequency of the Total System to meet the requirements of Frequency control. Generating Plant operating in Frequency Sensitive Mode are required to operate taking into account the Target Frequency notified by OETC.

OETC will give 15 minutes notice of variation of Target Frequency.

The Frequency of the Total System shall be nominally 50.00 Hz with System Frequency set points between 49.95Hz and 50.05Hz. Normal control deviations will not exceed 49.90Hz to 50.10Hz. Under transient disturbed conditions, System Frequency could rise to 51.50Hz or fall to 48.00Hz.

SDC3.4.4 Low Frequency initiated response from Gensets

If Frequency falls below Target Frequency, output from the CDGenset should be maintained. CDGensets that have provided Primary Response shall not be de-energised provided that the System Frequency is above 47.5Hz. A Power Producer must not reduce the power increase of a CDGenset induced by a change in Frequency of the Total System that assists recovery to Target Frequency.

CDGensets shall remain Connected to the Total System at Frequencies down to 47.5Hz. Thereafter, CDGensets may be de-energised from the Total System to ensure integrity of the Plant but should be kept running to supply local Demand wherever possible and so that they are Available to assist Total System recovery promptly.

If the Frequency of the Total System falls below 47.5Hz, Power Producers will be required to take action to protect their Generating Plant and in such circumstances the requirement not to disconnect CDGensets from the Transmission System does not apply.

OETC in certain circumstances may issue Emergency Instructions to CDGensets and for Plant held as Tertiary Reserve to be synchronised and Generate output.

SDC3.5 Low Frequency initiated response from Users

Licensed Suppliers and Directly Connected Consumers shall follow the requirements of OC4 – Demand Control that sets out the procedures that may be instructed by OETC in the event of low Frequency.

The situations covered in OC4 relevant to action in the event of low Frequency include;

- Planned manual de-energisation or emergency manual de-energisation of Demand initiated by OETC; and
- De-energisation of Demand by automatic Demand shedding equipment and automatic relays to preserve Total System security.

SDC3.6 Actions to be undertaken by International Interconnected Parties

OETC shall agree with International Interconnected Parties plans of action in the event of abnormal Frequency that could occur due to events on either System. Where possible, adjacent Systems shall endeavour to provide mutual support but the over-riding priority shall be to maintain their Systems in Operation. Suitable automatic relaying may need to be put in place to assist this.



SDC3.7 Actions to be undertaken by Internally Interconnected Parties

OETC shall agree with Internally Interconnected Parties plans of action in the event of abnormal Frequency occurring on the Total System. These plans shall require Generating Plant owned by the Internally Interconnected Party to be operated in Frequency Sensitive Mode and respond positively to attempts to correct the Frequency deviation.

OETC may also agree Demand Control arrangements whereby the Internally Interconnected Party reduces Demand on instruction from OETC or by automatic under Frequency relays.

The over-riding priority of Internally Interconnected Parties shall be to maintain their Systems in Operation and be able to assist OETC in restoring the Total System. Suitable automatic relaying may have to be put in place to assist safe separation of the Systems. OETC will discuss each situation with the respective party and they should jointly determine the optimum solution for that situation. OETC will implement and meet the costs of the relaying system unless the sole beneficiary is the other party in which case implementation and costs fall to the other party. If OETC and the other party cannot reach agreement, OETC will determine and implement the required relaying system.

SDC3.8 Action to be undertaken during sustained abnormal Frequency conditions

SDC3.8.1 Actions during sustained low Frequency conditions

OETC shall issue instructions to minimise the duration of any low Frequency conditions. Instructions will be given to Power Producers to synchronise Available CDGensets and maximise CDGenset output whilst maintaining some reserve Capacity to manage Frequency control.

OETC shall also issue instructions to Licensed Distributors and Directly Connected Consumers to institute pre-arranged Demand Control to reduce Demand to match Available Generation output and so restore the Frequency of the Total System to within the normal set point range. The instructions may include;

- Consumer Demand Control initiated by Licensed Distributors;
- Consumer Demand Control initiated by OETC; and
- Planned manual de-energisation or emergency manual de-energisation of Demand initiated by OETC, possibly including rota Demand shedding.

SDC3.8.2 Actions during sustained high Frequency conditions

CDGensets that have provided negative Primary Response shall not be de-energised provided that the System Frequency is below 51.50 Hz and the CDGenset loading is above Minimum Generation. If the Frequency of the Total System is at or above 51.50 Hz, the Power Producer is required to take action to protect the Generating Plant and the requirement to make all reasonable efforts to avoid tripping does not apply.

In the event of the Frequency of the Total System becoming stable above 50.50 Hz, after all CDGenset action has taken place, OETC shall issue Dispatch Instructions to trip appropriate CDGensets to bring the Frequency of the Total System to 50.00 Hz or below and follow this with Dispatch Instructions to return the Frequency to Target Frequency.



SDC3.9 Electric time

OETC shall endeavour (in so far as it is able) to control Electric Time to within plus or minus 10 seconds of Oman official time by specifying changes to Target Frequency as part of Dispatch Instructions, taking into account the Generation Schedule and Desalination Schedule and forecast Generating Plant/Demand margins.

OETC shall be responsible for monitoring and recording Electric Time error.



Ancillary Services Code

Issued April 2010

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Ancillary Services Code

ASC 1 Introduction

Ancillary Services are services ancillary to the transmission of electricity that OETC requires to operate the Transmission System in accordance with its statutory obligations.

OETC has a number of specific obligations regarding Ancillary Services;

- OETC is required to ensure sufficient Ancillary Services will be available on the day ahead when preparing the Generation Schedule and Desalination Schedule (see SCD1); and
- OETC is required by the terms of the Transmission and Dispatch Licence to cooperate with PWP in determining which Ancillary Services should be procured by the PWP from Production Facilities.

This Ancillary Services Code (ASC) lists the Ancillary Services required by OETC, the contractual arrangements governing the provision of such services and details of the Ancillary Services to be provided by Power Producers and other Users. This code also sets down the form of instruction that will be used by OETC to implement the requirements for Ancillary Services.

ASC 2 Objectives

The objectives of the ASC are as follows;

- to list the Ancillary Services that OETC requires to operate the Transmission System in accordance with statutory requirements;
- to clarify the contractual arrangements governing the purchase of Ancillary Services from Power Producers and Users; and
- to clarify the process for scheduling and instructing the requirements for the use of Ancillary Services.



ASC 3 Scope

In addition to OETC, ASC applies to;

- PWP (as the purchaser of Ancillary Services from Power Producers);
- Power Producers;
- Licensed Distributors;
- Licensed Suppliers;
- Directly Connected Consumers;
- International Interconnected Parties;
- Internally Interconnected Parties; and
- RAEC if Connected to the Total System.

ASC 4 Requirement for Ancillary Services

The requirements for Ancillary Services can be categorised as follows;

- Regulation of System Frequency;
- Reactive Power and voltage control; and
- Black Start capability for System Restoration.

ASC4.1 Regulation of System Frequency

OETC is required to maintain Frequency within the following limits.

During normal operating conditions, the nominal System Frequency of the Transmission System shall be 50.00 Hz and will be controlled normally between 49.95Hz and 50.05Hz. During exceptional steady state conditions, Frequency deviations will not exceed 49.90Hz to 50.10Hz unless disturbed circumstances prevail.

Under disturbed conditions, System Frequency could rise transiently to 51.50 Hz or fall to 48.0 Hz.

The Frequency of the Total System is responsive to changes in the balance between Demand and total Available Generation Capacity. OETC must therefore ensure that at all times sufficient Generation Capacity and Demand is Available and Connected to the System to respond automatically to Active Power imbalances and correct any credible Frequency change.

The Grid Code requires all CDGensets to have the capability to contribute to Frequency control. Synchronised Gensets can provide continuous Frequency control through their automatic governing systems. Frequency control will also be assisted by synchronised Gensets through changes in output in response to Dispatch Instructions issued by OETC.

Frequency control can also be provided through Demand Side Management arrangements with Users that allow demand to be adjusted for short periods for the purposes of Active Power balance and Frequency control.



ASC4.2 Reactive Power and voltage control

OETC is required to maintain voltage control within certain limits. The voltage on the 220kV and 132kV parts of the Transmission System at each Connection Site with a User will remain within the limits of a minimum voltage of -10% and a maximum voltage of +10%.

The voltage on the 33kV and 11kV sides of Transmission transformers at Connection Sites with Users will normally remain within the limits +/-6% of the nominal value unless abnormal conditions prevail.

During some System Disturbances such as where short circuits occur, the voltage may collapse transiently to zero at the point of fault until the fault is cleared.

Voltage regulation requires both Active and Reactive Power flows across the Transmission System to be carefully controlled. The physical characteristics of the Plant of the Transmission System also give rise to the Generation and absorption of Reactive Power. Reactive Power flows across the System can give rise to substantial voltage differences and it is therefore necessary to maintain Reactive Power balances between sources of Capacity and demand on a “zonal” basis.

Unlike Frequency, which is consistent across an interconnected Transmission System, voltages at different points on an interconnected System are determined by the local sources of demand and Capacity, by the prevailing network configuration and by the Reactive Power flows across the network. The voltages at different points on a interconnected System thus form a “voltage profile”.

The management of voltage requires control of Reactive Power and this can be provided by CDGensets, Autogenerators, or by means of synchronous or static compensators/reactors.

ASC4.3 System restoration

Black Start is an Ancillary Service required to restore the Total System following a Partial Shutdown or Total Shutdown of the System. System Restoration Procedures and the procedures to be followed in Black Start situations are dealt with in section OC7 of the Grid Code.

Black Start capability would normally be Available as required from certain Power Producers in accordance with the terms of a PPA or PWPA. Autogenerators may also have Black Start capability.

ASC 5 Ancillary Service contractual arrangements

The Sector Law requires that Ancillary Services are provided for in either (i) an agreement between a Licensed Generator or a Licensed Generator/Desalinator and the PWP or (ii) an agreement established under the Grid Code or the Distribution Code.

OETC can enter Ancillary Service Agreements with Users for Ancillary Services provided the facilities providing the Ancillary Services are not party to a PPA or a PWPA with PWP.



OETC is responsible for identifying the Transmission System Ancillary Services requirements both in the short term, when preparing the day ahead Schedule, and in accordance with the System expansions plans of the PWP.

The Transmission and Dispatch Licence and the Power and Water Procurement Licence require OETC and the PWP to liaise and cooperate on the issue of providing and contracting for Ancillary Services.

All Ancillary Services whether provided through a PPA, PWPA or Ancillary Service Agreement shall be utilised in accordance with OETC instructions and the requirements of the Grid Code.

ASC 6 Ancillary Services provided by Power Producers

The PPA or PWPA for each Power Producer shall state the Active Power and Reactive Power ranges for each CDGenset. It also shall state that each CDGenset must be capable of contributing to Frequency and voltage control by continuous modulation of Active Power and Reactive Power supplied to the Transmission System or the User System in which it is Embedded. These services cover the requirements for Primary Response, Secondary Response and Tertiary Reserve and the provision of Reactive Power response from Power Producers.

The Turbine Speed Controller of a CDGenset in co-ordination with other control devices must control the Active Power output with stability over the entire operating range of the CDGenset. The speed governor shall be capable of being set so that it operates with an overall speed droop of between 3.0% and 5.0%.

OETC may instruct a CDGenset to operate anywhere within the operating envelope defined in its Generator Performance Chart. This envelope is contained between declared Active Power capability and registered Minimum Generation and between the practical stability limit line (leading Reactive Power) and the lagging Reactive Power line determined by the rotor-heating limit. The Reactive Power limits are shown by way of illustration in Appendix D of OC2.

Each CDGenset should be capable of providing constant voltage control at its terminals over the entire operating range without instability. This shall be by a continuously acting Automatic Voltage Regulator which should be in service at all times when the CDGenset is Synchronised unless otherwise instructed by OETC

It is essential that OETC has Black Start Capability Available to it. Black Start Capability will be provided in accordance with a PPA or PWPA. Non-availability of this capability must be declared in the Daily Status Form.

ASC 7 Ancillary Services provided by Users

OETC may have Ancillary Service Agreements with Licensed Suppliers, Directly Connected Consumers and/or other Users not party to a PPA or PWPA for the provision of Ancillary Services such as Demand Control, Reactive Power output and response and Black Start capability.

Licensed Suppliers, Directly Connected Consumers or other Users not party to a PPA or PWPA may make arrangements for the switching out of or a reduction in discrete levels of Demand.



Switching out of Demand or reduction of Demand may take place following;

- instructions from OETC or a Licensed Distributor to reduce Load on the respective networks; and
- instructions from OETC to assist in matching Available Active Power output to Demand.

An Ancillary Service Agreement may also provide for automatic operation of under Frequency relays to switch off Demand to assist System response in cases of emergencies. The Frequency settings and any time delays of relays will be agreed between OETC and the User.

Additionally, Ancillary Service Agreements with Licensed Suppliers, Licensed Distributors and/or other Users not party to a PPA or PWPA may provide for the Supply of Reactive Power capability and/or response. This may be provided from rotating Plant or switched static Plant.

OETC will instruct the use of such Ancillary Services at the appropriate time.

Autogenerators or other Users with Gensets not centrally Dispatched may wish to offer Black Start capabilities to OETC to assist restoring the Total System following Emergency Conditions. Appropriate commercial arrangements may be put in place for this purpose. OETC would issue the necessary instructions calling for the use of Black Start capability at the appropriate time.

ASC 8 OETC instructions to Users

OETC will normally schedule the requirements for use of Ancillary Services within in its day ahead Scheduling plans provided for in Code section SDC1. Users will be informed by 16:00 hours on the day preceding the relevant Schedule Day of the potential requirements.

Potential requirements are not firm Instructions but are indicative only, and are provided as a guide to the expected output requirements from Ancillary Service Providers.

Instructions to Ancillary Service Providers relating to the Schedule Day will normally be issued as a list of special actions in respect of that Schedule Day at any time during the period beginning immediately after the issue of the Generation Schedule and Desalination Schedule at 16:00 hours as provided for in SDC2. OETC will issue instructions directly to the Users at each Control Centre in relation to special actions and Demand Control. Instructions may include;

- a requirement for Demand reduction, de-energisation or restoration;
- an instruction to effect a Load transfer between Connection Points;
- an instruction to switch in a Demand Intertrip Scheme; and
- an instruction to switch in or out Reactive control plant.

The procedure for a Black Start situation will be that specified by OETC at the time of the Black Start situation as provided for in OC7. Users shall abide by OETC instructions



during a Black Start situation provided the instructions are to operate within the declared operational capability of the Plant.

OETC may issue instructions to;

- a Production Facility with Black Start Capability or to a Licensed Distributor with an Embedded Production Facility with Black Start Capability relating to the commencement of Generation output;
- a Licensed Distributor or to a Directly Connected Consumer relating to the restoration of Demand; and
- a Production Facility relating to commencement of Generation output when an external Power Supply is made available to it.



Metering And Data Exchange Code

Issued January 2008

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METERING AND DATA EXCHANGE CODE

MDEC.1 Introduction

All Active and Reactive Power entering or exiting the Transmission System and Distribution Systems of Licensed Operators shall be metered using one or more Metering Systems. Electricity delivered to Consumer premises shall also be metered.

Similarly all Water exiting Production Facilities' sites must be metered and recorded using one or more Water Meters or Water Metering Systems.

The metering of all such quantities and flows is required for a variety of purposes, including;

- i) for the purpose of establishing a record of electrical quantities entering or exiting the systems of a Licensed Transmission System Operator and Licensed Distribution System Operators;
- ii) for the purpose of establishing the quantities of electricity delivered to Consumer premises;
- iii) for the purpose of establishing a record of the quantities of water exiting Production Facilities;
- iv) for calculating amounts to be paid in accordance with agreements between Persons to whom this code applies;
- v) for certain contractual purposes between Persons to whom this code applies;
- vi) for the provision of data to the Regulatory Authority in connection with the monitoring and enforcement of Licences, the Sector Law and related matters, including the calculation and establishment of cost reflective tariffs and the monitoring of the electricity supply market;
- vii) for the purpose of establishing compliance with the Grid Code by those Persons who are bound by it; and
- viii) such other purposes as may be expedient or requisite from time to time in connection with matters contemplated by the Sector Law and/or under this Grid Code.

The requirements of this Metering and Data Exchange Code (MDEC) are complimentary to the metering and data exchange requirements of agreements between Persons to whom this code applies.

References in MDEC to Meter Owner include Meters and Metering Systems used by Persons under any agreement with a third party.



MDEC.2 Objectives

The objectives of the Metering and Data Exchange Code are to establish;

- The standards to be met in the provision, location, installation, operation and maintenance of Metering Systems;
- The standards to be met by those bound by MDEC in relation to all matters associated with Metering Systems;
- The responsibilities of each Person bound by MDEC in relation to ownership and management of Metering Systems and Meters and the provision and use of Meter data; and
- The responsibilities of all Persons bound by MDEC in relation to the storage of Meter data.

It is important that all relevant Persons may prepare, calculate, assess and validate invoices between such Persons with a view to their prompt settlement, having available to them all necessary Meter data of reliable quality and accuracy for those purposes at the times at which they require the same.

MDEC.3 Scope

The Metering and Data Exchange Code applies to OETC and;

- PWP;
- PAEW;
- Power Producers;
- Licensed Distributors;
- Licensed Suppliers;
- International Interconnected Parties;
- Internally Interconnected Parties;
- Directly Connected Consumers; and
- RAEC if Connected to the Total System.

MDEC is concerned with the Metering Systems and related Meters and Meter data associated with Production Facilities, the Systems of Licensed Transmission System Operators, Distribution System Operators, and Meters to final Consumers.

MDEC.4 General

Metering Systems and Meters shall be established, metering shall take place and Meter data shall be recorded, checked and exchanged between Persons bound by this code and then stored, sufficient to ensure that all such Persons are able to prepare and calculate, assess and validate and, keep appropriate records concerning and where appropriate, challenge, invoices as listed below, on a prompt, comprehensive and accurate basis.

Meter data shall be permanently recorded and stored for these purposes in accordance with other provisions of MDEC. If a contract between relevant Persons has additional requirements for Metering Systems or in relation to Meters, those requirements shall, so long as they do not prevent compliance with MDEC, apply in addition to MDEC.

At each Electrical and Water Delivery Point, Meters and/or Metering Systems shall be installed, operated and maintained and metering shall take place sufficient for all



purposes of this code. The Delivery Points shall be at the ownership boundary and shall be set out in each Connection Agreement.

OETC, Licensed Distributors, Licensed Suppliers and Users shall each respectively take all reasonable steps to ensure that each relevant Metering System is located as close as is reasonably practicable to the Delivery Point at each Connection Point, particularly where Metering Systems are required for settlement purposes or other purposes set out in MDEC.

The actual location of a Metering System is referred to as the "Actual Metering Point". This may be different from the Delivery Point established pursuant to the relevant Connection Agreement. Where the Actual Metering Point is not coincident with the Delivery Point, compensation shall be provided for power transformer and/or line losses so that the overall accuracy requirement at the Delivery Point is met.

Each CDGenset shall have a Metering System to measure Capacity and Output. Each Production Facility that produces water shall have a Metering System to measure the Capacity and Output of water production units at the Production Facility.

MDEC.4.1 Meter and Metering System ownership

The term, Meter Owner, also relates to Meters and Metering Systems used by Persons under any agreement with a third party.

The Meter Owner shall be responsible for all aspects of ownership, purchase, maintenance, calibration and testing unless stated otherwise in MDEC.

Meter ownership shall be determined as follows;

- Power Producers shall own and be responsible for electricity Metering Systems for entry/exit to/from OETC busbars;
- Power Producers shall own and be responsible for electricity Metering Systems between the Production Facility and Licensed Distributor busbars located on the Production Facility site whether or not there is another User connected to the busbars;
- Power Producers shall own and be responsible for the Water Metering Systems where the Production Facility is connected to PAEW's system;
- OETC shall own and be responsible for the Metering Systems at a substation with a single Licensed Distributor;
- Where ownership by a single party of a complete Metering System at a substation is not possible, ownership shall be as follows;
 - VTs shall be owned by the owner of the busbar or circuit to which the VT is Connected;
 - CTs shall be owned by the owner of the circuit of which the CT is installed;
 - Cabling associated with the VTs and CTs shall be owned by the Measurement Transformer owners up to the local junction box, thereafter the cabling shall be part of the general substation cabling owned by the substation site owner;
 - Meters and the Meter cubicles on which Meters are located shall be owned by the substation site owner;
 - The substation site owner shall have overall responsibility for the specification, maintenance, calibration and testing of the Metering Systems on the site;



- For Metering Systems that meter electricity flows between Licensed Distributors, the owner of the Metering System shall be the owner of the site or site on which the Measurement Transformers are located; and
- The ownership and responsibility for Metering Systems between OETC or Licensed Distributors and Consumers shall be as determined in the Connection Agreement or other agreement between the parties.

MDEC.5 Electricity Meters

MDEC.5.1 General

All Meters and Metering Systems procured, installed, operated and maintained for the purposes of this code shall be sufficient for all purposes of this code such that the standards to be met in relation to those Meters and Metering Systems, metering and the recording and exchange of Meter data set out in this code are met.

Each Meter and Metering System shall comply with the all provisions of this code, including those as to the standards of accuracy and calibration to be achieved in Metering Systems.

All data communications equipment required for the purposes of this code and forming part of or associated with any Meter or Metering System shall perform to the relevant International Telecommunications Union (ITU) standards and recommendations for data transmission over telecommunication systems, or such other communication protocols as the Metering and Data Exchange Code Review Panel may specify.

MDEC.5.2 Meter, CT and VT requirements

MDEC.5.2.1. Equipment required

MDEC.5.2.1.1 Meters

For Connections greater than or equal to 20 MVA, Metering Systems shall include main and check Meter equipment both having the same levels of accuracy and functionality.

Main Meters and check Meters shall be installed, operated and maintained so as to comply at all relevant times with the standards and accuracy classes indicated in Appendix A.

For Connections to consumers, Metering Systems shall be in accordance with Appendix B.

For each Delivery Point, a Metering System shall be installed, operated and maintained to measure the following parameters;

- i) Entry and exit Active Energy; and
- ii) Entry and exit Reactive Energy

The Meter Owner shall configure active Energy Meters such that the number of measuring elements is equal to or one less than the number of primary system conductors. These include the neutral and/or earth conductor where system configurations enable the flow of energy in such conductors.

All Meters shall be labelled by the Meter Owner or otherwise be readily identifiable in accordance with Appendix C.



The Metering Systems shall meter quantities on a continuous basis and the information shall be displayed on a non-volatile Meter Register. The Meter Registers shall not pass through zero more than once within the normal meter reading cycle.

Where main Meters and check Meters are provided with Outstations, the Outstations shall provide two outputs per measured quantity. The Outstations shall enable Meter data to be interrogated locally and at a later date for Meter data to be provided remotely over communications channels.

Where Meters provide Meter data to Outstations external to the Meter, the Outstations shall provide two outputs per measured quantity.

The Meter Owner shall provide Test terminals for main Meters and check Meters to facilitate on-site tests. These terminals shall be in close proximity to the Meters and shall be capable of providing suitable means for accessing current and voltage signals, injecting test quantities, connecting test Meters, and replacing Meters without a circuit outage.

MDEC.5.2.1.2 Current transformers

The Plant Owner shall provide current transformers in accordance with the standards and accuracy classes indicated in Appendix A – A3.

Where main Meters and check Meters are required, the Plant Owner shall provide two sets of current transformers. The current transformers supplying main Meters, the current transformer windings and cables connecting such windings to main Meters shall be dedicated for such purposes and such cables and connections shall be securely sealed.

The current transformers supplying check Meters may be used for other purposes provided that overall accuracy requirements are met. Evidence of the additional Burden imposed by such purposes shall be made available for inspection by relevant parties.

The additional Burden shall not be modified without prior agreement from relevant parties and evidence of the value of the modified additional Burden shall be available for inspection by relevant parties. The total Burden on each current transformer shall not exceed the rated Burden of such current transformer.

Current transformer test certificates showing errors at the overall working Burden or at Burdens which allow the error at working Burden to be calculated shall be made available by the Plant Owner for inspection by the relevant parties.

MDEC.5.2.1.3 Voltage transformers

The Plant Owner shall provide voltage transformers in accordance with standards and accuracy classes indicated in Appendix A – A3.

Where main Meters and check Meters are required the Plant Owner shall provide two voltage transformers or one voltage transformer with two or more secondary windings.

The voltage transformer winding supplying main Meters shall be dedicated to that purpose and such windings and connections shall be securely sealed.

The voltage transformer secondary winding supplying check Meters may be used for other purposes provided the overall Burden and accuracy requirements are met and evidence of the additional Burden imposed by such purposes is available for inspection by the relevant parties.

The additional Burden shall not be modified without prior argument from the relevant parties and evidence of the value of such additional Burden shall be available for



inspection by the relevant parties. The total Burden on each voltage transformer shall not exceed the rated Burden of such voltage transformer.

Voltage transformer test certificates showing errors at the overall working Burden or at Burdens that allow the error at working Burden to be calculated shall, wherever possible, be available by the Plant Owner for inspection by relevant parties.

Separately fused voltage transformer supplies shall be provided by the Plant Owner for the main Meter, the check Meter, and any additional Burden. The fuses shall be located as close to the voltage transformer as possible.

MDEC.5.2.2. Accuracy requirements

MDEC.5.2.2.1 Overall accuracy

The accuracy of the various items of measuring equipment comprising Meters and Metering Systems shall conform to the relevant IEC standards current at the time that the User's Connection Agreement is signed. Standards relevant to this code are listed in Appendix A – A1 and A2.

Accuracy requirements for the purpose of this code are defined by circuit Capacity, rated in MVA. Circuit Capacity shall be determined by the lowest rated primary plant of the circuit (i.e. transformer, line, etc) and must be based on the primary plant maximum continuous ratings. The rating and accuracy requirements of Metering Systems shall anticipate future uprating of the primary plant.

Where relevant standards change from time to time, the Metering and Data Exchange Code Review Panel will review such changes and recommend to the Regulatory Authority the extent to which any such changes should be implemented.

MDEC.5.2.2.2 Compensation for power transformer or Line losses

Where the Actual Metering Point is not coincident with the Delivery Point, compensation shall be provided for power transformer and/or line losses so that the overall accuracy requirement at the Delivery Point is met. The compensation may be applied locally within the Metering System or remotely. Compensation factors and their justification shall be established in accordance with Good Industry Practice and must be recorded in the Meter Registration System.

MDEC.5.2.2.3 Compensation for Measurement Transformer error

Errors arising from the Measurement Transformers and associated leads to the Meters that affect the overall accuracy shall be compensated such that the overall accuracy requirement is met. Values of the compensation factors and their justification including test certificates shall be established in accordance with Good Industry Practice and recorded in the Meter Registration System and shall be available for inspection by relevant parties.

MDEC.5.2.3. Meter approval and certification

Meters used in accordance with this code shall be approved Meter types. The Grid Code Review Panel shall maintain a list of approved Meter types that shall be made available on request. The Grid Code Review Panel shall also be responsible for type approval of Meters to ensure compliance with the provisions of this code in accordance with Good Industry Practice.

The Grid Code Review Panel will issue Meter Certificates to PWP, the relevant Meter Owner and the Regulatory Authority in accordance with Good Industry Practice to



confirm that Meters and Metering Systems comply with the requirements of this code. Meter Owners shall provide certification and other documentation as required to the Grid Code Review Panel to enable the Grid Code Review Panel to carry out this responsibility. Meter Certificates shall be issued for specified time spans and the duration may differ for different Meter types.

MDEC.5.2.4. Operation and maintenance

Metering Systems shall be operated and maintained in accordance with the manufacturer's recommendations or as otherwise necessary for the Meter Owner to comply with its obligations under this code.

The Consumer representatives of each Licensed Distributor shall be responsible for providing Consumers supplied at LV with the Meter requirements applicable to Consumer Metering Systems.

MDEC.5.3 Metering System Calibration and testing

MDEC.5.3.1. Initial Calibration

All new Meters shall undergo relevant certification tests in accordance with Good Industry Practice.

All initial calibration of Meters shall be performed in a recognised test facility (including any Meter manufacturer's works). These tests shall be performed in accordance with the relevant IEC standards and shall confirm that Meter accuracy is within the limits stated in Appendix A – A2. A uniquely identifiable calibration record shall be provided by the recognised test facility before the Connection is made live.

The Meter Owner will apply a certification seal following initial calibration. The Meter Owner must maintain this seal intact in order for the Meter to retain certified status. No Person bound by this code shall break the seal unless properly authorised to do so. The Meter Owner is responsible for ensuring that Meter certification is carried out for compliance with the provisions of this code.

Meters removed from service must be re-certified before reconnection for use under this code.

New voltage transformers and current transformers shall be calibrated prior to installation on site. Meter Owners shall provide manufacturers' test certificates to OETC for inclusion in the Meter Registration System to show compliance with the accuracy classes.

MDEC.5.3.2. Commissioning

Commissioning tests shall be carried out on all new Metering Systems providing Meter data before the Connection is made live and in accordance with Good Industry Practice. Commissioning tests shall also be carried out before reconnection where a replacement Metering System is fitted as part of an existing Metering System. No Connection or reconnection shall be permitted unless the tests are passed.

Following commissioning, the Meter Owner shall provide such evidence that relevant parties may require to confirm that a Metering System meets the requirements of this code.

All Meters, current transformers and voltage transformers shall be tested by the respective Owner for accuracy in accordance with Good Industry Practice at initial commissioning before the Connection is made live, as indicated in Appendix D. Appendix D sets out the tests and checks that as a minimum shall be included in a commissioning programme.



MDEC.5.3.3. Periodic Calibration and testing

MDEC.5.3.3.1 General

Periodic Calibration of Metering Systems shall be undertaken by the Meter Owners to ensure that the requirements of this code are met at all relevant times.

Periodic calibration of Meters shall be performed in a recognised test facility (including any Meter manufacturer's works) or by competent persons using standard Meters certified by a recognised authority. Accuracy Tests shall be performed in accordance with the relevant IEC standards and shall confirm that Meter accuracy is within the limits stated in Appendix A. The calibration record shall be uniquely identifiable, retained in a safe place and the significant details (Identification Number, date, names and status of authorised testing persons and accuracy results) recorded in the Meter Registration System.

Periodic Calibration of all Meters other than Active Energy class 0.2S may be performed on site provided that the percentage error limits associated with the accuracy classes given in Appendix A are met.

Periodic Calibration of class 0.2S Active Energy Meters and other Meters not meeting the error limits as described above, shall be performed in a recognised test facility (including any Meter manufacturer's works).

Meters shall also be tested outside of the prescribed intervals stated in MDEC.5.3.3.2 below if the main Meters and check Meters diverge by more than 1.5 times the prescribed limit of error associated with the accuracy classes given in Appendix A.

Complete and accurate records of Accuracy Tests, work carried out and pertinent data to confirm successful testing/calibration in accordance with the requirements of this code shall be kept by the Meter Owner and promptly registered in the Meter Registration System where appropriate.

MDEC.5.3.3.2 Frequency of testing

Electromechanical Meters shall be Calibrated and refurbished as necessary at intervals not exceeding ten years.

Active Energy Meters of accuracy class 0.5 shall have on-site Accuracy Tests performed at intervals not exceeding 5 years.

On-site Accuracy Tests are not required for all other types of electromechanical Meters.

For electronic Meters;

At least one of each type of electronic Meter owned by each Meter Owner shall be calibrated in any 5-year period. A minimum of 20% of the total of each type of Meter on-circuit with a Meter Owner shall be calibrated in an evenly phased programme over a 10-year period.

Where the main Meters and check Meters employed on a circuit are of the same manufacture and type (and are thus likely to have similar failure characteristics), on-site Accuracy Tests shall be performed at intervals not exceeding 5 years for Active Energy Meters and intervals not exceeding ten years for Reactive Energy Meters.

Where the main Meters and check Meters employed on a circuit are of a different manufacture or type, no on-site Accuracy Tests are required.

Where only a main Active Energy Meter is employed on a circuit, on-site Accuracy Tests shall be performed at intervals not exceeding five years.

Where only a main Reactive Energy Meter is employed, on-site Accuracy Tests shall be performed at intervals not exceeding ten years.



Periodic testing of Measurement Transformers is not required.

The testing intervals may be modified by the Metering and Data Exchange Code Review Panel.

MDEC.5.3.3.3 Suspected Metering errors

If any item of a Metering System is suspected of performing incorrectly, any affected party may request the Meter Owner to carry out Accuracy Tests in accordance with Good Industry Practice to confirm correct operation and accuracy. The Meter Owner shall carry out any test so requested. The party requesting the Accuracy Test shall bear the reasonable costs of such testing if the Meter is found to be operating within the prescribed limits of error, otherwise the cost of the Accuracy Test shall be borne by the Meter Owner. All affected parties shall be given 24 hours notice of such tests and be invited to witness the tests. Accuracy Test results shall be made available promptly and in writing to the affected parties.

Certified test equipment and reference standards (all traceable to recognised national or international standards) shall be used in such tests and if, by agreement, it is deemed necessary, an approved independent laboratory may be employed.

Where a Accuracy Test indicates that an error exceeds the limits of error associated with the accuracy classes given in Appendix A, the errors shall be recorded before promptly adjusting, repairing or renewing the Metering System (or part thereof) or replacing defective components. In such cases substitute Meter data shall be provided in accordance with PWP's/Licensed Distributors'/Licensed Suppliers' procedures.

The Metering System shall be restored to service and proved to be operating within the prescribed limits of accuracy as soon as is reasonably practicable. Upon the completion, examination, maintenance, repair, recalibration or replacement of any component in the Metering System, the Metering System shall be sealed.

MDEC.5.4 Meter and data security and registration

MDEC.5.4.1. Meter access and sealing

All Metering Systems and associated communications equipment shall be located in secure metering cabinets located in an area that is readily accessible, free from obstructions and well lit by artificial light. The cabinets shall include as a minimum, effective protection from moisture and dust ingress and from physical damage, including vibration. Appropriate temperature controls shall be provided. The cabinets must be lockable and capable of being sealed to prevent unauthorised access.

Meter Owners and the relevant parties, as appropriate, shall jointly seal the Metering System that shall include data collection equipment and associated modems and telephone links. Only the Meter Owner's personnel shall break such seals. All other affected parties shall be given at least forty-eight (48) hours' advance notice of the breaking of seals on any part of the Metering System. No such notice will be necessary when the breaking of a seal is necessitated by the occurrence of an Emergency.

Neither party shall tamper or otherwise interfere with any part of the Metering System in any way. Where it is established that the Metering System has been tampered or interfered with, then until such tampering or interference has been rectified either;

- (a) the quantity measured or recorded shall be that measured or recorded by any other relevant installed Metering System; or
- (b) if there is no other relevant Metering System or it is established to have been tampered or interfered with, the quantity shall be agreed by the parties, or, in



the absence of such agreement, either party shall be entitled to refer the matter to an Expert for determination.

If the Meter Owner is not the Person who owns or controls the land on which the Meter or Metering System is situated, that Person (if bound by this code) shall grant the Meter Owner and all other Persons who require the same for the purposes of this code sufficient rights of access for metering purposes and for the purposes of testing calibration, operation and maintenance and replacement of the Meter and Metering System.

Where any Person requires right of access or to deal in some other way with a Meter or Metering System for the purposes of this code, all such necessary rights shall be granted by the Person with the power to grant them if that Person is bound by this code. All such rights shall be set down in the relevant Connection Agreement where this is practicable.

The right of access provided for in this code includes the right to bring onto such a party's property any vehicles, plant, machinery and maintenance or other materials as shall be reasonably necessary for the purposes of performance of obligations under this code.

Each party shall ensure that all reasonable arrangements and provisions are made and/or revised from time to time as and when necessary or desirable in accordance with Good Industry Practice to facilitate the safe exercise of any right of access.

MDEC.5.4.2. Meter records

The Meter Owner shall label all Meters with a unique identification number from lists maintained by OETC.

Each Meter Owner shall ensure that complete and accurate records are maintained of the calibration and operation of Metering System. These records shall include but not be limited to the dates and results of any tests, readings, adjustments or inspection carried out and the dates on which any seal was applied or broken. The reasons for any seal being broken and the Persons, and their affiliations, attending any such tests, readings, inspections or sealings shall be recorded.

Meter Owners shall ensure that the pertinent data (Appendix E) is provided promptly to OETC for entry into the Meter Registration System. Such data shall be kept up to date. They shall also provide any other Metering System data requested by other involved parties.

MDEC.5.4.3. Meter registration

Metering Systems shall be registered in a central database, the Meter Registration System, which is to be operated and maintained by OETC in accordance with Good Industry Practice. The purpose of the Meter Registration System is to provide a complete, accurate and up to date central database of all Meter data and to ensure an auditable trail to demonstrate compliance with this code. The Meter Registration System shall contain, as a minimum, specific information at each Actual Metering Point as indicated in Appendix E.

All Users are responsible for ensuring that data relating to all changes to Users' Metering Systems including any changes to the types of data set out in Appendix E and any site de-energisations or disconnections are promptly reported in writing, to the Meter Registration System. Any other information regarding each metering point as may be reasonably required by the involved parties.



The Meter Registration System shall maintain the specified information for a minimum of seven years after the replacement or disconnection of a Meter.

Any data held in the Meter Registration System (a) shall be the intellectual property of OETC and (b) may be freely accessed by;

- The Meter Owner;
- The Regulatory Authority;
- OETC; and
- PWP.

Any User but with access limited to that equipment directly associated with the Metering System of that User.

MDEC.6 Water Meters

MDEC.6.1 General

All Water Meters and Water Metering Systems procured, installed, operated and maintained for the purposes of this code shall be sufficient for all purposes of this code such that the standards to be met in relation to those Water Meters and Water Metering Systems, metering and the recording and exchange of Meter data set out in this code are met.

Each Water Meter and Water Metering System shall comply with the all provisions of this code, including those as to the standards of accuracy and calibration to be achieved in Metering Systems.

All data communications equipment required for the purposes of this code and forming part of or associated with any Meter or Metering System shall perform to the relevant International Telecommunications Union (ITU) standards and recommendations for data transmission over telecommunication systems.

The relevant Connection Agreement may provide for site-specific isolation or other requirements in accordance with established Good Industry Practice and in particular, to comply with the requirements of any telecommunications service providers.

MDEC.6.2 Water Meter requirements

Water Metering Systems shall include main Water Meter equipment and check Water Meter equipment in series with a means of removing each Meter without affecting the operation of the other. Both Meters shall have at all relevant times the same levels of accuracy and functionality.

Water Meters shall include a pulsed output providing instantaneous and integrated flow readings and shall be equipped with battery back up power supplies for 24 hours operation.

All Water Meters and/or Water Metering Systems shall comply with the technical requirements specified in Appendix F.

Water Metering Systems shall meter the quantities on a continuous basis and the information shall be displayed on a non-volatile Meter Register. The Meter Registers shall not pass through to zero more than once within the normal reading cycle.

The Water Meter Owner shall provide Water Metering Systems with Outstations that shall provide two outputs per measured quantity. The Outstations shall enable Water



Meter data to be interrogated locally and at a later date for Water Meter data to be provided remotely over communications channels.

MDEC.6.2.1. Accuracy requirements

The Meter accuracy over the normal operating range shall not be more than $\pm 0.20\%$ of full-scale reading.

MDEC.6.2.2. Meter approval and certification

Water Meters used in accordance with this code shall be approved Water Meter types. The Grid Code Review Panel shall maintain a list of approved Water Meter types that shall be made available on request. The Grid Code Review Panel shall also be responsible for type approval of Water Meters to ensure compliance with the provisions of this code in accordance with Good Industry Practice.

The Grid Code Review Panel will issue Meter Certificates to the Water Meter Owner and the Regulatory Authority in accordance with Good Industry Practice to confirm that Water Meters and Water Metering System comply with the requirements of this code. Water Meter Owners shall provide certification and other documentation as required to the Grid Code Review Panel to enable the Grid Code Review Panel to carry out this responsibility. Meter Certificates shall be issued for specified time spans and the duration may differ for different Water Meter types.

MDEC.6.2.3. Operation and maintenance

Water Metering System shall be operated and maintained in accordance with the manufacturer's recommendations or as otherwise necessary for the Water Meter Owner to comply with its obligations under this code.

MDEC.6.3 Water Metering System Calibration and testing

MDEC.6.3.1. Initial Calibration

The Water Meter Owner will apply a certification seal following initial calibration. The Water Meter Owner must maintain this seal intact in order for the Meter to retain certified status. No Person bound by this code shall break the seal unless properly authorised to do so. The Water Meter Owner is responsible for ensuring that Meter certification is carried out for compliance with the provisions of this code.

All new Water Metering Systems shall undergo relevant certification tests in accordance with Good Industry Practice.

All initial calibration of Water Meters shall be performed in a recognised test facility (including any Meter manufacturer's works). These tests shall be performed in accordance with the relevant IEC standards. A uniquely identifiable calibration record shall be provided by the recognised test facility before the Meter enters service.

The Water Meter Owner will apply a certification seal following initial calibration. The Water Meter Owner must maintain this seal intact in order for the Meter to retain certified status. No Person bound by this code shall break the seal unless properly authorised to do so. The Water Meter Owner is responsible for ensuring that Meter certification is carried out for compliance with the provisions of this code.

Water Meters removed from service must be re-certified before reconnection for use under this code.



MDEC.6.3.2. Commissioning

Commissioning tests shall be carried out on all new Water Metering Systems to ensure Meter data can be provided before the Connection is placed into service and in accordance with Good Industry Practice. Commissioning tests shall also be carried out before reconnection where a replacement Water Metering System is fitted as part of an existing Water Metering System. No Connection or reconnection shall be permitted unless the tests are passed.

Following commissioning, the Water Meter Owner shall provide such evidence that the relevant parties may require to confirm that the Water Metering System meets the requirements of this code.

MDEC.6.3.3. Periodic Calibration and testing

MDEC.6.3.3.1 General

Periodic Calibration of all Water Meters shall be undertaken by the Meter Owners to ensure that the requirements of this code are met at all relevant times. The calibration of Meters shall be performed in a recognised test facility (including any Meter manufacturer's works). The tests shall be performed in accordance with the relevant ISO standards and shall confirm that Meter accuracy is within the limits stated in MDEC.6.2.1. The calibration record shall be uniquely identifiable, retained in a safe place and the significant details (Identification Number, date, names and status of authorised testing persons and accuracy results) recorded in the Meter Registration System.

Meter Owners shall test in accordance with Good Industry Practice all Water Meters at specified intervals for accuracy to verify that operation is within the limits of accuracy given in MDEC.6.2.1.

The testing intervals are shown in MDEC.6.3.3.2 below but may be modified by the Water Metering System Review Panel. Water Meters shall also be tested if the main Water Meter and check Water Meter in a Water Metering System diverge by more than 1.5 times the limit of error associated with the accuracy given in MDEC.6.2.1.

Complete and accurate records of tests, work carried out and pertinent data to confirm successful testing/calibration in accordance with the requirements of this Code shall be kept by the Water Meter Owner and promptly registered in the Water Meter Registration System where appropriate in accordance with Good Industry Practice.

MDEC.6.3.3.2 Timing of Water Meter tests

All Water Meters shall be re-calibrated at intervals not exceeding 2 years.

MDEC.6.3.3.3 Suspected metering errors

If any item of a Water Metering System is suspected of performing incorrectly, any affected party may request the Water Meter Owner to carry out Accuracy Tests in accordance with Good Industry Practice to confirm correct operation and accuracy. The Meter Owner shall carry out any Accuracy Test so requested. The party requesting the Accuracy Test shall bear the reasonable costs of such testing if the Water Meter is found to be operating within the prescribed limits of error, otherwise the cost of the test shall be borne by the Water Meter Owner. All affected parties shall be given 24 hours notice of such tests and be invited to witness the tests. Accuracy Test results shall be made available promptly and in writing to the affected parties.

Certified test equipment and reference standards (all traceable to recognised national or international standards) shall be used in such tests and if, by agreement, it is deemed necessary, an approved independent laboratory may be employed.



Where a Accuracy Test indicates that an error exceeds the limits of error associated with the accuracy given in this code, then these errors shall be recorded before promptly adjusting, repairing or renewing the Water Metering System (or part thereof) or replacing defective components. In such cases substitute Meter data shall be provided in accordance with procedures agreed by the Metering and Data Exchange Code Review Panel.

The Water Metering System shall be restored to service and proved to be operating within the prescribed limits of accuracy as soon as is reasonably practicable. Upon the completion, examination, maintenance, repair, recalibration or replacement of any component in the Water Metering System in accordance with Good Industry Practice, the Water Metering System shall be sealed.

MDEC.6.4 Water Meter and data security and registration

MDEC.6.4.1. Water Meter access and sealing

All Water Metering Systems and associated communications equipment shall be located in a secure metering cabinet located in an area that is readily accessible, free from obstructions and well lit by artificial light. The cabinets shall include as a minimum, effective protection from moisture and dust ingress and from physical damage, including vibration. Appropriate temperature and humidity controls shall be provided. The cabinets must be lockable and capable of being sealed to prevent unauthorised access.

Water Meter Owners and PAEW as appropriate shall jointly seal the Water Metering System including data collection equipment and associated modems and telephone links. Only the Water Meter Owner's personnel shall break such seals. All other affected parties shall be given at least forty-eight (48) hours' advance notice of the breaking of seals on any part of the Water Metering System. No such notice will be necessary when the breaking of a seal is necessitated by the occurrence of an Emergency.

Neither party shall tamper or otherwise interfere with any part of the Water Metering System in any way. Where it is established that the Water Metering System has been tampered or interfered with, then until such tampering or interference has been rectified either;

- (a) the quantity measured or recorded shall be that measured or recorded by any other relevant installed Water Metering System; or
- (b) if there is no other relevant Water Metering System or it is established to have been tampered or interfered with, the quantity shall be agreed by the parties, or, in the absence of such agreement, either party shall be entitled to refer the matter to an Expert for determination.

If the Water Meter Owner is not the Person who owns or controls the land on which the Water Meter or Water Metering System is situated, that Person (if bound by this code) shall grant the Water Meter Owner and all other Persons who require the same for the purposes of this code sufficient rights of access for Water Metering System purposes and for the purposes of testing calibration, operation and maintenance, replacement, etc. of the Water Meter and Water Metering System.

Where any Person requires right of access or to deal in some other way with a Water Meter or Water Metering System for the purposes of this code, all such necessary rights shall be granted by the Person with the power to grant them if that Person is bound by this code. All such rights shall be set down in the relevant Water Connection Agreement where this is practicable.



Each party shall ensure that all reasonable arrangements and provisions are made and/or revised from time to time as and when necessary or desirable in accordance with Good Industry Practice to facilitate the safe exercise of any right of access.

MDEC.6.4.2. Water Meter records

Water Meter Owners shall label all Water Meters with a unique identification number from lists maintained by PWP.

Each Water Meter Owner shall ensure that complete and accurate records are maintained of the calibration and operation of Water Metering System. These records shall include but not be limited to the dates and results of any tests, readings, adjustments or inspection carried out and the dates on which any seal was applied or broken. The reasons for any seal being broken and the Persons, and their affiliations, attending any such tests, readings, inspections or sealings shall be recorded.

Water Meter Owners shall ensure that the pertinent data (Appendix E) is provided promptly to PWP for entry into the Water Meter Registration System. Such data shall be kept up to date. They shall also provide any other Water Metering System data requested by PAEW or PWP.

MDEC.6.4.3. Water Meter registration

Water Metering Systems shall be registered in a central database, the Water Meter Registration System, which is to be operated and maintained by PWP in accordance with Good Industry Practice. The purpose of the Water Meter Registration System is to provide a complete accurate and up to date central database of all Water Meter data and to ensure an auditable trail to demonstrate compliance with this code. The Water Meter Registration System shall contain, as a minimum, specific information at each Water Delivery Point as indicated in Appendix E.

All Users are responsible for ensuring that data relating to all changes to a Water Metering System including any changes to the types of data set out in Appendix E. Any other information regarding each Water Delivery Point as may be reasonably required by PAEW and PWP shall be recorded in the Water Meter Registration System.

The Water Meter Registration System shall maintain the specified information for a minimum of seven years after the replacement or disconnection of a Water Meter.

Any data held in the Water Meter Registration System (a) shall be the intellectual property of PWP and (b) may be freely accessed by;

- i) The Water Meter Owner;
- ii) The Regulatory Authority;
- iii) PAEW; and
- iv) PWP.

MDEC.7 Data Exchange

MDEC.7.1 General

Meter data covered by this code is required by Persons to prepare and calculate invoices and to assess, verify and where appropriate, challenge invoices. Meter data is also required for accounting and record keeping purposes.



Meters and/or Metering Systems shall be installed, operated and maintained and metering shall take place sufficient for all purposes of this code at each Electrical Delivery Point and Water Delivery Point.

The Delivery Points shall be at the ownership boundary and shall be set out in a relevant Connection Agreement.

Meter Owners shall in good faith, and in accordance with Good Industry Practice conduct such metering operations as may be necessary to produce and record complete and accurate Meter data. Meter Owners shall provide Meter data to other Persons bound by this code in accordance with the following provisions of this code.

Where this code requires data to be exchanged between such Persons or invoices to pass between them supported by Meter data, Meter Owners shall undertake Meter reading at the times required by this code. If no time is specified for Meter reading to take place, Meter reading shall take place as close in time as possible to the time required in relation to the relevant invoice or Meter data flow specified in this code. All Meter data shall include the time or times at which Meter reading took place.

Where Meter data is required for the purpose of this code or relevant contracts referred to in this code, the Meter data shall be provided by making accurate readings of the relevant Meter or Meters, accurately recording the Meter data arising from those readings and supplying that Meter data to other Persons in accordance with the requirements of this code

MDEC.7.2 Data exchange requirements and flows

The principal transactions and agreements to which the data exchange requirements of this code apply are listed below;

- a) Payments by PWP to Power Producers and Internally Interconnected Parties for Capacity and Output of Production Facilities and Ancillary Services (PPAs & PWPAs);
- b) Payments between PWP and International Interconnected Parties for Active Energy transfers across an International Interconnection (Import/Export Contracts);
- c) Payments by Licensed Suppliers to PWP for bulk purchases of Active Energy (Bulk Supply Agreement);
- d) Payments by PAEW to PWP for bulk purchases of Desalinated water (Bulk Supply Agreement);
- e) Payments by relevant Persons to PWP for purchases of demineralised water (demineralised water contracts);
- f) Payments by Licensed Suppliers acting as agent for the PWP to Internally Interconnected Parties for Active Energy (Agency Contracts);
- g) Payments by Directly Connected Consumers to Licensed Suppliers for Active Energy (Supply Contracts);
- h) Payments by OETC to providers of Ancillary Services (Ancillary Service Agreements);
- i) Payments by Power Producers to a Licensed Transmission System Operator or Licensed Distributor for Connection to its System (Connection Agreements); and
- j) Payments by Licensed Suppliers to a Licensed Transmission System Operator or Licensed Distributor for Use of System (Use of System Agreements).



This code also covers the technical requirements of metering at Consumer premises and the storage of the associated Meter data, although the contractual arrangements and data exchange requirements of such metering are outside the scope of this code.

The data that must be exchanged between the various Persons to satisfy the conditions of the agreements listed above are shown in Appendix H. All data exchanges shall be in the English language.

The table shows;

- In column A - The data item;
- In column B - The person who is obliged to conduct metering as the producer of the data;
- In column C - The Person who is obliged to send the data to the recipient of the data;
- In column D - The recipient of the data.

MDEC.7.3 Meter data validation and quality checks

Meter data shall be collected, validated and aggregated as required for the proper functioning of invoicing in accordance with the relevant parties.

In cases where Meter data is not available due to a failure of the main Meter or its associated equipment such as CT, VT, cabling or protection devices, or in cases where the main Meter has been proven to have operated outside the prescribed limits of error, the Meter data obtained from the check Meter shall be admissible.

In cases where check Meters are not provided, estimated or substitute Meter data will be used as required in accordance with procedures agreed between the relevant parties.

MDEC.7.4 Meter data communications system

Local or remote communications provided in connection with any Metering System shall conform to the requirements of this section, MDEC.7.4.

Meters may be provided with either integral or separate Local Outstations. Any Local Outstations must be capable of being connected to and interrogated by Remote Instations at a central location, such as the OETC Load Dispatch Centre (LDC). The Remote Instations would read the Meter data at the specified time and frequency.

Any Meter Communications System would be independent from the operational SCADA data systems in order to avoid potential conflicts of interfacing and protocol. However, new communication routes using fibre optic cables and digital PLC communications have been installed over all main transmission routes to serve the SCADA system. These communication routes have adequate capacity and provide duplicate routes to all major substations and Production facilities and would be used also for the communication of Meter data.

The Meter Communication System would be a duplex system, wherever possible, i.e., each LDC Remote Instation shall be able to interrogate both the main Meter and check Meter Outstations over either of two communication routes.

MDEC.7.4.1. Local Outstations

Any Local Outstation that is installed (whether internal or external) shall have facilities to enable Meter data to be interrogated locally and for the required Meter data to be provided to Remote Instations. Separate ports shall be used for local and remote interrogations wherever possible.



The interrogation ports shall be opto-coupler ports with a serial protocol such as IEC Standard 61107 or equivalent as agreed by the Metering and Data Exchange Code Review Panel. The local interrogation port shall be capable of use for commissioning, maintenance and fault finding, time setting, in addition to the transfer of Meter data and alarms. A series of security levels and coding facilities shall be provided so that only authorised Persons limit access to data and other features.

Local Outstations may perform some processing of data.

The Local Outstation data shall conform to a format and protocol specified by relevant parties.

Facilities shall be provided to select a relevant demand period from one of the following values; 60, 30, 15, and 10 minutes with, in each case, one demand period ending on the hour.

A secure power supply shall be provided to each Local Outstation system with separate fusing for each Local Outstation.

Where a Local Outstation system uses a separate modem the modem shall be provided with a secure supply, separately fused. Alternatively, line or battery powered modem types may be used.

The Local Outstations shall provide an alarm output signal at a manned point in the event of a supply failure.

Meter data together with alarm indications, and Local Outstation time and date shall be capable of being transferred on request during the interrogation process.

In the event of an Local Outstation failure, any partial Demand Values, data associated with an Local Outstation supply failure and/or restoration, and zero Demand Values associated with an Local Outstation supply failure, shall be marked so that a future interrogation can identify them.

Local interrogation units may be used by authorised Users to interrogate the Local Outstations for the purposes of commissioning, maintenance/fault finding and when necessary the retrieval of stored Meter data.

MDEC.7.4.2. Remote Instations

Remote Instations if provided, shall be computer-based systems that collect or receive Meter data on a routine basis from Local Outstations.

The broad specification for the Remote Instations shall be similar to those for Local Outstations outlined above. The Remote Instations shall be fitted with separate ports for local and remote interrogations. The local interrogation port would be capable of use for commissioning, maintenance and fault finding and time setting. A series of security levels and coding facilities will be provided to limit access to data and other features to authorised Persons only.

Remote Instations shall be capable of collecting all Meter data by daily interrogation or other time interval to be specified. It should however, be possible to repeat collections of Meter data at any time throughout the Local Outstation data storage period.

One pair of Remote Instations shall be located at the LDC to communicate directly with all Local Outstations. Such Remote Instations at the LDC shall interface with the LDC computers to enable required calculations to be carried out and data to be presented within LDC.



MDEC.7.4.3. Communications

All data communications equipment shall conform to the relevant International Telecommunications Union (ITU) standards and recommendations for data transmission over telecommunications systems.

Interrogation of Local Outstations shall be possible using any of the following media, as specified by relevant parties;

- public switched telephone networks;
- radio data networks;
- private network of a Licensed Transmission System Operator;
- mains signalling / power line carrier channels/fibre optic channels; and
- low power radio.

In addition the relevant parties may specify other media and the format and protocol of any Meter data provided that such other media is consistent with the requirements of this code.

Error checking facilities shall be included in all communication facilities between Local Outstations and Remote Instations.

MDEC.7.5 Data display and storage

MDEC.7.5.1. Registers

The Metering Systems shall Meter the quantities on a continuous 24 hour basis and the data shall be displayed on a non-volatile Meter Register. The language of displays shall be English.

Where Meters provide Meter data to Local Outstations external to the Meter, the Local Outstations shall provide two outputs per measured quantity.

Where a separate Local Outstation is used, cumulative register values shall be provided in the Local Outstation that can be set to match and increment with the Meter Registers.

MDEC.7.5.2. Storage

Any Local Outstations provided shall have the capability to store all Meter data collected by the respective Meters including alarms and other functions for relevant parties for two (2) complete calendar months.

All Users responsible for providing Meter data in accordance with this code shall retain a copy of the data in electronic format in accordance with Table 7.1. The format of data to be stored shall be agreed by the Metering and Data Exchange Code Review Panel but shall include the following essential parameters; time period, Meter Identification number and Meter readings.

OETC shall maintain a log in the form of electronic storage of digital data of all data from all Metering Systems and Local Outstations and the associated data received from relevant parties for at least ten (10)] complete operational years other than the Meter data for sales between Licensed Suppliers and final Consumers.

OETC and Users shall ensure that back-up copies of data in electronic format are made in accordance with Table 7.1. All back up copies shall be made promptly at the end of the period or immediately following completion of the data set.

**Table 7.1 Data storage by OETC and Users**

Data	Frequency of back up	Place of storage	Retained for	Comment
Current day's working data; (1)	End of each working day;	On site;	One complete week;	Each day's back up stored separately;
Current week's working data; (1)	Each Thursday at the end of working day;	One copy at User site; One copy at another site;	One complete month;	Each week's back up stored separately;
Current month's working data; (1)	Each month at the end of the last working day;	One copy at User site; One copy at OETC;	One complete year;	
Each month of finalised data;	First working day of following month;	One copy at User site; One copy at OETC;	Five Financial Years;	Finalised means all settlements agreed;
One Financial Year's set of finalised data;		One copy at OETC; One copy at another site;	Ten Financial Years;	

Notes:

- (1) The period of a day, a week or a month will depend on locally agreed arrangements
- (2) Current period, i.e., day, etc, means all work undertaken in that period including new data and changes to existing data.

Providers of Meter data shall be provided promptly with a copy at no cost, in electronic or paper format, as agreed in writing with OETC, of current working data relevant to its transactions by giving 24 hours notice to OETC.

Any User shall be provided promptly with a copy, in electronic or paper format, as agreed in writing with OETC, of selected archived data relevant to its transactions by giving 24 hours notice to OETC. OETC shall agree with the Regulatory Authority a scale of charges for the supply of such data and any limitations on the supply of such data to individual Users.

Licensed Suppliers shall maintain records of Meter data associated with final Consumers in accordance with Table 7.2. Most of such Meter data will be read and recorded manually. The records shall be transcribed to electronic format. All back up copies shall be made promptly at the end of the individual periods or immediately following completion of the data set whichever is sooner.

**Table 7.2 Data storage by Licensed Suppliers**

Data	Manual readings		Electronic record		
	Place of storage	Retained for	Frequency of back up	Place of storage	Retained for
Current month's working data;	On site;	One year;	Daily;	On site;	One complete year;
Each month of finalised data;	On site;	Two years;	Weekly;	One copy on site; One copy at another site;	Five Financial Years;
One Financial Year's set of finalised data;	On site;	Ten Years;	Annually;	One copy on site; One copy at another site;	Ten Financial Years;

Notes:

- (1) The term site in this table means the site or offices of a Licensed Supplier
- (2) Current period, i.e., day, etc, means all work undertaken in that period including new data and changes to existing data.

The providers of Meter data referred to in Table 7.2 shall be provided promptly with a copy at no cost, in electronic or paper format, as agreed in writing with the Licensed Supplier, of current working data relevant to its transactions by giving 24 hours notice to the Licensed Supplier.

Any User shall be provided promptly with a copy, in electronic or paper format, as agreed in writing with the Licensed Supplier, of selected archived data relevant to its transactions by giving 24 hours notice to the Licensed Supplier. The Licensed Supplier shall agree with the Regulatory Authority a scale of charges for the supply of such data and any limitations on the supply of such data to individual Users.

MDEC.8 Meter and Data Exchange Code Review

MDEC.8.1 Electricity Meter and Data Exchange Code Review

MDEC.8.1.1. Electricity Meter and Data Exchange Code Review management

A Metering and Data Exchange Code Review Panel shall be established for the purposes of reviewing and updating the Metering and Data Exchange Code excluding those parts of the MDEC that refer to Water Meters. The Grid Code Review Panel will review all recommendations and guidance proposed by this panel. If the Grid Code Review Panel supports the recommendations, they will be passed to the Regulatory Authority for approval. Otherwise, the recommendations will be returned to the Metering and Data Exchange Panel with comments for further consideration.

OETC shall have overall responsibility for the management of the Metering and Data Exchange Code.



MDEC.8.1.2. Electricity Meter and Data Exchange Code Review Panel

The Metering and Data Exchange Code Review Panel shall carry out the following functions;

- i) generally review, discuss and develop the Metering and Data Exchange Code and its implementation with particular reference to electricity Metering and all data exchange;
- ii) review and discuss proposals for amendments to the Metering and Data Exchange Code which OETC, the Regulatory Authority or any party with Metering Systems or Meters may submit for consideration by the Metering and Data Exchange Panel from time to time;
- iii) discuss changes necessary to the Metering and Data Exchange Code arising from unforeseen circumstances referred to it by relevant parties;
- iv) publish recommendations and ensure that User consultation upon such recommendations has occurred through Metering and Data Exchange Review Panel members; and
- v) issue guidance in relation to the Metering and Data Exchange Code and its implementation, performance and interpretation when asked to by any party with Metering Systems or Meters

MDEC.8.1.2.1 Membership

The Panel shall consist of;

- i) a Chairman and up to 2 members appointed by OETC;
- ii) 1 Person appointed by the Regulatory Authority;
- iii) 1 Person representing each Licensed Distributor;
- iv) 1 Person representing each Licensed Supplier;
- v) 1 Person appointed by PWP;
- vi) 1 Person (rotated between Power Producers) representing all Power Producers each having Power Facilities with a total Registered Capacity of 100 MW or less;
- vii) 1 Person (rotated between Power Producers) representing Power Producers each having Power Facilities with a total Registered Capacity exceeding 100 MW;
- viii) 1 Person representing Internally Connected parties; and
- ix) 1 Person representing Consumers with Demand greater than 5 MW.

MDEC.8.1.2.2 Rules

The Metering and Data Exchange Code Review Panel shall establish its own rules and procedures relating to the conduct of its business and shall comply with them at all times. The rules shall be submitted to the Grid Code Review Panel for review and then to the Regulatory Authority for approval.

MDEC.8.1.2.3 Amendments to the code

Relevant parties shall submit all proposed amendments and comments concerning the Metering and Data Exchange Code to OETC for consideration by the Metering and Data Exchange Code Review Panel. OETC shall also notify in writing all Users that are likely to be materially affected by proposed amendments to the Metering and Data Exchange Code.



All proposed amendments to the Metering and Data Exchange Code must be reviewed by the Metering and Data Exchange Code Review Panel and shall be submitted to the Grid Code Review Panel for review and then to the Regulatory Authority for approval.

MDEC.8.2 Water Meter System review

MDEC.8.2.1. Water Meter System review management

A Water Metering System Review Panel will be established for the purposes of reviewing and updating the parts of the Metering and Data Exchange Code referring to Water Meters. All recommendations and guidance proposed by this panel will be passed to the Metering and Data Exchange Code Review Panel for approval.

PWP shall have the overall responsibility for the management of the Water Metering parts of the Meter and Data Exchange Code.

MDEC.8.2.2. Water Metering System Review Panel

A Water Metering System Review Panel shall be established which shall be a standing body to carry out the following functions;

- i) review proposals for amendments to those parts of the Metering and Data Exchange Code applicable to Water Metering Systems or Water Meters that any party with such systems may wish to submit to PWP for consideration by the Panel from time to time;
- ii) make recommendations for amendments to those parts of the Metering and Data Exchange Code that refer to Water Metering Systems or Water Meters;
- iii) issue guidance in relation to those parts of the Metering and Data Exchange Code that refer to Water Metering Systems or Water Meters and their implementation, performance and interpretation if requested by any party with Water Metering Systems or Water Meters; and
- iv) consider changes proposed to those parts of the Metering and Data Exchange Code that refer to Water Metering Systems or Water Meters arising from unforeseen circumstances referred to it.

MDEC.8.2.2.1 Membership

The Panel shall consist of;

- i) a Chairman and one other person appointed by PWP;
- ii) 1 Person appointed by the Regulatory Authority;
- iii) 1 Person appointed by PAEW; and
- iv) 2 Persons (rotated between Power Producers) representing all Power Producers with Water Production capability.

MDEC.8.2.2.2 Rules

The Water Metering System Review Panel shall establish its own rules and procedures relating to the conduct of its business and shall comply with them at all times. The rules shall be submitted to the Metering and Data Exchange Code Review Panel for review and then to the Regulatory Authority for approval.

***MDEC.8.2.2.3 Amendments***

Relevant parties shall submit all proposed amendments and comments those parts of the Metering and Data Exchange Code that refer to Water Metering Systems or Water Meters to PWP for consideration by the Water Metering Systems Review Panel. PWP shall also notify in writing all Users that are likely to be materially affected by proposed amendments to those parts of the Metering and Data Exchange Code that refer to Water Metering Systems or Water Meters.

All proposed relevant amendments to the Metering and Data Exchange Code must be reviewed by the Water Metering Systems Review Panel and shall be submitted to the Grid Code Review Panel for review and then to the Regulatory Authority for approval.



Appendices

APPENDIX A Accuracy of Metering System

APPENDIX B Metering Systems for Consumer Connections

APPENDIX C Labelling of Meters

APPENDIX D Commissioning Tests

APPENDIX E Meter Registration Data

APPENDIX F Water Meter Technical Requirements

APPENDIX G Locations of Metering Systems

APPENDIX H Data Flow Tables



Appendix A Accuracy of Metering System

A.1 Standards

The following standards are among those related to this code;

IEC Standard 60687 – Alternating current static watt-hour meters for active energy (classes 0.2 S and 0.5 S);

IEC Standard 61036 - Alternating current static watt-hour meters for active energy (classes 1 and 2);

IEC Standard 60521 – Alternating current watt-hour meters (classes 0.5, 1 and 2);

IEC Standard 61268 – Alternating current static var-hour meters for reactive energy (classes 2 and 3);

IEC Standard 60044 Part 1 – Current transformers;

IEC Standard 60044 Part 2 – Voltage transformers;

IEC Standard 60044 Part 3 – Combined transformers;

IEC Standard 61107 – Data exchange for meter reading – direct local data exchange;

All Metering Systems and Meters shall comply with the relevant standards current at the time that the User's Connection Agreement is signed.

Where relevant standards change from time to time, the Metering and Data Exchange Code Review Panel will review such changes and recommend to the Regulatory Authority the extent to which any such changes should be implemented.

A.2 Overall accuracy requirements

For the measurement and Metering of Active Energy, Reactive Energy, Active Power and Demand, Metering System shall be tested and calibrated to operate within the overall limits of error set out in Table A -1, after taking due account of CT and VT errors and the resistance of cabling or circuit protection. Calibration equipment shall be traceable to a recognised national or international standard.

**Table A-1 : Overall accuracy of Metering System**

Condition	Limits of error at stated Power Factor for Active Power and Energy measurement				
Current expressed as a percentage of rated measuring current	Power Factor	Limits of error for Connections			
		>100 MVA	>20–100 MVA	>1–20 MVA	<=1 MVA
120% to 10% inclusive	1	±0.5%	±1.0%	±1.5%	±1.5%
Below 10% to 5%	1	±0.7%	±1.5%	±2.0%	±2.5%
Below 5% to 1%	1	±1.5%	±2.5%		
120% to 10% inclusive	0.5 lag	±1.0%	±2.0%	±2.5%	±2.5%
120% to 10% inclusive	0.8 lead	±1.0%	±2.0%	±2.5%	±2.5%
Condition	Limits of error for Reactive Power and Energy at stated Power Factor				
Current expressed as a percentage of rated measuring current	Power Factor	Limits of error for Connections			
		>100 MVA	>20–100 MVA	>1–20 MVA	<=1 MVA
120% to 10% inclusive	0	±4.0%	±4.0%	±4.0%	±4.0%
120% to 20% inclusive	0.866 lag	±5.0%	±5.0%	±5.0%	±5.0%
120% to 20% inclusive	0.866 lead	±5.0%	±5.0%	±5.0%	±5.0%



A.3 Metering System accuracy classes

The accuracy class or equivalent, is based on the MVA Capacity of the Connection and shall as a minimum be as follows;

Table A-2: Equipment accuracy classes

Equipment type	Equipment accuracy class for Connections			
	>100 MVA	>20–100 MVA	>1–20 MVA	≤1 MVA
Current transformers (Note 1)	0.2S	0.2S	0.5	0.5
Voltage transformers (Note 2)	0.2	0.5	1	1
Active Energy and Power Meters (Note 3)	0.2S	0.5S/0.5	1	2
Reactive Energy and Power Meters	2	2	2	2

Note 1: Current transformers shall meet the class accuracy requirements irrespective of CT secondary ratings.

Note 2: OES14 specifies Class 1 accuracy to BS 3941/IEC186 for VTs used at 11kV

Note 3: A Meter accuracy class of 0.5 may be used where energy transfers to be measured by the entry/exit Meter during normal operating conditions is such that the metered current will be above 5% of the rated measuring current for periods equivalent to 10% or greater per annum (excluding periods of zero current).

A.4 Service connections

Kilowatthour Meters for service Connections shall conform to IEC Standard 60521 as set out in the following Table A3. These requirements are in accordance with OES as shown in the table.

Table A3: Kilowatthour Meters for service Connections

Type	Voltage	Current	Accuracy	OES Number
Single phase	240v	20 – 100A	Class 2	22A
Three phase, Direct Connected	415v, 3 phase, 4 wire	50A, 100A	Class 2	22B
Three phase, With current transformers	415v, 3 phase, 4 wire	200A, 300A, 400A	Class 2	22C



Appendix B Metering Systems for Consumer Connections

This Appendix is concerned with the Metering System requirements of Consumers and applies to all Consumers. Direct Connected Consumers are those Connected to the Transmission System. Other Consumers will be Connected to the Distribution System at 33kV, 11kV or LV, the Connection voltage generally being a function of the size of the Consumer Demand.

The Metering Systems that shall be applied to the different sizes of Consumer Connections are given in Table B1.

Table B1 Metering System requirements

Cat.	Connection size MW ¹	Meters required				Check Energy Meters required
		KWh	KVarh	Maximum Demand		
				KW	KVar	
1.	>5MW	Yes	Yes	Yes	Yes	Yes
2.	>1MW to 5MW	Yes	Yes	Yes	Yes	No
3.	>500kW to 1MW	Yes	Yes	Yes	No	No
4.	>100 kW to 500kW	Yes	Yes	Yes	No	No
5.	# 100kW	Yes	No	No	No	No

The Metering Systems shall be in accordance with the requirements of the MDEC.5 except as determined by the conditions in Table C1 and those that follow;

- i) Local Outstations (internal or external) shall be provided for category 1 Connections only;
- ii) Separate test terminals for accessing current and voltage signals, injecting test quantities and connecting test Meters shall be provided for categories 1 and 2 Connections only;
- iii) Meters for category 5 Connections may be accepted based on sample inspection and certification by manufacturers;
- iv) Meters for category 5 Connections shall be re-Calibrated at least once every ten years; and
- v) The requirements of MDEC.6 for access, sealing and Registration shall be met for all categories of Connections.

The Licensed Distributor companies' Consumer representatives shall provide appropriate summaries of the Metering requirements applicable to Consumer Metering.

¹ The appropriateness of the size categories need confirmation by MHEW



Appendix C Labelling of Meters

C.1 General

Each Meter shall be allocated a unique Meter identification number that will be given by OETC and recorded in the Meter Registration System.

The number shall be marked permanently on the Meter in a position that is clearly visible under all normal viewing of the Meter.

The number will be quoted on all records arising from and related to the Meter including Meter readings.

Test blocks and other related Metering equipment shall be clearly identified with the Metering System with which they are associated.

C.2 Entry and exit labelling

The following standard method of labelling meters, test blocks, etc; based on the definitions for entry and exit shall be incorporated. The required labelling shall be as follows.

Active Energy

Meters or Meter Registers shall be labelled

“Entry” for all Active Energy Flows normally entering the Transmission System, and

“Exit” for all Active Energy Flows normally leaving or exiting the Transmission System,

Reactive Energy

Within the context of this code the relationship between Active Energy and Reactive Energy can be best established by means of the Power Factor. The following table gives the relationship;

Table C.1: Reactive Energy entry/exit convention

Flow of Active Energy	Power Factor	Flow of Reactive Energy
Entry	Lagging	Entry
Entry	Leading	Exit
Entry	Unity	zero
Exit	Lagging	Exit
Exit	Leading	Entry
Exit	Unity	zero

Meters or Meter Registers for registering entry Reactive Energy shall be labelled “Entry” and those for registering exit Reactive Energy shall be labelled “Exit”.



Appendix D Commissioning tests

This Appendix sets out the tests and checks that shall be included in the Metering Systems commissioning programme. Metering System shall in addition have basic tests carried out on earthing, insulation, together with all other tests that would normally be conducted in accordance with Good Industry Practice.

D.1 Measurement Transformers

For all installations with new/replaced Measurement Transformers the Meter Owner shall ensure that from site tests and inspections the following are confirmed and recorded;

1. Details of the installed units, including serial numbers, rating, accuracy classes, ratio(s);
2. CT ratio and polarity for selected tap; and
3. VT ratio and phasing for each winding.

For installations with existing Measurement Transformers the Meter Owner shall ensure that, wherever practically possible, 1, 2 and 3 above are implemented, but as a minimum must confirm and record VT and CT ratios. If it is not possible to confirm the CT ratio on site, the reason must be recorded on the commissioning record and details must be obtained from any relevant party.

D.2 Measurement Transformer leads and burdens

For all installations the Meter Owner shall wherever practically possible;

1. Confirm that the VT and CT connections are correct;
2. Confirm that the VT and CT Burden ratings are not exceeded; and
3. Determine and record the value of any Burdens (including any Burdens not associated with Metering Systems or Meters) necessary to provide evidence of the overall metering accuracy.

D.3 Metering

D.3.1 General tests and checks

The following may be performed on-site or elsewhere (e.g. factory, meter test station, laboratory, etc).

1. Record the Metering System details required by the Meter Registration System.
2. Confirm that the VT/CT ratios applied to the Meter(s) agree with the site Measurement Transformer ratios.
3. Confirm correct operation of Meter test terminal blocks where these are fitted (e.g. CT/VT operated metering).
4. Check that all cabling and wiring of the new or modified installation is correct.
5. Confirm that Meter registers advance (and that output pulses are produced for meters which are linked to separate Outstations) for entry and where appropriate exit flow directions. Confirm Meter operation separately for each phase current and for normal polyphase current operation.
6. Where separate Outstations are used confirm the Meter to Outstation channel allocations and that the Meter units per pulse values or equivalent data are correct.



7. Confirm that the local interrogation facility (Meter or Outstation) and local display etc operate correctly.

D.3.2 Site tests

The following tests shall be performed on site;

1. Check any site cabling, wiring, connections not previously checked under clauses D.1, D.2 and D.3.1 above;
2. Confirm that Meter/Outstation is set to UTC (Oman time) within +/- 5 seconds;
3. Check that the voltage and the phase rotation of the measurement supply at the Meter terminals are correct;
4. Record Meter start readings (including date and time of readings);
5. Wherever practically possible, a primary prevailing load test (or where necessary a Primary injection test) shall be performed which confirms that the Meter(s) is registering the correct primary energy values and that the overall installation and operation of the metering installation are correct;
6. Where for practical or safety reasons (5) is not possible then the reason shall be recorded on the commissioning record and a secondary prevailing load or injection test shall be performed to confirm that the Meter registration is correct including, where applicable, any Meter VT/CT ratios. In such cases the VT/CT ratios shall have been determined separately as detailed under D.1, Measurement Transformers, above;
7. Record values of the Meter(s)/Outstation(s) displayed or stored Meter data (at a minimum one complete half-hour unless otherwise approved by the Metering and Data Exchange Code Review Panel) value with the associated date and time of the reading) on the commissioning record;
8. Confirm the operation of Metering System alarms (not data alarm or flags in the transmitted data); and
9. Confirm from Meter Owner that accuracy certificates exist for the Meters.



Appendix E Meter Registration data

The Meter Registration Systems are the Meter database that holds Meter data for both electricity and water Metering System installations.

Data in the Meter Registration Systems shall be treated as confidential and only relevant Meter data shall be released to the appropriate party.

Meter data to be contained in the Meter Registration Systems shall include, but is not limited to the following;

- (a) A unique meter identification number;
- (b) Connection Point and Metering point reference details for both Delivery Point and Actual Metering Point, including;
 - i) location and reference details (i.e. drawing numbers);
 - ii) participant details at the Connection Point;
 - iii) site identification nomenclature;
 - iv) Meter Owner; and
 - v) loss compensation calculation details where Actual Metering Point and Delivery Point differ.
- (c) Main and check Meter installation details, including;
 - vi) serial numbers;
 - i) metering installation identification name;
 - ii) Meter types and models;
 - iii) instrument transformer ratios (available and connected);
 - iv) test and calibration programme details; test results and reference test certificates for Meters and Measurement Transformers;
 - v) asset management plan and testing schedule;
 - vi) calibration tables, where applied to achieve Meter installation accuracy; and
 - vii) any Meter summation scheme values and multipliers.
- (d) data register coding details;
- (e) data communication details (when communication systems are used);
- (f) telephone number for access to data;
- (g) communication equipment type and serial numbers;
- (h) communication protocol details or references;
- (i) data conversion details;
- (j) User identifications and access rights;
- (k) data validation and substitution processes agreed between affected parties, including;
 - i) algorithm;
 - ii) data comparison technique;
 - iii) processing and alarms (i.e. voltage source limits, phase-angle limits);
 - iv) check metering compensation details.



Appendix F Water Meter technical requirements

F.1 General

The Water Metering Systems shall include main Meters and check Meters each with sensors and converter units/Outstations. The Outstations may be integral with the converter units. The sensor shall be sited in or above the water being measured.

The Outstations shall provide two outputs per measured quantity and shall enable Water Meter data to be interrogated locally and at a later date for Water Meter data to be provided remotely over communications channels.

Converter units/Outstations shall provide, by means of the local interrogation port, facilities for configuring the instrumentation system. It shall provide a local LCD display of the measured parameter, programming facilities and fault annunciation. The circuit boards shall comply with BS 6221 (IEC 60326).

The Water Metering System and associated communications equipment shall be located in a secure metering cabinet located in an area that is readily accessible, free from obstructions and well lit by artificial light. The cabinets shall include as a minimum, effective protection from moisture and dust ingress and from physical damage, including vibration. Appropriate temperature controls shall be provided. The cabinets must be lockable and capable of being sealed to prevent unauthorised access

The Water Metering Systems shall be resistant to corrosion for the lifetime of the works. Materials, which are exposed to the Desalinated Water, shall not corrode. In all cases materials shall be chosen that are compatible and that no chemical or electrochemical actions are present other than those intended. Support systems and housings for instrumentation devices mounted close to water pipes shall be non-metallic.

All Water Metering Systems shall function within the limits of their normal performance specification over the temperature range -20° to 50°C at a relative humidity of between 10% and 90%.

The Meter cabinet and any associated Metering Systems shall be rated IP 55 indoors and IP 65 outdoors as a minimum. Where an instrumentation device is located below the flood level it shall be rated to IP 68 (submersible). Cable connections to Metering Systems shall not reduce the IP rating of the device.

Instrumentation systems shall be designed such that failure of the system shall not result in damage to plant or result in the development of a hazardous situation.

F.2 Flow meters

Each flow Metering System shall comply with BS EN ISO 6817 and comprise a flow sensor mounted in the pipeline and a separate signal converter.

Where electromagnetic flow Meters are used, they shall be of the pulsed dc type with automatic zero error averaging and low power consumption.

The system accuracy over the normal operating range shall not be more than $\pm 0.2\%$ of full-scale reading.

Flow sensors shall comprise a Meter tube assembly containing all necessary electrodes, housing and terminations. Water Meter tubes shall be made from a non-magnetic material lined with an inert substance suitable for the medium and flanged. The lining material shall extend from the bore of the tube to fully cover the raised face of the tube flanges. There shall be no protruding parts to restrict the flow.



Water Meter tubes installed in areas susceptible to flooding shall be environmentally protected to IP 68 and shall be suitable for continual submergence at the likely depth of any flood water. Where potting compounds are used to achieve this performance it shall not prevent disconnection of the sensor cabling.

The flow Meter converter shall provide the following facilities;

- adjustment of flow range according to size of flow sensor
- independent 4 to 20 mA output proportional to flow rate and a 24 V dc pulse output suitable for an integration counter drive
- manual adjustment of pulsed and current output response time
- failure of the flow Meter shall cause the output to be driven down scale
- means of testing the converter electronics shall be an integral part of the converter design.



Appendix G Locations of Metering Systems

Metering Systems must be installed at each Delivery Point at the ownership boundaries of the Systems of the various parties, as follows.

- 1** Between a Licensed Transmission System; and
 - Power Producers;
 - Licensed Distributors;
 - Externally Interconnected Parties;
 - Internal Interconnected Parties; and
 - Directly Connected Consumers.
- 2** Between the Systems of Licensed Distributors; and
 - Embedded Power Producers and Autogenerators;
 - International Interconnected Parties where interconnections exist;
 - Internal Interconnected Parties, where interconnections exist; and
 - Consumers.
- 3** Between the Production Facilities of Power and Water Producers and PAEW.

The Delivery Points shall be at the ownership boundary and shall be specified in each Connection Agreement or Electrical Connection and Use of System Agreement.

The actual location of a Metering System is referred to as the “Actual Metering Point”. This may be different from the Delivery Point established pursuant to the relevant Connection Agreement.

OETC, Licensed Distributors, Licensed Suppliers and Users shall each respectively take all reasonable steps to ensure that each relevant Metering System is located as close as is reasonably practicable to the Delivery Point at each Connection Point.



Appendix H Data exchange tables

See notes at foot of table.

Data Item	Data		
	Provider	Sender	Receiver
A	B	C	D
Data exchange relating to PWPAs and PPAs			
MW	Meter Owner	Power Producer	PWP
MWh	Meter Owner	Power Producer	PWP
Water Production	Meter Owner	Power Producer	PWP/PAEW
Data Exchange relating Bulk Supply Agreement			
MWh	Meter Owner	Meter Owner	PWP
Mvarh	Meter Owner	Meter Owner	PWP
Water Production	Meter Owner	Meter Owner	PWP/ PAEW
Data Exchange relating to Supply Contracts			
MW	Meter Owner	Meter Owner	Licensed Supplier
MWh	Meter Owner	Meter Owner	Licensed Supplier
Mvarh	Meter Owner	Meter Owner	Licensed Supplier
Data Exchange relating to Agency Contracts			
MW	Meter Owner	Meter Owner	Licensed Suppliers /PWP
MWh	Meter Owner	Meter Owner	Licensed Suppliers /PWP
Data exchange relating to Import and Export Contracts			
MW	Meter Owner	Meter Owner	PWP
MWh	Meter Owner	Meter Owner	PWP
Data exchange relating to Transmission and Distribution Use of System Agreements			
MW	Meter Owner	Meter Owner	OETC/ Licensed Distributor
MWh	Meter Owner	Meter Owner	OETC/ Licensed Distributor
Mvarh	Meter Owner	Meter Owner	OETC/ Licensed Distributor

Notes

- 1 All Meter data in the above table is required for invoices
- 2 Electronic formats shall be used for data collection and for data transmission
- 3 The frequency of all measurements will be hourly
- 4 The frequency of sending all measurements will be monthly



Grid Code

Abbreviations and Definitions

Issued April 2010

Abbreviations

A	Ampere
AC	Alternating current
AVR	Automatic Voltage Regulation
CCGT	Combined Cycle Gas Turbine
CD	Centrally Dispatched / Central Dispatch
CT	Current Transformer
DC	Direct Current
DSM	Demand Side Management
ECA/ECUOSA	Connection Agreement or Electrical Connection and Use of System Agreement
G	Giga or 10^9
GC	General Conditions
GWh	Giga Watt Hour
HP	High Pressure
HV	High Voltage
Hz	Hertz
IEC	International Electro-technical Commission
ITU	International Telecommunications Union
k	Kilo or 10^3
kV	Kilo-Volt
LV	Low Voltage
M	Mega or 10^6
MHEW	Ministry of Housing Electricity and Water, Sultanate of Oman
ms	milli second
MVA	Mega-Volt-Ampere
Mvar	Mega-Volt-Ampere Reactive / Mega-var (Reactive Power)
Mvarh	Mega-var- hour (Reactive Energy)
MW	Mega-Watt (Active Power)
MWh	Mega-Watt-hour (Active Energy)
OC	Operating Code (of the Grid Code)
PPA	Power Purchase Agreement
PSS	Power System Stabiliser



PAEW	Public Authority for Electricity and Water
PWP	Power and Water Procurer
PWPA	Power and Water Purchase Agreement
PC	Planning Code
RAEC	Rural Areas Electricity Company
SCADA	Supervisory Control and Data Acquisition
SD1	Schedule Day 1 (or another day as the number indicates)
SDC	Scheduling and Dispatch Code
SPD	Standard Planning Data
VA	Volt-Ampere
VT	Voltage Transformer
WD-MHEW	Water Department of the Ministry of Housing Electricity and Water, Sultanate of Oman
PAEW	Public Authority for Electricity and Water

**Issued January 2008**

Definitions

The following definitions identify the meanings of words used in the Grid Code. Plurals of the words and variations of tense are deemed to have similar meanings;

Accuracy Test

A test to determine the percentage error of any item of a Metering System;

Active Energy

The electrical energy produced during a time interval measured in units of watt-hours or standard multiples thereof. Where the term **Energy** is used without any modifier, this will have the same meaning;

Active Power

The product of voltage and the in-phase component of alternating current measured in units of watts or multiples thereof. When the term **Power** is used without any modifier, this will have the same meaning;

Actual Metering Point

The physical point at which electricity is metered;

Alert

A warning issued by OETC to inform Users of potential Emergency Conditions on the System;

Ancillary Services

The services which (1) Licensed Generators, Licensed Generators/Desalinators or other Persons Connected to a Transmission System may be required to provide from time to time in connection with the security and stability of such Transmission System or the Total System; and (2) are provided for in either (i) an agreement between a Licensed Transmission System Operator or a Licensed Distribution System Operator and any Person or (ii) an agreement between a Licensed Generator or a Licensed Generator/Desalinator and the PWP;

Ancillary Services Agreement (ASA)

An agreement for the purchase of Ancillary Services by OETC or PWP from a User;

Autogenerator

A Person that Generates electricity primarily for the purposes of self-supply;

Automatic Under-Frequency Relays

Frequency relays used for the automatic de-energising of feeders Connecting Consumers at preset Frequencies to assist stabilising the Active Power balance between Demand and Available Generation;

**Automatic Voltage Regulation (AVR)**

A continuously acting automatic excitation system to control Genset terminal voltage;

Availability

The MW Capacity of a CDGenset declared Available to OETC and/or PWP by a Power Producer and **Available** shall be construed accordingly;

Availability Notice

A notice issued by a Power Producer, in the form set out in SDC1, stating the Availability of a Genset to apply for the following Schedule Day;

Back-Up Protection

Protection equipment or system that is intended to operate when a System fault is not cleared because of a failure of the Main Protection to operate;

Black Start

The procedure necessary for the recovery from a Partial System Shutdown or a Total System Shutdown;

Bulk Supply

Bulk Supply means the Bulk Supply by the PWP of (1) electricity to any Licensed Supplier or (2) Desalinated water to the Ministry of Housing, Electricity and Water;

Bulk Supply Points

The point at the interface between OETC and Licensed Distributors where Bulk Supply Metering is located;

Burden

Burden is the electrical Load, measured in VA, connected to current and/or voltage transformers for the purposes of Metering, protection or measurement;

Business Day

A day on which banks in Oman are open for business purposes;

Calibration

The procedure whereby the relevant percentage errors of any item of Metering Systems are determined and, where appropriate, modified;

Capacity

The capacity of any Plant to produce, deliver or receive electricity, as the case may be, stated in MW at an assumed or agreed Power Factor or in MVA;

**Caution Notice**

A notice issued in accordance with Safety Rules approved by OETC and placed at a point of adequate physical separation which must be in accordance with, and maintained in accordance with Safety Rules to allow safe working;

CCGT Module

A group of Gensets, comprising one or more Gas Turbine Gensets (or other gas based engine set) and one or more Steam Turbine Gensets where, under normal Operation, the waste heat from the gas turbines, is used to drive the steam turbine(s) and the component sets within the CCGT Module are designed to Operate together for increased efficiency and are registered as a CCGT Module under this Code;

CDGenset (Centrally Dispatched Genset)

A Connected Genset with a Registered Capacity in excess of 5 MW and which is subject to the procedure of Central Dispatch;

Central Dispatch (CD)

The process of Scheduling and issuing Dispatch Instructions by OETC;

Check Meter

A device where required, that duplicates and provides back up to the Main Meter for measuring and recording units of Active Power, Active Energy, Reactive Power or Reactive Energy or other electrical quantities;

Code Notices

A notice served under or for the purposes of the Grid Code;

Cold

A situation in which a Genset has been shut down for more than forty-eight (48) hours if the Genset is in combined cycle configuration and more than twenty-four (24) hours if the Genset is in open cycle configuration;

Committed Project Planning Data

The data relating to the proposed User development at the time of acceptance of an offer for a Connection Agreement and the subsequent data required by OETC;

Completion Date

Has the meaning set out in the Connection Agreement with each User, or in the absence of a definition, it shall mean the date when a User is expected to Connect to or start using OETC's Transmission System;

Complex

One or more Connection Sites together with the associated Production Facility, Transmission substation and/or Distribution substation and/or associated Plant, as appropriate;

Connection



In relation to any Premises, Production Facility or System, the presence of a physical connection between those Premises, Production Facility or System and the System of a Licensed Transmission System Operator or Licensed Distribution System Operator other than a System owned or Operated by the Rural Areas Electricity Company and **Connect** and **Connected** shall be construed accordingly;

Connected Planning Data

The estimated values assumed for planning purposes by OETC if and when confirmed or replaced by validated actual values;

Connection Offer

The terms and conditions offered by OETC to a User for Connection of a User's System to the Transmission System as a result of application for Connection of Plant made in accordance with OETC's Licence;

Connection Point

The point on the Transmission System to which a User Connects its System to the Transmission System;

Connection Site

The physical site belonging to OETC or a User where a Connection Point is located;

Constrained Schedule

A Generation Schedule and Desalination Schedule produced by OETC that takes account of limits on the Total System and that is developed in accordance with the Scheduling and Dispatch Code SDC1.4.9;

Consumer

A Person who is Supplied with electricity at Premises for consumption at those Premises;

Contingency Reserve

The margin of Available Generation Capacity over forecast Demand that is required in the period from 24 hours ahead down to real time to cover against uncertainties in Genset Availability and against Demand forecast errors;

Control Centre

The centre from where Scheduling, Dispatch and Operational Instructions are given to other control rooms or Plant operators. The term is used to any such centre which may be a fully fitted control centre, an operational room or a Person designated with such responsibilities;

Control Phase

The phase from the issue of the Generation Schedule and Desalination Schedule on the day ahead (D-1) to real time Operation;

Daily Status Form

The form used by Power Producers for submission of data to OETC and PWP under SDC1;

**Daily Status Form – OETC Assumed Data**

The form used by OETC to inform Power Producers of the data to be used by OETC in connection with Scheduling and Dispatch following failure by the Power Producer to submit the Daily Status Form;

Electrical Delivery Point

The point on the High Voltage terminals of the Production Facility at which the Production Facility Connects to the Transmission System and at which electrical Energy is delivered in accordance with PPAs and PWPAs and by reference to which the electrical Energy is measured.

Deloaded

The condition under which a CDGenset has reduced or is not delivering Active Power to the System to which it is Synchronised;

Demand

The demand for Active Power or Reactive Power;

Demand Control

Any method of achieving a reduction or increase in Demand;

Demand Control Imminent Warning

A warning that may be issued within the following 30 minutes, relating to a Demand reduction which will be issued by OETC to Licensed Distributors and to Power Producers at Production Facilities and to Directly Connected Consumers;

Demand Intertrip Scheme

Automatically initiated circuit breaker tripping sequences that are switched into service following instructions from OETC or a Licensed Distributor;

Demand Side Management

The controlled reduction in Demand achieved in real time by a User;

Desalination

The production of demineralised or potable water by desalination and **Desalinated** shall be construed accordingly;

Desalination Unit

A unit forming part of the Production Facility and which is capable of producing Desalinated water;

Designated Operator

The operator approved in writing by the relevant User as competent to carry out the procedures in agreed Operational Instructions;

**Desynchronise**

The act of taking a Genset off a System to which it has been Synchronised by opening any connecting circuit breaker;

Detailed Planning Data

The additional data required by OETC as part of the Planning Code to allow detailed stability studies to be carried out;

Directly Connected

A Consumer or User which imports and/or exports electricity directly from/to the Transmission System and **Direct Connected** shall be construed accordingly;

Dispatch

The general process by which instructions are determined and the issuing of those instructions, to (1) Licensed Generator and/or Licensed Generator/Desalinator as to the Operation or cessation of Operation of their Production Facilities and (2) other Persons whose facilities are Connected and **Dispatch Instructions** shall be construed accordingly;

Distribution

Means, in relation to electricity, the transport of electricity by means of a Distribution System and **Distribute** shall be construed accordingly;

Distribution System

A System which; (i) is not a Transmission System; (ii) is used to transport electricity; (iii) consists (wholly or mainly) Electric Lines and Electric Plant (namely, Electric Lines and Electric Plant with voltage levels of less than a nominal 132kV) and (iv) which is used wholly or mainly for the transport of electricity to Premises;

Disturbance

Any sudden significant change to the Total System caused by a sudden loss of a Genset, or the interruption of Demand, or the failure of Plant;

Earthing Device

A means of providing a connection between a conductor and the general mass of earth, being adequate to allow the flow of the maximum prospective earth fault current, at that point on the Total System and **Earthing** shall be construed accordingly;

Economic Purchase

The purchase on the best economic terms reasonably obtainable, having regard to quality, quantity, the nature of the things to be purchased, the available manner of delivery and the future security, reliability and diversity of supply of the things to be purchased;

Electric Lines

Any line, whether underground or overground, which is used for carrying electricity for any purpose and includes, unless the context otherwise requires;

- (a) any support for any such line, including, without limitation, any structure, pole, pylon or other thing in, on, by or from which any such line is or may be supported,



- carried or suspended;
- (b) any Plant Connected to any such line for the purpose of carrying electricity; and
 - (c) any wire, cable, tube, pipe or other similar thing (including its casing, insulator or coating) which surrounds or supports, or is surrounded or supported by, or is installed in close proximity to, or is supported, carried or suspended, in association with, any such line;

Electric Plant

Any plant, apparatus, equipment or appliance used for, or for purposes connected with, the Generation, Transmission, Dispatch, Distribution or Supply of electricity, other than;

- (a) an Electric Line;
- (b) a Meter used for ascertaining the quantity of electricity supplied to any Premises; and
- (c) an electrical appliance under the control of a Consumer;

and **Plant** shall be construed accordingly;

Electric Time

The time shown on an electric clock connected to the Total System;

Electrical Connection Agreement

An agreement between a User and OETC for the Connection of the User's System to the Transmission System;

Electrical Connection and Use of System Agreement

An agreement between OETC and a System User to provide principally for (i) the Connection of System User's Plant to the Transmission System; (ii) the calculation of charges for use of the Transmission System; and (iii) to record the mechanism relating to the payment of Connection Fees;

Embedded Genset

Gensets that are Connected to a Distribution System or the System of any other User, such Connection being either a Direct Connection or a Connection via the busbar of another User but with no Direct Connection to the Transmission System, where

Large Embedded Gensets are deemed to be those with a Registered Capacity of greater than 5MW; and

Small Embedded Gensets are deemed to be those with Registered Capacity of less than or equal to 5MW;

Embedded Power Producer

A User Operating an Embedded Genset;

Emergency Conditions

Abnormal System conditions that require automatic or rapid manual action to prevent or limit loss of Transmission facilities, Distribution facilities or Generation Capacity that could adversely affect the reliability of the Transmission System;

**Emergency Instructions**

A Dispatch Instruction issued by OETC that may require an action or response that is outside the limits implied by a Daily Status Form submitted by a CDGenset or instructions issued by OETC to prevent or limit abnormal System conditions;

Emergency Manual Demand Shedding

The manual de-energisation of Consumers or Electric Lines feeding Consumers in Emergency Conditions to assist regaining the Active Power balance between Available Generation Capacity and Demand;

Expert

A Person with appropriate educational and practical experience to provide relevant advice to the subject in question and who should have no direct involvement with any of the parties;

Exported

In relation to electricity, electricity which is Generated in Oman and which is transported from Oman and **Export** shall be construed accordingly;

Final Station Outage Schedule

The Outage schedule submitted by a User to OETC for Operational Year 1 specifying for each CD Genset and Desalination Unit owned by that User, the proposed timing for Outages and Winter Downtime;

Final System Outage Schedule

The Outage schedule for Operational Year 1 produced by OETC in accordance with the provisions of OC 2, specifying for each CD Genset and Desalination Unit in the Total System the proposed timing for Outages and Winter Downtime;

Five-Year Statement

A statement, prepared by OETC, in accordance with the terms of the Transmission Licence showing for each of the 5 succeeding Operational Years, amongst other matters, the forecast Demands and Power flows on the Transmission System;

Flexible Outage

A Planned Outage that, at the request of OETC, can be deferred or advanced by a period;

Flicker Severity (Long Term)

A value derived from 12 successive measurements of Flicker Severity (Short Term) over a two hour period and a calculation of the cube root of the mean sum of the cubes of 12 individual measurements.

**Flicker Severity (Short Term)**

Measure of the visual severity of flicker derived from the time series output of a flicker meter over a 10 minute period and as such provides an indication of the risk of customer complaints.

Forced Outage

An Outage for which no timely notice can be provided by the User to OETC;

Frequency

The number of alternating current cycles per second (expressed in Hertz) at which a Total System is running;

Frequency Sensitive Mode

The Operation of a CDGenset (which can be part of a CCGT Module) that will result in Active Power output changing automatically in response to changes in Total System Frequency;

Fuel

Natural gas or fuel oil;

Gas Turbine Genset

A Genset with a gas turbine as its prime mover;

Gas (SF₆) Zone Diagram

A single line diagram showing boundaries of, and interfaces between, SF₆ gas-insulated HV Plant modules which comprise part, or the whole, of a substation at a Connection Site, together with the associated stop valves and SF₆ gas monitors required for the safe Operation of the Transmission System or the User System;

Genset (Generating Set)

Any Plant which produces electricity (including a (single) Genset and its associated prime mover, within a CCGT Module);

Genset De-loading Rate

The rate at which a Genset can decrease its output of Active Power from Maximum Generation to Minimum Generation. The Genset De-loading Rate for each Genset will be as detailed in the Operating Parameters;

Genset Loading Rate

The rate at which a Genset can increase its output of Active Power from Minimum Generation to Maximum Generation;

Genset Run-Down Time

The time taken for a gas turbine or steam turbine rotor to come to a complete stop after the opening of the Genset circuit breaker following initiation of a normal stop signal initiation;

**Genset Run-Up Time**

The time taken for a gas turbine or steam turbine to reach full speed at no load from the initiation of a start signal. The Genset Run Up Time for each Genset will be detailed in the Operating Parameters;

Generation

Means the production of electricity by any means and "**Generate**" and "**Generated**" shall be construed accordingly;

Generator Performance Chart

A diagram which shows the MW and Mvar capability limits within which a Genset will be expected to Operate under steady state conditions;

Generation Schedule and Desalination Schedule

A statement prepared by OETC of the CDGensets and Desalination Units that may be required to meet the Total System Demand at all times, and ensure (as far as possible) the integrity of the Transmission System and the security and quality of Supply, with an appropriate margin of reserve;

Generation Security Planning Standard

The standards by which PWP's performance in maintaining Generation security, and the Availability and quality of the Total System may be measured, as prescribed in its Licence;

Good Industry Practice

Acting in good faith to perform obligations in accordance with the requirements of the Sector Law and international good practice in the electricity and Desalination industries;

Government

The Government of the Sultanate of Oman;

Grid Code

Means the Grid Code prepared pursuant to Condition 3 of OETC's Transmission Licence;

Grid Code Review Panel

The panel with the functions set out in GC.4 of the General Conditions;

High Frequency Response

An automatic reduction in the Active Power output from a CDGenset in response to an increase in Total System Frequency above the Target Frequency notified by OETC under SDC3;

High Voltage (HV)

A nominal alternating voltage equal to or exceeding one kilovolt;

**Hot**

When referring to a Genset, it means a Genset that has been shut down for less than eight (8) hours if the Genset is in combined cycle configuration and less than two (2) hours after such Genset has been shut down if the Genset is in open cycle configuration;

Import/Export Contract

A contract entered into in accordance with Article [(85)(2)] of the Sector Law for the Import or Export of electricity;

Imported

In relation to electricity, electricity that is Generated outside Oman and which is transported into Oman and **Import** shall be construed accordingly;

Incident

An unscheduled or unplanned occurrence on, or relating to, a System (including Embedded Gensets) including, faults, events and breakdowns and adverse weather conditions being experienced;

Inflexible Outage

A Planned Outage that cannot be deferred or advanced by a period at the request of OETC, under OC2;

Instation

Equipment located within OETC Premises that receives and stores Metering Data from Outstations;

Interconnection Agreement

An agreement made between OETC, a Licensed Distributor or RAEC and a Person external to the Sultanate of Oman, relating to the transfer of Power and or Active Energy/Reactive Energy and or Ancillary Services across an Interconnector;

Interconnector

A facility that Connects two Systems;

Interface Agreement

An agreement between a User and OETC containing provisions for dealing with the consequences of a User owning or Operating Plant which is sited on another User's land and/or for the sharing of facilities and/or the provision of services at or near a Connection Site;

Internal Interconnection

A Connection that facilitates the transfer of electricity to or from OETC's Transmission System, the Distribution System of a Licensed Distributor or a User System into or out of another System located within Oman. A single Internal Interconnection may comprise several circuits Operating in parallel;

**Internally Interconnected Party**

A Licensed Person located in Oman that owns and/or Operates a Transmission System, a Licensed Distribution System and/or Plant for the purpose of providing Energy and/or Ancillary Services to other Users and/or OETC;

International Interconnected Party

A Person responsible for the operation of an electrical Transmission System or Distribution System outside the Sultanate of Oman that is Connected to a System that exists within Oman;

International Interconnection

An Interconnector that Connects a System that exists within Oman with a System that exists outside Oman and **International Interconnection** shall be construed accordingly;

Islanded

Following a Total System Disturbance, a situation in which parts of the System with its Connected Production Facilities become detached from the rest of the Total System;

Isolating Device

A device used for achieving electrical isolation;

Isolation

The disconnection of HV Plant from the remainder of the System in which that HV Plant is situated in accordance with OC8;

Licence

An authorisation to undertake a Regulated Activity issued by the Regulatory Authority pursuant to the Sector Law;

Licensed Distribution System Operator

A Person who is the holder of a Distribution Licence and **Licensed Distributor** shall be construed accordingly;

Licensed Generator

A Person who is the holder of a Generation Licence;

Licensed Generator/Desalinator

A Person who is the holder of a Generation and Desalination Licence;

Licensed Supplier

A Person who is the holder of a Supply Licence;

Licensed Transmission System Operator

OETC and each other Person who is the holder of a Transmission Licence;

**Load**

The Active or Reactive Power, as the context requires, Generated, Transmitted or Distributed;

Local Interrogation Unit

Portable or fixed equipment capable of interrogating, updating and/or programming an Outstation;

Local Safety Instructions

Instructions on each User site and OETC site approved by OETC or the relevant User, setting out the methods to achieve safety for those working on Plant to which their Safety Rules apply;

Low Voltage or LV

An alternating voltage less than one kilovolt;

Main Meter

The primary Meter for measuring and recording electrical quantities;

Main Protection

Protection equipment or system expected to have priority in initiating fault clearance or an action to alleviate an abnormal condition on the Total System;

Maximum Generation (Max Gen)

The maximum stable electrical output that a Production Facility can make Available under Emergency Conditions;

Maximum Water Production

The maximum water production achievable in one hour on the Schedule Day;

Measurement Transformers

Voltage and/or current transformers or combinations thereof used in Metering Systems;

Member

A Person who is a member of the Grid Code Review Panel;

Merit Order

An order for ranking Available Production Facilities which order shall aim to optimise Total System economy, security, stability and reliability; and shall otherwise be determined by OETC and each other Licensed Transmission System Operator in accordance with its Transmission Licence;

Meter

A device for measuring and recording units of Active Power, Active Energy, Reactive Power or Reactive Energy or other electrical and water quantities;

**Meter Certificate**

The statement issued by the Grid Code Review Panel confirming that a Meter or Metering System complies with the requirements of the Metering and Data Exchange Code;

Meter Owner

The Person responsible for ensuring the procurement, installation, testing, commissioning and operation and maintenance of Meters;

Meter Register

A device associated with a Meter, from which it is possible to obtain a visual reading of the quantities that have passed the Meter;

Meter Registration System

A system that uniquely identifies the Meter and Users associated with the Meter and contains pertinent data relating to the Meter as required by the Meter and Data Exchange Code;

Meter Service Provider

A Person that provides to a Meter Owner Meter services such as the installation, commissioning, operation, maintenance, and general servicing of Metering Systems;

Metering

The activity of measuring and recording units of Active Power, Active Energy, Reactive Power or Reactive Energy or other electrical and water quantities using a Metering System or a Meter;

Metering Communication System

The system of communications between Meters, Local Outstations and Remote Instations;

Metering System

The group of equipment including Meters, time switches, Measurement Transformers, metering protection and isolation equipment including alarms, circuitry, associated data storage and data communications equipment that are part of the Active Energy, Reactive Energy and Demand measuring equipment at or relating to a Connection Site;

Minimum Generation (Min Gen)

The minimum stable output Power which is registered for a CDGenset through the Planning Code and/or the Scheduling and Dispatch Code, with OETC;

Minimum Shutdown Time

The minimum amount of time between a CDGenset being Desynchronised and being able to Synchronise again;

Notice to Synchronise

The amount of time (in minutes) that is declared by a Power Producer for a CDGenset to enable it to be Synchronised following receipt of a Dispatch Instruction from OETC;



Numbering and Nomenclature Policy

The policy document of OETC or a Licensed Distributor setting out a consistent and distinct numbering and nomenclature system of HV Plant;

Oman Electrical Standards (OES)

Standards and regulations in relation to safety of equipment and electrical Systems and procedures associated with the specification and Operation of electrical Systems, formerly issued by the Ministry of Housing Electricity and Water, and known as Oman Electrical Standards. Such standards may from time to time be reviewed, modified or replaced pursuant to the Sector Law and including any such new standards as may be established, reviewed or modified from time to time pursuant to the Sector Law;

Operating Margin

The combination of Contingency Reserve and Operating Reserve;

Operating Parameters

The technical capabilities, flexibilities and limitations of a Genset, taking into account changes due to Site Rating, registered in the Operational Planning Code, OC2 and notified under the Scheduling and Dispatch Code through the Daily Status Form, as amended in accordance with these Codes;

Operating Reserve

The additional output from Gensets or the reduction in Demand that can be realised in real time Operation to contribute to containing or correcting a Frequency deviation to an acceptable level following a sudden change in Demand or Generation;

Operation

A planned, scheduled or erroneous action relating to the Operation of part of the Total System and **Operate** will be construed accordingly;

Operation Diagram

A diagram that is a schematic representation of the HV Plant and the Connections to all external circuits and a Connection Site, incorporating its numbering, nomenclature and labelling;

Operational Effect

Any effect on the Operation of another System that causes the Transmission System or the User's System to Operate (or be materially at increased risk of Operating) differently to the way in which they would or may have normally Operated in the absence of that effect;

Operational Instructions

Instructions and procedures issued in Connection with the actual Operation of Plant;

Operational Log

A chronological record of messages relating to Operational Instructions and safety coordination sent and received by each operator and Safety Coordinator under OC8;

**Operational Planning Phase**

The period from 8 weeks to the end of the 2nd Operational Year ahead and **Operational Planning** shall be construed accordingly;

Operational Test

A test carried out in order to acquire information in respect of Plant under pre-determined System conditions;

Operational Year

The year running 1 April to 31 March where Operational Year 0 means the current Operational Year, Operational Year 1 means the following Operational Year, etc.;

Outage

In relation to a Genset or Desalination Unit, an event, which affects a Power Producer's ability to make Capacity Available. In relation to OETC, or a Licensed Distributor, the removal of any part of the Transmission or Distribution Systems for repair or maintenance, or as a result of failure or breakdown;

Outstation

On-site equipment which receives data from local equipment and may perform some processing of data before transmitting the data to an Instation or SCADA system or downloading to a Local Interrogation Unit on request.

When used with Metering Systems the Outstation will store data from a Meter(s) and may perform some processing of data. These functions may be facilitated in one or more separate units or may be integral with the Meter;

Overall Speed Droop

The percentage drop in the Total System Frequency that would cause the Genset, under free governor action, to alter its output from zero to its full Capacity;

Partial System Shutdown

As for a Total System Shutdown except that all Generation has ceased in a part of the Total System that has become detached from other parts of the Total System and there is no electricity Supply from other parts of the Total System, so it is necessary to invoke Black Start procedures;

Partially Constrained Schedule

A Generation Schedule and Desalination Schedule produced by OETC that takes account of limits on the Total System imposed by the Transmission System and as described in SDC 1.4.9;

Person

An individual, partnership, company, firm, trust, body corporate, government, government body, authority, emanation, agency, instrumentality, unincorporated body or an association;

**Planned Outage**

An Outage planned at least seven days in advance of the event;

Planned Rota Demand Shedding

The manual de-energisation and re-energisation according to planned rotas of Consumers or Electric Lines feeding Consumers in Emergency Conditions to maintain the Active Power balance between Available Generation and Demand;

Planning Margin

The margin by which electricity Generation Capacity must exceed forecast Demand in the planning years to ensure that the Generation Security Planning Standard is met;

Plant Owner

The Person responsible for ensuring the procurement, installation, testing, commissioning and Operation and maintenance of Plant;

Point of Common Coupling

That point of the Transmission System electrically nearest to the User installation at which more than one User is Connected;

Power Factor

The cosine of the phase angle between the Volt-Amperes and the Active Power component;

Power Producer

Any Person that Generates electricity and/or which Operates one or more Genset(s), which Connect to the Transmission System, or Distribution System and Operate Synchronously with that Transmission System or Distribution System. This includes a Person that Operates a Desalination Unit;

Power Purchase Agreement (PPA)

An agreement entered into by PWP and a Licensed Generator pursuant to which the PWP agrees, amongst other things, to purchase the Production Capacity and Output associated with the relevant Production Facilities;

Power and Water Purchase Agreement (PWPA)

An agreement entered into by PWP and a Licensed Generator/Desalinators pursuant to which the PWP agrees, amongst other things, to purchase the Production Capacity and Output associated with the relevant Production Facilities;

Power and Water Purchaser (PWP)

The Person of this name performing the functions assigned to it under the Sector Law;

Preliminary Project Planning Data

Means the data relating to the proposed User development at the time a User applies for a Connection Agreement but before an offer is made and accepted by the applicant User;

**Premises**

Any land, building or structure occupied or used by a Person;

Primary Control

A CDGenset operating mode which will result in Active Power output changing in response to a change in Frequency in a direction which assists to stabilise the Frequency at any level by operating so as to provide Primary Response and/or Secondary Response proportional to the difference between the speed/Frequency Target value and the measured speed/Frequency value;

Primary Response

The automatic increase in Active Power output of a CDGenset or a decrease in the Demand for Active Power in response to a fall in the Frequency of the Total System. The response will be fully Available within 5 seconds from the time of the Frequency fall;

Production Capacity

The electricity Generation Capacity or the combined electricity Generation and water Desalination Capacity of a Production Facility, as the context so requires;

Production Facility

Plant which is used for the Generation of electricity or the combined Generation of electricity and Desalination of water and includes, as applicable, all associated Electric Lines, Electric Plant and water equipment;

Programming Phase

The period from 8 weeks down to the issue of the Generation Schedule and Desalination Schedule on the day ahead (D-1);

Proposed Station Outage Schedule

The proposed Outage schedule submitted by a User to OETC for Operational Year 2 specifying for each CD Genset and Desalination Unit installed in the Production Facility owned by that User, the proposed timing for Outages and Winter Downtime;

Proposed System Outage Schedule

The Outage schedule for Operational Year 2 produced by OETC in accordance with the provisions of OC 2, specifying for each CD Genset and Desalination Unit in the Total System the proposed timing for Outages and Winter Downtime;

Protection

The provision for the detection of fault conditions on the Total System and the automatic or manual initiation of fault clearance action, including audible and visual alarms, indications and data logging;

Provisional Running Order

A statement prepared and issued by OETC to the Power Producer pursuant to SDC1, which indicates for each CDGenset and Desalination Unit owned or controlled by the Power



Producer, the expected output pattern and the required Synchronising and Desynchronising times for the following day;

Reactive Compensation Plant

Reactors and capacitors Connected to the System to compensate in part for excesses of Reactive Power;

Reactive Energy

The integral with respect to Reactive Power, measured in units of voltampere reactive hours (Varh) and standard multiples thereof;

Reactive Power

The product of alternating voltage and current and the sine of the phase angle between them measured in units of voltamperes reactive (vars) and standard multiples thereof.

Reactive Power Generation or output is an export onto the System and is referred to as lagging Reactive Power or lagging Mvar, and Reactive Power absorption is an import from the System and is referred to as leading Reactive Power or leading Mvar;

Red Warning

A warning that will be issued by OETC by 16:00 hours on the day ahead to those Licensed Distributors and Directly Connected Customers who will or may subsequently receive instructions under the Operating Code OC4;

Reference Conditions

Reference ambient conditions, the lower heating value of natural gas, and Frequency and Genset Power Factor as specified in the PPA and PWPA;

Registered Capacity

In relation to a Genset and/or a Desalination Unit that does not form part of a CCGT Module, the Production Capacity of that Genset taking into account changes due to site rating as registered with OETC and, as amended from time to time in accordance with the Grid Code. In the case of a CCGT Module, the Production Capacity of the CCGT Module taking into account changes due to site rating, as declared by the Power Producer and amended from time to time in accordance with the Grid Code;

Registered Data

Data submitted to OETC by Users describing the parameters of their Plant and Systems, including the Operating Parameters of Gensets and Standard and Detailed Planning Data and which is maintained by OETC as a continuing record that can be changed by formal documentation;

Regulatory Authority

The body established pursuant to Article [(38)] of the Sector Law;

**Remote Instations**

Computer-based systems operated by OETC that may collect or receive Metering data on a routine basis from Outstations;

Risk of Trip

The Operation of a Genset when the failure of any single piece of auxiliary equipment could result in the loss of the Genset's Active Power and/or Reactive Power output;

Rural Areas Electricity Company (RAEC)

The Company of that name established pursuant to Article (6) of the Sector Law;

Safety Coordinator

A Person nominated by a User to be responsible for the coordination of Safety Precautions at a Connection Point and/or a Bulk Supply Point when work which includes testing is to be carried out on a System which necessitates the provision of Safety Precautions on HV Plant and **Safety Coordination** shall be construed accordingly;

Safety Earthing

The connection to the general mass of earth of HV conductors by an Earthing Device in accordance with OC8;

Safety From The System

The condition that safeguards Persons when work is to be carried out on a System from the dangers that are inherent in the System;

Safety Permits

Safety documents issued under the Safety Rules relating to safe conditions for working on Plant;

Safety Precautions

The Isolation and or Earthing of HV Plant, posting of safety tags, use of safety equipment and other measures to ensure safety;

Safety Rules

The rules of OETC or a User that establish a safe system of working on HV Plant;

Schedule Day

The 24 hour period starting at 0000 hrs (midnight) of the day concerned. Schedule Days are designated SD0, SD1, SD2 etc, where SD0 is today in real time;

Scheduling

The process of compiling a Generation Schedule and Desalination Schedule in accordance with SDC1 and **Schedule** will be construed accordingly;

**Secondary Response**

The automatic increase in Active Power output of a CDGenset or a decrease in the Demand for Active Power in response to a fall in the Frequency of the Total System;

Sector Law

The Law Governing the Privatisation and Regulation of the Electricity Sector, Sultani Decree No. [/2003];

Short Notice Outage

An Outage for maintenance performed at no less than 48 hours notice to OETC, the approval of which will be at the sole discretion of OETC;

Significant Incident

An Incident that OETC has determined shall be defined as significant in the context of reporting in OC5;

Site Common Drawings

Drawings that incorporate Connection Site layout drawings, electrical layout drawings, common protection/control drawings and common services drawings prepared for each Connection Site;

Site Investigations

Tests conducted in relation to Plant and operational procedures at Production Facilities and User sites or to monitor and assess the characteristics of Plant;

Site Responsibility Schedule

A schedule forming part of the Connection Agreement containing the information and prepared in accordance with the Connection Conditions;

Speed Governor (Speed Control)

The mechanical and/or electrical equipment used to control the rotational speed of a Genset rotor according to a speed droop characteristic;

Spill

Energy supplied to the Total System after some captive on-site Demand has been met;

Spill Contract

A contract between a Licensed Supplier and an Autogenerator, entered into in accordance with Article (35)(7) of the Sector Law and Condition 3 of the PWP Licence for the purchase by the Power and Water Procurer of Production Capacity and/or Output;

Spinning Reserve

Those Gensets, which form part of the Operating Reserve, that are Synchronised to the Total System;

**Standard Planning Data**

The general data required by OETC under the Planning Code;

Steam Turbine Genset

A Genset with a steam turbine as its prime mover;

Summer Period

The period commencing 00:00 on 1 April in a Gregorian Calendar Year and ending at 24:00 on 30 September in the same Gregorian Calendar Year;

Supply

In relation to electricity, the Supply of electricity to any Premises and **Supplied** and **Supplies** shall be construed accordingly;

Synchronised

The condition where a Genset, or a System, is Connected to the busbars of another System or Total System, so that the Frequencies and phase relationships of that Genset or System are identical (within operational tolerances) to those of the other System or Total System and **Synchronise** and **Synchronisation** will be construed accordingly;

System

A Distribution System or a Transmission System, as the context requires;

System Normalisation Procedures

The procedures necessary for a recovery from a Partial System Shutdown or Total System Shutdown;

System Separation

A situation where following an Incident parts of the Transmission System are out of synchronism with each other;

Target Frequency

That Frequency determined by OETC as the desired Frequency of the Total System. This will normally be 50.00 Hz plus or minus 0.05Hz except in exceptional circumstances as determined by OETC;

Tertiary Reserve

The component of the Operating Reserve that would be Available as a result of Emergency Instructions to Synchronise and Dispatch other CDGensets;

Total System

The entire interconnected electricity Systems of Licensees in Oman, including all Production Facilities and all Transmission Systems and Distribution Systems, as the same may be developed or modified from time to time and includes any such System which interconnects with any System which is outside Oman;

**Total System Shutdown**

The situation when all Generation Connected to the Total System has ceased and the Total System has ceased to function;

OETC

The Oman Electricity Transmission Company SAOC established pursuant to Article (6), of the Sector Law; (*Referred as Transco in some documents*)

Transmission

Means, in relation to electricity, the transport of electricity by means of a Transmission System, and **Transmit** shall be construed accordingly;

Transmission Licence

A Licence to Transmit electricity;

Transmission Security Standard

The standards as set down in the Condition 28 of the Transmission Licence and to which the Transmission System will be developed, Operated and maintained;

Transmission System

A System for the transport of electricity, which System consists (wholly or mainly) of High Voltage Electric Lines and Electric Plant (namely, Electric Lines and Electric Plant with a nominal voltage equal to or greater than 132kV) and which is used for transporting electricity from a Production Facility to a sub-station, from one Production Facility to another, from one sub-station to another or to or from any Interconnector, Premises, or Distribution System and any Electric Plant used for the purposes of Dispatch;

Transmission System Outage Plan

The Outage schedule for the Operational Year produced by OETC in accordance with the provisions of OC 2 regarding outages of Plant and/or Electric Lines of the Transmission System;

Transmission Use of System Charges

Charges made by OETC for the use of the Transmission System determined in accordance with the Transmission Licence;

Turbine Speed Controller

Any control device that is provided to govern the turbine output according to set values (speed control, power control, extraction flow control, temperature limitation control, etc.);

Unconstrained Schedule

A Generation Schedule and Desalination Schedule produced by OETC that does not take account of any limits on the Total System imposed by the Transmission System and as described in SDC 1.4.9;

**User**

A term used to refer to Persons using the Transmission System including all Power Producers having CDGensets, all Internally Interconnected Parties and International Interconnected Parties Connected to the Transmission System, Licensed Distributors and all Directly Connected Consumers. In some instances, this term means any Person to whom the Grid Code applies;

Voltage Control

The process of regulation of System voltages to maintain them within specified limits;

Warm

When referring to a Genset, it means a Genset that has been shut down for more than eight (8) hours but not more than forty-eight (48) hours if the Genset is in combined cycle configuration and more than two (2) hours but not more than twenty four (24) hours after such Genset has been shut down if the Genset is in open cycle configuration;

Water Delivery Point

The point at the boundary of the Production Facility at which Desalinated water is delivered in accordance with PWPAs and by reference to which the Desalinated water flow is measured;

Water Meter

A device for measuring and recording water quantities;

Water Meter Registration System

The central database operated and maintained by the PWP for the purposes of registering all Water Metering Systems

Water Metering System

The group of equipment including Meters, time switches, initiating devices, protection and isolation equipment including alarms, circuitry, associated data storage and data communications equipment that are part of the water quantity measuring equipment at or relating to a Connection Site;

Winter Downtime

In respect of a CDGenset or Desalination Unit, those hours of the Winter Period where the availability of the respective CD Genset or Desalination Unit is not affected by an outage and for which no Dispatch Instruction will be given nor Capacity payments will be made; and

Winter Period

The period commencing 00:00 on 1 October in a Gregorian calendar year and ending at 24:00 on 31 March in the following Gregorian calendar year;