THE
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PART II

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THE ELECTRICITY ORDINANCE

THE ELECTRICITY (STATE GRID CODE) RULES, 2003

(Made under section 36(1))

In exercise of the powers conferred by section 36(1) of the Electricity Ordinance *[Cap. 50],* the Majlis Mesyuarat Kerajaan Negeri has made the following Rules:

Citation and commencement

1. These Rules may be cited as the Electricity (State Grid Code) Rules, 2003, and shall come into force on the 1st day of January, 2004.

Generation, transmission and distribution of electricity

2. The generation, transmission and distribution of electricity within the State of Sarawak shall be regulated by a State Grid Code as prescribed in the Schedule.

Amendment and modification of the State Grid Code

3. The Director of Electricity Supply may, with the approval of the Minister, amend, modify or alter the State Grid Code from time to time by a notification published in the *Gazette.*

SCHEDULE

Part 1

THE STATE GRID CODE OF SARAWAK

Preamble

1 INTRODUCTION

This Grid Code:

(a) sets out the procedure which regulates all Users of the State Grid System which comprises the Transmission Network and Distribution Network for electrical power and energy. These networks are currently owned by the Sarawak Electricity Supply Corporation (SESCO); and

(b) provides criteria guidelines and procedures for Users of the State Grid System to coordinate the planning, development, maintenance and operation thereof.

This Grid Code comprises any or all the codes contained in this document and all words and expression used in this Grid Code shall have the meanings and effect given to them in the Interpretation, Glossary and Definition sections.

2 SCOPE

The Grid Code contains procedures to permit the equitable management of the electricity supply industry, taking into account a wide range of operational conditions likely to be encountered under both normal and exceptional circumstances . It is nevertheless necessary to recognise that the Grid Code cannot predict and address all possible operational situations. Power Producers, Consumers and other Users must therefore understand and accept that the Grid System Operator, in such unforeseen circumstances, will be required, in the course of the reasonable and prudent discharging of its responsibilities, to act decisively in pursuance of any one or any combination of the following general requirements:

(a) The preservation or restoration of the integrity of the Grid System;

(b) The compliance by Power Producers, Transmission Network Service Providers (TNSPs) or Distribution Network Service Providers (DNSPs) with obligations imposed by Licences issued under the Ordinance;

(c) The avoidance of breakdown, separation, collapse or blackout (total or partial) of the Grid System;

(d) The requirements of safety under all circumstances, including the prevention of personal injury; and

(e) The prevention of damage to Plant and/or Apparatus or the environment.

In the absence of an applicable provision of the Grid Code or any of the general requirements above:

(a) The application of a policy aimed at equitable distribution among Power Producers, TNSPs, DNSPs or Consumers of any temporary restriction that might be necessary in exceptional circumstances; and

(b) The application of Prudent Utility Practice.

The Grid System Operator shall advise the Grid Code Panel in relation to the operation of the Grid Code from time to time.

This Code shall be administered by the Grid System Operator acting in consultation with the Grid Code Panel.

Users shall provide such reasonable cooperation and assistance as the Grid System Operator may request in pursuance of the above general requirements, including compliance with instructions issued by the Grid System Operator.

3 CODES OF PRACTICE

3.1 GENERAL

The Grid Code is divided into the following codes of practice as contained in Part 2 of this Schedule:

(a) General Conditions;

(b) Planning Code;
(c) Connection Conditions;

(d) Operating Codes Nos. 1 to 11;

(e) Scheduling and Dispatch Codes Nos. 1 to 3; and

(f) Metering Code.

3.2 GENERAL CONDITIONS

The General Conditions section deals with those aspects of the Grid Code not covered in other sections, including the resolution of disputes, the revision of the Grid Code, definitions and glossary used in the Grid Code.

3.3 PLANNING CODE

The Planning Code deals with issues relating to the medium term development and expansion of generation capacity and the grid Networks through the annual Transmission and Generation Master Plans.

Furthermore, it provides for the procedures involved for existing or new Users intendir to connect on to the Grid System and the data to be provided to the GSSP Networ Planner in order for the planner to assess the application.

3.4 CONNECTION CONDITIONS

Connection Conditions, which specify the minimum technical, design and certain operational criteria that must be complied with by directly connected Users.

3.5 OPERATING CODES

A set of Operating Codes, which govern the way in which Grid System operation i planned, programmed, notified, scheduled and then run in real time. This sequenc starts with the forecasting of demand for the year ahead, in accordance with OC1 With the receipt of demand forecasts from Users, the GSO coordinates requests fo outages and matches these against forecast demand to produce the Annual Gri Generation Plan under OC2.

In producing the Annual Grid Generation Plan, taking into account planned plant ar apparatus outages, the GSO also applies the generation reserve standards of OC and also the demand control methods of OC4. Information is communicated and operation are coordinated in accordance with OC5 and the occurence of significant incidents reported in accordance with OC6.

Where the Grid System experiences a failure in the control of system frequency c nodal voltage, which results in separation of the Grid System components and/c widespread load shedding, then restoration to normal operation is covered by OC7.

Any work to be carried out at a Connecti on P(int shall be in accordance to the safety coordination procedures detailed under oca.

Where a new Connection Point is to be constructed or changes are to be made an existing Connection Point, then the numbering and naming of the equipment covered by OC9.

Monitoring and investigation of the performance of Users equipment is covered by OC10 while commissioning and testing of equipment that have a significant impact on the Grid System is covered by OC11.

These are summarised below:

(a) demand forecasting (OC1);

(b) the coordination of the outage planning processes in respect of generating set and power station equipment and outage of Grid System equipment (OC2);

(c) the specification of different types of reserve, which make up the operating reserve (OC3);

(d) different methods of demand control including reduction of demand (OC4);

(e) the reporting and communication, of scheduled and planned actions and unexpecte occurrences such as faults on the power system or faults on the User's system (OC5);

(f) the provision of written fault and incident reports for significant incidents (OC6);

(g) contingency planning and Grid System restoration (OC7);

(h) the coordination of power system safety procedures in order that work can be carried out safely at the Connection Point (OC8);

(i) the procedures to be used for numbering and naming of plant and apparatus at Connection Points (OC9);

(J) monitoring and investigation in relation to Users plant and apparatus (OC10);

(k) the procedures to be followed for system tests (OC11).

3.6 SCHEDULING AND DISPATCH CODES

The Grid Code also contains a generation scheduling and dispatch code, which is split into three sections and deals with:

(a) the preparation of a planned centrally dispatch generating units (CDGUs) running schedule covering all CDGUs, based upon a least cost merit order (SDC1);

(b) the issue of dispatch instructions to power producers with CDGUs (SDC2); and

(c) the procedures and requirements in relation to frequency control and active energy and or power transfer levels (SDC3).

3.7 METERING CODE

The Metering Code deals with transmission metering and is split into a number of sections and deals with:

(a) the specific requirements for fiscal metering; and

(b) the basic requirements for operational metering.

This Metering Code contains the metering requirements at the Custody Transfer Points in relation to users who have, or plan to have access to the Transmission Network.

SCHEDULE

Part 2

THE STATE GRID CODE OF SARAWAK

Arrangement of Codes

Abbreviation	Codes of Practice	Description
GC	General Conditions	Rules and provisions of a general application to the Grid Code
PC	Planning Code	Planning requirements for connection to the Grid System
CC	Connection Conditions	Connection requirements
OC1	Operating Code No. 1	Demand Forecasting
OC2	Operating Code No. 2	Operational Planning
OC3	Operating Code No. 3	Operating Reserve
OC4	Operating Code No. 4	Demand Control
OC5	Operating Code No. 5	Operational Liaison
OC6	Operating Code No. 6	System Fault and Incident Reporting
OC7	Operating Code No. 7	Contingency Planning and System Restoration
OC8	Operating Code No. 8	Safety Coordination
OC9	Operating Code No. 9	Numbering and Nomenclature
OC10	Operating Code No. 10	Testing and Monitoring
OC11	Operating Code No. 11	System Tests
SDC1	Scheduling and Dispatch Code No. 1	Generation Scheduling
SDC2	Scheduling and Dispatch Code No. 2	Control, Scheduling and Dispatch
SDC3	Scheduling and Dispatch Code No. 3	Frequency and Transfer Control
MC	Metering Code	Metering requirements on the Transmission Network

General Conditions

GC1 INTRODUCTION

Each specific code of practice of the Grid Code contains the provisions relating specifically to that particular code. There are also provisions of a more general application to allow the various codes to operate together. Such provisions are included in these General Conditions (GC).

GC2 INTERPRETATION

GC2.1 GENERAL

In Wis Grid Code, unless the context otherwise requires:

(a) 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;

(b) the singular includes the plural and vice versa; and

(c) any one gender includes the others.

References to codes, paragraphs, clauses or schedules are to the codes, paragraphs, clauses or schedules of this Grid Code:

(a) code, paragraph and schedule headings are for convenience of reference on and do not form part of and shall neither affect nor be used in the construction o this Grid Code;

(b) 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;

(c) references to the consent or approval of the Regulator shall be references to th approval or consent of the Regulator in writing, which may be given subject t such conditions as may be determined by the regulatory authority, as tha 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 th Regulator given, made or issued under it;

(d) all references to specific dates or periods of time shall be calculated according t the Gregorian calendar and all references to specific dates shall be to the da commencing on such date at 00:00 hours;

(e) where a word or expression is defined in this Grid Code, cognate words and expressions shall be construed accordingly;

(f) references to "person" or "persons" include individuals, firms, companies, state government agencies, committees. departments, ministries and other incorporate and unincorpor::ited bodies as well as to individuals with a separate lega personality or not; and

(g) the words "such as", "include", "including", "for example" and "in particular" sha be construed as being by way of illustration or emphasis and shall not limit c prejudice the generality of any foregoing words.

GC2.2 GLOSSARY AND DEFINITIONS

In this Grid Code, the following words and expressions, including abbreviations shall, unless the subject matter or the context otherwise requires or 1s inconsistent therewith, bear th following meanings:

Abnormal Overload	The loading of any Apparatus beyond the limit which a prudent operator acting reasonably in the circumstances tha t pertain at that precise time would consider acceptable.
Ancillary Service	A service as defined in an agreement , other than for the production of Energy and/or provision of Capacity which 1s used to operate a stable and secure Grid System including automatic generation control, Reactive Power, Operating Reserve, frequency control, voltage control and Black Start capability.
Apparatus	All Grid System equipment , or User's equipment, as the case may be, in which electrical conductors are used, supported or which they form a part. Where reference is restricted only to HV apparatus this will be indicated in the specific text (as HV Apparatus).
Associated User	When reference is made to a User who does not own the Metering Installation at a Custody Transfer Point but has a contractual interest in the test results or data flowing from the Metering Installation, then within the Metering Code the term associated user is used to differentiate them from the User who owns the metering equipment. For the avoidance of doubt, the associated user includes a Consumer who has such an interest.
Availability	The *IlfIN* Capacity of a Generating Unit made available to the SSDC across a specified time period by a Power Producer in an Availability Notice.
Availability Notice	A notice issued in accordance with SDC1 by a Power Producer to the SSDC stating the Availability of each of its CDGUs . Such notice shall provide such detail as required by SDC1.
Black Start	The procedure necessary for a System recovery from a Total Blackout or Partial Blackout.

Black Start (Station or Generating Unit)	A Generating Unit or Power Station that is registered with the GSO as having Black Start capabilities.
Business Days	Any day excluding Saturday, Sunday or public holidays for Sarawak.
Capacity	The MW capacity, at a stated power factor, of a Generating Unit, available to be sent-out by that unit to the Grid System, or a Transmission Network circuit, as the case may be.
Centrally Dispatched Generating Unit or CDGU	A Generating Unit subject to Dispatch by the GSO.
Cold Standby	Cold standby is a condition of readiness in relation to any CDGU that is declared available, in an Availability Notice, to start, synchronise and attain target Loading all within a period of time stated in the Availability Notice.
Connection Agreement	An agreement between a User and a DNSP or TNSP, as the case may be, by which the User is connected to the Grid System at a Connection Point.
Connection Point	The site, or in the case of a schematic diagram the node point, on the Grid System at which a User, including without limitation a Power Producer, or a Customer, connects their User System to the Grid System, under the terms of their Connection Agreement. This is where the GSSP's Apparatus connects to the User's Apparatus and consequently results in an asset ownership interface.
Consumer	A person or entity to whom Energy is supplied for consumption.
Control Phase	That period from the issue of the Indicative Running Notification through to real time.
Critical Incident	An Incident or series of Incidents which would, in the reasonable opinion of the GSO, result in the Grid System frequency or voltage exceeding the operational limits as contained inthe PC.
Custody Transfer Point	The site on a GSSP Network, or a User's Network, where supplies of electrical Energy are metered and supplied by one User to another User. The custody transfer point does not by itself constitute a Connection Point. It is a metering point, where the custody of the commodity (electricity) has been transferred fromone partytoanother.
Data Collection System	The data collection system operated by the GSSP and GSO on behalf of the Single Buyer, for use in the calculation of payments dueforwholesale electricity supplied orreceived.
Demand	The demand for Active and/or Reactive Power by Consumers connected to the Grid System.

Demand Control	The term demand control is used to describe any or all of these methods of achieving a Demand reduction, to maintain the stable and/or interconnected operation of the Grid System.
Disconnection	The switching off by manual or automatic means for the purpose of Demand Control on the Grid System or during the automatic operation of network protection devices.
Dispatch	The issue by the SSDC or RDC of instructions for a Generating Unit to achieve specified Load and/or target voltage levels, within its Generating Unit Capability Limits, by a stated time.
Dispatcher	That authorised person currently on shift-duty and authorised by the GSO, in accordance with procedures approved by the Regulator to issue Dispatch instructions to Power Producers for the operation of CDGUs. This shift-duty will be covered on a 24 hour a day 7 day a week basis.
Distribution Network	The distribution network owned by SESCO including 33kV, 11kV and LV overhead lines and cables, 33/11kV or 11kV/LV substations and other associated Plant and/or Apparatus.
Distribution Network Service Provider or DNSP	The managed unit responsible for the operation, maintenance and planning of a Distribution Network and the associated Plant and Apparatus required for the purpose of providing distribution services to other Users of the Grid System.
Economic Capacity	That loading, as determined by the Single Buyer, that represents the optimum economic loading point for a Generating Unit, taking into account all variable operating costs.
Energy (Active and Reactive)	Active energy is that instantaneous energy derived from in-phase voltage and current which is integrated over time and measured in watt-hours or multiples thereof. Reactive energy is that instantaneous energy derived from the product of voltage and current and the sine of the voltage-current phase angle between them which is integrated over time and measured in var-hours or multiples thereof.
Energy Balance Statement or EBS	A statement of the primary-energy balance at a specified day, for the week ahead, indicating those CDGUs that have fuel constraints.
Event	The term event means an unscheduled or unplanned (although it may be anticipated) occurrence on, or relating to, a System including faults, incidents and breakdowns, and adverse weather conditions being experienced.
Export	The vector relationship between voltage and current as contained in Appendix A of the Metering Code.

Fiscal Metering	A Metering Installation at a Connection Point or a Custody Transfer Point or a Generator Circuit, for fiscal accounting, contractual and/or statistical purposes.
Frequency Sensitive Mode	The operation of a Centrally Dispatched Generating Unit in a frequency sensitive mode that will result in Active Power output changing in response to changes in Grid System frequency. The timing for such changes is detailed in SOC3.
Generating Unit	Any Apparatus which produces electricity.
Generating Unit Capability Limits	A capability chart, registered with the Single Buyer and the GSO, which shows the MW and Mvar capability limits within which a Generating Unit will be expected to operate under steady state conditions.
Generator Circuit	A circuit from a power station having a CDGU and the associated current and voltage transfonners which form a Metering Installation which measure the output from one or more CDGUs using this circuit.
Grid System	The interconnected power system within the state of Sarawak consisting of both the Transmission Networts and Distribution Networks and the Power Stations connected to these Networks.
Grid System Operator or GSO	The department in SESCO responsible for the overall coordination of the operation, maintenance and development of the Grid System amongst all the Users. The GSO is also responsible for generation Scheduling and Dispatch and monitoring and control of the Grid System to ensure that the Grid System is operated, at all times, reliably, securely, safely and economically.
Grid System Service Provider or GSSP	The operation and maintenance functions of the Grid System provided by the TNSP and/or DNSP.
High Voltage or HV	A voltage level equal to or greater than 1 OOOV alternating current between conductors.
Hot Standby	Hot standby is a condition of readiness of a CDGU where it is ready to be synchronise and attain an instructed Load within 30 minutes and subsequently maintained such Load continuously by that CDGU.
Import	The vector relationship between voltage and current as contained in Appendix A of the Metering Code.
Independent Power Producer or IPP	An entity independent of SESCO connected to the Grid System which produces electricity from its Generating Units and sells the majority of the output to the Single Buyer.

Indicative Running Notification	An advanced generation notice issued by 10:00 hours on SD5 of Week 0 for the Scheduled Days (SD1 to SD7) of Week 1, in accordance with SDC1, detailing by CDGU the anticipated requirements from such CDGUs during the period covered by the Indicative running notification.
Interconnector	A facility that interconnects the Sarawak Grid System to another power system external to the State of Sarawak.
Interconnected Party	Any external party outside Sarawak which owns and operates a transmission or distribution networX which is connected to the Sarawak Grid System.
Interconnector Agreement	The agreement between the SIngle Buyer and an Interconnected Party for the export or import of Active Energy and the provision of generation Capacity and transmission Capacity across a transmission interconnector.
Large Consumer	The Consumer with a Demand equal to or greater than *5 wrN.*
Load	That *MN* and/ or Mvar, as the case may be produced by a Generating Unit.
Long Term	A period covering from 5 years ahead to 10 years ahead.
Low Voltage or LV	A voltage level not exceeding 1000V alternating current between conductors or 600V alternating current between conductor and earth.
Licence	Licences issued by the State in accordance with the Ordinance. There are currently four categories of licence: (a) use, work or operate licence; (b) supply licence; (c) transmission and/or distribution licence; and (d) generation licence.
Maximum Continuous Rating (MCR)	The maximum loading of the Generating Unit concerned, as registered with the Single Buyer, under an agreement, at which the Generating Unit can operate continuously without any undue degradation of operational performance, in accordance with Prudent Uti ity Practice.
Medium Term	A period covering from 1year ahead to 5 years ahead.
Merit Order	The prioritised list, approved by the Single Buyer, of CDGUs declared Available in a weekly AvallablIlty Notice, which gives the order in which such CDGUs will be Loaded by the GSO in accordance with SDC1 and SDC2.

Meter	A device for measuring and recording units of Active Energy and/or Reactive Energy and/or Power and/or Demand.
Metering Installation	A Meter and the associated current transformers, voltage transformers, metering protection equipment including alarms, LV electrical circuitry and associated data collectors, related to the measurement of Active Energy and/or Reactive Energy and/or Active Power and/or Reactive Power, as the case may be.
Minimum Generation	The minimum stable output (in whole MN) that a CDGU has registered with the Single Buyer.
Minister	Minister means the minister having the responsibility for electricity in the State of Sarawak.
Near Term	A period from 1 month ahead to the start of the Control Phase.
Network	The GSSP's Transmission Network and Distribution Network and/or User's Network as the case may be. In certain instances it means all of these networks.
Non-Spinning Reserve	The component of the Operating Reserve not connected to the Grid System but capable of serving Demand within a specified time which include Generating Units on Hot Standby and Cold Standby.
Normal Operating Condition	That Grid System condition where the GSO reasonably expects that the Demand for that day will be met by the available generating Capacity with an N-1 contingency reserve without the need for load-shedding.
Notice Submission Time	The time specified in SDC1 by which an Avallablllty Notice and/or a SOP Notice or amendments to such notices shall be received by the SSDC.
Open Access	The provision by a Transmission Network Service Provider or a Distribution Network Service Provider of access by Users including, for the avoidance of doubt, prospective Users to the Grid System.
Operating Reserve	That generation Capacity in excess of Grid System Demand required to provide for regulation, load forecasting error, equipment forced, and scheduled outages. It consists of Spinning Reserve and Non-Spinning Reserve.
Operation	The term operation means a previously planned and instructed action relating to the operation of *any* Plant or Apparatus that forms a part of the Grid System. Such Operation would typically involve some planned change of state of the Plant or Apparatus concerned, which the GSO requires to be informed of.

Operational Diagram	A schematic representation of all User and GSSP Plant and Apparatus and circuits at the Connection Point incorporating its numbering, nomenclature and labelling.
Operational Effect	The term operational effect means any effect on the operation of the relevant System which will or may cause the Grid System or other User Systems to operate (or be at a materially increased risk of operating) differently to the way in which they would or may have normally operated in the absence of that effect.
Operational Metering	A Metering Installation at a Connection Point or a Custody Transfer Point or a Generating Unit, or a Generation Circuit required for the purpose of Grid System control.
Operational Planning Phase	The Operational Planning Phase occurs in the Short Term and Near Term down to the start of the Control Phase.
Ordinance	The Electricity Ordinance (Cap. 50) of Sarawak.
Partial Blackout	The situation existing on an Power Island of the Grid System, when all CDGUs in the Power Island have disconnected from the Power Island and there is no energy flowing across the Power Island.
Peak Capacity	The maximum short duration loading of a Generating Unit in *f.NiN* for a maximum period of one hour. The peak capacity shall be calculated on the basis of the Generating Unit being loaded to Economic Capacity and having achieved normal operating temperatures, prior to being loaded to peak capacity. Following loading at peak capacity it should be considered to have returned, for calculation purposes, to loading at Economic Capacity.
Peak Demand	That half-hourly period when the Grid System Demand achieves or is forecast to achieve, as the case may be, the highest Demand for that day.
Plant	Fixed and movable equipment used in the generation and/or supply and/or transmission and/or distribution of electricity other than Apparatus. For the avoidance of doubt, equipment may be considered to be plant even though it contains LV conductors, that provide electrical power for that plant item.
Power Island	The condition that occurs when parts of the Transmission NetwoFk_and associated Distribution Network including associated Generating Units become detached electrically from the rest of the Grid System. This detached System with its associated Networks and Generating Units is a power island.

Power Producer	Any entity which has a generation Licence, including SESCO, IPPs and Self-generators which owns or operates Generating Units which connects through its User System and on to the Grid System.
Power (Active and Reactive)	Active power is that instantaneous energy derived from in-phase voltage and current and is measured in watts or multiples thereof. Reactive energy is that instantaneous energy derived from the product of voltage and current and the sine of the voltage-current phase angle which is measured in vars or multiples thereof
Power Station	The Power Producer's Generating Unlt(s) together with its associated auxiliary equipment, fuel, stores and stoCks, buildings and property at or adjacent to the generating site and including Plant and Apparatus belonging to the Power Producer and required for the connection of these Generating Units to the Grid System.
Primary Reserve	Primary reserve is an automatic response by a Synchronised CDGU to a fall or rise in Grid System frequency which require changes in the CDGU's output, to restore the frequency back to within target limits. Such response should be fully available within 5 seconds and sustainable for a further 25 seconds.
Prudent Utility Practice	The exercise of that degree of skill, diligence, prudence, and foresight which would reasonably and ordinarily be expected from a skilled and experienced operator engaged in power utility activities under the same or similar circumstances.
Regional Dispatch Centre or RDC	The regional dispatch centres under the responsibility of the State Dispatch Centre that are responsible for the issuing of Dispatch instructions to CDGUs and coordinating Transmission and Distribution Network operations induding safety coordination within their assigned regions.
Regulator	The Director of Electricity Supply appointed under section 3(1) of the Ordinance or any other person temporarily discharging the functions of that office.
Sarawak State Dispatch Centre (SSDC)	The GSO's dispatch centre and control centre responsible for the supervision of all Reglonal Dispatch Centres in Sarawak and for the issuing of Dispatch instructions to CDGUs and coordinating Transmission Network operations induding safety coordination to the extent detennined by the GSO.
Safety Log	A chronological record of messages relating to safety coordination sent and received by each Safety Coordinator under OC8.
Safety Rules	The rules for the establishment of a safe system *cl* working on Plant and Apparatus . Such rules shall comply with the Ordinance and associated rules of the State of Sarawak and Prudent Utility Practice.

Scheduling	The process as set out in SDC1, of compiling a programme for the Merit Order Dispatch of Centrally Dispatched Generating Units to meet forecast Demand.
Schedule Day (SD)	The 24 hour period starting at 00:00 hours (midnight) of the scheduled day concerned. The schedule days are designated SD1. SD2 etc where SD1 is the first day referred to in the programming process concerned. In specific instances. SDO will be used to designate today or present time.
Scheduling and Dispatch Parameters or SOP	The relevant data required by the GSO in carrying out the Scheduling and Dispatch of generation in accordance to SDC1.
SOP Notice	A notice issued by a Power Producer, in accordance to SDC1, stating the SOP data of a CDGU.
Secondary Reserve	The automatic response to Grid System frequency changes which is fully available by 30 seconds from the time of frequency change to take over from the Primary Reserve, and which is sustainable for a period of at least 30 minutes.
Self-generator	An entity which produces electricity for its own consumption but may import electrical energy when required or may export excess generation to the Grid System (if permitted in the generating Licence) which is usually operated in parallel with the Grid System.
SESCO	SESCO means the Sarawak Electricity Supply Corporation established under the Sarawak Electricity Supply Corporation Ordinance, 1962 and includes its successors-in-title, or permitted assigns, or any entity incorporated to succeed SESCO or to whom its assets, rights and liabilities shall be transferred.
Short Term	A period covering from 1 month ahead to 1 year ahead.
Significant Incident	An Event on the Grid System or the User System which has had or may have had a significant effect on either Networks or on the wider System.
Single Buyer	The agency appointed by the Regulator responsible for: (a) monitoring the scheduling, dispatch and operational planning by the GSO to ensure the equitable treatment of all Power Producers and to meet aqequacy of Demand; (b) procuring new generation Capacity; and (c) ensuring that all new Power Purchase Agreements (PPAs) between the relevant parties meet the requirements of the Grid Code and Licence requirements.

Spinning Reserve	Those loaded Generating Units, which form part of the Operating Reserve, that are Synchronised to the Grid System and contribute to Primary Reserve and Secondary Reserve. A full explanation of this is found in OC3.
Synchronised	The condition where a Generating Unit, or an Interconnector having generation already connected to it, is made ready to be connected to the Grid System, and then connected such that frequencies and phase relationships of that Generating Unit or Interconnector, as the case may be, are identical (within operational tolerances) to those of the Grid System.
System	Any User System or the Grid System or the combination of these systems or parts thereof, as the case may be.
System Stress	That condition of the Grid System when the GSO reasonably considers that a single credible incident would most probably result in the occurrence of Power Islands or Partial Blackout or Total Blackout. Normally such system stress would only apply across the periods of system Peak Demand
Total Blackout	The situation existing when all CDGUs in the Grid System have disconnected from the Grid System.
Transfer Level	The level of Active Power and/or Active Energy transfer which is agreed between two parties across an Interconnector.
Transmission Network	The transmission networks namely transmission lines, substations and other associated Plant and/or Apparatus operating at 132 kV and above in the State of Sarawak.
Transmission Network Service Provider (TNSP)	That entity holding a transmission Licence responsible for the operation and maintenance of a Transmission Network and its associated Plant and Apparatus for the purpose of providing transmission services, including access to Users of the Grid System.
User	*Any* person other than the GSO and the Single Buyer, making use of the Grid System, as more particularly identified in each section of the Grid Code. A User may be a GSSP, a Power Producer or a Consumer or an Interconnected Party. In certain cases this term means *any* person to whom the Grid Code applies.
User Network	A User network including the HV Apparatus at the Connection Point owned by that User.
User System	All Plant and HV Apparatus, including the User Network and Generating Units, owned by the User to operate its facility.

Use of System Agreement	An agreement between a User and a DNSP and/or TNSP, as the case may be, by which the User uses the Grid System for the transportation of electrical Energy between agreed entry points to the Grid System and agreed exit points from the Grid System.

GC3 OBJECTIVES

The objectives of the General Conditions are as follows:

(a) to ensure, insofar as it is possible, that the various sections of the Grid Code work together for the benefit of GSO and all Users; and

(b) to provide a set of principles governing the status and development of the Grid Code and related issues as approved by the Regulator.

GC4 GRID CODE PANEL

The GSO shall, with the approval of the Regulator, establish and maintain the "Panel" which shall be a standing body to carry out the functions as follows:

(a) to keep the Grid Code and its working under review;

(b) review all suggestions for amendments to the Grid Code which the GSO, Regulator, Panel member or User may wish to submit to the GSO for consideration by the Panel from time to time;

(c) publish recommendations as to the amendments to the Grid Code that the Panel feels are necessary or desirable and the reasons for these recommendations;

(d) issue guidance in relation to the Grid Code and its implementation, performance and interpretation upon the reasonable request of any User; and

(e) consider what changes are necessary to the Grid Code arising out of any unforeseen circumstances referred to it by the GSO under GC5 or derogations approved under GC6.

The Panel will establish and comply with its own rules.

The GSO shall consult in writing with Users liable to be affected in relation to all proposed amendments to the Grid Code and shall submit all proposed amendments to the Panel for discussion prior to such consideration.

The Panel decisions are not binding on the Regulator, but shall have only the nature of an opinion. Any decision for amendment to the Grid Code must be approved by the Regulator and be published by the GSO in a manner agreed with the Regulator.

The Panel shall consist of:

(a) a Chairman appointed by the Regulator in consultation with the Minister;

(b) a representative from the office of the Regulator;

(c) two persons appointed by the GSO;

(d) a person representing the TNSP;

(e) a person representing the DNSP;

(f) two persons representing Power Producers with CDGUs;

(g) a person representing Interconnected Parties; and

(h) up to four persons appointed by the Minister.

GC5 UNFORESEEN CIRCUMSTANCES

If circumstances not envisaged in the provisions of the Grid Code or divergent interpretations of any provisions included in the Grid Code should arise, the GSO shall, to the extent reasonably practicable in the circumstances, consult promptly with all affected Users in an effort to reach agreement as to what should be done. If agreement cannot be reached in the time available, the GSO shall in good faith determine what is to be done and notify all Users affected.

The GSO shall promptly refer all such unforeseen circumstances and any determination to the Panel for consideration in accordance with GC4.

GC6 PROCEDURE FOR GRID CODE REVIEW PANEL

GC&.1 ALL REVISIONS TO BE REVIEWED

All revisions to the Grid Code must be reviewed by the Panel prior to application to the Regulator by the Chairman.

All proposed revisions from Users, the Regulator or GSO should be brought before the Panel by the Chairman for consideration.

The Chairman will advise the Panel, all Users, and the Regulator 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 provided the Panel may waive or reduce this period of notice of meeting.

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

The Regulator 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, and if he agrees with the proposal

for revision, he shall seek the approval of the Minister before issuing a notification relating thereto.

Having been notified by the Regulator that the revision shall be made, the Chairman shall notify each User, in a manner approved by the Regulator, of the revision at least 1O Business Days prior to the revision taking effect. The revision shall take effect with this Grid Code deemed to be amended accordingly from and including the date specified in such notification or other such date as directed by the Regulator.

"Revision" shall include amendment, modification and variation of the Grid Code.

GC6.2 DEROGATIONS

f a User finds that it is, or will be, unable to comply with any provision of the Grid Code, then it shall, without delay, report such non-compliance to the GSO and the Regulator and shall make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.

The non-compliance may be with reference to Plant and Apparatus:

(a) connected to the Grid System and is caused solely or mainly as a result of a revision to the Grid Code; and

(b) which is connected, approved to connect or for which approval to connect to the Grid 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 Regulator a request for derogation from such provision in accordance to GC6.3 and shall provide the GSO with a copy of such application.

If the GSO 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 the GSO requests for the derogation, the GSO shall submit the information set out in GC6.3 to the Regulator.

GC6.3 A REQUEST 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 Apparatus and/or 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 Regulator shall promptly consider such a request provided that the Regulator consiaers that the grounds for the derogation are reasonable. The Regulator shall grant such derogation unless the derogation would, or is likely to:

(a) have a material adverse impact on the security and/or stability of the Grid System; or

(b) impose unreasonable costs on the operation of the Grid System or on an Interconnected Party's System.

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

To the extent of any derogation granted in accordance with this GC6.3, the GSO and/or the User (as the case may be) hall 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.

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

GC7 HIERARCHY

In the event of any irreconcilable conflict between the provisions of the Grid Code and any contract, agreement, or arrangement between the GSO, GSSP, Single Buyer and a User, the following circumstances shall apply.

(a) If the contract agreement or arrangement exists at the date this Grid Code first comes into force, it shall prevail over this Grid Code for five years from the date upon which this Grid Code is first in effect, unless and to the extent:

- specifically provided for in the Grid Code or in the contract agreement or arrangement or;
- that the User has agreed to comply with the Grid Code.

(b) In all other cases, the provisions of the Grid Code shall prevail unless the Grid Code expressly provides otherwise.

GCB 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.

The GSO shall prepare a proposal to correct the default for consideration by the Panel.

GC9 TIME OF EFFECTIVENESS

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

GC10 GRID 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.

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

Both GSO and all Users shall be entitled to amend in any respect their contact details previously supplied and GSO 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;

(a) if sent by hand, at the time of delivery;

(b) if sent by post, from and to any address within Sarawak, 4 Business Days after posting unless otherwise proven; or

(c) 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 08:00 hours on the following Business Day unless the contrary is shown to be the case

GC11 GRID CODE DISPUTES

GC11.1 GENERAL

If any dispute arises between Users or between the GSO 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 60 calendar days of the giving of a notice under GC10, then:

(a) either party !?hall 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 Sarawak, the most senior executive of each party present in the State of Sarawak;

(b) if either party exercises its right under GC11.1 paragraph 1 (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 30 calendar 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 GC11.1 paragraph 1 (a), either party may refer the matter to the Regulator for determination as the Regulator sees fit. All parties shall be bound by any decision of the Regulator. If it sees fit the Regulator may:

- determine the dispute itself; or
- refer the dispute for determination by arbitration.

GC112 DISPUTES DETERMINED BY THE REGULATOR

Where the Regulator decides to determine the dispute himself, he may direct either party or both parties to pay his costs.

Any party aggrieved with a decision of the Regulator may appeal to a Tribunal constituted by the Minister. The Tribunal shall comprise a maximum of three members and its decision shall be final.

GC11.3 DISPUTES DETERMINED BY ARBITRATION

If the dispute is referred by the Regulator to arbitration, the Regulator shall serve a written notice on the parties to the dispute to that effect and the rules of arbitration of the Regional Centre for Arbitration Kuala Lumpur (RCAKL). The rules for arbitration under the auspices of the centre are the UNCITRAL Arbitration Rules of 1976 with certain modifications and adaptations as set forth in the rules for arbitration of RCAKL.

Any arbitration conducted in accordance with the preceding paragraph shall be conducted in accordance with RCAKL rules, as modified:

(a) in the City of Kuching in Sarawak;

(b) in English;

(c) the law applicable to this Grid Code shall be the Laws of Malaysia; and

(d) by a single arbitrator.

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.

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

GC12 GRID CODE CONFIDENTIALITY

Several parts of the Grid Code specify the extent of confidentiality which applies to data supplied by Users to GSO. Unless otherwise specifically stated in the Grid Code, the GSO shall be at liberty to share all data with Users and the Single Buyer likely to be affected by the matters concerned and with the Regulator.

GC13 INTERIM TRANSITIONAL PROVISIONS

Until such a time the Single Buyer's office is set up, SESCO shall Hase with the Regulator's office in matters relating to the Single Buyer's functions and duties in accordance with this Grid Code.

Planning Code

PC1 INTRODUCTION

The Planning Code (PC) specifies the requirements for the supply of information by Users connected or seeking connection to the Grid System. This is required to enable the TNSP and DNSPs (the "GSSP Network Planners") and the GSO to undertake the planning and development of the Grid System, which also takes due account of the network development plans required to meet future generation requirements. It also specifies the technical and design criteria and procedures to be applied by the GSO, TNSP and DNSPs in the planning and development of the Grid System. These need to be taken into account by Users connected or seeking connection to the Grid System in the planning and development of their own User Networks and Power Stations.

In addition, the PC includes the requirements for the Single Buyer to notify the GSO and GSSP Network Planners of its proposals for future generation capacity through a "Generation Master Plan".

For the purpose of the PC the Users referred to above are defined in PC3.

PC1.1 DEVELOPMENT OF THE GRID SYSTEM

Development of the Grid System, involving its reinforcement or extension, will arise for a number of reasons including, but not limited to:

(a) growth in Demand for electricity on a system wide basis;

(b) the addition of new generating Capacity, modification of existing generating Capacity, or the removal of generation Capacity connected to the Grid System by a User;

(c) a development on a User's Network already connected to the Grid System;

(d) the introduction of a new Connection Point or the modification of an existing Connection Point between a User's Network and the Grid System;

(e) the introduction of a new Custody Transfer Point or the modification of an existing Custody Transfer Point between a User's Network and the Grid System;

(f) the cumulative effect of a number of such developments referred in (a), (b) and (c) by one or more Users including the addition or removal of significant blocks of Demand.

Grid System developments must be planned with sufficient lead-time to allow any necessary consents to be obtained and detailed engineering, design and construction work to be completed. Therefore, the PC and the relevant Connection Agreement impose appropriate time scales on the exchange of information between the User and the appropriate GSSP Network Planner.

PC2 OBJECTIVES

The objectives of the Planning Code are:

- to enable the Grid System to be planned, designed and constructed economically, reliably, safely and having regard to sustainable development and the minimising of environmental impact;

- to provide for the supply of information required from Users, in order for the TNSP and DNSP Network. Planners to plan the development of the Grid System and to facilitate existing and proposed connections;

- to set out requirements for the supply of information in respect of any proposed development on a User's Network which may impact on the performance of the Grid System;

- to formalise the exchange and specify the requirements of planning data between the GSO and the Users which would eventually form the basis of a connection offer and Connection Agreement;

- to provide for the supply of information required by the Single Buyer for the optimisation of future generation capacity planning and procurement of new generation capacity;

- to provide the procedures for application for new connections or modification to existing connections; and

- to provide sufficient information for a User to assess opportunities for connection and to plan and develop the Users' System so as to be compatible with the Grid System.

PC3 SCOPE

The PC applies to the Single Buyer, the GSO, the TNSP and DNSPs and to Users which in the PC means;

(a) Power Producers;

(b) Interconnected Parties; and

(c) Large Consumers.

The above categories of Users will become bound by the PC prior to them generating, supplying or consuming, as the case may be. References to the various categories of User should therefore be taken as referring to them in that prospective role as well as to Users actually connected.

It is the responsibility of each User to keep the appropriate GSSP Network Planner and/or Single Buyer informed of all changes, relating to the information requirements of the Planning Code.

The production of the "Transmission Master Plan", referred to in PC5.1 is the responsibility of the TNSP Network Planner who will coordinate the inputs from DNSPs and Users.

The production of the "Generation Master Plan", referred to in PC5.2, is the responsibility of the Single Buyer. All Users with a Power Station will submit their proposals, including any modifications that impact upon Power Station performance to the Single Buyer in accordance with the Planning Code.

Any information relating to changes to an Interconnector will be notified directly by the Interconnected Party to the GSSP Network Planner. Where transmission Capacity is affected by a proposed change. the GSSP Network Planner will advise the Single Buyer, who will include this in the Generation Master Plan as appropriate.

PC4 GRID SYSTEM PERFORMANCE CHARACTERISTICS

The GSO shall in accordance with Prudent Utility Practice plan, develop, design and operate the Grid System so as to endeavour to maintain the performance targets at the Connection Point as set out in this PC4.

PC4.1 FREQUENCY

The Grid System frequency is nominally maintained at 50Hz. Due to the dynamic nature of the Sarawak Grid System, the frequency can change rapidly under System Stress or fault conditions.

Frequency limits are contained in this section of the Planning Code. This caters for Normal Operating Conditions and for frequency control under System Stress where under System fault conditions, the frequency can deviate outside the Normal Operating Conditions for brief periods. Such conditions are summarised in Table 4.1-1.

Table 4.1: Frequency Excursions

Under Normal Operating Conditions	49.5 Hz to 50.5 Hz
Under System Stress conditions	49.0 Hz to 51.0 Hz
Maximum operating band for frequency excursions under System fault conditions.	48.75 Hz to 51.25 Hz
Under extreme System fault conditions all sets should have disconnected by this frequency unless agreed otherwise in writing with the GSO.	51.5 Hz or above and 47.5 Hz or below

PC4.2 VOLTAGE

PC4.2.1 Steady State Voltage

The Transmission and Distribution Networks are designed under Nonnal Operating Conditions to operate within specific voltage ranges. However, under actual System Stress conditions the voltage range can go outside this range. Such conditions are summarised in Table 4.2-1.

The Grid System steady state voltages of the present GSSP Networks are nominally:

(a) Transmission Networks: 500/400 kV (future voltage level), 275 kV and 132 kV; and

(b) Distribution Networks: 33 kV, 11 kV, 415 V three phase and 240 V single phase.

Table 4.2-1:Voltage Excursions

Under Normal Operating Conditions	± 5% at Transmission Network nominal voltage of 500/400 kV ± 5% at Transmission Network nominal voltages of 275 kV and 132 kV
	± 5% at Distribution Network nominal voltages of 33 kV and 11kV + 5% and - 10% at Distribution Network nominal voltages of 415 kV and 240 V
Under System Stress conditions or following System fault	± 10% at all Grid System voltages, however in the case of Transmission Network, this condition should not occur for more than 30 minutes.

PC4.2.2 Transient Voltage

Due to the effect of travelling waves on the Transmission and/or Distribution Networks as a result atmospheric disturbances or the switching of long transmission lines, transient over-voltage can occur at certain node points of the network concerned. The insulation level of all Apparatus must be coordinated to take account of transient over-voltages and sensitive User equipment, such as computer and other solid state equipment, should be suitably isolated from this effect.

The transient over-voltage during lightning strikes is typically experienced over a voltage range of ± 20% of nominal voltage. Connection Points close to a Network lightning strike will experience voltages higher than this.

Unless otherwise agreed by the GSSP the basic insulation level (Bil) for User Apparatus shall be as follows:

(a) at 275 kV voltage level, the BIL is 850 kV;

(b) at 132 kV voltage level, the BIL is 550 kV;

(c) at 33 kV voltage level, the BIL is 170 kV.

PC4.2.3 Voltage Fluctuations and Flicker

Voltage fluctuations and flicker are normally caused by a User's equipment that distorts or interferes with the normal voltage waveform of the Grid System. Such interference is a product of a relatively large current inrush when Apparatus, such as a large motor. is suddenly switched on or resulting from the sudden increased Demand from for example welding equipment. Such distortions can disturb Users equipment and cause, for instance through flickering lights, Consumer annoyance. The current inrush acting over the Network impedance is the mechanism that produces the voltage dip and the corresponding voltage swell when the Apparatus concerned is offloaded. Hence, the cause of the voltage fluctuation and/or flicker.

Users are required to minimise the occurrence of voltage fluctuations and flicker on the GSSP's Network as measured at the User's Connection Point. The voltage fluctuations and flicker limits are contained in but not limited to the following documents;

(a) IEC 61000-3-3 (2002-03) "Limitation of voltage changes, voltage fluctuations and flicker in public Jaw-voltage supply systems for equipment with rated current <= 16A per phase and not subject to conditional connection";

(b) IEC/TR2 61000-3-5 (1994-12) "Limitation of voltage fluctuations and flicker in low-voltage power supply systems for equipment with rated current > 16A";

(c) IEC/TR3 61000-3-7 (1996-11) "Assessment of emission limits for fluctuating loads in MV and HV power systems";

(d) IEC 61000-3-11 (2000-08) "Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems for equipment with rated current <= 75A and subject to conditional connection";

(e) IEC 61000-4-15 (2003-02) "Flickermeter – functional and design specifications" (formerly IEC868);

(f) BS EN 50160:2000 – Voltage characteristics of electricity supplied by public distribution systems;

(g) EA Engineering Recommendation P.28 (1989) – Planning limits for voltage fluctuations caused by industrial, commercial and domestic equipment in the United Kingdom; and

(h) MS 1533 (2002) – Recommended practices in monitoring electric power quality.

PC4.3 HARMONICS

Harmonics are normally produced by User's Apparatus generating wavefonns that distort the fundamental 50 Hz wave. Such harmonic generation can damage User Apparatus and can result in failure of GSSP Apparatus. The limits for harmonic levels are given in but not limited to the following documents:

(a) IEC 61000-3-2 (2001-10) "Limits for harmonic current emissions for equipment input current <= 1.6A";

(b) IEC 61000-3-4 (1998-10) "Limitation of emission of harmonic curr,nts in low-voltage power supply systems for equipment with rated current greater than 16A";

(c) IEC 61000-3-6 (1996-10) "Assessment of emission limits fcir fluctuating loads in MV and HV power systems"; and

(d) EA Engineering Recommendation G5/4 (2001-02) – Planning levels for harmonic voltage distortion and the connection of non-linear equipment to transmission systems and distribution networks in the United Kingdom.

PC4.4 PROTECTION

PC4.4.1 PROTECTION CRITERIA

Total fault clearance times include relay operation, circuit breaker operation, telecommunications signalling and local breaker back-up (stuck breaker back-up at same site). For the overhead line protection these times are:

(a) for the 500/400 kV lines, 5 cycles (100 ms);

(b) for the 275 kV lines, 6 to 7 cycles (120 to 140 ms); and

(c) for the 132 kV lines, 6 to 7 cycles (120 to 140 ms).

Users will be expected to coordinate their protection times according to the clearance times given in this PC4.4.1. Prospective Users whose proposed protection scheme cannot achieve these times, or whose Power Station cannot continue operations, whilst line faults on the Grid System are cleared, may be required to resubmit their proposals for final approval by the GSSP Network Planner.

PC4.5 PUBLISHED GRID SYSTEM PERFORMANCE

The GSO and GSSP shall submit to the Regulator data relating to the actual Grid System performance on a regional basis. The relevant data to be submitted shall be determined by the Regulator.

The User may request for such Grid System performance data as and when it becomes available.

PC5 ANNUAL PLANNING REQUIREMENTS

PC5.1 TRANSMISSION MASTER PLAN

PC5.1.1 TNSP to Prepare

The TNSP Netwoi"k Planner is required by the Planning Code to produce by encl of December each year a "Transmission Master Plan• to help Users and those intending to assess opportunities for connecting to and use of the Grid System and taking account of new Power Stations approved by the Single Buyer.

The Transmission Master Plan covers each of the 5 succeeding calendar years and it shows the opportunities available for connecting to and using the Transmission Network indicating those parts most suited to new connections and the transport of additional quantities of electricity.

(I) Routine Requirements.

To enable the Transmission Master Plan to be prepared each User is required to submit to its GSSP Network Planner "Standard Planning Data• and "Detailed Planning Data• as listed in Parts 1 and 2 of the Appendix to the PC. For the purpose of PC5.1 the GSSP Network Planner to whom Users should provide data In the first instance is that TNSP Network Planner or DNSP Network Planner responsible for the Network the User's Network is connected to. Where a User has more than one Connection Point then data is required for each Connection Point.

Data should be submitted by Users to the GSSP Network Planner by end of January in the current year, "Year O"for each calendar year and it should cover each of the five succeeding calendar years (and in certain circumstances, Year 0).

Where, from one year to another, there is no change in the data, {or in some of the data) to be submitted, instead of re-submitting the data, a User may send a written statement declaring that has been no change in the data (or in some of the data) from the previous time.

The DNSP Network Planner will then prepare plans, utilising the data provided by Users connected to its Network, showing how they propose to develop their part of the 33 kV Networks in accordance with PCS. These plans will then be submitted to the TNSP Network Planner annually by end of June.

The TNSP Network Planner will notify each User of any material modifications to their submissions that concern that User. This will be in order that agreement is reached with the User over the changes proposed. This could be, for example, to provide additional inter-entity transmission facilities to remove generation constraints.

(II) Non-routine requirements

Planning data submissions must be provided by a User (and any proposed User) when applying for new or modified arrangements for connection to or use of the Grid System. PC5.1.1 (ii) deals with this type of data pursuant to the Grid Code in these cases; and data provided by a User at the time it notifies the GSSP Network Planner of any significant changes to its Network or operating regime. In these submissions, the User must always provide Standard Planning Data. It will only supply Detailed

Planning Data if requested by the GSSP Network Planner. The notification must also include the date and time at which the change is expected to become effective.

In the case of submissions under paragraphs PC5.1.1 (ii), information must refer to the remainder of the current year as well as to the five succeeding years.

PC5.1.2 Transmission Network Planning Criteria

The Network is planned to meet certain planning criteria by the GSSP Network Planner in coordination with the GSO. "Generation Capacity Planning" is undertaken by the Single Buyer in consultation with the GSO, GSSP Network Planner and Users and in accordance with the generation planning criteria determined by the Single Buyer in accordance with PC5.2.2.

The TNSP Network Planner shall publish the relevant Transmission Network planning criteria applied in the Transmission Master Plan. Minimally, the (N-1) primary criterion shall be applied to cater for the loss of the largest loaded circuit or Interconnector.

PC5.2 GENERATION MASTER PLAN

PC5.2.1 Single Buyer to Prepare

The Single Buyer will prepare and publish in accordance with the requirements of this Planning Code, a Generation Master Plan, being primarily a generation Capacity plan, by end of December annually showing in respect of the 5 succeeding calendar years:

(a) the projection of the seasonal maximum and minimum Demand for electricity in Sarawak and the corresponding Energy requirements for each year across the study period ;

(b) the amount and nature of generation Capacity currently available to meet that Demand and any anticipated restrictions in the production of Energy, the amount and nature of generation that it expects will be out of service for more than one year (identifying whether such capacity will be temporarily or permanently out of service) and generation under construction;

(c) the amount and nature of Demand that can be met across Interconnectors with power systems external to Sarawak;

(d) the amount and nature of generation Capacity it expects will be required to ensure that generating security standards are achieved; and

(e) general details of its current plans for securing that additional Capacity.

PC5.2.2 Generation Capacity Planning Criteria

The Single Buyer shall be responsible for determining the generation capacity· planning cterion to be used for the "Primary Criterion". This should be based on a model utilising loss of load probability, where the Single Buyer determines the acceptable loss of load probability value (LOLP). The generation capacity planning

study based on the primary criterion shall then be judged against the secondary criterion which shall be the loss of the single largest Generating Unit connected to the Grid System or the loss of the largest Interconnector. Whichever criterion then prevail$ in terms of the required new Capacity shall be the one used for that period.

Currently the LOLP value is one day per year representing an expected energy not served (EENS) value of 0.1%. Any changes to this shall be published in the Generation Master Plan.

However, the Single Buyer and/or Power Producers should avoid the use of Generating Units that are too large for the Grid System, in the planning period under review, such that the provision of excessive Spinning Reserve is required to provide for the loss of that Generating Unit. Where excessive Spinning Reserve has to be provided by the GSO to cater for the loss of an overly large CDGU, then such additional costs will be considered by the GSO as marginal costs associated with the operation of that CDGU for the purpose of determining least cost Dispatch in accordance with SOC 1.

PCS.2.3 Power Producers to provide details to the GSSP Network Planner

Power Producers requiring a new Connection Point and/or CTP or modifications to an existing Connection Point and/or CTP will also provide the data required under this PC to the TNSP Network Planner and/or DNSP Network Planner by the end of January each year in connection with the Generation Master Plan. The TNSP Network Planner and/or DNSP Network Planner will then incorporate the proposed Network connections for these Power Stations in the submission to the Single Buyer, under PC5.2 who will prepare a submission, in accordance with PC5.2, relating to existing and proposed Power Stations connected to the Grid System. This submission will also include full details of the Power Station Capacity, expected year of commissioning and fuel type. Additional data will be supplied by the TNSP Network Planner or DNSP Network Planner on request of the Single Buyer.

PC6 PLANNING DATA

PC6.1 DATA TO BE PROVIDED

The PC requires two types of data to be provided:

(a) Standard Planning Data; and

(b) Detailed Planning Data.

Listings of Standard Planning Data, required in every case, and Detailed Planning Data, required in certain cases. are set out in Parts 1 and 2 of Appendix A of the PC.

PC6.2 STATUS OF PLANNING DATA

(I) General

The PC allocates planning data to one of three different status levels. These reflect a progression in degrees of confidentiality, commitment and validation. They are;

(a) Preliminary Project Data;

(b) Committed Project Data; and

(c) Contracted Project Data.

(II) Preliminary Project Data

Data supplied by a User inconjunction with an application for connection to or use of the Grid System shall be considered "Preliminary Project Data• until a binding Connection Agreement and or Use of System Agreement is established between the TNSP and/or DNSP Network Planner and the User. The TNSP Network Planner and/or DNSP Network Planner and/or the Single Buyer shall not disclose this data to another User unless and until it becomes "Committed Project Data" or "Contracted Project Data" whereupon the following disclosure provisions of this PC6.2 will apply.

Preliminary Project Data will normally contain only Standard Planning Data, unless Detailed Planning Data is specifically requested by the TNSP and/or DNSP Network Planner and/or Single Buyer to permit more detailed Grid System studies.

(Iii) Committed Project Data

When the offer for a Connection Agre,ement and or Use of System Agreement is accepted, the data relating to the User's development already submitted as Preliminary Project Data and subsequent data required by the TNSP Network Planner and or DNSP Network Planner under this PC, will become Committed Project Data once it has been approved by the TNSP and/or DNSPs as the case may be.

Committed Project Data, together yvith other data held by the TNSP Network Planner and/or DNSP Network Planner rerating to the Grid System will form the background against which new applications from Users will· be considered and against which planning of the Grid System shall be undertaken. Accordingly, Committed Project Data will be treated as confidential except to the extent that the TNSP Network Planner, DNSP Network Planner or Slngle Buyer is obliged to disclose it:

(a) in the preparation of a Transmission Master Plan or a Generation Master Plan and in any further information required to provide with these master plans;

(b) when considering and or advising on applications (or possible applications). In such cases, the TNSP and/or ONSP Network Planner may disclose Committed Project Data both orally and in writing to other Users making an application (or considering a possible application);

(c) for operational planning purposes;

(d) by the Single Buyer to an Interconnected Party where it is necessary for that Interconnected Party to carry out work on their Network in connection with the User's application; or

(e) under the terms of an Interconnection Agreement or Custody Transfer Agreement between the Single Buyer and a party external to Sarawak, to provide information on the power systems that are interconnected.

Committed Project Planning Data may contain both Standard Planning Data and Detailed Planning Data.

(Iv) Contracted Project Data

The Connection Conditions require that, before an agreed connection to the Grid System may be physically established, any estimated values contained within the Contracted Project Data shall be replaced, where applicable, by validated actual values and as appropriate by updated forecasts for future data items including Demand. That data provided at this stage is termed "Contracted Project Data", since this will form the basis of the eventual contractual agreement between the parties.

Contracted Project Data, together with other data held by the TNSP Network Planner and/or DNSP Network Planner relating to the Grid System will form the background against which new connection applications from Users will be considered and against which planning of the Grid System shall be undertaken. Accordingly, Contracted Project Data will not be treated as confidential to the extent that the TNSP Network Planner, DNSP Network Planner or Single Buyer is obliged to disclose it under the following circumstances:

(a) in the preparation of the Transmission or Generation Master Plans and in any further information required to provide with the Master Plans;

(b) when considering and/or advising on applications (or possible applications). In such cases. the GSSP Network Planner may disclose Contracted Project Data both orally and in writing to other Users making an application (or considering a possible application);

(c) for operational planning purposes;

(d) by the Single Buyer to an Interconnected Party where it is necessary for that Interconnected Party to carry out work on their Network in connection with the User's application; or

(e) under the terms of an Interconnection Agreement or Custody Transfer Agreement between the Single Buyer and a party external to Sarawak, to provide information on the power systems that are interconnected.

Contracted Project Planning Data may contain both Standard Planning Data and Detailed Planning Data.

PC6.3 CONFIDENTIALITY OF PLANNING DATA

All Users shall identify such data that are submitted pursuant to the PC that are required to be maintained as confidential apart from those data already identified in PC6.2 and submit these to the GSSP. Such data that are classified as confidential

may be shared with the GSO, Single Buyer or Regulator and be marked as confidential.

Where a potential or existing User wishes to have details of an existing Connection Point from the GSO or GSSP to which it can demonstrate a genuine "Need to Know" then such details shall be submitted to the User on request. Where the GSO or GSSP believes that such inquiry to be not genuine but rather mischievous, it can refuse to give such information until a User, including a potential User can demonstrate bona fide rights or requirements to have the information.

PC7 PLANNING CRITERIA

The TNSP Network Planner will apply the relevant technical and Grid Code standards in the planning and development of the Transmission Network and these shall be taken into account by Users in the planning and development of their own Power Station and/or User Network. Such planning criteria for the Transmission Network shall be published in the Transmission Master Plan.

The Single Buyer, TNSP Network Planner and the Interconnected Party will apply the relevant technical, national, international and Grid Code standards in the planning and development of the Generation Master Plan in accordance with PC5.2.2 and these shall be taken into account by Users in the planning and development of their own Power Stations. Such planning criteria shall be published in the Generation Master Plan.

PLANNING CODE - APPENDIX A

PLANNING DATA REQUIREMENTS

PART 1

PC A1 STANDARD PLANNING DATA

PC A1.1 CONNECTION POINT AND USER NETWORK DATA

PC A1.1.1 General

All Users shall provide the GSSP Network Planner with details specified in PC A 1.1 and PC A 1.2 relating to their User Network.

(I) User Network Layout

all supply single line diagrams showing the existing and proposed arrangements of the main co ctions nd primary systems showing equipment ratings and where available numbering and nomenclature.

(II) Short Circuit Infeed

User shall supply the following information;

(a) the maximum 3-phase short circuit current injected into the Transmission Network; and

(b) the minimum zero sequence impedance of the User Network at the point of connection with the Grid System.

PC A1.2 DEMAND DATA

PC A1.2.1 General

All Users with Demand in excess of 1 *r.fN* shall provide the GSSP Network Planner with Demand, both current and forecast, as specified in this PC A 1.2 provided that all forecasted maximum Demand levels submitted to the GSSP Network Planner by Users shall be on the basis of corrected Average Hot Spell (AHS) Conditions.

In order that the GSSP Network Planner is able to estimate the diversified total Demand at various times throughout the year, each User shall provide such additional forecasts Demand data as the GSSP Network Planner may reasonably request.

PC A1.2.2 Demand (Active And Reactive) Data Requirements

Users shall provide forecast peak day Demand profile (MW and power factor) and monthly peak Demand variations by time marked hourly throughout the peak day, net of the output profile of all Generating Units directly connected to a User's Network and not subject to

Central Dispatch. In addition Users shall advise of any sensitivity of User Demand to any voltage and frequency variations on the Grid System;

The maximum harmonic content which the User would expect its Demand to impose on the Grid System; and the average and maximum phase unbalance which the User would expect its Demand to impose on the Grid System, shall also be supplied.

PC A1.2.3 FLUCTUATING LOADS (> 1MVA)

The following details are required by the GSSP Network Planner responsible for the Network to which the User is connected, or proposes to connect, concerning any fluctuating Loads in excess of 1 MVA:

(a) details of the cyclic variation of Demand (Active and Reactive Power).

(b) The rates of change of Demand (Active and Reactive Power) both increasing and decreasing;

(c) The shortest repetitive time interval between fluctuations in Demand (Active and Reactive Power);

(d) The magnitude of the largest step changes in Demand (Active and Reactive Power) both increasing and decreasing;

(e) Maximum Energy demanded per hour by the fluctuating Demand cycle; and

(f) Steady state residual Demand (Active Power) occurring between Demand fluctuations.

PC A1.2.4 User's Abnormal Loads

Details should be provided on any individual loads which have characteristics differing from the typical range of loads in domestic, commercial or industrial fields. In particular, details on arc furnaces, rolling mills, traction installations etc that are liable to cause flicker problems to other Consumers.

PC A1.3 GENERATING UNIT AND POWER STATION DATA

PC A1.3.1 GENERAL

All Generating Unit and Power Station data submitted to the GSSP Network Planner shall be in a form approved by the GSSP Network Planner. Where the User has undertaken modelling of the Grid System then the GSSP Network Planner should be advised of this and the results of the modelling including an electronic copy of the modelling data made available to the GSSP Network Planner. For the avoidance of doubt the User is not required under the PC to provide the modelling software to the GSSP Network Planner, unless it so chooses.

PC A1.3.2 Power Station Data Requirements

The data required relates to each point of connection to the Grid System, and shall include;

(a) the Capacity of Power Station in MW sent out for Peak Capacity, Economic Capacity and Minimum Generation; and

(b) maximum auxiliary Demand (Active and Reactive Power) made by the Power Station at start up and normal operation; and

(c) the operating regime of Generating Units not subject to Central Dispatch.

Where a Generating Unit connects to the User's Network, the output from this Generating Unit is to be taken into account by the User in its Demand profile submission to the GSSP Network Planner, except where such Generating Unit is subject to Central Dispatch. In the case where Generating Unit are not subject to Central Dispatch, the User must inform the GSSP Network Planner of the number of Generating Units together with their total Capacity. On receipt of such data, the User may be further required, at the GSSP Network Planner's discretion, to provide details of the Generating Unit together with their energy output profile.

PC A1.3.3 Generating Unit Data Requirements

The following parameters are required for each Generating Unit (which includes for the avoidance of doubt unconventional Generating Units);

(a) Prime mover type;

(b) Generating Unit type;

(c) Generating Unit rating and nominal voltage (MVA @ power factor & kV);

(d) Generating Unit rated power factor;

(e) Economic Capacity sent out (MW);

(f) Maximum Continuous Rating generation (MCR) and Minimum Generation capability sent out (MW);

(g) Reactive Power capability (both leading and lagging) at the lower voltage terminals of the generator transformers for MCR generation, Economic Capacity and minimum loading;

(h) Maximum auxiliary Demand in MW and Mvar;

(i) Inertia constant (MW sec/MVA);

(j) Short circuit ratio;

(k) Direct axis transient reactance;

(l) Direct axis sub-transient time constant;

(m) Generator transformer rated MVA, positive sequence reactance and tap change rate;

(n) Generating Unit capability chart (example given in OC3 Appendix A).

PART 2

PC A2 DETAILED PLANNING DATA

PC A2.1 CONNECTION POINT AND USER NETWORK DATA

PC A2.1.1 General

All Users shall provide the appropriate GSSP Network Planner with the details as specified in PC A2.1.

PC A2.1.2 User Network Lay-out

Single line diagrams of existing and proposed arrangements of Grid System connection and primary User Networks including:

(a) Busbar layouts;

(b) Electrical circuitry (such as lines, cables, transformers, switch gear etc);

(c) Phasing arrangements;

(d) Earthing arrangements;

(e) Switching facilities and interlocking arrangements;

(f) Operating voltages; and

(g) Numbering and nomenclature.

PC A2.1.3 Reactive Compensation Equipment

For all independently switched reactive compensation equipment on the User's Network at HV and above, other than power factor correction equipment associated directly with the User's Plant and Apparatus, the following information is required:

(a) Type of equipment (for example, fixed or variable);

(b) Capacitive and or inductive rating or its operating range in Mvar;

(c) Details of automatic control logic, to enable operating characteristics to be determined by the GSSP Network Planner; and

(d) The point of connection to the User's Network in terms of electrical location and voltage.

PC A2.1.4 Short Circuit Infeed into the Transmission Network

Each User is required to provide the total short circuit infeeds, calculated in accordance with good industry practice, into the TNSP Transmission Network from its User's System at the Transmission Connection Point as follows:

(a) the maximum 3-phase short-circuit infeed including infeeds from any Generating Unit connected to the User's System;

(b) the additional maximum 3-phase short circuit infeed from any induction motors connected to the User's Network; and

(c) The minimum zero sequence impedance of the User's System.

PC A2.1.5 Lumped System Susceptance

Details of equivalent lumped network susceptance of the User's System at normal frequency at the transmission Connection Point. This should included any shunt reactors which are an integrated part of the cable network and which are not normally in or out of service independent of the cable. This should not include:

(a) independent reactive compensation plant on the User's System; or

(b) any susceptance of the User's System inherent in the Active and Reactive Power Demand data given under sub-section PC A2.2.

PC A2.1.6 Interconnector Impedance

For User interconnections that operate in parallel with the Grid System equivalent signal impedance (resistance, reactance and shunt susceptance) of the parallel User system. If the impedance is, in the reasonable opinion of the TSP Network Planner low, then more detailed information on the equivalent or active part of the parallel User System may be requested.

PC A2.1.7 Demand Transfer Capability

Where the same Demand may be supplied from alternative Grid System points of supply, the proportion of Demand normally fed from each Grid System point and the arrangements (manual and automatic) for transfer under planned or fault outage conditions shall be provided. Where the same Demand can be supplied from different Users, then this information should be provided by all parties.

PC A2.1.8 System Data

Each User with an existing or proposed User Network connected at High Voltage shall provide the following details relating to that High Voltage Network:

(a) Circuit parameters for all circuits:

(b) Rated Voltage (kV)

(c) Operating voltage (kV)

(d) Positive phase sequence reactance

(e) Positive phase sequence resistance

(f) Positive phase sequence susceptance

(g) Zero phase sequence reactance

(h) Zero phase sequence resistance

(i) Zero phase sequence susceptance

0) Inter-bus transformers between the User's High Voltage Network and the User's main Network;

(k) Rated MVA

(l) Voltage ratio

(m) Winding arrangements

(n) Positive sequence reactance (max, min and nominal tap)

(o) Positive sequence resistance (max. min and nominal tap)

(p) Zero sequence reactance

(q) Tap changer range

(r) Tap change step size

(s) Tap changer type: on Load or off circuit

(t) Switchgear including circuit breakers, and disconnecters on all circuits connected to the Connection Point including those at Power Stations:

(u) Rated voltage (kV);

(v) Operating voltage (kV);

(w) Rated short-circuit breaking current, 3-phase (kA);

(x) Rated short-circuit breaking current, 1-phase (kA);

(y) Rated load-breaking current, 3-phase (kA);

(z) Rated load-breaking current, 1-phase (kA);

(aa) Rated short-circuit making current. 3-phase (kA); and

(bb) Rated short-circuit making current, 1-phase (kA).

PC A2..19 Protection Data

The information essential to the TNSP and/or DNSP Network Planner relates only to protection that can trip, intertrip or close any Connection Point circuit breaker or any Grid System circuit breaker. The following information is required:

(a) a full description, including estimated settings. for all relays and protection systems installed or to be installed on the User's Network;

(b) a full description of any auto-reclosing facilities installed or to be installed on the User's Network, including type and time delays;

(c) a full description, including estimated settings, for all relays and protection systems installed or to be installed on the Generating Unit, generating unit transformer, station transformers and their associated connections;

(d) for Generating Units having (or intending to have) a circuit breaker on the circuit leading to the generator terminals, at the same voltage, clearance times for electrical faults within the Generating Unit zone; and

(e) The most probable fault clearance time for electrical faults on the User's Network.

PC A2.1.10 Earthing Arrangements

Full details of the system earthing on the User's Network, including impedance values.

PC A2.1.11 Transient Overvoltage Assessment Data

When undertaking insulation coordination studies, the TNSP and/or DNSP Network Planner will need to conduct overvoltage assessments. When requested by the appropriate Network Planner each User is required to submit estimates of the surge impedance parameters present and forecast of its User Network with respect to the Connection Point and to give details of the calculations carried out The GSSP Network Planner may further request information on physical dimensions of electrical equipment and details of the specification of Apparatus directly connected to the Connection Point and its means of protection.

PC A2.2 DEMAND DATA

PC A2.2.1 General

All Users with demand shall provide the GSSP Network Planner with the Demand both current and forecast specified in this PC A2.2.

All forecast maximum Demand levels submitted to the GSSP Network Planner by Users shall be on the basis of average climatic conditions; and

So that the GSSP Network Planner is able to estimate the diversified total Demand at various times throughout the year . each User shall provide such additional forecast Demand data as the GSSP Network Planner may reasonable request.

PC A2 2.2 User's System Demand (Active and Reactive Power)

Forecast daily Demand profiles net of the output profile of all Generating Units directly connected to the User's Network, but not subject to Central Dispatch, by hours throughout the day as follows;

(a) peak Demand day on the User's System;

(b) day of peak Grid System Demand (Active Power); and

(c) day of minimum Grid System Demand (Active Power).

PC A2.2.3 User Consumer Demand Management Data

The potential reduction in Demand available from the User in MW and Mvar, the notice required to put such reduction into effect, the maximum acceptable duration of the reduction in hours and the permissible number of reductions per annum.

PC A2.3 GENERATING UNIT AND POWER STATION DATA

PC A2.3.1 General

All Power Producers with Power Stations which have a site rating Capacity of 5 MW and above shall provide the TNSP and/or DNSP Network Planner with details as specified in this PC A2.3.

PC A2.3.2 Auxiliary Demand

The normal unit-supplied auxiliary Demand is required for each Generating Unit at rated output Wo/; and the Power Station auxiliary Demand, if any, additional to the Generating Unit Demand, where the Power Station auxiliary Demand is supplied from the Grid System, is required for each Power Station.

PC A2.3.3 Generating Unit Parameters

The following parameters are requiring for each Generating Unit;

(a) Rated terminal voltage (kV);

(b) Rated MVA;

(c) Rated MW;

(d) Minimum Stable Generation (Wo/);

(e) Short circuit ratio;

(f) Direct axis synchronous reactance;

(g) Direct axis transient reactance;

(h) Direct axis sub-transient reactance;

(i) Direct axis transient time constant;

(j) Direct axis sub-transient time constant;

(k) Quadratrure axis synchronous reactance;

(l) Quadratrure axis transient reactance;

(m) Quadratrure axis sub-transient reactance;

(n) Quadratrure axis transient time constant;

(o) Quadratrure axis sub-transient time constant;

(p) Stator time constant;

(q) Stator resistance;

(r) Stator leakage reactance;

(s) Turbo generator inertial constant (MNsec/MVA);

(t) Rated field current; and

(u) Field current (amps) open circuit saturation curve for voltages at the generator terminals ranged from 50% to 120% of rated value in 10% steps as derived from appropriate manufacturer's test certificates.

PC A23.4 Parameters for Generator Unit Transformers

The following parameters are required for the generator unit transformer, or for the interbus transformer, where Generating Units connect to the Grid System through a transformer:

(a) Rated t.WA with natural cooling and forced cooling;

(b) Voltage ratio;

(c) Positive sequence reactance (at max, min & nominal tap);

(d) Positive sequence resistance (at max, min& nominal tap);

(e) Zero phase sequence reactance;

(f) Tap changer range;

(g) Tap changer step size; and

(h) Tap changer type: on load or off circuit.

PC A2.3.5 Power Station Transformer Parameters

The following parameters are required for the Power Station interbus transformer where a User interbus transformer Is used to connect the Power SUtlon to the Grid System:

(a) Rated MVA with natural cooling and forced cooling;

(b) Voltage ratio; and

(c) Zero sequence reactance as seen from the higher voltage side.

PC A2.3.8 Excitation Control System Parameters

(a) DC gain of excitation loop;

(b) Rated field voltage;

(c) Minimum field voltage;

(d) Maximum field voltage;

(e) Maximum rate of change of field voltage (rising);

(f) Minimum rate of change of field voltage (falling);

(g) Details of excitation loop described in block diagram form showing transfer functions of individual terms;

(h) Dynamic characteristics of over-excitation limiter; and

(i) Dynamic characteristics of under-excitation limiter.

PC A2.3.7 Governor Parameters (for Reheat Steam Generating Unit)

The following parameters are required for a reheat steam Generating Unit:

(a) HP governor average gain MW/Hz;

(b) Speeder motor setting rate;

(c) HP governor valve time constant;

(d) HP governor valve opening limits;

(e) HP governor valve rate limits;

(f) Reheater time constant (Active energy stored in reheater);

(g) IP governor average gain MW/Hz;

(h) IP governor setting range;

(i) IP governor valve time constant;

(j) IP governor valve opening limits;

(k) IP governor valve rate limits;

(l) Details of acceleration sensitive elements in HP & IP governor loop; and

(m) A governor block diagram showing transfer functions of individual elements.

PC A2.3.8 Governor Parameters (for non-Reheat Steam Generating Units and Gas Turbine Generating Units) including Generating Uni > within CCGT Blocks.

The following parameters are required for a heat recovery steam powered Generating Unit (without re-heat) and/or a gas turbine powered Generating Unit:

(a) Governor average gain;

(b) Speeder motor setting range;

(c) Time constant of steam or fuel governor valve;

(d) Governor valve opening limits;

(e) Governor valve rate limits;

(f) Time constant of turbine; and

(g) Governor block diagram.

PC A2.3.9 Governor and Associated Prime Mover Parameters - Hydro Generating Units

(a) Guide Vane Actuator Time Constant (in seconds);

(b) Guide Vane Opening Limits (%);

(c) Guide Vane Opening Rate Limits (%/second);

(d) Guide Vane Closing Rate Limits ((%/second); and

(e) Water Time Constant (in seconds).

PC A2.3.10 Plant Flexlbllity Performance

The following parameters are required for Generating Unit flexibility;

(a) Rate of Loading following weekend shutdown (Generating Unit and Power Station);

(b) Rate of Loading following an overnight shutdown (Generating Unit and Power Station);

(c) Block Load following Synchronising;

(d) Rate of de-Loading from normal rated Mi/I/;

(e) Regulating range; and

(f) Load rejection capability while still Synchronised and able to supply Load.

PC A2.4 ADDITIONAL DATA

PC A2.4.1 General

Notwithstanding the Standard Planning Data and Detailed Planning Data set out in this Appendix, the TNSP Network Planner and/or DNSP Network Planner may require additional data from Users. This will be to represent correctly the performance of Plant and Apparatus on the Grid System where the present data submissions would, in the TNSP Network Planner's or DNSP Network Planner's reasonable opinion, prove insufficient for the purpose of producing meaningful system studies for the relevant parties.

As the GSO is responsible for the overall coordination of the Grid System, then any data required by it will be requested through the relevant Network Planner. In addition, if the Single Buyer requires additional data then it will request such data through the GSO who will request data from a Network Planner if required to enable the GSO to answer the Single Buyer.

CONNECTION CONDITIONS

CC1 INTRODUCTION

The Connection Conditions (CC) specify the minimum technical, design and certain operational criteria which must be complied with by the Users connected to, or seeking connection to the Grid System. They also set out the procedures by which the Transmission Network Service Provider (TNSP) or Distribution Network Service Providers (DNSPs) (in total the GSSP) will seek to ensure compliance with these criteria as a requirement for the granting of approval for the connection of a User to the Grid System.

The procedures by which the GSSP and Users may commence discussions on a Connection Agreement are reflected in the Planning Code section of this Grid Code. Each Connection Agreement shall require Users to comply with the terms of the Grid Code and the GSSP will not grant approval to connect the User Network to the Transmission or Distribution Networks until it is satisfied that the criteria laid down by this CC have been met.

The provisions of the CC shall apply to all connections to the Transmission or Distribution Networks;

(a) existing at the date when this Grid Code comes into effect;

(b) existing at the date of commencement of the GSSP's approval, where these dates precede the date in (a) above; and

(c) as established or modified thereafter.

CC2 OBJECTIVES

The Connection Conditions are designed to ensure that:

(a) no new or modified connection will impose unacceptable effects upon the Grid System or the total System or on any User Network nor will it be subject itself to unacceptable effects by its connection to the Grid System; and

(b) the basic rules for connection treat all Users of an equivalent category in a non-discriminatory fashion.

CC3 SCOPE

The CC apply to the TNSP, DNSPs (together the GSSP) and to Users which in this Connection Conditions means;

(a) Power Producers; and

(b) Consumers requiring connection to an HV Network and

(c) Large Consumers.

Parties whose prospective activities would place them in any of the above categories of User will, either pursuant to a Licence or as a result of an application for supply, become bound by this CC prior to their providing Ancillary Services and/or producing or consuming Energy.

CC4 CONNECTION PRINCIPLES

The design of connections between the Grid Network and User Networks shall be in accordance with the technical standards determined by the GSSP in accordance with the Planning Code (PC). Metering installations shall be designed in accordance with the Metering Code.

The "GSSP Network Planner" will, after consultation with the User, determine the voltage at which the User will connect to the GSSP's Network concerned and will, in consultation with the User, decide the point of connection to the appropriate Network.

CC4.1 EXCHANGE OF INFORMATION CONCERNING THE CONNECTION POINT

There shall be an exchange of information concerning the Connection Point in terms of operational responsibilities and safety coordination in accordance with the Grid Code. These shall include but not be limited to the requirements of OCS, OC8 and OC11.

CC4.1.1 Site Responsibillty Schedule

A schedule shall be agreed between the GSSP and the User concerning division of responsibilities at the site pertaining to, amongst other things, ownership, control, safety, operation and access. The "Site Responsibility Schedule" and an Operational Diagram will be agreed by the "GSSP Network Manager" and User.

These will indicate the operational boundaries and asset ownership boundaries, between the GSSP and other Users at the Connection Point (including a proposed Connection Point). This shall include a geographic site plan and operational schematic indicating ownership boundaries that will be clearly displayed at each part of the site, once mutual agreement has been reached. Such agreement, not being unreasonably withheld by either party, shall be necessary before commissioning can commence on the site.

CC4.2 CONFIDENTIALITY OF CONNECTION DATA

All Users shall identify such data that are submitted pursuant to the CC that are required to be maintained as confidential and submit these to the GSSP. Such data

that are classified as confidential may be shared with the GSO, Single Buyer or Regulator and be marked as confidential.

Where a potential or existing User wishes to have details of an existing Connection Point from the GSO or GSSP to which it can demonstrate a genuine "Need to Know" then such details shall be submitted to the User on request. Where the GSO or GSSP believes that such inquiry to be not genuine but rather mischievous, it can refuse to give such information until a User, including a potential User can demonstrate a genuine "Need to Know".

CC5 CONNECTION REQUIREMENTS

CC5.1 SUPPLY STANDARDS

The frequency, voltage and harmonic design criteria of the Grid System are designed to comply with international requirements. The Grid System in Sarawak is a nominal 50 Hz system.

The Grid System frequency shall be maintained between 50.5 Hz and 49.5 Hz unless there are exceptional circumstances. This is detailed more fully in the Planning Code.

CC5.1.1 Power Factor

Each User is required to ensure that its installation has satisfactory power factor correction to ensure that, as measured at the Connection Point, the power factor meets the GSO's current requirements for that part of the System. Unless reasonably required otherwise by the GSO, each User should use reasonable endeavours to maintain its average power factor between unity and 0.90 lagging.

CC5.12 Harmonic Content

The maximum total level of harmonic on the existing and any future System from all sources under both scheduled outage and fault outage conditions must not exceed:

(a) at 500/400 kV, a total harmonic distortion of 1.5% with no individual harmonic greater than 1%;

(b) at 275 kV, a total harmonic distortion of 2% with no individual harmonic greater than 1.5%; and

(c) at 132 kV, a total harmonic distortion of 2% with no individual harmonic greater than 1.5%.

CC5.13 TECHNICAL CRITERIA FOR PLANT AND APPARATUS.

At the Connection Point all User's Plant and Apparatus shall meet acceptable technical design and operational criteria. Detailed information relating to a particular connection will be made available by the GSSP's Network Manager on request by the User. Such information will include, but not be limited to, the following;

(a) load flow studies;

(b) short circuit studies;

(c) System stability analysis;

(d) annual/monthly load curves;

(e) line forced outage rates, for the Network associated with the proposed Connection Point or Custody Transfer Point; and

(f) telecommunications network associated with the proposed Connection Point or Custody Transfer Point.

CC5.1.4 Plant and Apparatus

Plant and Apparatus proposed for connection to the Grid System is required to meet certain minimum technical standards. Additionally new Plant and Apparatus to be connected to the Grtd System, must conform to relevant technical standards as detailed below, in the following order of preference;

(a) relevant Malaysian national standards (MS);

(b) relevant international and pan-Europe technical standards, such as IEC, ISO and EN;

(c) other relevant national standards such as BSS, DIN and ASA.

The User shall ensure that the specification of Plant and Apparatus at the Connection Point or CTP shall be such to permit operation within the applicable safety procedures agreed between the User and GSSP.

CC5.2 TECHNICAL REQUIREMENTS FOR PARALLEL OPERATION OF CONSUMER'S GENERATING UNITS

CC5.2.1 General

The technical requirements for parallel operation of Consumer's Generating Units not subject to Dispatch by the GSO shall be as follows:

(a) Each Generating Unit must be capable of continuously supplying its output within the System frequency range given in the Planning Code.

(b) The output voltage limits of Generating Units must not cause excessive voltage excursions in excess of ± 5% of nominal. Voltage regulating equipment shall be installed by the User to maintain the output voltage level of its Generating Units to within limits.

(c) The speed governor of each Generating Unit must be capable of operating to the standards approved by the GSO, such approval not to be unreasonably withheld.

(d) The isolation and earthing requirements shall be in accordance with the GSSP's current guideline documents.

CC5.2.2 Synchronous Generators

Consumers utilising synchronous generators shall be required to generate Reactive Power so that they do not impose any additional Reactive Power requirements upon the Grid System. Sufficient generator Reactive Power capability shall be provided to withstand normal voltage changes on the Grid System. The Consumer shall not be permitted to deliver excess Reactive Power to the Grid System unless otherwise agreed with the GSO to control the voltage at the Connection Point and/or as contracted through an Ancillary Services agreement.

CC5.2.3 Induction Generators

If the Consumer utilises induction type generators, the Consumer shall provide the necessary power factor correction such that it shall operate within acceptable power factor limits. The GSO shall have the right to review the Consumer's power factor correction plan and to require modifications or additions as needed if in the GSO's reasonable opinion, it is required to maintain the Grid System's voltage within the limits specified in the Planning Code.

CC5.3 TECHNICAL CRITERIA COMMUNICATION EQUIPMENT

The technical criteria concerning voice and data communication equipment for Power Stations is contained in the GSSP's guidelines document, which is available on request.

CC5.4 PROTECTION CRITERIA

In order that the GSO and the appropriate GSSP Network Manager can coordinate the operation of the Grid System protection, it will be necessary for prospective Users to submit their protection scheme proposals to the GSSP Network Manager.

Users should request existing protection details from the relevant GSSP Network Manager, concerning the proposed Connection Point or CTP. The scheme proposed by the User should take account of any planned upgrades to the GSSP's Network protection as notified by the Network Manager. Such schemes could also include Interconnectors with Sabah and other utilities, which the GSSP will advise of.

Fault clearance times at the Connection Point and the method of system earthing including, where relevant, the recommended generator neutral earthing configuration, will also be provided by the GSSP Network Manager on request.

Users will be expected to coordinate their protection times according to the clearance times given in PC4.4.1.

CC6 PROCEDURES FOR APPLICATIONS FOR CONNECTION TO AND USE OF THE GRID SYSTEM

CC6.1.1 Application Procedure for New Connection and Use of the Grid System

Any person or User seeking to establish new or modified arrangements for connection and or use of the Grid System must make an application on the standard application form available from the TNSP Network Planner or DNSP Network Planner on request. The application should include:

(a) a description of the User Network to be connected to the Grid System or of the modifications to User Network already connected to the Grid System. Both cases are termed "Development" in this CC;

(b) the relevant Standard Planning Data as listed in Part 1 of Appendix A of the Planning Code; and

(c) the desired completion date of the proposed Development.

CC6.1.2 Offer of Terms of Connection

The GSSP Network Planner will, in accordance with the Grid Code and having obtained the consent of the Single Buyer, where such an offer involves a Power Producer, offer terms upon which it is prepared to enter into an agreement with the applicant for the establishment of the proposed new or modified connection to and/or use of the Grid System.

The offer shall specify, and the terms shall take account of, any works required for the extension or reinforcement of the Grid System necessitated by the applicant's proposed activities.

The offer must be accepted by the applicant User within the period stated in the offer, otherwise the offer automatically lapses.

Acceptance of the offer renders the GSSP Network Planner's works related to that User Development committed and binds both parties to the terms of the offer.

Within 28 calendar days (or such longer period as the GSSP Network Planner may agree in any particular case) of acceptance of the offer, the User shall supply the Detailed Planning Data pertaining to the Development as listed in Part 2 of Appendix A of the Planning Code. Any significant changes to this information, compared with the preliminary data agreed by the GSSP Network Planner will need to be agreed by the appropriate GSSP Network Planner. The GSSP Network Planner will be responsible under these circumstances for accepting the Users results and will notify the Single Buyer of any changes in the Users data where appropriate.

CC6.2 COMPLEX TRANSMISSION NETWORK CONNECTIONS

The magnitude and complexity of any Transmission Network extension or reinforcement will vary according to the nature, location and timing of the applicants

proposed Development. In the event, it may be necessary for the GSSP Network Planner to carry out additional more extensive system studies.

In suth circumstances, the GSSP Network Planner shall, within the original time scale, provide a preliminary offer indicating those areas that require more detailed analysis.

The User shall indicate whether it wishes the GSSP Network Planner to undertake the work necessary and to proceed to make a revised offer within the 3-month period normally allowed. The GSSP Network Planner shall apply for an extension from the Regulator if it is not able to make the revised offer within the normal time scale.

The GSSP Network Planner may require the User to provide some or all the Detailed Planning Data listed in Part 2 of Appendix A of the Planning Code at this stage (in advance of the normal time scale specified).

CC6.3 RIGHT TO REJECT AN APPLICATION

The GSSP Network Planner shall be entitled to reject an application for connection and or use of the Grid System:

(a) if to do so would be likely to involve the GSSP Network Planner or the Single Buyer in a breach of its duties under the Grid Code or Electricity Ordinances or of any regulations relating to safety or standards applicable to the Grid System; or

(b) if the person making the application does not undertake to be bound, in so far as applicable, by the terms of the Grid Code.

CC6.4 CONNECTION AND USE OF SYSTEM AGREEMENT

A Connection Agreement and or Use of System Agreement (or the offer for a Connection Agreement and or Use of System Agreement) will include as appropriate, within its terms and conditions:

(a) a condition requiring both parties to comply with the Grid Code;

(b) details of connection and or "Use of System" charges;

(c) details of any capital related payments arising from the necessary reinforcement or extension of the Grid System;

(d) a "Site Responsibility Schedule", detailing the divisions of responsibility at the Connection Point in relation to ownership, control, operation, and maintenance of Plant and Apparatus and to the safety of staff and members of the public; and

(e) a condition requiring the User to supply Detailed Planning Data (to the extent not already supplied) within 28 calendar days of the acceptance of the offer (or such longer period as may be agreed in a particular case).

CC7 APPROVAL TO CONNECT

CC7.1 READINESS TO CONNECT.

A User whose Development is under construction in accordance with the relevant Connection Agreement who wishes to establish a connection with the Transmission Network or an HV Distribution Network• shall apply to the relevant GSSP in writing giving the following details;

(a) confirmation that the User's Plant and Apparatus at the Connection Point will meet the required technical standards, as agreed with the GSSP where appropriate;

(b) a proposed connection date;

(c) updated Planning Code data, as appropriate; and

(d) a proposed commissioning schedule, including commissioning tests, for the final approval of the GSO

CC7.2 CONFIRMATION OF APPROVAL TO CONNECT

Within 30 calendar days of notification by a User, in accordance with CC7.1;

(a) the GSSP will inform the User whether the requirements of CC7.1 and the Connection Agreement have been satisfied; and

(b) in consultation with the GSO, the GSSP will inform the User of the acceptability of the proposed commissioning programme.

Where approval is withheld, reasons shall be stated by the GSSP and or the GSO.

Operating Code No. 1

Demand Forecasting

OC1.1 INTRODUCTION

Operating Code No. 1 (0C1) outlines the obligations on the GSO and Users regarding the preparation of Demand forecasts of Active Energy, Active Power and Reactive Power on the Grid System. OC1 sets out the time scales within the Short Term and Near Term periods in which Users shall provide forecasts of Energy and Demand to the GSO so that the relevant operational plans can be prepared.

There are two aspects of electricity forecasts, the first is Demand forecasting and the second is Energy forecasting. Accurate Demand forecasting is essential to ensure that Generating - Unit Scheduling and Dispatch is economically matched to Grid System Demand. Accurate Energy forecasting is required for optimising thermal fuel purchase and storage and hydro-electricity reservoir usage.

In this OC1. Year 0 means the current year at any time. Year 1 means the next year at any time, Year 2 means the year after Year 1. For operational purposes, each year will be considered to start on 1 January. The following distinct phases are used to define the Demand forecasting periods:

(a) Operational Planning Phase occurs in the Short Term and Near Term down to the start of the Control Phase.

(b) Control Phase occurs in the Near Term with the phase covering 1 week ahead through to real time. This phase occurs after the completion of Scheduling and the Indicative Running Notification has been issued by the GSO under Scheduling and Dispatch Code No. 1 (SDC1).

(c) "Post Control Phase" is the phase following real time operation.

In the Operational Planning Phase, Demand forecasting shall be conducted by the GSO taking account of Demand forecasts furnished by Users who shall provide the GSO or GSSP with Demand forecasts and other information as outlined in this OC1.4.

In the Control Phase, the GSO will conduct its own Demand forecasting taking into account of any revised information provided by Users and the other factors referred to in OC1.5.

in the Post Control Phase, the GSO shall collate Demand forecasting data on the Grid System with post real time information for use in future forecasts.

OC1.2 OBJECTIVES

The objectives of OC1 are to:

(a) ensure the provision of data to the GSO and Single Buyer by Users for Operational Planning purposes in the Short Term; and

(b) provide for the factors to be taken into account by the GSO when Demand forecasting is conducted in the Near Term and Control Phase.

OC1.3 SCOPE

OC1 applie.s to the GSO and the Single Buyer and the following Users which in this case are:

(a) All Power Producers with CDGUs;

(b) All Power Producers with Generating Units not subject to Dispatch by the GSO, with total on-site generation capacity equal to or above 5 MW where the GSO considers it necessary;

(c) Large Consumers where the GSO considers it necessary;

(d) Interconnected Parties;

(e) Transmission Network Service Provider (TNSP); and

(f) Distribution Network Service Providers (DNSPs).

OC1.4 PROCEDURE IN THE OPERATIONAL PLANNING PHASE

OC1.4.1 Information Flow and Coordination

Users must provide the necessary information requested for in OC1.4.2 to the GSO or GSSP at the time and in the manner agreed between the relevant parties to enable the GSO to carry out the necessary Demand forecasting for the Operational Planning Phase.

In OC1.4.2. the GSO requires information regarding any changes in incremental Demand anticipated by the Users excluding forecast Demand growth. For example, this would include any significant incremental Demand change due to additional equipment added, removed or modified by the User which is not knqwn to the GSO.

In preparing the Demand forecast, the GSO shall take into account the information provided for under OC1.4.2, the factors detailed in OC1.7 and also any forecasted or actual Demand growth data provided under the Planning Code for new or modification to existing connections .

The GSO shall collate all data necessary and prepare the Demand forecast for. this Operational Planning Phase for Year 1 and submit copies to the Single Buyer by the end of September of Year 0. Additionally, where the Single Buyer reasonably requires additional information or assistance, the GSO will provide such information or assistance requested in a reasonable timeframe.

OC1.4.2 Information Providers

(I) Transmission Network Service Provider

The TNSP shall submit to the GSO by the end of August in Year 0 electronic files or in a format agreed in writing by the GSO, detailing the following:

(a) Based on the most recent historical Demand data, the TNSP shall inform the GSO of any anticipated changes in incremental Demand by equal to or greater than :t 1 *MN* during Year 1 at the various Custody Transfer Points (CTPs) between the Transmission Network and Distribution Network or User System

based on the information provided by the DNSP and Consumers under OC1.4.2 or any planned changes by the TNSP.

(b) Where the GSO reasonably requires additional information or assistance, the TNSP will provide such information or assistance requested in a reasonable timeframe.

(c) The TNSP shall notify the GSO immediately of any significant changes to the data submitted above.

(II) Distribution Network Service Provider

The DNSP shall submit to the TNSP by the end of July each year electronic files, in a format agreed in writing by the TNSP, detailing the following:

(a) Based on the most recent historical Demand data, the DNSP shall inform the TNSF> of any anticipated changes in incremental Demand by equal to or greater than :t 1 during Year 1 at the various CTPs between the Transmission Network and Distribution Network due to planned changes in Consumer Demand or planned change by the DNSP.

(b) Where the TNSP reasonably requires additional information or assistance, the DNSP will provide such information or assistance requested in a reasonable timeframe.

(c) The DNSP shall notify the TNSP immediately of any significant changes to the data submitted above.

(iii) Other Users

The relevant Users identified in OC1.3 (b) and (c) shall submit to the GSSP by the end of June each year electronic files, in a format agreed in writing by the GSSP, detailing the following:

(a) For Large Consumers having direct connections to the Transmission Network or connected to the Distribution Network, they have to inform the TNSP or DNSP of any planned changes that will alter the incremental Demand by equal to or greater than :t 1 during Year 1 at the respective CTPs.

(b) For Power Producers with CDGUs having direct connections to the Transmission Network or connected to the Distribution Network, they have to inform the TNSP or DNSP of any planned changes that will alter the incremental Demand by equal to or greater than :t 1 during Year 1 at the respective CTPs. Such Demand could be associated with auxiliary and start-up loads supplied directly from the Grid System.

(c) For Power Producers with non-CDGUs (Self-generators) having direct connections to the Transmission Network or connected to the Distribution Network, they have to inform the TNSP or DNSP of any planned changes that will alter the incremental Demand by equal to or greater than :t 1 during Year 1 at the respective CTPs.

(d) Power Producers with non-CDGUs having total on-site generation capacity equal to or greater than 5 may be required to provide the GSO, through the appropriate RDCs, relevant generation output information relating to its plant as

when reasonably required by the GSO when carrying out its Demand forecasting task.

(e) Where the GSSP or GSO reasonably requires additional information or assistance, the Consumers will provide such information or assistance requested in a reasonable timeframe.

(f) The Consumers shall notify the TNSP or DNSP immediately of any significant changes to the data submitted above.

Such requirements to provide information pursuant to OC1.4.2 does not remove the requirement to notify the GSSP of any changes in Demand data in accordance with the respective Connection Agreements.

(iv) Interconnected Party

The Single Buyer will advise the GSO of any half-hourly Active Power Demand and half-hourly Active Energy to be imported from or exported to Interconnected Parties over the total time period agreed in the Interconnection Agreement.

OC1.5 PROCEDURE IN THE CONTROL PHASE

The Control f'hase occurs 1 week ahead of real time (during Week 0) after the completion of Scheduling and the Indicative Running Notification (IRN) has been issued by the GSO under SDC1 to the respective Power Producers with CDGUs.

All Users shall inform the GSO or GSSP immediately of any significant anticipated changes in incremental Demand that was submitted previously under OC1.4.2.

OC1.6 PROCEDURE IN THE POST CONTROL PHASE

The GSO and GSSP may also require information in the "Post Control Phase" for future forecasting purposes. Such information shall be provided at the time and in the manner agreed between the relevant parties.

The net station output in Ml/I/ and Mvar of each Power Stations with a MCR capacity of 5 Ml/I/ and above will be monitored by the GSO at its control centre in real time. The output in MW and Mvar of Power Stations with a MCR capacity of 2 Ml/I/ and above but below 5 Ml/I/ may be monitored by the GSO at its control centre if the GSO, acting reasonably, so decides. In the case of hydro-Generating Units, the output will also include half-hourly kWh data.

The GSO may request the Power Producer with non-CDGUs to provide it with electronic metered half-hourly data by approved electronic data transfer means, in respect of each generating site that does not have the GSO's direct monitoring facilities. Such information shall be provided to the GSO in the manner and format approved by the GSO, within 3 Business Days of real time operation.

OC1.7 DEMAND FORECASTS

The following factors will be taken into account by the GSO when conducting Demand forecasting :

(a) Historical generation output information pursuant to OC1.6 and SDC1 – the Active Power Demand and Active Energy forecasts in the Operational Planning Phase will be prepared by the GSO based on the summation of net half-hourly Power Station outputs. This will be adjusted by the network losses provided by the TNSP and DNSP to arrive at a total Grid System figure;

(b) Historical Grid System Demand profiles compiled by the GSO through SCADA, metered data, Energy sales data from the DNSP and information obtained pursuant to the Post Control Phase, OC1.6;

(c) Load factors known to the GSO in advance which may affect the Demand on the Grid System, for example, Public holidays;

(d) Anticipated Loading profiles of the CDGUs pursuant to SDC1;

(e) Temperature corrected forecast – to arrive at such a forecast, the effect of temperature change above or below the seasonal average is taken into account;

(f) Weather adjusted figure – for example, the impact of storms on increased Demand due to lighting or air conditioning loads will result in adjustments being made to correct for this effect. In addition any load shedding during the period will be added back into the forecast data using SCADA and metered data to indicate the Demand and Energy just before the load shedding; and

(g) Any Interconnector export or import.

Operating Code No. 2

Operational Planning

OC2.1 INTRODUCTION

"Operational Planning" involves planning through various time scales, the matching of generation capacity with forecast Demand pursuant to OC1 together with a reserve of generation to provide for the necessary Operating Reserves, in order to maintain the security of the Grid System taking into account:

(a) planned outages of Power Producers;

(b) planned outages and operational constraints on parts of the Grid System;

(c) planned outages of Large Consumers; and

(d) transfers of capacity between the Grid System and any Interconnected Parties.

Operating Code No. 2 (OC2) is concerned with the coordination between the GSO and Users through the various time scales of planned outages of Plant and Apparatus on the User System which may affect the operation of the Grid System and or require the commitment of the GSO's resources.

OC2 is also concerned with the coordination between the GSO and GSSP through the various time scales of planned outages of Plant and Apparatus on the Grid System.

The time scales involved in OC2 are in the Medium Term, Short Term and Near Term periods where "Year O" means the current year, "Year 1" means the next year and "Year 2" means the year after Year 1.

OC2.2 OBJECTIVES

The objectives of OC2 are:

(a) to set out the operational planning procedure including information required and a typical timetable for the coordination of planned outage requirements for Power Producers with CDGUs;

(b) to set out the operational planning procedure including information required and a typical timetable for the coordination of planned outage requirements for other Users that will have an effect on the operation of the Grid System; and

(c) to establish the responsibility of the GSSP to produce a "Grid System Maintenance Schedule" for Plant and Apparatus on the Grid System based on the approved "Grid System Maintenance Criteria".

OC2.3 SCOPE

OC2 applies to the GSO and the following Users which in this case are:

(a) Grid System Service Provider (GSSP) in coordination with the GSO on Grid System maintenance matters;

(b) All Power Producers with CDGUs;

(c) All Power Producers with Generating Units not subject to Dispatch by the GSO, with total on-site generation capacity equal to or greater than 5 MW where the GSO considers it necessary;

(d) Large Consumers where the GSO considers it necessary; and

(e) Interconnected Parties.

OC2.4 ANNUAL GRID GENERATION PLAN

The GSO shall submit the "Annual Grid Generation Plan· for Year 1 to the Single Buyer by the end of September of Year 0.

Such a document would contain but not limited to the following information:

(a) Provisional Generator Maintenance Schedule

(b) Transmission Maintenance Schedule

OC2.5 GRID OPERATIONS COMMITTEE

The primary objective of the Grid Operations Committee (GOC) is to ensure that the operation and maintenance of Generating Units and Transmission Networtt equipment are coordinated to achieve safe, reliable and economic production of electricity in the State.

The GOC shall comprise of the following members:

(a) GSO (Chairman) who shall provide the secretariat;

(b) A representative from each Power Producer with CDGUs; and

(c) Two representatives from the GSSP.

The GOC shall meet once a month or as may be decided by the Chairman acting reasonably. The minutes of the meeting shall be copied to the Regulator.

OC2.6 OUTAGE PLANNING PROCEDURES FOR POWER PRODUCERS WITH CENTRALLY DISPATCHED GENERATING UNITS

OC2.6.1 Medium Term – up to 5 Years ahead

In each calendar year, by the end of March of Year 0, each Power Producer with CDGUs will provide the GSO with an "Indicative Generator Maintenance Schedule" which covers Year 1 up to Year 5. The schedule will contain the following information:

(a) Identity of the CDGU;

(b) MW not available;

(c) Other Apparatus affected by the same outage;

(d) Duration of outage;

(e) Preferred start and end date;

(f) State whether the planned outage is flexible, if so. provide period for which the outage can be deferred or advanced ; and

(g) State whether the planned outage is due to statutory obligation (for eg. Pressure vessel inspection / boiler check), if so, the latest date the outage must be taken.

OC2.6.2 Short Term – up to 1 Year ahead

In each calendar year, by the end of August of Year 0, each Power Producer with CDGUs will provide the GSO with a Provisional Generator Maintenance Schedule which covers Year 1 on a daily basis. This schedule shall be submitted in an agreed format by the GSO comprising of:

(a) type of outages for each CDGU; and

(b) any other outages as required by statutory organisations etc.

Power Producers with CDGUs shall also provide to the GSO information regarding primary fuel used, supply and storage including any possible interruption to the fuel supply.

The GSO then uses this information to produce the approved Annual Grid Generation Plan for Year 1 by the end of September of Year 0.

OC2.6.3 Near Tenn – up to 1month ahead

The GOC shall meet by the third week of each calendar month or as may be decided by the GSO to coordinate the maintenance scheduling of the CDGUs with planned outages on the Grid System from the Near Term (day ahead) to the Medium Term (5 years ahead). The committee members would review the Indicative and Provisional Generator Maintenance Schedules and make the necessary revisions where necessary. They would also review and contribute to the approved Annual Grid Generation Plan.

Where required, any revisions to the approved Annual Generation Plan shall be produced and agreed amongst the committee members during this meeting.

OC2.7 GRID SYSTEM MAINTENANCE SCHEDULE

This schedule developed by the GSSP in consultation with the GSO, shall be based on the "Grid System Maintenance Criteria" produced in accordance with Prudent Utility Practice. This schedule will contain a list of the following:

(a) the nature of maintenance that will be carried out on an Apparatus;

(b) the required outage duration (for example, • Breaker XYZ needs an outage of 3 weeks for an overhaul"); and

(c) a specific outage time, date and duration for the specific Apparatus (for example, "Breaker XYZ will be on outage from 07:00 hours Monday week 23 to 17:00 hours Friday week 26").

The maintenance schedule will try to balance the requirements of the GSSP to maintain and preserve the reliability of Grid System assets with the short term security requirements of the GSO. The GSSP who also sits in the GOC will coordinate the Grid System Maintenance Schedule on a Near Term basis with the Committed Generator Maintenance Schedules for the calendar month ahead during the monthly GOC meetings.

In each calendar year, by the end of August of Year 0, the GSSP will provide the GSO with a Grid System Maintenance Schedule which covers Year 1 on a daily basis. Following the production of the maintenance schedule, the actual maintenance work will be carried out by the GSSP.

OC2.8 OUTAGE PLANNING PROCEDURES FOR THE OTHER USERS

This section applies to the Users indicated in OC2.3 (c) and (d). If any planned outages on these User Networks causes a 5 MW or more increase in Demand at the Connection Point, the Users have to inform the GSO at least 30 calendar days in advance.

The Users shall provide but not limited to providing the following information:

(a) details of proposed outages on their User Systems which may affect the performance of the Grid System;,

(b) details of any trip testing and risk of trip; and

(c) other information where known which may affect the reliability and security of the Grid System.

These Users shall submit details of any changes made to the information provided above to the GSO as soon as practicable.

OC2.9 OUTAGE PLANNING PROCEDURES FOR INTERCONCTED PARTIES

Because Interconnected Parties have knowledge of both generation and transmission outages on the power system they are involved with, it is important that they keep the GSO informed of anything that they become aware of that could affect the Sarawak Grid System.

Interconnected Parties shall keep the GSO informed of any changes to the MW export or MW import due to changes in generation Capacity or transmission Capacity. These shall be in addition to the requirements to inform the Single Buyer of proposed export/import generation Capacity and/or transmission Capacity, under the Interconnector Agreement.

Operating Code No. 3

Operating Reserve

OC3.1 INTRODUCTION

The Grid System is required to be operated by the GSO under the direction of the Single Buyer with sufficient Operating Reserve to account for such factors as planned and unplanned outages on the overall System, inaccuracies in Demand forecasting, frequency regulation and transmission voltage control requirements.

Operating Code No. 3 (OC3) sets out the different types of reserves that make up the Operating Reserve that the GSO might use in real-time operation of the Grid System in order to maintain the required levels of security and reliability.

OC3.2 OBJECTIVES

The objective of OC3 is to set out and describe the types of reserves which may be utilised by the GSO pursuant to the Scheduling and Dispatch Codes (SOC) taking into account of any reserves which may be available across any Interconnector.

OC3.3 SCOPE

OC3 applies to the GSO, and Users, which in OC3 are:

(a) Power Producers with CDGUs; and

(b) Interconnected Parties.

OC3.4 COMPONENTS OF OPERATING RESERVE

In preparing the generation Schedule, in accordance with SDC1 the Single Buyer will use the Demand forecasts provided by the GSO, as detailed in OC1 and then match generation to Demand plus Operating Reserve. These reserves are further detailed below. These reserves are essential for the stable operation of the Grid System and Power Producers will have their CDGUs tested from time to time in accordance to OC10 to ensure compliance with this OC3.

There are two types of Operating Reserve namely Spinning Reserve and Non-Spinning Re!lerve.

OC3.4.1 Spinning Reserve

Spinning Reserve is the additional output from Synchronised CDGUs, which must be realisable in real-time operation to respond to containing and restoring any Frequency deviation to an acceptable level in the event of a loss of generation or a mismatch between generation output and Demand.

The Spinning Reserve from the CDGUs must be capable of providing response in two distinct time scales – Primary Reserve and Secondary Reserve. Some form of Demand Control can also be utilised to provide this reserve.

(I) Primary Reserve

Primary Reserve is an automatic response by a Synchronised CDGU to a fall in Grid System frequency which require changes in the CDGU's output, to restore the frequency back to within target limits which increased output is released increasingly with time over the period 0 to 5 seconds from the time of initial frequency change and becomes fully available by 5 seconds, and which is sustainable for at least a further 25 seconds.

Primary Reserve is provided by CDGUs which are already Synchronised to the Grid System.

(II) Secondary Reserve

The automatic response to Grid System Frequency changes which is fully available by 30 seconds from the time of frequency change to take over from the Primary Reserve, and which is sustainable for a period of at least 30 minutes.

Secondary Reserve is provided by CDGUs which are already Synchronised to the Grid System.

(iii) Demand Control

Spinning Reserve can also be supported by a reduction in Demand which is implemented by the under frequency load shedding (UFLS) Scheme. This is further detailed in OC4.

OC3.4.2 Non-spinning Reserve

The component of the Operating Reserve not connected to the Grid System but capable of serving Demand within a specified time. Non-spinning Reserve shall consist of Hot Standby and Cold Reserve.

(I) Hot Standby

Hot Standby is a condition of readiness of a CDGU where it is ready to be synchronise and attain an instructed Load within 30 minutes and subsequently maintained such Load continuously by that CDGU.

OC3.4.3 Cold Standby

Cold Standby is a condition of readiness in relation to any CDGU that is declared available, in an Availability Notice, to start, synchronise and attain target Loading all within a period of time stated in the Availability Notice.

OC3.5 ALLOCATION OF OPERATING RESERVES

Operating Reserve will be allocated in accordance with the Schedule for that day, as authorised by the Single Buyer at the period of daily Peak Demand. During periods of light Demand, the GSO may, at its reasonable discretion. share out Operating Reserve on a regional basis in accordance with contingency planning undertaken in accordance with OC7.

OC3.5.1 Spinning Reserve

The level of Spinning Reserve should cater for forecasting errors plus a single credible incident that causes the loss of the largest amount of Power output due to:

(a) the loss of the largest Synchronised Generating Unit;

(b) the loss of the largest transmission circuit; or

(c) the loss of an Interconnector that is exporting Energy to Sarawak.

This is regarded as an N-1 contingency and as such only one incident is planned for in terms of Spinning Reserve cover, but it is the largest Power loss resulting from the incident that should be covered by Spinning Reserve, plus a margin for forecasting errors.

OC3.5.2 Non-Spinning Reserve

In order to cover for abnormal Demand forecasting errors or CDGU breakdown, a basic allocation of CDGUs for Hot Standby purposes shall be kept available up to at least one hour after system Peak Demand.

The Non-Spinning Reserve allocation shall be determined from time to time by the GSO in accordance with OC3 and OC4.

OC3.6 DATA REQUIREMENTS

The response capability data required for each CDGU's Operating Reserve response characteristics consist of:

(a) Primary Reserve response characteristics to frequency change data which describe the CDGU's response at different levels of Loading up to MCR Loading;

(b) Governor droop characteristics expressed as a percentage of frequency drop; and

(c) CDGU control options for maximum droop, normal droop and minimum droop, each expressed as a percentage of frequency drop.

Power Producers shall register this data under the Planning Code (PC) and any revisions shall also be notified under SDC1.

OC3.7 USE OF OPERATING RESERVE

OC3.7.1 Within the Grid System

The CDGU Dispatched to meet or restore Operating Reserve will be in accordance with the GSO's Constrained Schedule issued in accordance with SDC1 or SDC2, except where unforeseen changes are made in accordance with SDC1 or SDC2.

When Cold Standby is utilised to restore Operating Reserve the GSO shall issue a new Indicative Running Notification to CDGUs to replace this Cold Standby, if in the opinion

of the GSO this is necessary in accordance with the Grid Code or the GSO's Licence conditions.

OC3.7.2 Contracts with Interconnected Partie

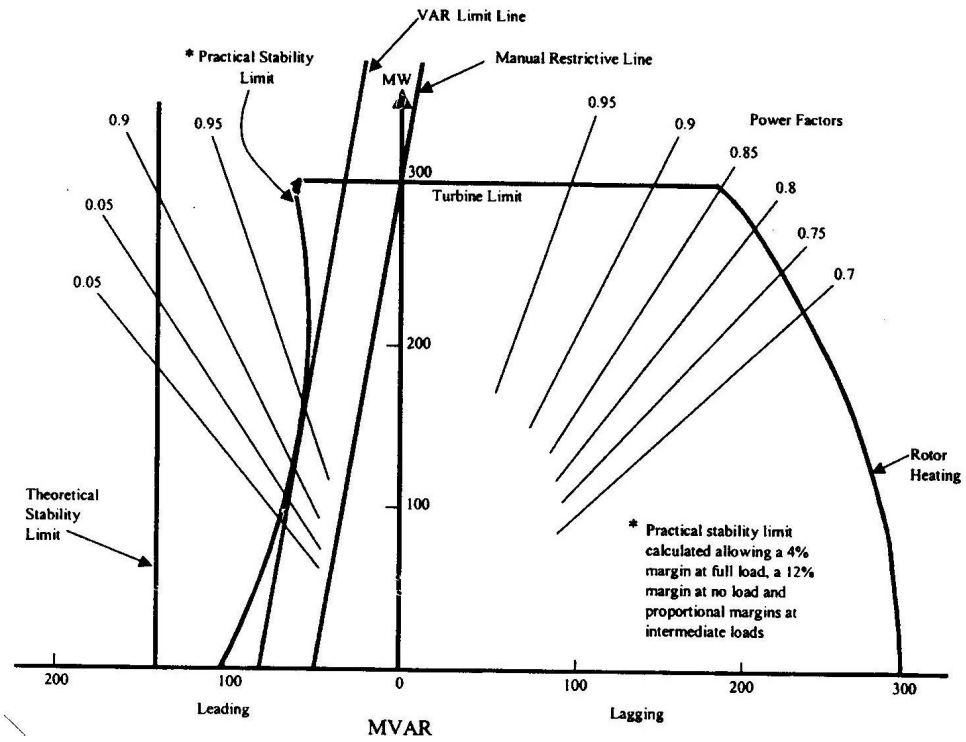
Contracts with Interconnected Parties for the provision and receipt of Operating Reserve across an Interconnector are managed by the Single Buyer. Where the use of an Interconnector is considered to be necessary to restore Operating Reserve on the Grid System then this will be determined by the GSO, in accordance with guidelines issued by the Single Buyer. Where an Interconnected Party requires the use of the GSO's Operating Reserve to meet a sudden failure or shortage on its system then the GSO will take the necessary action to assist and restore the necessary Operating Reserve within the Grid System in accordance with OC3, as if the loss of reserve had been due to problems within the Grid System.

The Energy delivered or received on the basis of the use of the Operating Reserve with an Interconnected Party shall be recorded by the GSO and issued to the Single Buyer at the month end.

OC3-APPENO!XA

Typical Steam Turbine Capability Chart

Capability Chart



Operating Code No. 4

Demand Control

OC4.1 INTRODUCTION

Operating Code No. 4 (OC4) is concerned with the procedures to be followed by the GSO and Users to initiate reductions in Demand in the event that insufficient generating capacity is available to meet forecast or real-time Demand, leading to the possibility of frequency excursions outside the limits given in the Planning Code. In addition, these provisions may be used by the GSO to prevent an Abnormal Overload of Apparatus within the Grid System, or prevent a voltage collapse.

OC4.2 OBJECTIVES

The objective of OC4 is to establish procedures such that the GSO in consultation with the GSSP, shall endeavour, as far as practicable, to spread Demand reductions equitably.

OC4.3 SCOPE

OC4 applies to the GSO, the Single Buyer and Users which in OC4 are:

(a) Transmission Network Service Providers;

(b) Distribution Network Service Providers;

(c) Large Consumers; and

(d) Interconnected Parties.

OC4.4 METHODS USED

OC4 deals with the following methods of Demand Control:

(a) Automatic under frequency load shedding (UFLS) schemes;

(b) Demand reduction initiated by the GSO; and

(c) Consumer Demand management initiated by GSO.

The term "Demand Control" is used to describe any or all of these methods of achieving a Demand reduction, to maintain the stable and/or interconnected operation of the Grid System. Where the Grid System splits or islands, then Demand Control can also be used in accordance with OC7 to maintain the Power Islands until such time as the GSO can restore interconnection of the Power Islands, and/or restoration of any external Interconnector that was disconnected during the incident.

OC4.5 PROCEDURES

OC4.5.1 Automatic Under Frequency Load Shedding Scheme

Demand may be disconnected automatically by under frequency relays at selected locations on the Grid System in the event of a sud'en fall in frequency, in order to restore the balance between available generator Peak Cap•--ty and real-time system Peak Demand. Such an arrangement will be coordinated by the LSO as part of an overall scheme. The GSO, in consultation with the Single Buyer, will determine the appropriate low frequency settings and percentage Demand to be disconnected at each stage of Disconnection. Currently these are set out in Table 4.7-1.

The areas of Demand affected by this automatic UFLS scheme would be such that it allows the Demand relief to be applied uniformly throughout the Grid System by the GSO taking into account any operational constraints on the Grid System and priority Consumer groups.

OC4.5.2 Demand Control initiated by the GSO

The GSO will arrange to have available manual or automatic SCADA Demand reduction and/or Disconnection schemes to be employed throughout the Grid System. These schemes are intended for use when it is possible to carry out such Demand reduction or Disconnection in the required timeframe by this means. Such a scheme could involve 5% or 10% voltage reductions and/or manual or automatic operation of the SCADA switching facilities.

As well as reducing Demand, with the objective of preventing any overloading of Apparatus, including for avoidance or doubt, CDGUs; the GSO may, in the event of fuel shortages and/or water shortages at hydro-CDGUs, utilise OC4.5.2 to initiate Demand Disconnections in order to conserve primary fuel and/or water. The programming of these rota Disconnections will be in accordance with OC4.6.

OC4.5.3 Consumer Demand Management

Where a Large Consumer, agrees in writing with the GSO and Single Buyer to provide Demand Control, that it is able to demonstrate that it has the means to reduce significant Demand on its User Network when requested to do so by the GSO, then these would result in these Users remaining connected to the Grid System when other Users are disconnected.

OC4.6 IMPLEMENTATION OF DEMAND CONTROL

During the implementation of Demand Control, Scheduling and Dispatch in accordance with the principles in the SOC may cease and will not be re-implemented until the GSO decides that normal operation can be resumed. The GSO will inform Power Producers with CDGUs when normal Scheduling and Dispatch in accordance with the SOC is to be re-implemented as soon as reasonably practicable.

Where time permits, the GSO will, insofar as it is reasonably practicable, inform all affected Users that Demand Control is planned to be exercised in accordance with OC4.8.2.

The GSO shall seek the approval of the Regulator in determining the priority Consumer groups involved in Demand Control.

OC4.7 IMPLEMENTATION OF AUTOMATIC UNDER FREQUENCY LOAD SHEDDING SCHEME

The Demand on the Grid System subject to automatic UFLS scheme will be split into discrete blocks. The number, location, size and the associated low frequency settings of these blocks will be as determined by the GSO in consultation with the GSSP. The GSO will also take into account constraints on the Grid System and other priorities in determining the size and location of Demand reduction by UFLS.

Each RDC will coordinate with the TNSP and DNSP to ensure that automatic under-frequency load shedding arrangements are in place to cover the load shedding stages given in Table 4.7-1 below.

Table 4.7-1: Indicative Load Shedding Stages

LOAD SHEDDING STAGE	FREQUENCY. Hz	TIME DELAY, sec	INDICATIVE LOAD[1] REDUCTION. MW	CUMULATIVE REDUCTION, MW
I	49\4	0.10	63.7	63.7
II	49.3	0.10	66.1	129.8
III	49.2	0.10	23.8	153.6
IV	49.1	0.10	18.8	172.4
V	49.0	0.10	4.0	176.4
VI	48.8	0.10	32.5	208.9
VII	48.6	0.10	15.4	224.3
VIII	48.4	0.20	38.0	262.3
IX	48.2	0.20	12.0	274.3

I Tius 1s

target load reduction subject to review by 1he GSO. During hght load eond1t1ons, actual values will be some *50%* - 60% of these peak .alues.

For the avoidance of doubt, no Demand disconnected by operation of the automatic under frequency scheme will be restored without the specific direction of the GSO.

Load shedding figures given in Table 4.7-1 above are indicative only and can be changed by the GSO if, in consultation with the Regul:.tor the GSO reasonably determines such changes are necessary.

OC4.8 IMPLEMENTATION OF DEMAND CONTROL INmATED BY THE GSO

OC4.8.1 Types of Warnings Issued

All the warnings issued will state the hours and days of risk and for a 'Orange' Warning and a 'Red' Warning, the estimated quantum of Demand reduction forecast.

If, after the issue of a warning, it appears that system conditions have so changed that the risk of Demand reduction is reduced or removed entirely, the GSO will issue the appropriate modification or cancellation by telephone.

(I) Yellow Warning

An 'Yellow Warning' will be issued by the GSO to Power Stations and GSSP's substation personnel when, for a;iy reason, there is cause to believe that the risk of serious system disturbances is abnormally high. During the period of an Yellow Warning, Power Stations and TNSP substations affected will be alerted and maintained in the condition in which they are best able to withstand system disturbances, for example. Power Stations with means of safeguarding the station auxiliary supplies will bring them into operation. Power Station control room and substation staff should be standing by to receive and carry out switching instructions from the GSO or to take any authorised independent action.

(II) Orange Warning

A Orange Warning will be issued to the RDCs and all Users, as designated in OC4.3, during periods of protracted generation shortage or expected high risk of disturbance on the Grid System. This is to provide guidance to the GSSP in the utilisation of their manpower resources in rota Disconnections. To this end, estimates of the quantum of Disconnections required together with the time and duration of the Demand reductions likely to be enforced are to be included in the warning.

(iii) Red Warning

A 'Red Warning' will be issued to indicate that Disconnection of Consumer Demand under controlled conditions is imminent. The GSSP will take such preparatory action as is necessary to ensure that at any time during the period specified, Disconnection of supplies can be apped promptly and effectively.

OC4.8.2 Warnings of the Possibility of Demand Reduction

Warnings will be issued by the GSO via telephone to the GSSP and Large Consumers as appropriate. When the estimates of the Demand and generation availability for the following week indicate a potentially critical situation, warnings should be issued Consum as soon as possible.

"uring periods of protracted generation shortage exceeding several days for whatever cause, a 'Orange' warning shall be issued by the GSO. This is to be based on the best information available at that time and shall indicate the amount of Demand reduction that is anticipated to be required. Confirmation of modification of the 'Orange' warning should be issued as soon as possible.

It may also be necessary for the GSO to issue a warning of possible Demand reduction to cover a local situation where the risk of serious overloading is foreseen on the Plant or ApparatIll6 of Power Stations or Grid System in a particular section of the Network.

OC4.8.3 Purpose of Warning

The purpose of warnings is to obtain the necessary Demand relief required with the least possible inconvenience to Consumers and, to that end, to ensure that response to requests for Disconnection is both prompt and effective. Demand reduction will, however, be required without warning if unusual and unforeseeable circumstances create severe operational problems.

The 'Orange' warnings are to enable the GSSP and Large Consumers to assess the urgency of the Disconnection requirements.

OC4.8.4 Conditions Requiring Controlled Demand Reduction

(I) Temporary Generation Shortage or Grid System Overloading

The GSO will initiate and instruct controlled Demand reduction to Large Consumers by telephone and, subsequently, in writing. Except when protracted plant shortage is expected, voltage reduction will be instructed to prevent the Grid System Frequency falling below 49.5 Hz.

Voltage reduction pursuant to OC4.5.2 shall normally precede any Disconnection stages. However, should circumstances arise which, in the judgement of the GSO, required more drastic action, Demand Disconnec:tion instruction may be issued to the regional GSSP and subsequently, inwriting, at the same time or in place of voltage reduction stages.

During periods of protracted plant shortage, voltage reduction may be reserved for frequency regulation after Demand DIsconnec:tlon has taken place. Voltage reduction and/or Disconnection will be instructed as necessary irrespective of frequency to prevent serious overloading of main grid circuits.

(II) Protracted Generation Shortage or Grid System Overloading

Protracted loss or deficiency of generation must be met by the Disconnection of Consumers. Rota Disconnec:tion plans have been made by the regional GSSP and will be implemented on instructions from the GSO. The procedures for warning and Demand reduction instructions shall be in accordance with this OC4.8.

(III) Demand Reduction

The GSO in consultation with the regional GSSP will endeavour, as far as practicable, to spread Demantl reductions equitably. In protracted generation shortage or Grid System overloading, large imbalances of generation and demand may cause excessive power transfers across the Grid System. Should such transfers endanger the stability of the Grid System or cause a risk of damaging its Apparatus, the pattern of Demand reduction shall be adjusted to secure the Grid System, notwithstanding the inequalities of Disconnection that may arise from such adjustments. .

(Iv) Rota Disconnection Plans

The GSO in coordination with the DNSPs will prepare rota Disconnec:tlon plans for levels of Demand Disconnection in accordance with plans drawn up by the GSO. These plans will be reviewed at least bi-annually in consultation with the GSO.

(v) Situation Requiring Rapid Demand Reduction

In certain circumstances, Demand reduction at User Systems may not be adequate for relieving dangerous Grid System conditions. In such circumstances, the UFLS scheme takes over as described in OC4.7.

OC4.9 DEMAND RESTORATION

When conditions permit, Demand restoration will be initiated and under the instructions of the GSO. Demand restoration will normally be instructed in stages as equitably as practicable. Two or more stages of Demand restoration may be carried out simultaneously where appropriate.

The procedures for Demand restoration after a Total Blackout or Partial Blackout shall be in accordance witti OC7.

Operating Code No. 5

Operational Liaison

OC5.1 INTRODUCTION

Operating Code No. 5 (OCS) sets out the requirements for the exchange of information in relation to the Operations and or Events on the Grid System or a User System which have had or may have an Operational Effect on the Grid System or other User Systems.

OCS.2 OBJECTIVES

The objectives of OCS are:

(a) to provide for the exchange of information that is needed in order that possible risks arising from the Operations and or Events on the Grid System and or User Systems can be assessed and appropriate action taken. OC5 does not seek to deal with any actions arising from the exchange of information but rather only with that exchange;

(b) to detail the communication facilities required between the GSO and each category of User; and

(c) to detail the general procedures that will be established to authorise personnel who will initiate or carry out Operations on the User System.

OCS.3 SCOPE

OCS applies to the GSO and Users which in OC5 means:

(a) Grid System Service Provider (GSSP);

(b} Power Producers with CDGUs;

(c) All Power Producers with Generating Units not subject to Dispatch by the GSO, with total on-site generation capacity equal to or greater than 5 MW where the GSO considers it necessary;

(d} Large Consumers where the GSO considers it necessary ; and

(e) Interconnected Parties.

OCS.4 OPERATIONAL LIAISON TERMS

The term Operation means a previously planned and instructed action relating to the operation of any Plant or Apparatus that forms a part of the ystem. Such Operation would typically involve some planned change of state of the Plant or Apparatus concerned, which the GSO requires to be informed of.

The term Event means an unscheduled or unplanned (although it may be anticipated) occurrence on, or relating to, a System including faults, incidents and breakdowns, and adverse weather conditions being experienced.

The term Operational Effect means any effect on the operation of the relevant System which will or may cause the Grid System or other User Systems to operate (or be at a materially increased risk of operating) differently to the way in which they would or may have normally operated in the absence of that effect.

OC5.5 PROCEDURES FOR OPERATIONAL LIAISON

The GSO, GSSP and Users shall nominate persons and or contact locations and agree on the communication channels to be used in accordance with the Connection Conditions (CC) for the necessary exchange of information to make effective the exchange of information required by the provisions of OC5. There may be a need to specify locations where personnel can operate, such as Power Station, control centre etc. Also manning levels to be required, for example, 24 hours, official holiday cover etc. These arrangements may have been agreed upon producing the Site Responsibility Schedule pursuant to the CC.

In general, all Consumers including Power Producers with Generating Units not subject to Dispatch by the GSO will liase with the relevant RDCs while Power Producers with CDGUs and Interconnected Parties shall liase with the SSDC to initiate and establish any required communication channel between them.

SCADA equipment, remote terminal units or other means of communication specified in the CC may be required at the User's site for the transfer of information to and from the GSO. As the nature and configuration of communication equipment required to comply with will vary between each category of User connected to the Grid System, it will be necessary to clarify the requirements in the respective Connectioo Agreement and/or Power Purchase Agreement. •"

Information between the GSO and the Users shall be exchanged on the reasonable request from either party.

In the case of an Operation or Event on the User System which will have or may have an Operational Effect on the Grid System or other User Systems, the User shall notify the GSO in accordance with OC5.6. The GSO shall inform other Users who in its reasonable opinion may be affected by that Operational Effect.

In the case of an Operation or Event on the Grid System which will have or may have an Operational Effect on any User Systems, the GSO shall notify the corresponding User in accordance with OC5.6.

OC5.6 REQUIREMENT TO NOTIFY

While in no way limiting the general requirements to notify set out in OC5, the GSO and Users shall agree to review from time to time the Operations and Events which are required to be notified.

Examples of Operations where notification by the GSO or Users may be required under OC5 are:

(a) the implementation of planned outage of Plant or Apparat ursuant to OC2;

(b) the operation of circuit breaker or isolator/disconnector;

(c) voltage control; and

(d) on-load fuel changeover on CDGUs.

Examples of Events where notification by the GSO or Users may be required under OC5 are:

(a) the operation of Plant and/or Apparatus in excess of its capability or may present a hazard to personnel;

(b) activation of alarm or indication of an abnormal operating condition;

(c) adverse weather condition;

(d) breakdown of, or faults on, or temporary changes in, the capability of Plant and/or Apparatus;

(e) breakdown of, or faults on, control, communication and metering equipment;

(f) increased risk of unplanned protection operation; and

(g) abnormal operating parameters, such as governor problem, fuel system trouble, LO high temperature , etc.

OC5.6.2 Form of Notification

A notification under OC5 shall be of sufficient detail to describe the Operation or Event that might lead or have led to an Operational Effect on the relevant Systems. although it does not need to state the cause. This is 18 enable the recipient of the notification to reasonably consider and assess the implications or risks arising from it. The recipient may seek to clarify the notification.

This notification may be in writing if the situation permits it, otherwise, the other agreed communication channels in OC5.5 shall be used.

The notification shall include the name of the nominated person making the notification as agreed between the relevant parties in OC5.5.

OC5.6.3 Timing of Notification

A notification under OC5 for Operations which will have or may have an Operational Effect on the relevant Systems shall be provided as far in advance as practicable and at least 3 Business Days in advance to allow the recipient to consider the implications and risks which may or will arise from it.

A notification under OC5 for Events which will have or may have or have had an Operational Effect on the relevant Systems shall.be provided within 3 Business Days after the occurrence of the Event or as soon as practicable after the Event is known or anticipated by the person issuing the notification.

OC5.7 SIGNIFICANT INCIDENTS

Where an Event on the Grid System has had or may have had a significant effect on the User System or when an Event on the User System has had or may have had a significant effect on the Grid System or other User Systems, the Event shall be deemed a Significant Incident by the GSO in consultation with the User.

Significant Incidents shall be reported in writing to the affected party in accordance with OC6.

Operating Code No.6

System Fault and Incident Reporting

OC6.1 INTRODUCTION

Operating Code No. 6 (OC6) sets out the requirements for reporting in writing those Events termed Significant Incidents which were initially reported verbally under OCS and to fulfil any legal obligations to report specific Events including faults and breakdowns. The reporting of Total Blackout or Partial Blackout arising from OC7 shall also be reported in accordance with this OC6.

OC6 also provides for joint investigation of Significant Incidents by the Users involved and the GSO.

OC6.2 OBJECTIVES

The objectives of OC6 are to:

(a) facilitate the provision of more detailed information in reporting Significant Incidents; and

(b) where agreed, facilitate joint investigations with Users and the GSO of those Significant Incidents reported verbally under OC6.

OC6.3 SCOPE

OC6 applies to the GSO and the following Users:

(a) Grid System Service Provider (GSSP);

(b) All Power Producers with CDGUs;

(c) All Power Producers with Generating Units not subject to Dispatch by the GSO, with total on-site generation capacity equal to greater than 5 *wrN* where the GSO considers it necessary;

(d) Large Consumers where the GSO considers it necessary ; and

(e) Interconnected Parties.

OC6.4 PROCEDURE FOR REPORTING SIGNIFICANT INCIDENTS

While in no way limiting the general requirements to report Significant IncU..nts under OC6, a Significant Incident will include Events having an Operational Effect will *or* may result in the following:

(a) unplanned operation of Plant and/or Apparatus either manually or automatica)Jy;

(b) System voltage outside Normal Operating Condition limits;

(c) frequency outside Normal Operating Condition limits; and

(d) .System instability.

The GSO and User shall nominate persons and or contact locations and communication channels to ensure the effectiveness of OC6, such persons or communication channels may be the same as those established in OC5. For any change in relation to the nominated persons, the contact locations and the communication channels, the GSO and User shall promptly inform each other inwriting.

In the case of an Event which has been reported to the GSO under OC5 by the User and subsequently determined to be a Significant Incident by the GSO, a written report shall be given to the GSO by the User involved in accordance with OC6.5.

In the case of an Event which has been reported to the User under OC5 by the GSO and subsequently determined to be a Significant Incident by the GSO, a written report shall be given to the User involved by the GSO inaccordance with OC6.5.

In all cases, the GSO shall be responsible for the compilation of the final report before issuing to all relevant parties, including the Regulator.

OC6.5 SIGNIFICANT INCIDENT REPORT

OC6.5.1 Form of Report

A report shall be inwriting or any other means mutually agreed between the two parties. The report shall contain:

(a) confirmation of the notification given under OC5;

(b) a more detailed explanation or statement relating to the Significant Incident from that provided inthe notification given under OCS; and

(c) any additional information which has become known with regards to the Significant Incident since the notification was issued.

The report shall as a minimum contain the following details.

(a) Date, time and duration of the Significant Incident;

(b) Location;

(c) Apparatus and or Plant involved;

(d) Brief description of Significant Incident under investigation; and

(e) Conclusions and recommendations effective actions if applicable.

OC6.5.2 Timing of Report

A written report under OC6 shall be given as soon as practical after the initial notification under OC5.

In general, the GSO will request the relevant User for a preliminary written report under OC6 within 4 hours of being aware of any such Significant Incidents. The User will then have to investigate the cause of the incident and to take any corrective measures necessary, and submit the formal written report in line with OC6.5.1 within 3 Business Days.

If the Significant Incident occurred on the Grid System, the GSO will submit the report to the affected Users in line with OC6.5.1 within 3 Business Days of receiving the User's formal written report. When a User require more than 3 Business Days to report an occurrence of a Significant Incident, the User may request additional time from the GSO to carry out the relevant investigations.

OC8.6 PROCEDURE FOR JOINT INVESTGATION

Where a Significant Incident has been declared and a report submitted under OC6.4, the affected party or parties may request in writing for a joint investigation to be carried out

The composition of such an investigation panel shall be appropriate to the incident to be investigated and agreed by all parties involved. If an agreement cannot be reached, the Regulator shall decide.

The form and procedures and all matters relating to the joint investigation shall be agreed by the parties by using good faith and without delay at the time of the joint investigation. The joint Investigation must begin within 1O Business Days from the date of the occurrence of the Significant Incident.

Operating Code No. 7

Contingency Planning and System Restoration

OC7.1 INTRODUCTION

Operating Code No. 7 (OC7) is concerned with the operation of the Grid System by the GSO in accordance with the principles and procedures set out in the Grid Code under conditions of System Stress or in the event of a Critical Incident. System Stress coupled with the occurrence of a Critical Incident on the Grid System will together produce unacceptable System operating conditions, such as frequency or transmission voltage deviations, outside the operational limits given in the Planning Code.

Critical Incidents can be caused by natural events, such as storms, floods, earthquakes or typhoons or they can be caused by equipment failure or human acts, accidental or intentional. System Stress can result from Insufficient Operating Reserve or a shortage of transmission Capacity.

As such events are generally infrequent, it is important that the GSO and Users are familiar with contingency plans prepared under OC7 and at suitable times practice these to ensure that all operations staff are familiar with these plans, in order that they are ready to perform their assigned role at a moments notice.

OC6 sets out the procedures for notification by the GSO of expected periods of System Stress to Users and OC7 covers the implementation of recovery procedures following Critical Incidents that occur during System Stress. These periods of System Stress are:

(a) a Total Blackout or Partial Blackout of the Grid System;

(b) the separation into one or more Power Islands of the Grid System with associated loss of synchronisation due to the activation of an automatic de-coupling scheme or the unexpected tripping of parts of the Grid System;

(c) voltage collapse of a transmission circuit; or

(d) the loss of a strategic transmission group[1].

OC7.2 OBJECTIVES

The primary objective of OC7 is to ensure that in the event of Power Island operation or a Partial Blackout or a Total Blackout normal supplies are restored to all Consumers as quickly and as safely as practicable in accordance with Prudent Utility Practice and outlines the general restoration strategy which shall be adopted by the GSO in this event.

The secondary objective of OC7 is to initiate the communication procedures, specified in OC5, between the GSO and relevant Users when System Stress is anticipated or occurs and also when a Critical Incident is imminent or has occurred.

[1] A transmission group is a significant Demand block fed from a number of transmission circuits.

OC7.3 SCOPE

OC7 applies to the GSO and the following Users:

(a) Grid System Service Provider (GSSP);

(b) Power Producers with CDGUs;

(c) Power Producers with Black Start capability;

(d) Large Consumers identified by the GSO who may be involved in the restoration or re-synchronisation process; and

(e) Interconnected Parties.

OC7 applies to the GSSP in coordination with the GSO on Grid System restoration or re-synchronisation matters.

OC7.4 PROCEDURES

Due to the distributed geographic positions of Generating Units and Consumers in Sarawak, coupled with the nature of the terrain and the high incidents of tropical storms including heavy lightning activity, Power Islands can occur on the Grid System at any time. Consequently it is necessary for the GSO to prepare a "Grid System Restoration Plan• in conjunction with Users, which can be called into action at a moments notice.

It is important that all Users identified under OC7 make themselves fully aware of contingency requirements, as failure to act in accordance with the GSO's instructions will risk further disruptions to the Grid System.

OC7.4.1 Grid System Restoration Plan

The "Grid System Restoration Plan will serve as a guide during a Total Blackout or Partial Blackout and will outline the operational structure to facilitate a safe and prompt restoration process. The Grid System Restoration Plan will address the restoration priorities of the different Consumer groups and also the ability of each CDGU to accept sudden loading increases due to the re-energising of Demand blocks.

The generic tasks outlined in the Grid System Restoration Plan are:

(a) the re-establishment of full communications between parties;

(b) the determination of the status of the post Critical Incident stem including the status and condition of HV Apparatus and Plant;

(c) instructions by the GSO to the relevant parties;

(d) mobilisation and assignment of priorities to personnel;

(e) preparation of Power Stations and the Grid System for systematic restoration;

(f) re-energisation of Power Islands using Black Start Stations if necessary;

(g) re-synchronisation of the various Power Islands to restore the interconnected Grid System; and

(h) an audit of the Grid System after restoration to ensure that the overall Grid System is back to normal and all Demand is connected, and in line with the reporting requirements of OC6 all data has been collected for reporting purposes.

The Grid System Restoration Plan will be developed and maintained by the GSO in consultation with the GSSP and other Users as appropriate. The GSO will issue the Grid System Restoration Plan and subsequent revisions to appropriate Users and other relevant parties.

OC7.4.2 General Restoration Procedures

The procedure for Grid System restoration shall be that notified in writing by the GSO to the User for use at the time of a Total Blackout or Partial Blackout. Each User shall abide by the SSDC or RDC instructions during the restoration process, unless to do so would endanger life or would cause damage to Plant or Apparatus.

In general, the procedures outlined within OC7.4 and the previously prepared Grid System Restoration Plan should be followed. Where necessary, the GSO can vary these procedures in real-time where, under System Stress conditions, the GSO in its reasonable opinion considers that such a change is required. Users and the GSSP are required to comply with the GSO's instructions, issued through the SSDC and/or RDCs unless to do so would endanger life or would cause damage to Plant or Apparatus.

OC7.4.3 Determination of a Total Blackout or a Partial Blackout

The GSO will activate the Grid System Restoration Plan when, under conditions of System Stress any of the following has occurred:

(a) data arriving at the SSDC or RDC indicating Grid System split or the existence of a risk to Plant or Apparatus which requires that Plant or Apparatus to be offloaded or shutdown, which itself constitutes a Critical Incident; or

(b) reports or data from Power Stations that a CDGU has tripped or needs to be offloaded which constitutes a Critical Incident.

OC7.4.4 Restoration Preparation

The GSO with the GSSP shall ensure that a systematic restoration process is conducted by energising each part Power Island in such a way as to avoid Load rejection by the CDGUs concerned. When energising a substation that has "Gone-Black", isolation of certain outgoing feeders at that substation may be necessary to prevent excessive Load pick-up on CDGUs connected to that Power Island or the Grid System as the case may be, upon re-energisation. Where a Power Island has "Gone-Black", meaning that no CGGUs are operating to supply Consumer Demand, then the GSO will need to call on the service of Black Start Stations to re-establish voltage and frequency in that Power Island.

(I) Switching Guldellnes

The following switching guidelines shall be used in preparation for restoration:

(a) the SSDC or RDC concerned establishes its communication channels for the Power Island concerned;

(b) the SSDC sectionalises the Grid System into pre-determined Power Islands;

(c) an "All Open Strategy" is adopted for 275 kV and 132 kV "Passive"[2] circuits at transmission substations;

(d) a "Selective Open Strategy" is adopted for 275 kV or 132 kV "Active"[1] circuits at transmission substations;

(e) a "Feeding Strategy" is adopted for the Black Start Power Stations; and

(f) a "Cross Feeding Strategy" is adopted for utilising Black Start Power Stations to support the start up of other Power Stations in the same Power Island.

OC7.4.5 Re-energisation and Demand restoration

The re-energisation of transmission substations and Power Islands will involve the act of balancing available generation Capacity to Grid System Demand. It is the responsibility of the SSDC and RDCs to have details of each transmission substation Demand by transmission circuit, in order that the CDGU's concerned shall not be presented with Load pickup in excess of the weakest CDGU's loading acceptance limit. If this is not followed, this can result in load-rejection by a CDGU.

Re-energisation procedures should address the following issues:

(a) CDGU maximum Load pickup shall not be exceeded by the SSDC and RDCs;

(b) long transmission lines should be energised with shunt reactors in circuit to obtain 75% compensation; and

(c) Demand shall be predicted and also monitored in real time by the SSDC and RDCs to determine when additional transmission circuits can be re-energised.

(Ii) Demand Restoration

Wherever practicable, "High Priority" Consumers such as hospitals, national and international airports, shall have their Demand restored first. During restoration of Demand, the Grid System frequency shall be monitored to maintain it above 49.5Hz. Such a priority list, as contained in the Grid System Restoration Plan shall be prepared on the basis of Consumer categories and the Power Islands by the GSO for the approval of the Regulator.

OC7.4.6 Synchronisation of "Power Islands"

Once each Power Island is restored, they will be synchronised under the instructions of the GSO. The synchronising points shall be established by the GSO.

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[2] "Passive" circuits are those transmission circuits that do not have generation connected and which connect the Transmission Network to DNSP and/or Consumer Demand.

[1] "Active" circuits are not "Passive" circuits and are those transmission circuits that have a CDGU connected and/or which adversely impact upon a CDGU's Dispatch capability if they are not available (for example due to creating a constraint on the CDGU).

At present, the Grid System can be split into three Power Islands:

(a) Miri Power Island

(b) Bintulu-Sibu-Sarikei Power Island

(c) Kuching-Sri Aman Power Island

These three Power Islands are indicative only and can be changed by the GSO if, in consultation with the Regulator the GSO reasonably determines such changes are necessary. The SSDC and RDCs shall maintain full details of their responsibility for each Power Island that they are responsible for, which will be determined by the GSO.

OC7.5 GRID SYSTEM SPLIT DUE TO UNEXPECTED TRIPPING

OC7.5.1 General

Where the Grid System becomes split it is important that any Power Islands that exist are re-synchronised as soon as practicable to the main Grid System, but where this is not possible, Consumers should be kept on-supply from the Power Islands they are connected to. Where CDGUs have shutdown and sections of the Network are experiencing blackout conditions then the GSO will have to consider the available generating Capacity including any Operating Reserve and the prospective Demand that will be restored to ensure each Power Island operates within the frequency band given in the Planning Code.

To assist this process, the GSO, through the SSDC and the RDCs will prepare Demand data for each major transmission group on a weekly basis. This information will be updated annually. The SSDC and RDCs will prepare plans, for the GSO's approval, to cover unexpected tripping of the Transmission Network and dealing with Power Islands under System Stress conditions. These plans will be reviewed from time to time. In general it is considered that tripping under System Stress is considered to be that condition where following tripping of a transmission circuit it is not possible to restore Grid System interconnection due to a shortage of Operating Reserve.

Where Power Islanding occurs under System Stress, then the SSDC and RDCs should also have available rota load shedding programmes to avoid disconnected Consumers from being without supplies for extended periods. Where from analysis the GSO considers that certain transmission groups are at risk of extended periods of load shedding, then the GSO shall:

(a) submit details of these issues to the Single Buyer for its consideration of the planting of new generation; and/or

(b) prepare transmission development plans to deal with this in accordance with the Planning Code.

OC7.5.2 Communication Channels

The GSO and Users shall agree on the communication channels to be used for the purpose of OC7. These may be similar to the agreed channels identified pursuant to Operational Liaison OC5.

OC7.5.3 Grid System Restoration Plan Familiarisation and Training

It shall be the responsibility of the User to ensure that any of its personnel who may reasonably be expected to be involved in Grid System restoration are familiar with, and are adequately trained and experienced in their standing instructions and other obligations so as to be able to implement the procedures and comply with any procedures notified by the GSO.

The GSO will be responsible for arranging for simulator training and exercises between the GSSPs and the SSDC and RDCs plus Interconnected Parties to ensure that all parties are aware of their roles in this OC7. Once these parties are familiar with the role assigned by the GSO then exercises can be conducted, using simulators as appropriate with the Power Producers covered by OC7.

OC7.5.4 Grid System Restoration Test

The GSO shall in consultation with each User and GSSP on at least one occasion each year, carry out a Grid System Restoration Test for the purposes of assisting training. The content of the tests shall be notified in advance to the relevant parties, and a date and time for execution of the tests shall be agreed. The User must cooperate with any such testing.

OC7.6 AUTOMATIC DE-COUPLING SCHEME

There is an Automatic De-coupling Scheme (ADS) which creates a self-sustaining Power Island. This scheme is designed to operate in the event of a major loss of generation on the Grid System or when there is a split in vital sections of the Transmission Network or Interconnector.

The decision to switch the ADS on or off lies with the GSO in consultation with the Regulator.

The GSO shall be the overall coordinator for monitoring and control of the ADS operation.

Operating Code No. 8

Safety Coordination

OCS.1 INTRODUCTION

Operating Code No. 8 (OC8) specifies the Safety Rules criteria to be applied by the GSO to meet the Ordinance, other legal requirements and Prudent Utility Practice. The Safety Rules contain principles and procedures to be adopted by the relevant party to ensure safe operation of the Grid System and safety of personnel working on the Grid System.

Similar criteria and standards of safety are required to be provided by Users of the Grid System when carrying out work, tests or operations at the respective Connection Point.

OCS.2 OBJECTIVES

The objectives of OC8 are to:

(a) is to establish the requirement on the GSO, GSSP and Users (or their contractors) .to operate the Grid System or User System respectively in accordance with approved safety regulations; and

(b) ensure safe working conditions for personnel working on or in close proximity to Plant and Apparatus on the Grid System or personnel who may have to work at or use the equipment at the interface between the Grid System and a User System.

The work carried out will normally involve making Apparatus dead, securing associated Plant, including disabling and suitably securing any prime movers, isolating and earthing that Plant and Apparatus such that it cannot be made live again from the Grid System or subject to mechanical power and the establishing of a safe working area. It also includes the testing of Plant and Apparatus.

OCS.3 SCOPE

OC8 applies to the GSO and the following Users:

(a) Power Producers with CDGUs;

(b) All Power Producers with Generating Units not subject to Dispatch by the GSO, with total on-site generation capacity equal to or greater than 5 *Ml/ti* where the GSO considers it necessary;

(c) Large Consumers where the GSO considers it necessary;

(d) Interconnected Parties;

(e) GSSPs where safety coordination is required between TNSP and DNSP or between a GSSP and another User; and

(f) any other party reasonably specified by the GSSP or GSO.

Within OC8 on matters of safety the "Network Controller" shall be consulted when *any* User has *any* doubt about the required procedures under OCB. Where a Network Controller is uncertain then it should consult the GSO who in turn *may* consult the Regulator over matters relating to the Electricity Rules and Ordinances.

OC8.4 PROCEDURES

OCS does not seek to impose a particular set of Safety Rules on the GSO, GSSP and Users. The Safety Rules to be adopted and used by the GSO, GSSP_ and each User shall be those chosen by each party's management. Such Safety Rules and associated safety instructions shall comply with the Ordinance and applicable Malaysian Federal Regulations.

OC8.4.1 Defined Terms

Users should bear in mind that in OCB only, in order that OCB reads more easily with the terminology used in certain User's Safety Rules, the term "HV Apparatus" is defined more restrictively and is used accordingly in OCS. Users should, therefore, exercise caution in relation to this term when reading and using OCB.

In OCS only the following terms shall have the following meanings:

(a) "HV Apparatus" means High Voltage electrical Apparatus forming part of a Network to which "Safety Precautions" must be applied to allow work to be carried out on that Network or a neighbouring Network.

(b) "Isolation" means the disconnection or separation of HV Apparatus from the remainder of the Network in accordance with the following:

- an Isolating device maintained in an isolating position. The isolating position must either be;
  - maintained by immobilising and or locking of the isolating device in the isolating position and affixing an "Isolation Notice" to it. Where the isolating device is locked with a "Safety Key", the Safety Key must be retained in safe custody;or
  - maintained and/or secured by such other method which must be in accordance with the "Local Safety Instructions" of the Network Controller or that User, as the case may be; alternatively
- an adequate physical separation which must be in accordance with, and maintained by, the method set out in the Local Safety Instructions of the Network Controller or that User, as the case may be, and, if it is a part of that method, an Isolation Notice must be placed at the point of separation.

(c) "Earthing" means a *way* of providing a connection between HV conductors and earth by an Earthing device which is either:

- immobilised and locked in the Earthing positions. Where the Earthing device is locked with a Safety Key, the Safety Key must be secured and kept in safe custody; or

- maintained and/or secured in position by such other method which must be in accordance with the Local Safety Instructions of the Network Controller or that User as the case may be.

(d) For the purpose of the coordination of safety under this OC8 relating to HV Apparatus, the term "Safety Precautions" means Isolation and/or Earthing.

(e) "Network Controller" means the SSDC or RDC or GSSP network control centre that is responsible for that part of the Transmission Network or Distribution Network that the User has its Connection Point on.

In OC8, references to a Connection Agreement shall be deemed to include references to the application or offer thereof.

OCS.4.2 Approval of Local Safety Instructions

In accordance with the timing requirements of its Connection Agreement, each User will supply to the Network Controller a copy of its Safety Rules and any Local Safety Instructions relating to its side of the Connection Point.

Prior to connection each party must have agreed the other's relevant Safety Rules and relevant Local Safety Instructions in relation to Isolation and Earthing and obtained the approval of the GSO to such instruction.

Either party may require that the Isolation and/or Earthing provisions in the other party's Safety Rules be made more stringent by the issue by that party of a Local Safety Instructions affecting the Connection Point concerned. Provided that these requirements are not unreasonable in the view of the other party, then that other party will make such changes as soon as reasonably practicable. These changes may need to cover the application of Isolation and/or Earthing at a place remote from the Connection Point, depending upon the Network layout. Approval may not be withheld because the party required to approve reasonably believes the provisions relating to Isolation and/or Earthing are too stringent.

If, following approval, a party wishes to change the provisions in its Local Safety Instructions relating to Isolation and/or Earthing, it must inform the other party. If the change is to make the provisions more stringent, then the other party merely has to note the changes. If the change is to make the provisions less stringent, then the other party needs to approve the new provisions referred to OC8 apply.

The procedures for the establishment of safety coordination by the GSO with an Interconnected Party are set out in an Interconnector Agreement with each Interconnected Party.

OCS.4.3 Safety Coordinators

For each Connection Point and or Custody Transfer Point each User will at all times have a person nominated as " Safety Coordinator", to be responsible for the coordination of safety precautions when work is to be carried out on a Network, which necessitates the provision of Safety Precautions on HV Apparatus as required by OC8. A Safety Coordinator may be responsible for the coordination of safety on HV Apparatus at more than one Connection Point. The names of these Safety Coordinators will be notified in writing to the Network Controller by Users.

Each Safety Coordinator shall be authorised by a User, as the case may be, as competent to carry out the functions set out in OC8 to achieve safety from the Grid System. Existing Users have 90 calendar days to so notify the GSSP and RDC from the date of publication of the Grid Code. Only persons with such authorisation will carry out the provisions of OC8.

Contact between Safety Coordinators and the Network Controller will be made via normal operational channels and accordingly separate telephone numbers for Safety Coordinators shall be provided to the Network Controller. At the time of making contact, each User will confirm to the Network Controller that they are authorised to act as Safety Coordinator, pursuant to OC8.

If work is to be carried out on a Network which necessitates the provision of Safety Precautions on HV Apparatus in accordance with the provisions of OC8, the "Requesting Safety Coordinator" who requires the Safety Precautions to be provided will contact the Network Controller who will contact the relevant "Implementing Safety Coordinator" to coordinate the establishment of the Safety Precautions.

OC8.4.4 Record of Safety Precautions (ROSP)

This part sets out the procedures for utilising the "Record of Safety Precautions" ("ROSP") between Users through the Network Controller.

The Network Controller will use the format of the ROSP forms set out in Appendix A and Appendix B of this OC8. That set out in Appendix A and designated as "ROSP-R," will be used where the RDC or GSSP or User is acting for the Requesting Safety Coordinator. Appendix B sets out "ROSP-1," which will be used when the Network Controller is acting for the Implementing Safety Coordinator. Pro formas of ROSP-R and ROSP-1 will be provided for use by Network Controller staff by the GSO.

The format used adopted by Users shall be as follows:

(a) User may either adopt the format referred to in OC8.4.4, or use an equivalent format, provided that it includes sections requiring insertion of the same information and has the same numbering of sections as ROSP-R and ROSP-1 as set out in Appendices A and B respectively.

{b) Whether Users adopt the format referred to in OC8.4.4, or use the equivalent format as above, the format may be produced, held in, and retrieved from an electronic form by the User.

(c) Whichever method Users choose, each must provide pro formas (whether in tangible or electronic form) for use by its staff.

All references to ROSP-R and ROSP-1 shall be taken as referring to the corresponding parts of the alternative forms or other tangible written or electronic records used by each User.

ROSP-R will have an identifying number written or printed on it, comprising a prefix which identifies the location at which it is issued, and a unique (for each User or the GSSP or RDC as the case may be) serial number consisting of four digits and the suffix "R".

Concerning the prefix to be adopted by a User;

(a) In accordance with the timing requirements set out in the Connection Conditions, each User shall apply in writing to the RDC for the RDC's approval of its proposed prefix.

(b) RDC shall consider the proposed prefix to see if it is the same as (or confusingly similar to) a prefix used by another User and shall, as soon as possible (and in any event within 21 calendar days), respond in writing to the User with its approval or disapproval.

(c) If the RDC disapproves, it shall explain in its response why it has disapproved and will suggest an alternative prefix.

(d) Where the RDC has disapproved, then the User shall either Aotify the RDC in writing of its acceptance of the suggested alternative prefix or it shall apply in writing to the RDC with revised proposals and the above procedure shall again apply to that application.

OC8.5 SAFETY PRECAUTIONS FOR HV APPARATUS

OC8.5.1 Agreement of Safety Precautions.

The Requesting Safety Coordinator who requires Safety Precautions on another User's Network, will contact the RDC giving the details of the required work location and the requested Isolation point, where known. The RDC will contact the other User's Implementing Safety Coordinator, to agree the Safety Precautions carried out. This agreement will be recorded inthe respective Safety Logs.

It is the responsibility of the RDC to ensure that the Implementing Safety Coordinator can establish and provide Safety Precautions on his and/or any other User's Network connected to his Network, to enable the Requesting Safety Coordinator to achieve safety from this part of the Power System.

When the RDC is of the reasonable opinion that it necessary for additional Safety Precautions on the Network of the Requesting Safety Coordinator, he shall contact the Requesting Safety Coordinator and the details shall be recorded in Part 1.1 of the ROSP forms. In these circumstances it is the responsibility of the Requesting Safety Coordinator to establish and maintain such Safety Precautions.

OC8.5.2 Inthe Event of Disagreement

In any case where the Requesting Safety Coordinator and or the Implementing Safety Coordinator are unable to agree with the RDC the location of the Isolation and (if requested} Earthing, then this shall be at the closest available points on the infeeds to the HV Apparatus on which safety from the Grid System is to be achieved.

OC8.5.3 Implementation of an Isolation Request

Following agreement of the Safety Precautions in accordance with OC8 the Implementing Safety Coordinator's shall, on the instructions of the RDC, establish the agreed Isolation point. The confirmation shall specify:

(a) for each location, the identity (by means of HV Apparatus name, nomenclature and numbering or position, as applicable) of each point of Isolation.

(b) whether Isolation has been achieved by an Isolating Device in the isolating position or by an adequate physical separation.

(c) where an Isolating Device has been used whether the isolating position is either:

- maintained by immobilising and locking the Isolating Device in the isolating position and affixing an Isolation Notice to it. Where the Isolating Device has been locked with a Safety Key, that the Safety Key has been retained in safe custody; or
- maintained and/or secured by such other method which must be in accordance with the Local Safety Instructions of the RDC or that User, as the case may be; and

(d) where an adequate physical separation has been used that it will be in accordance with, and maintained by, the method set out in the local Safety Instructions of the RDC or that User, as the case may be, and, if it is a part of that method, that a Caution Notice has been placed at the point of separation.

The confirmation of Isolation shall be recorded in the respective Safety Logs.

Following the confirmation of Isolation being established by the Implementing Safety Coordinator and the necessary establishment of relevant Isolation on the Requesting Safety Coordinators Network, the Requesting Safety Coordinator may then request the implementation of Earthing by the Implementing Safety Coordinator, if agreed in OC8.5.4.

OC8.5.4 Implementation of Earthing

The Implementing Safety Coordinator shall now establish the agreed points of Earthing.

The Implementing safety Coordinator shall confirm to the Requesting Safety Coordinator that the agreed Earthing has been established, and identify the Requesting Safety Coordinator's HV Apparatus up to the Connection Point, for which the Earthing has been provided. The confirmation shall specify:

(a) for each location, the identity (by means of HV Apparatus name, nomenclature and numbering or position, as is applicable) of each point of Earthing; and

(b) in respect of the Earthing Device used, whether it is:

- immobilised and locked in the Earthing position. Where the Earthing Device has been Locked with a Safety Key, that the Safety Key has been secured in a Key Safe and the key Safe Key will be retained in safe custody; or
- maintained and/or secured in position by such other method which is in accordance with the Local Safety Instructions of the RDC or the User, as the case may be.

The confirmation of Earthing shall be recorded in the respective Safety Logs.

The Implementing Safety Coordinator shall ensure that the established Safety Precautions are maintained until requested to be removed by the relevant Requesting Safety Coordinator.

OC8.5.5 ROSP Issue Procedure

Where Safety Precautions on a Network are being provided to enable work on the Requesting Safety Coordinator's Network, before any work commences they must be recorded by a ROSP being issued. The ROSP is applicable to HV Apparatus up to the Connection Point in the ROSP-R and ROSP-1 forms.

Where Safety Precautions are being provided to enable work to be carried out on both sides of the Connection Point at ROSP will need to be issued for each side of the Connection Point with each User enacting the role of Requesting Safety Coordinator. This will result in a ROSP-R and ROSP-1 fonn being completed by each User, with each Safety Coordinator issuing one ROSP number and advising the RDC accordingly.

Once the Safety Precautions have been established, the Implementing Safety Coordinator shall complete parts 1.1 and 1.2 of a ROSP-1 fonn recording the details specified in OC8.5.3 and OC8.5.4. Where Earthing has not beenrequested, Part 1.2(b) will be completed with the words "not applicable" or "N/A". He/she shall then contact the Requesting Safety Coordinator to pass on these details.

The Requesting safety Coordinator shall complete Parts 1.1 and 1.2 of the ROSP-R making a precise copy of the details received. On completion, the Requesting Safety Coordinator shall read the entries made back to the sender and verbally check that an accurate copy has been made.

The Requesting Safety Coordinator shall then issue the number of the ROSP, taken from the ROSP-R, to the Implementing Safety Coordinator who will ensure that the number, including the prefix and suffix, is accurately recorded in the designated space on the ROSP-1 fonn.

The Requesting Safety Coordinator and the Implementing Safety Coordinator shall complete and sign Part 1.3 of the ROSP-R and ROSP-1 respectively and then enter the time and date. Once signed no alteration to the ROSP is pennitted; the ROSP may only be cancelled.

The Requesting Safety Coordinator is then free to authorise work (including a test that does not affect the Implementing Safety Coordinator's Network). Where testing is to be carried out which affects the Implementing Safety Coordinator's Network, the procedure set out below in OC8.8 shall be implemented.

OC8.6 ROSP CANCELLATION PROCEDURE

When the Requesting Safety Coordinator decides that Safety Precautions are no longer required, he will contact the relevant Implementing Safety Coordinator to effect cancellation of the associated ROSP.

The Requesting Safety Coordinator will inform the relevant Implementing Safety Coordinator of the ROSP identifying number (including the prefix and suffix), and agree it is the ROSP to be cancelled.

The Requesting Safety Coordinator and the relevant Implementing Safety Coordinator shall then respectively complete Part 2.1 of their respective ROSP-R and ROSP-1 fonns and shall then exchange details. The details being exchanged shall include their respective names and time and date. On completion of the exchange of details the respective ROSP is cancelled.

Neither Safety Coordinator shall instruct the removal of any Isolation fonning part of the Safety Precautions as part of the returning of the HV Apparatus to service until ii is confinned to each by each other that every earth on each side of the Connection Point, within the points of isolation identified on the ROSP, has been removed or disconnected by the provision of additional points of Isolation.

Subject to the provisions of OC8.6, the Implementing Safety Coordinator is then free to arrange the removal of the Safety Precautions, the procedure to achieve that being entirely

an internal matter for the party the Implementing Safety Coordinator is representing. The only situation in which any Safety Precautions may be removed without first cancelling the ROSP in accordance with OC8.6 is when Earthing is removed in the situation envisaged in OC8.8.

OCS.7 ROSP CHANGE CONTROL

Nothing in OC8 prevents the RDC and Users agreeing to a simultaneous cancellation and issue of a new ROSP, if both agree. It should be noted, however, that the effect of that under the relevant Safety Rules is not a matter with which the Grid Code deals.

OCS.8 TESTING AFFECTING ANOTHER SAFETY COORDINATOR'S NEIWORK

Where the carrying out of a test may affect Safety Precautions on ROSPs or work being carried out which does not require a ROSP, then the. Testing can, for example, include the application of an independent test voltage. Accordingly, where the Requesting Safety Coordinator wishes to authorise the carrying out of such a test to which the procedures in OC8.8 apply he may not do so and the test will not take place unless and until the steps in (a) to (c) below have been followed and confirmation of completion has been recorded in the respective Safety Logs:

(a) confirmation must be obtained from the Implementing Safety Coordinator that:

- no person is working on, or testing, or has been authorised to work on, or test, any part of its Network or another Network(s) (other than the Network of the Requesting Safety Coordinator) within the points of Isolation identified on the ROSP form relating to the test which is proposed to be undertaken, and;
- no person will be so authorised until the proposed test has been completed (or cancelled) and the Requesting Safety Coordinator has through the RDC notified the Implementing Safety Coordinator of its completion (or cancellation).

(b) any other current ROSPs which relate to the parts of the Network in which the testing is to take place must have been cancelled in accordance with procedures set out in OC8.5.5.

(c) the Implementing Safety CoordinatQr must agree through the SSDC with the Requesting Coordinator to permit the testing on that part of the Network between the points of Isolation identified in the ROSP associated with the test and the points of Isolation on the requesting Safety Coordinator's Network.

The Requesting Safety Coordinator will inform through the RDC the Implementing Safety Coordinator as soon as the test has been completed or cancelled and the confirmation shall be recorded in the respective Safety Logs of the RDC and Users.

When the test gives rise to the removal of Earthing which it is not intended to re-apply, the relevant ROSP associated with the test shall be cancelled at the completion or cancellation of the test in accordance with the procedure set out in either OC8.5.5. Where the Earthing is re-applied following the completion or cancellation of the test, there is no requirement to cancel the relevant ROSP associated with the test under OC8.8.

OC8.8.2 LOSS OF INTEGRITY OF SAFETY PRECAUTIONS

Jn any instance when any Safety Precautions may be ineffective for any reason, the relevant Safety Coordinator shall inform the other Safety Coordinator(s) through the Network Controller without delay of this fact. and if requested, the reasons why.

OC8.9 SAFETY LOGS

The Network Controllers and **Users** shall maintain **Safety Logs,** which shall be a chronological record of all messages relating to safety coordination under OC8 sent and received by the Safety Coordinators. The **Safety Logs** must be retained for a period of not less than one year.

oca - APPENDIX A

[SESCo) _____CONTROL CENTRE/SITE

RECORD OF SAFETY PRECAUTIONS (ROSP-R)
(Requesting Safety Co-ordinator's Record)

ROSP NUMBER____

PART 1

1.1 **HV APPARATUS IDENTIFICATION**

Safety Precautions have been established by the Implementing Safety Co-ordinator (or by another User on that User's System connected to the Implementing Safety Co-ordinator's System) to achieve safety from the Power System on the following HV Apparatus on the Requesting Safety Co-ordinator's System: (state identity - name(s) and, where applicable, identification of the HV circuit(s) up to the Connection Point):

Further Safety precautions required on the Requesting Safety Co-ordinator's System as notified by the Implementing Safety Co-ordinator.

1.2 **SAFETY PRECAUTIONS ESTABLISHED**

(a) **ISOLATION**

State the Location(s) at which Isolation has been established (whether on the Implementing Safety Co-ordinator's Network or on the Network of another User connected to the Implementing Safety Co-ordinator's Network). For each Location, identify each point of Isolation, state the means by which Isolation has been achieved, and whether, immobilised and locked, Isolation Notice affixed and other safety procedures applied, as appropriate.

(b) **EARTHING**

State the Location(s) at which Earthing has been established (whether on the Implementing Safety Co-ordinator's Network). For each location, identify each point of Earthing. For each point of Earthing, state the means by which Earthing has been achieved, and whether, immobilised and Locked, other safety procedures applied, as appropriate.

1.3 **ISSUE**

I have received confirmation from (name of the Implementing Safety Co-ordinator) that the Safety Precautions identified in paragraph 1.2 have been established and that instructions will not be issued at his location for their removal until this ROSP is cancelled.

Signed_____(Requesting Safety Co-ordinator)

at_____;(time) on_____(Date)

PART 2

2.1 **CANCELLATION**

I have confirmed to (name of the Implementing Safety Co-ordinator) that the Safety Precautions set out in paragraph 1.2 are no longer required and accordingly the ROSP is cancelled.

Signed _____(Requesting Safety Co-ordinator)

at_____(time) on _____(Date)

OCS -APP'ENDIX B

[SESCo] _____CONTROL CENTRE/SITE

RECORD OF SAFETY PRECAUTIONS (ROSP-1)
(Implementing Safety Co-ordinator's Record)

ROSP NUMBER_____

PART 1

1.1 HV APPARATUS IDENTIFICATION

Safety Precautions have been established by the Implementing Safety Co-ordinator (or by another User on that User's Network connected to the Implementing Safety Co-ordinator's Network) to Safety From The Power System on the following HV Apparatus on the Requesting Safety Co-ordinator's System: [state identity • name(s) and, where applicable, identification of the HV circuit(s) up to the Connection Point]:

Recording of notification given to the Requesting Safety Co-ordinator concerning further Safety Precautions required on the Requesting Safety Co-ordinator's Network.

1.2 SAFETY PRECAUTIONS ESTABLISHED

(a) ISOLATION

State the location(s) at which Isolation has been established (whether on the Implementing Safety Co-ordinator's Network or on the Network of another Urer connected to the Implementing Safety Co-ordinator's Network). For each location, identify each point of Isolation, state the means by which Isolation has been achieved, and whether, immobilised and locked, Isolation Notices affixed, other safety procedures applied. as appropriate.

(b) EARTHING

State the Location(s) at which Earthing has been established (whether on the Implementing Safety Co-ordinator's Network). For each Location, identify each point of Earthing. For each point of Earthing, state the means by which Earthing has been achieved, and whether, immobilised and locked, other safety procedures applied, as appropriate.

1.3 ISSUE

I have received confirmation from (name of the Requesting Safety Co-ordinator) that the Safety Precautions identified in paragraph 1.2 have been established and that instructions will not be issued at his location for their removal unit this ROSP is cancelled.

Signed_____(Implementing Safety Co-ordinator)

at_____(time) on_____(Date)

PART 2

2.1 CANCELLATION

Ihave confirmed to (name of the Requesting Safety Co-ordinator) that the Safety Precautions set out in paragraph 1.2 are no longer required and accordingly this ROSP is cancelled.

Signed_____(Implementing Safety Co-ordinator)

at_____(time) on_____(Date)

OCS -APPENDIX B

[SESCo] _____CONTROL CENTRE/SITE

RECORD OF SAFETY PRECAUTIONS (ROSP-1)
(Implementing Safety Co-ordinator's Record)

ROSP NUMBER_____

PART 1

1.1 HV APPARATUS IDENTIFICATION

Safety Precautions have been established by the Implementing Safety Co-ordinator (or by another User on that User's Network connected to the Implementing Safety Co-ordinator's Network) to Safety From The Power System on the following HV Apparatus on the Requesting Safety Co-ordinator's System: [state identity • name(s) and, where applicable, identification of the HV circuit(s) up to the Connection Point]:

Recording of notification given to the Requesting Safety Co-ordinator concerning further Safety Precautions required on the Requesting Safety Co-ordinator's Network.

1.2 SAFETY PRECAUTIONS ESTABLISHED

(a) ISOLATION

State the location(s) at which Isolation has been established (whether on the Implementing Safety Co-ordinator's Network or on the Network of another Urer connected to the Implementing Safety Co-ordinator's Network). For each location, identify each point of Isolation, state the means by which Isolation has been achieved, and whether, immobilised and locked, Isolation Notices affixed, other safety procedures applied. as appropriate.

(b) EARTHING

State the Location(s) at which Earthing has been established (whether on the Implementing Safety Co-ordinator's Network). For each Location, identify each point of Earthing. For each point of Earthing, state the means by which Earthing has been achieved, and whether, immobilised and locked, other safety procedures applied, as appropriate.

1.3 ISSUE

I have received confirmation from (name of the Requesting Safety Co-ordinator) that the Safety Precautions identified in paragraph 1.2 have been established and that instructions will not be issued at his location for their removal unit this ROSP is cancelled.

Signed_____(Implementing Safety Co-ordinator)

at_____(time) on_____(Date)

PART 2

2.1 CANCELLATION

Ihave confirmed to (name of the Requesting Safety Co-ordinator) that the Safety Precautions set out in paragraph 1.2 are no longer required and accordingly this ROSP is cancelled.

Signed_____(Implementing Safety Co-ordinator)

at_____(time) on_____(Date)

Operating Code No. 9

Numbering and Nomenclature

OC9.1 INTRODUCTION

Operating Code No. 9 (OC9) sets out the responsibilities and procedures for notifying the relevant Users of the numbering and nomenclature of Plant and Apparatus at the Connection Point.

The numbering and nomenclature of Plant and Apparatus shall be included in an Operational Diagram prepared for each Connection Point as detailed in this OC9.

OC9.2 OBJECTIVES

The main objective of OC9 is to ensure that at any Connection Point. every item of Plant and or Apparatus has numbering and or nomenclature that has been mutually agreed and notified between the User and the GSO, to reduce any risk of error that might affect site and personnel safety.

OC9.3 SCOPE

OC9 applies to the GSO and the following Users:

(a) Grid System Service Provider (GSSP);

(b) All Power Producers with CDGUs;

(c) All Power Producers with Generating Units not subject to Dispatch by the GSO, with total on-site generation capacity equal to or greater than 5 *f.8'N* whero the GSO considers it necessary;

(d) Large Consumers where the GSO considers it necessary; and

(e) Interconnected Parties.

OC9.4 PROCEDURES FOR NUMBERING AND NOMENCLATURE

The GSO, GSSP and or User shall provide upon a reasonable request by either party details of the numbering and nomenclature to be applied at the relevant Connection Point.

The GSO, GSSP and User will be responsible for the provision and erection of clear and unambiguous labelling showing the numbering and nomenclature of its respective Plant and Apparatus at the Connection Point. The details and language to be used on the labelling shall be as agreed between the parties.

Guidance for suitable circuit designations and labelling is given in "PPG 9.3: Nomenclature for SESCO HV equipment" or as amended.

OC9.4.1 New Plant and Apparatus

When the GSO, GSSP or User intends to install new Plant and Apparatus at the Connection Point, the proposed numbering and or nomenclature to be adopted for the Plant and Apparatus must be notified to other relevant parties.

The notification shall be made in writing to the relevant parties and will consist of the latest revision of the Operational Diagram pursuant to the Connection Conditions (CC) incorporating the proposed new Plant and Apparatus to be installed and its proposed numbering and nomenclature. If such an Operational Diagram does not exist, such a diagram shall be produced and agreed between the parties involved in compliance with the Grid Code.

This notification shall be made to the relevant parties at least 180 calendar days (or such shorter period as GSO, GSSP or the User, as the case may be, may agree) in advance prior to the installation of the proposed Plant and Apparatus. The relevant parties shall respond within 30 calendar days of the receipt whether the proposed numbering and nomenclature is acceptable or not. In the event that an agreement cannot be reached between the relevant parties, the GSO. acting reasonably, shall determine the appropriate numbering and nomenclature.

OC9.4.2 Existing Plant and Apparatus

When the GSO, GSSP or User intends to change the existing numbering and or nomenclature for its Plant and Apparatus at the Connection Point, these proposed changes must be notified to other parties.

The notification shall be made in writing to the relevant parties and will consist of the latest revision of the Operational Diagram pursuant to the CC or OC9.4.1 with the necessary amendments to reflect the proposed changes.

The relevant parties shall respond within 30 calendar days upon receipt of this notification. In the event that an agreement cannot be reached between the relevant parties, the GSO, acting reasonably, shall determine the appropriate numbering and nomenclature if this change is deemed necessary by the GSO.

Operating Code No. 10

Testing and Monitoring

OC10.1 INTRODUCTION

To ensure that the Grid System is operated efficiently to network planning standards and to meet legal requirements, the GSO may organise and carry out testing and or monitoring of the effect of a User's System on the Grid System.

The testing and monitoring procedure will be specifically related to the technical criteria detailed in the Planning Code (PC) or Connection Conditions (CC) to which the User must comply. This will also relate to the technical parameters submitted by Users as requested for by the GSO in the CC.

Operating Code No. 10 (OC10) specifies the procedures to be followed by the GSO in coordinating and the GSSP in carrying out the following functions:

(a) testing and monitoring to ensure compliance by Users with the PC and CC;

(b) testing and monitoring of CDGUs against their Generating Unit Scheduling and Dispatch parameters registered under Scheduling and Dispatch Code No. 1 (SDC1);

(c) testing carried out on CDGUs to ensure that the CDGUs are available in accordance with their Availabllity declaration, under the Scheduling and Dispatch Code (SOC) and other appropriate agreements;

(d) testing carried out on CDGUs to test that they have the capability to comply with the CC and, in the case of response to frequency, SDC3; and

(e) testing of the provision by Users of Ancillary Services which they are required or have agreed to provide, including the provision of any Black Start services required.

OC10.2 OBJECTIVES

The objectives of OC10 are:

(a) to specify the GSO's requirements to test and or monitor the Grid System or User's System at the Connection Point or Custody Transfer Point (CTP) to ensure that Users are not operating outside the technical parameters required by the PC and CC;

(b) to establish whether CDGUs operate within their Generating Unit Scheduling and Dispatch parameters registered under SDC1 (and other appropriate agreements);

(c) to establish whether a CDGU is available as declared;

(d) to establish whether Power Producers or GSSPs can provide those Ancillary Services which they are either required or have agreed to provide; and

(e) to enable the GSO to comply with its Licence conditions, Ordinance and other legal requirements.

OC10.3 SCOPE

OC10 applies to the GSO, GSSP and all Users of the Grid System.

OC10.4 PROCEDURES RELATING TO QUALITY OF SUPPLY

The GSO will from time to time determine the need to test and or monitor the quality of supply at various points on its Grid System.

The requirement for specific testing and or monitoring may be initiated by the GSO or GSSP on receipt of complaints by a User as to the quality of supply on its Grid System or by the GSO where in the reasonable opinion of the GSO, such tests are necessary.

In certain situations, the GSO may require the testing and or monitoring to take place at the point of connection of a User with the Grid System. This may require the User to allow the GSO a right of access on to the User's property to perform the necessary tests and/or monitoring on any equipment at the Connection Point and/or other equipment on the User's System where the GSO deems necessary; such right to be exercised reasonably 5 Business Days after a prior written notice has been served on the User.

After such testing and or monitoring has taken place, the GSO will advise the User involved in writing within 90 calendar days or such a period mutually agreed between the parties and will make available the results of such tests to the User.

Where the results of such a test show that the User is operating outside the technical parameters specified in the Grid Code, the User will be informed accordingly in writing.

The GSO shall agree with the User a suitable timeframe to resolve those problems on its User System, failing to do so may lead to the de-energisation of the User System as indicated in the terms of the Connection Agreement .

OC10.5 PROCEDURE RELATING TO CONNECTION POINT PARAMETERS

The GSO from time to time may monitor the effect of the User System on the Grid System.

This monitoring will normally be related to the amount of Active Power and or Reactive Power swing or voltage flicker or voltage sag/swell and any harmonics generated by the User System and transferred across the Connection Point.

The GSO may check from time to time that the Users are in compliance with agreed protection requirements and protection settings or require the User to demonstrate such settings .

OC10.6 PROCEDURE RELATING TO MONITORING CENTRALLY DISPATCHED GENERATING UNITS

OC10.6.1 General

The GSO or GSSP will monitor:

(a) the performance of CDGUs against the parameters registered as generation Scheduling and Dispatch Parameters (SOP) under SDC1 and other appropriate agreements;

(b) compliance by Power Producers with the CC; and

(c) the provision by Power Producers of Ancillary Services which they are required or have agreed to provide.

OC10.6.2 Failure In Performance

In the event that a CDGU fails persistently, in the GSO's and or GSSP's reasonable view, to meet the parameters registered as generation Scheduling and Dispatch Parameters under SDC1 or a Power Producer fails persistently to comply with the CC and in the case of response to frequency, SDC3 or to provide the Anclllary Services it is required, or has agreed to provide, the GSO or GSSP shall notify the relevant User giving details of the failure and of the monitoring that the GSO or GSSP has carried out.

The relevant User will, as soon as possible, provide the GSO or GSSP, as appropriate, with an explanation of the reasons for the failure and, in the case of a Power Producer, details of the action that it proposes to take to enable the CDGU to meet those parameters, and in the case of a GSSP or User, details of the action it proposes to take to comply with the CC and in the case of response to frequency, SDC3, or to provide the Ancillary Services it is required or has agreed to provide, within a reasonable period.

The GSO or GSSP, as appropriate, and the Power Producer will then discuss the action it proposes to take and will endeavour to reach agreement as to the parameters which are to apply to the CDGU and the effective date(s) for the application of the agreed parameters.

In the event that agreement cannot be reached within 14 calendar days of notification of the failure by the GSO or GSSP to the Power Producer, the GSO or GSSP shall be entitled to require a test, as set out in OC10.7 to be carried out.

OC10.7 PROCEDURE RELATING TO TESTING CENTRALLY DISPATCHED GENERATING UNITS

The GSO or GSSP, as appropriate, will notify a Power Producer with CDGUs that it proposes to carry out any relevant tests at least 2 Business Days prior to the time of the proposed test. The GSO or GSSP will only make such a notification If the relevant Power Producer has declared the relevant CDGU available in an Avallablllty declaration in accordance with the SOC at the time at which the notification is issued. If the GSO or GSSP, as appropriate, makes such a notification, the relevant Power Producer shall then be obliged to make that CDGU available in respect of the time and for the duration that the test is instructed to be carried out, unless that CDGU would not then be available by reason of planned outage approved prior to this instruction in accordance with OC2.

Any testing to be carried out is subject to Grid System conditions prevailing on the day

OC10.7.1 Reactive Power Tests

This test would be conducted to.demonstrate that the relevant CDGU meets the Reactive Power capability registered with the GSO under the SOC which shall meet the requirements set out in the CC.

The test will be initiated by the issue of Dispatch instructions under SDC2. The duration of the test will be for a period of up to 60 minI.(tes during which period the Grid System voltage at the Connection Point for the relevant CDGU will be maintained by the Power Producer at the voltage required by SDC2 through adjustment of Reactive Power on the remaining CDGUs, if necessary.

The performance of the GDGU will be recorded by a method to be determined by the GSO or GSSP, and the GDGU will pass the test if it is within ± 2.5 % of the capability registered under the PC which shall meet the requirements set out in CC (with due account being taken of any conditions on the Grid System which may affect the results of the test). The relevant Power Producer must, if requested, demonstrate, to the GSO or GSSP's reasonable satisfaction, the reliability and accuracy of the equipment used in recording the perfonnance.

Testing of synchronous compensation by de-clutched Gas Turbine CDGUs and hydro CDGUs spinning in air, will also be carried out under the procedure set Ol.lt in this section.

OC10.7.2 Registered Generating Unit Scheduling and Dispatch Parameters

This test would be conducted to demonstrate that the relevant CDGU meets the relevant generation Scheduling and Dispatch Parameters which are being or have been monitored under OC10.6.

The test will be initiated by the issue of Dispatch instructions under SDC2. The duration of the test will be consistent with and sufficient to measure the relevant generation Scheduling and Dispatch Parameters, which are still in dispute following the monitoring procedure.

The performance of the CDGU will be recorded as determined by the GSO or GSSP, as appropriate, and the CDGU will pass the test if the following generation Scheduling and Dispatch Parameters are met:

(a) in the case of achieving Synchronisation, Synchronisation is achieved with ± 5 minutes of the time it should have achieved Synchronisation;

(b) in the case of Synchronising and Loading, the Loading achieved is within an error level equivalent to ± 2.5 % of Dispatched instructions;

(c) in the case of meeting run-up rates, the CDGU achieves the instructed output and, where applicable, the first and or second intermediate breakpoints, each within ± 3 minutes of the time it should have reached such output and breakpoint(s) from Synchronisation calculated from its contracted run-up rates;

(d) in the case of meeting de-loading rates, if the CDGU achieves de-loading within ± 5 minutes of the time, calculated from registered de-loading rates; and

(e) in the case of all other generation Scheduling and Dispatch P...,..,. not contained in (a) to (d) above, the test results are within t 2.5 % of the declared value being tested.

Due account will be taken of any conditions on the Grid System which may affect the results of the test. The relevant Power Producer must, if requested, demonstrate, to the GSO or GSSP's reasonable satisfaction, the reliability and accuracy of the equipment used during the tests.

OC10.7.3 Availability Declaration Testing

The GSSP may at any time, following on the instructions from the GSO, carry out a test on the Availability of a CDGU (an "Availability Test"), by Scheduling and Dispatching that CDGU in accordance with the requirements of the relevant provisions of any appropriate agreement or based on instructions from the GSO. Accordingly, the CDGU will be Scheduled and Dispatched even though it may not otherwise have been Scheduled and Dispatched on the basis of the relevant Merit Order or Grid System constraints, in the absence of the requirement for the Availability Test. The Power Producer whose CDGU is the subject of the Availability Test will comply with the instructions properly given by the GSO or GSSP relating to the Availability Test.

The GSO, after consulting with the GSSP, will determine whether or not a CDGU has passed an Availability Test, in accordance with the procedures set out in the appropriate agreement and SDCs.

OC10.7.4 Frequency Sensitive Testing

Testing of this parameter will be carried out as part of the routine monitoring under OC10.6 of CDGUs. to test compliance with Dispatch instructions for operation in Frequency Sensitive Mode under the SOC and in compliance with the PC and CC.

The performance of the CDGU will be recorded by the GSSP from voltage and current signals provided by the Power Producer for each CDGU. If monitoring at site is undertaken, the performance of the CDGU as well as Grid System frequency and other parameters deemed necessary by the GSO or GSSP will be recorded as appropriate and the CDGU will pass the test if:

(a) where monitoring of the Primary Reserve and or Secondary Reserve and or High Frequency Response to frequency change on the Grid System has been carried out, the measured response in MW/Hz is within ± 2.5 % of the level of response specified in the Ancillary Services agreement for that CDGU;

(b) where measurements of the governor pilot oil/valve position have been requested, such measurements indicate that the governor parameters are within the criteria as determined by the GSO; and

(c) where monitoring of the limited High Frequency Response to frequency change on the Grid System has been carried out. the measured response is within the requirements of the SOC for limited frequency sensitive response; except for Gas Turbine Generating Units where the criteria set out in the CC shall apply.

The relevant Power Producer must. if requested, demonstrate to the GSO or GSSP with reasonable satisfaction the reliability of any equipment used in the test.

OC10.7.5 Black Start Testing

The GSO may require a Power Producer with a Black Start Station to carry out a test ("Black Start Test") on a CDGU in a Black Start Station either while the Black Start Station

remains connected to an external alternating current electrical supply ("BS Generating Unit Test"), or while the Black Start Station is disconnected from all external alternating current supplies ("BS Station Tesr) in order to demonstrate that a Black Start Station has a Black Start capability.

Where the GSO requires a Power Producer with a Black Start Station to carry out a BS Generating Unit Test, the GSO or GSSP shall not require the Black Start Test to be carried out on more than one CDGU at that Black Start Station at the same time, and would not, in the absence of exceptional circumstances, expect .any of the other CDGUs at the Black Start Station to be directly affected by the BS Generating Unit Test.

(I) BS Generating Unit Test

Where local conditions require variations in this procedure the Power Producer shall submit alternative proposals, in writing, for the GSSP's or GSO's prior approval. The follOwing procedure shall, so far as practicable, be carried out in the following sequence for Black Start Tests:

(a) The relevant Black Start Generating Unit ("BSGU") shall be Synchronised and Loaded;

(b) All the auxiliary gas turbines and or auxiliary diesel engines and or auxiliary hydro generator in the Black Start Station in which that BSGU is situated, shall be shut down;

(c) The BSGU shall be de-Loaded and de-Synchronised and all alternating current electrical supplies to its auxiliaries shall be disconnected;

(d) The auxiliary gas turbine(s) or auxiliary diesel engine(s) to the relevant BSGU shall be started, and shall re-energise the unit board of the relevant BSGU;

(e) The auxiliaries of the relevant BSGU shall be fed by the auxiliary gas turbine(s) or auxiliary diesel engine(s) or auxiliary hydro-generator, via the BSGU's unit board, to enable the relevant BSGU to return to Synchronous Speed; and

{f) The relevant BSGU shall be Synchronised to the Grid System but not Loaded, unless the appropriate instruction has been given by the GSO or GSSP under SDC2.

(ii) BS Station Test

The following procedure shall, so far as practicable, be carried out in the following sequence for Black Start Tests:

(a) All Generating Units at the Black Start Station, other than the Generating Unit on which the Black Start Test is to be carried out (BSGU) and all the auxiliary gas turbines and or auxiliary diesel engines and or auxiliary hydro generators at the Black Start Station, shall be shut down;

(b) The relevant BSGU(s) shall be Synchronised and Loaded;

(c) The relevant BSGU(s) shall be de-Loaded and de-Synchronised;

(d) All external alternating current electrical supplies to the unit board of the relevant BSGU{s) and to the station board of the relevant Black Start Station shall be disconnected;

(e) An auxiliary gas turbine or auxiliary diesel engine or auxiliary hydro generator at the Black Start Station shall be started, and shall re-energise either directly, or via the station board, or the unit board of the relevant BSGU(s); and

(f) The provisions of items (e) and (f) in OC10.7.5 (i) above shall thereafter be followed.

All Black Start Tests shall be carried out at the time specified by the GSO or GSSP and shall be undertaken in a manner approved by the GSO or GSSP.

OC10.7.6 Failure of Test

If the CDGU concerned fails to pass the test the Power Producer must provide the GSO or GSSP, as appropriate, with a written report specifying in reasonable detail the reasons for any failure of the test so far as the Power Producer knows after due and careful enquiry. This must be provided within 5 Business Days of the test. If a dispute arises relating to the failure, the GSO or GSSP, as appropriate, and the relevant Power Producer shall seek to resolve the dispute by discussion, and, if they fail to reach agreement, the Power Producer may by notice require the GSO or GSSP to carry out a retest after 2 Business Days notice which shall be carried out following the procedure set out in this section.

If the CDGU concerned fails to pass the re-test and a dispute arises from that re-test, either party may use the Grid Code dispute resolution procedure, contained in the General Conditions, for a ruling in relation to the dispute, which ruling shall be binding. The Single Buyer shall be notified of the dispute and of the outcome.

If it is accepted that the CDGU has failed the test or re-test (as applicable), the Power Producer shall within 14 Business Days submit in writing to the GSO or GSSP, as appropriate, for the approval of the date and time by which the Power Producer shall have brought the CDGU concerned to a condition where it complies with the relevant requirements set out in the PC, CC or SOC and would pass the test. The GSO or GSSP, as appropriate, will not unreasonably withhold or delay its approval of the Power Producers proposed date and time submitted. The Power Producer shall then be subjected to the relevant test procedures outlined in OC10.7.

OC10.8 ALLOCATION OF COSTS FOR TESTS

On the allocation of cost between the party who proposes the test and the affected party, the general principle being that the test proposer shall bear the costs of the tests if the subsequent test results indicate that the proposed tests is not justified. However, the affected party shall bear the costs of the proposed test if the subsequent test results indicate that the proposed test requested by the test proposer is justified.

Operating Code No. 11

System Tests

OC11.1 INTRODUCTION

Operating Code No. 11 (0C11) sets out the responsibilities and procedures for arranging and carrying out system Tests• which have or may have a significant impact upon the Grid System or the wider System.

"System Tests" are those tests which involve either a simulated or a controlled application of irregular. unusual or extreme conditions on the Grid System or User Systems. In addition it includes commissioning and or acceptance tests on Plant and Apparatus to be carried out by the GSO or by Users which may have a significant impact upon the Grid System, other User Systems or the wider System.

To minimise disruption to the operation of the Grid System and to other User Systems, it is necessary that these tests be subjected to central coordination and control by the GSO.

Testing of a minor nature carried out on isolated Systems or those carried out by the GSO or GSSP in order to assess compliance of Users with their design, operating and connection requirements as specified in this Grid Code and in their_ Connection Agreement are covered by OC10.

OC11.2 OBJECTIVES

The objectives of OC11 are to;

(a) ensure that the procedures for arranging and carrying out System Tests do not, so far as is practicable, threaten the safety of personnel or members of the public and minimise the possibility of damage to Plant and or Apparatus and or the security of the Grid System supply or overall System; and

(b) set out procedures to be followed for the establishment and reporting of System Tests.

OC11.3 SCOPE

OC11 applies to the GSO, GSSP and the following Users:

(a) All Power Producers with CDGUs;

(b) All Power Producers with Generating Units not subject to Dispatch by the GSO, with total on-site generation capacity equal to or greater than 5 *WI* where the GSO considers it necessary;

(c) Large Consumers where the GSO considers it necessary; and

(d) Interconnected Parties.

OC11.4 PROCEDURE FOR ARRANGING SYSTEM TESTS

System Tests which are reasonably expected to have a "minimal effect" upon the Grid System, User Systems and or the wider System will not be subject to this procedure. "Minimal effect" means that any distortion to voltage and frequency at Connection Points does not exceed the standards contained in this Code.

OC11.4.1 Test Proposal Notice

The level of Demand on the Grid System varies substantially according to the time of day and time of year. Consequently, certain System Tests which may have a significant impact on the Grid System (for example, tests of the full Load capability of a Generating Unit over a period of several hours) can only be undertaken at certain times of the day and year. Other System Tests, for example, those involving substantial Mvar generation or valve tests, may also be subject to timing constraints. It therefore follows that notice of System Tests should be given as far in advance of the date on which they are proposed to be carried out as reasonably practicable.

When the GSO, GSSP or a User intends to undertake a System Test, a "Test Proposal Notice" shall be given by the person, the "Test Proposer", proposing the System Test to the GSO and to those Users who may be affected by such a test. The proposed Test Proposal Notice shall be in writing and include details .of the nature and purpose of the test and will indicate the extent and situation of the Plant and Apparatus involved. The proposal shall also include the detailed test procedures.

Each User must submit a Test Proposal Notice if it proposes to carry out any of the following System Tests, each of which is therefore considered to be a System Test:

(a) Generating Unit full Load capability tests including Load acceptance tests and re-commissioning tests;

(b) var limiter tests;

(c) main steam valve tests;

(d) Load rejection tests;

(e) on-load protection testing; and

(f) Primary Reserve and Secondary Reserve response on-load tests.

If the information outlined in the Test Proposal Notice is considered insufficient by the recipients, they shall contact the Test Proposer with a written request for further information which shall be supplied as soon as reasonably practical.

If the GSO wishes to undertake a System Test, the GSO shall be deemed to have received a proposal of that test through procedures internal to the GSO.

The GSO shall have overall coordination of any System Test, using the information provided to it under OC11.4.1 and shall identify in its reasonable estimations, which Users other than the Test Proposer or other Users not already identified by the Test Proposer, which may be affected by this test.

OC11.4.2 Test Panel

Following receipt of the Test Proposal Notice, the GSO shall evaluate and discuss the proposal with the Users identified as being affected. Within 30 calendar days of receipt of the Test Proposal and subject to delays arising from any additional information request, the GSO shall form a "Test Panel" which shall be headed by a suitably qualified person referred to as the "Test Coordinator" appointed by the GSO.

The Test Panel may also comprise of a suitable representative from each affected User and other experts deemed necessary by the Test Coordinator.

OC11.4.3 Pre-test Report

Within 30 calendar days of forming the Test Panel, the Test Coordinator shall submit upon the approval of the GSO, a report ("Pre-test Report") which shall contain the following:

(a) proposals for carrying out the System Test including manner in which it is to be monitored, this may be similar to those test procedures submitted by the Test Proposer if deemed appropriate and safe by the Test Panel;

(b) an allocation of costs between the affected parties, the general principle being that each party shall pay its own reasonable costs for such System Tests and the Test Proposer will bear any overtime or additional costs caused by this System Test If one party considers that it has incurred unreasonable costs due to the action or inaction of another party, in which case the dispute resolution procedure of the Grid Code shall apply; and

(c) other matters deemed appropriate by the Test Panel.

This Pre-test Report shall be submitted to all Users identified as being affected. If this report (or a revised report produced by the Test Panel and agreed by the GSO) is approved by all recipients, then the System Test can proceed and a suitable date shall be agreed between all parties.

OC11.4.4 Pre-system Test

At least 30 calendar days prior to the System Test being carried out, the Test Coordinator or GSO shall submit to all recipients of the Pre-test Report, a programme stating the switching sequence and proposed timings, a list of personnel involved in carrying out the test (including those responsible for site safety in accordance with OC8) and such other matters deemed appropriate by the Test Coordinator or GSO. All recipients shall act in accordance with the provisions contained in this programme.

OC11.4.5 Post-system Test

At the conclusion of the System Test, the Test Proposer shall be responsible for producing a written report which shall contain a description of the Plant and or Apparatus tested and of the System Test carried out, together with the results, conclusions and recommendations. This report shall be submitted to the GSO and copied to the Single Buyer where appropriate. The results of the tests shall be provided to the relevant parties by the GSO upon request, taking into account of any confidentiality issues.

All System Tests shall comply with all applicable standards or legal requirements.

SCHEDULING AND DISPATCH CODE No. 1

GENERATION SCHEDULING

SDC1.1 INTRODUCTION

Scheduling and Dispatch Code No.1 (SDC1) sets out the procedure for;

(a) The weekly notification by the Power Producers to the SSDC of the Availability of any of their CDGU in an Availability Notice;

(b) the daily notification to the SSDC of whether there is any CDGU which differs from the last Generating Unit Scheduling and Dispatch Parameters (SOP), in respect of the following Schedule Day by each Power Producer in a SOP Notice;

(c) The weekly notification of Power export availability or import requests and price information by Interconnected Parties to the Single Buyer;

(d} the submission of certain Network data to the SSDC, by each Transmission Network Service Provider (TNSP) or User with a Network directly connected to the Transmission Network to which Generating Units are connected (to allow consideration of Network constraints);

(e) the submission of certain Network data to the SSDC, as applicable by each Distribution Network Service Provider (TNSP) or User with a Network directly connected to the Distribution Network to which Generating Units are connected (to allow consideration of distribution restrictions);

(f) the submission by DNSPs, TNSPs and Users to the SSDC of Demand Control information (in accordance with OC4);

(g) agreement on Power and Energy flows between Sarawak and Interconnected Parties by the Single Buyer following discussions with the GSO;

(h) the production of a Merit Order and Energy Balance Statement, to include the Transfer Level, for use in the production of the schedules; and

(i) the production by the GSO in consultation with the Single Buyer of the schedule, based on the Merit Order and Energy Balance Statement and subsequent issue by the GSO of an Indicative Running Notification (IRN) on a weekly basis as a statement of which CDGU may be required. Amendments to this IRN to be delivered on a daily basis as described in SDC1.4.

SDC12 OBJECTIVES

To enable the Single Buyer and GSO to prepare a schedule based on a least cost dispatch model (or models) which, amongst other things, models variable costs, fuel take-or-pay costs and reservoir contents change and river flow rates and allows hydro/thermal optimisation and is used in the Scheduling and Dispatch process and thereby ensures:

(a) the integrity of the interconnected Grid System;

(b) the security and quality of supply;

(c) that there is sufficient available generating Capacity to meet Grid System Demand as often as is practicable with an appropriate margin of reserve;

(d) to enable the preparation and issue of an Indicative Running Notification;

(e) optimise the total cost of Grid System operation;

(f) optimum use of generating and transmission capacities;

(g) maximum possible use of Energy from hydro-power stations taking due account of river flow rates and reservoir contents and seasonal variations, and which is based upon long term water inflow records and provides an 80% probability level of achievement; and

(h) to maintain sufficient solid and liquid fuel stocks and optimise hydro reservoir depletion to meet fuel-contract minimum-take by the end of the calendar year and in accordance with monthly nominations.

This schedule contains the Merit Order which details those CDGUs that will be loaded, in accordance with their league table position in the Merit Order, to meet incremental blocks of Demand across specified time periods. Thus base load, mid range, peak loading and Operating Reserve will be specified, amongst other things.

SDC13 SCOPE

SDC1 applies to the Single Buyer, GSO and to Users which in SDC1 are:

(a) Power Producers with a CDGU;

(b) Power Producers with Black Start Generating Units or Black Start Stlltlons;

(c) Interconnected Parties;

(d) Transmission Network Service Provider (TNSP)

(e) Distribution Network Service Providers (DNSPs);

(f) Consumers with HV Networks to which Generating Units are connected where the GSO considers it necessary; and

(g) Large Consumers who can provide Demand Control in real time.

SDC14 PROCEDURE

SDC14.1 Preparation of the Week Ahead Plan

At the week ahead stage, the GSO will prepare a Merit Order and submit to the Slngle Buyer for approval together with an Energy Balance Statement, which will be compiled to illustrate the fuel use and hydro-CDGU use planned for the week ahead and take into account transfers to or from Interconnected Parties. The Energy Balance Statement will be used by the GSO, where appropriate, to determine the running hours of CDGUs.

Using the approved Merit Order and approved Energy Balance Statement obtained from the Single Buyer, a preliminary schedule will be compiled by the GSO.

The preliminary schedule will be an "Unconstrained Schedule" for the maximum forecast Demand and the minimum forecast Demand for the week ahead. This will assume a perfect Network with no thermal or voltage limitations and those CDGUs declared available in a week ahead Availability Notice.

A second schedule, the "Constrained Schedule", will be prepared by the GSO and will show how the CDGUs are proposed to be Dispatched and loaded at the maximum forecast Demand and the minimum forecast Demand taking account of the known limitations of the Transmission or Distribution Networks. This Constrained Schedule is then the statement by the GSO, in accordance with the Single Buyer's approved Merit Order and Energy Balance Statement, to Power Producers, of which CDGU may be required for the Schedule Days (SD1 of Week 1 to SD7 of Week 1) starting with Monday of the week ahead being SD1 of Week 1.

These arrangements are further detailed below.

(i) Merit Order

A least cost Merit Order will be compiled by the GSO and submitted to the Single Buyer for approval once a week for the week commencing on the following Monday from the submitted CDGU information (using fuel-take or pay data, reservoir levels and Availability declarations made in a week ahead Availability Notice).

in compiling the Merit Order and Energy Balance Statement for the Single Buyer's approval, the GSO will take account of and give due weight to the factors listed below (where applicable):

(a) The matching of any Large Consumer's contracted (Active and Reactive) requirements for Energy and Demand to the Loading of a CDGU, at the required MW and Mvar, as contained in an energy sales contract. Such energy sales contract to be approved by the Single Buyer, such that the net output of the contracted CDGU matches the Large Consumer's energy sales contract, including System losses between contracted CDGU and Large Consumer, whilst also meeting the Large Consumer's own (Active and Reactive) Demand requirements;

(b) Hydro/thermal optimisation, including any operational restrictions or Generating Unit operational inflexibility;

(c) Minimum and maximum water-take for hydro CDGU (to be optimised where necessary by the GSO) (to be stated in the Energy Balance Statement);

(d) Minimum and maximum fuel-take for thermal CDGU (to be optimised where necessary by the GSO) (to be stated in the Energy Balance Statement);

(e) The export or import of Energy across the Interconnector (to be stated in the Energy Balance Statement);

(f) Requirements by the State or Federal Government to conserve certain fuels (to be stated in the Energy Balance Statement);

(g) The Availability of a CDGU as declared in a weelCahead Availability Notice;

{h) The start up price of each thermal-CDGU; and

(i) The additional cost of carrying added Spinning Reserve resulting from the operation of an excessively large CDGU (such cost shall be considered as additional running cost allocated to that CDGU's variable operating costs).

After the completion of the Merit Order and Energy Balance Statement, the Merit Order and Energy Balance Statement shall be submitted to the Single Buyer by 10:00 hou,S on Wednesday (Week 0) for the week ahead (Week 1). The Single Buyer shall then infOfill the GSO by 16:00 hours on that same day whether the Merit Order and Energy ES'lance Statement submitted is approved or if not approved, provide any revisions accordingfy.

(II) Unconstrained Schedule

The GSO will produce an Unconstrained Schedule from the Merit Order, starting with the CDGU at the head of the Merit Order and the next highest CDGU that will:

- in aggregate be sufficient to match at all times the forecast Grid System Demand (derived under OC1) together with such Operating Reserve {derived from OC3) and;
- as will in aggregate be sufficient to match minimum Demand levels allowing for later Demand.

The Unconstrained Schedule shall also take into account the Energy Balance Statement.

The Unconstrained Schedule shall take into account the following;

(a) the requirements as determined by the GSO for voltage control and Mvar reserves;

(b) in respect of a CDGU the MW values registered in the current Scheduling and Dispatch Parameters (SOP);

(c) the need to provide an Operating Reserve, as specified in OC3;

(d) CDGU stability, as determined by the GSO following advice from the Power Producer and registered in the SOP;

{e) the requirements for maintaining frequency control (in accordance with SDC3);

(f) the inability of any CDGU to meet its full Spinning Reserve capability or its Non· Spinning Reserve capability;

(g) Operation of a Generating Unit over periods of low Demand to provide in the GSO's view sufficient margin to meet anticipated increases in Demand later in the current Schedule Day (SD1) or following Schedule Day (SD2);

(h) Transfers to or from Interconnected Parties (as agreed and allocated by the Single Buyer).

(Iii) Constrained Schedule

From the Unconstrained Schedule the GSO will prepare a Constrained Schedule, which will optimise overall operating costs and maintain a prudent level of Grid System security, in accordance with Prudent Utility Practice.

The Constrained Schedule shall take account of:

(a) Transmission Network and Distribution Network constraints;

(b) testing and monitoring and/or investigations to be carried out under OC10 and/or commissioning and/or acceptance testing under the CC;

(c) System tests being carried out under OC11;

(d) any provisions by the GSO under OC7 for the possible islanding of the Grid System that require additional Generating Units to be Synchronised as a contingency action; and

(e) re-allocation of Spinning Reserve and Non-Spinning Reserve to take account of the possibility of islanding.

The optimised Constrained Schedule will then be notified for information to the Single Buyer by 10:00 hours Thursday of Week 0 for final verification and issue of the Indicative Running Notifications for Week 1 to the Power Producers by 10:00 hours Friday of Week 0. The Constrained Schedule, with a no-objection from the Single Buyer, shall form the basis of the "Final Schedule" that now follows

(Iv) Final Schedule

Before the issue of the Indicative Running Notifications, the GSO may consider it necessary to adjust the output of the Final Schedule. Such adjustments could be made necessary by any of the following factors:

(a) changes to Availability and or SDPs of CDGU notified to the SSDC after the commencement of the Scheduling process;

(b) changes to the GSO's Demand forecasts (for example due to unexpected weather);

(c) changes to the Transmission Network and/or Distribution Network constraints emerging from the iterative process of Scheduling and Network security assessments;

(d) changes to CDGU requirements following notification to the GSO of the changes in capability of a Generating Unit to provide additional services as described in SDC2;

(e) changes to any conditions which in the reasonable opinion of the GSO could impose increased risk to the Grid System and could therefore require an increase in the Operating Reserve; and

(f) known *or* emerging limitations and *or* deficiencies of the Scheduling process.

(v) Content of Indicative Running Notification

The information contained in the Indicative Running Notification will indicate, on an individual CDGU basis, the period, Loading and declared fuel for which it is scheduled during the following week.

SDC1.4.2 Issue of Indicative Running Notification

The GSO, through the SSDC will, using all reasonable endeavours, issue a weekly Indicative Running Notification in writing to Power Producers with CDGUs by 10:00 hours each Friday of Week 0 for the week ahead of Week 1.

The Indicative Running Notification received by each Power Producer with a CDGU shall contain information relating to its CDGU only.

SDC1.4.3 Data Requirements

Appendix A to this SDC1 sets out the SDPs for which values are to be supplied by a Power Producer with a CDGU in respect of each of its CDGUs by not later than the Notice Submission Time of 10:00 hours on the Tuesday of Week 0 prior to the week ahead of Week 1.

SDC1.4.4 Day Ahead Amendment of Availabllity Notice

Each Power Producer shall, by no later than the Notice Submission Time each day, notify the SSDC of any changes anticipated in respect of the Availabllity declared in the week ahead Availability Notice of each of its CDGUs, by means of an "Amended Availability Notice", in a form as approved in writing by the GSO.

The amendment of an Availability Notice shall state the Availability of the relevant CDGU, subject to revision under SDC1.4.4 to apply for the following Schedule Day, and prior to weekends and holidays for all the forthcoming days that are not Business Days and the subsequent first working day. The figure for *WI* stated in the Amended Availability Notice must be to one decimal place.

In relation to gas turbine or diesel CDGU, the Availability of which varies according to ambient temperature, an Amended Availability Notice submitted by a Power Producer to the SSDC for the purposes of declaring the level of Availability of this CDGU must state the Availability based on site rating and an ambient temperature of 30 degrees Celsius. The Power Producer shall specify a "Temperature Correction Factor" to the SSDC to enable corrections to be made according to actual temperature.

In relation to a CDGU with a take-or-pay contract, a minimum Wlhr Take (for the Schedule Day) shall be submitted, by Notice Submission Time, in a form as approved in writing by the GSO.

SDC1.4.5 Availability of a Generating Unit

Each Power Producer shall, throughout the planned operation and maintenance cycles, as further covered in OC2, maintain, repair, operate and fuel the CDGU as required by Prudent Utility Practice and statutory requirements and as required under its contractual obligation to the Single Buyer.

The Power Producer shall use reasonable endeavours to ensure that it does not at any time declare by issuing to the SSDC or allowing to remain outstanding an Amended Availability Notice or a SOP Notice which declares the Availability or SOP of a CDGU at levels or values different from those that the CDGU could currently achieve.

A Power Producer must inform the SSDC as soon as it becomes aware that any of its CDGU are unable to meet the Spinning Reserve capability previously notified to the SSDC.

Such notification must be made by submitting a SOP Notice in the form given in Appendix A of this SDC1. The SSDC will, without delay, notify the GSO of any such information.

When a revised Amended Availability Notice comes into effect for a synchronised CDGU then any increase or decrease in Generating Units Load, as the case may be, will be undertaken at the Loading or de-Loading rate specified in the Generating Unit's latest SOP Notice.

If at any time when the Availability of a CDGU is zero, an Amended Availability Notice is given increasing the Availability of the CDGU with effect from a specified time, such notice shall be taken as meaning that the CDGU is capable of being synchronised to the Grid System at that specified time.

If at any time when a CDGU is synchronised to the Grid System the Power Producer issues an Amended Availability Notice altering the level of Availability of the CDGU from a specified time, such notice shall be taken as meaning that the CDGU will be capable of performing in accordance with the prevailing Amended Availability Notice up to the time of the revised Amended Availability Notice.

SDC1.4.6 Generation Data Submitted Week Ahead

Monday SD1 Week O	Tuesday SD2 Week O	Wednesday SD3 Week O	Thursday SD4 Week O	Friday SD5 Week O	Monday SD1 Week 1
Power Producers prepares SOP and Availability Notices	GSO receives SOP and Availability Notices by 10:00 hours	GSO submits by 10:00 hours the Merit Order to the Single Buyer for approval by 16:00 hours	GSO prepares a Constrained Schedule and discusses with Single Buyer by 10:00 hours	GSO issues IRN by 10:00 hours	GSO issues Dispatch instructions

(I) Generating Units Scheduling and Dispatch Parameters (SDPs)

The weekly Availability, cost information, and revisions to "Registered Operating Characteristics" for a CDGU in respect of the week beginning on the Schedule Day commencing on Monday (SD1 of Week 1) shall be submitted by the Power Producer by the Notice Submission Time of 10:00 hours on Tuesday of Week 0. Where applicable, they shall be calculated from any relevant Power Purchase Agreements or Energy Sales Agreements or Transfer Levels.

(a) By not later than the Notice Submission Time of 10:00 hours each Tuesday (of Week 0), each Power Producer may in respect of each CDGU submit to the SSDC any revision to the Generating Units parameter for such CDGU to apply throughout the next week beginning on the Schedule Day falling on the next Monday (SD1 of Week 1).

(b) By not later than the Notice Submission Time of 10:00 hours each T4esday of Week 0, each Power Producer may ih respect of each thermal CDGU submit to the SSDC any revisions to fuel stocks to apply throughout the next week beginning on the Schedule Day falling on the next Monday (SD1 of Week 1).

(c) By not later than the Notice Submission Time of 10:00 hours each Tuesday of Week 0, each Pcwer Producer may in respect of each hydro-CDGU submit to the SSDC any revision to the Reservoir Contents or River Flow Rates applicable to each hydro-CDGU to apply throughout the next week beginning on the Schedule Day falling on the next Monday (SD1 of Week 1).

Any such data or notice shall be submitted in a form as approved in writing by the GSO.

SDC1.4.7 Power Station Own Consumption

Once per month, each Power Producer must, in respect of each of its Power Stations, submit in writing to the SSDC details of the CDGU works consumption of electricity since the last submission. If appropriate, this can be indicated as a no change from the previous month.

SDC1.5 USER NETWORK DATA

SDC1.5.1 Week Ahead Notice

To enable the GSO to prepare the Constrained Schedule, it is necessary for all Users with HV Networks (including the GSSPs) to provide data on any changes to its Network that, in the GSO's reasonable opinion, could result in a CDGU being constrained during that schedule period.

Therefore. by not later than the Notice Submission Time of 10:00 hours each Tuesday of Week 0, each User with a HV Network will submit 'to the SSDC in writing, confirmation of the following in respect of the next Availability period:

(a) Constraints on a User's Network, which restrict in any way the operation of a CDGU, which the GSO may need to take into account in preparing the Constrained Schedule; and

(b) User requirements for voltage control and Mvar, which the SSDC may need to take into account for Grid System security reasons.

At any time between the Notice Submission Time of 10:00 hours each Tuesday (SD2 of Week 0) and 10:00 hours the following Friday (SOS of Week 0), each User with a HV Network must submit to the SSDC in writing any revisions to the information submitted under this SDC1.5 or under a previous submission under this SDC1.5.

SDC1 - APPENDIX A

GENERATION SCHEDULING AND DISPATCH PARAMETERS

For each CDGU the following SOP data are required;

(a) in the case of steam turbines the synchronising times for the various levels of warmth and in addition the time from synchronisation to Dispatched Load; and

(b) in the case of hydro sets and also gas turbines, the time from initiation of a start to achieving Dispatch Load.

In addition the following basic data requires to be confirmed if there has been any change since the last Availability Notice;

(a) Minimum Generation in MW;

(b) Governor Droop (%); and

(c) Sustained Operating Capability.

Where required by the GSO two-shifting limitations (limitations on the number of start-ups per Schedule Day) will be included as follows;

(a) Minimum on-time;

(b) Minimum off-time;

(c) Loading blocks in MW following Synchronisation;

(d) Maximum Loading rates for the various levels of warmth and for up to two output ranges including soak times where appropriate;

(e) Maximum De-Loading rates for up to two output ranges;

(f) The MW and Mvar capability limits within which the CDGU is able to operate as shown in the relevant Generator Performance Chart;

(g) Maximum number of on-Load cycles per 24 hour period, together with the maximum Load increases involved; and

(h) In the case of gas turbines and Diesels only, the declared Peak Capacity. Sufficient data should also be supplied to allow the SSDC to emperature correct this impaired Capacity figure to forecast ambient temperature.

For each hydro CDGU and thermal CDGU with a fuel take-or-pay agreement;

(a) Minimum Take (MW.hr) per Schedule Day; and

(b) Maximum Take (MW.hr) per Schedule Day.

SCHEDULING AND DISPATCH CODE No. 2

CONTROL, SCHEDULING AND DISPATCH

SDC2.1 INTRODUCTION

Scheduling and Dispatch Code No. 2 (SDC2) which is complementary to SDC1 and SDC3, sets out the following procedures;

(a) the procedure for the SSDC to issue Dispatch instructions to Power Producers in respect of their CDGUs ;

(b) the procedure for the Single Buyer to coordinate and manage trading with Interconnected Parties; and

(c) the procedure for optimisation of overall Grid System operations by the GSO for the Scheduled Day.

SDC2.2 OBJECTIVES

The procedure for the issue of Dispatch instructions to Power Producers by the GSO through its SSDC and is intended to enable (as far as possible) the SSDC to continuously meet the Transfer Level across the Interconnectors utilising the Merit Order derived from SDC1, with an appropriate margin of reserve, whilst maintaining the integrity of the Grid System together with the necessary security and quality of supply.

It is also intended to allow the SSDC to maintain a coordinating role over the System as a whole, maximising system security on the 275 kV, 132 kV and 33 kV Networks, while optimising generation costs to meet Grid System Demand.

SDC2.2 SCOPE

SDC2 applies to the Single Buyer, GSO, and to all Users which in SDC2 means;

(a) Power Producers having Generating Units subject to Central Dispatch;

(b) Interconnected Parties;

(c) TNSP;

(d) DNSPs; and

(e) Large Consumers who can provide Demand Control in real time.

SDC2.3 PROCEDURE

SDC2.3.1 Information Used

The information which the Single Buyer, and GSO shall use in assessing weekly or daily, as appropriate, which CDGU to Dispatch will be the Availability Notice, the Merit Order as derived under SOC 1 and the other factors to be taken account listed in SDC1, Generating Unit Scheduling and Dispatch Parameters, and 'Generation Other Relevant Data' in respect of that CDGU, supplied to the SSDC by the Power Producers, and to the Single Buyer.

Subject as provided below, the factors used in the Dispatch phase in assessing which CDGU to Dispatch in conjunction with the Merit Order, will be those used by the GSO in compiling the schedules under SDC1.

Additional factors that the GSO will also take into account in agreeing changes to the Constrained Schedule are:

(a) those where a Power Producer has failed to comply with a Dispatch instruction given after the issue of the Indicative Running Notification;

(b) variations between forecast Demand and actual Demand including variations in Demand reduction actually achieved by Users;

(c) the need for Generating Units to be operated for monitoring, testing or investigation purposes under OC10 or at the request of a User under OC10 or for commissioning or acceptance tests under OC11;

(d) requests from the Single Buyer for an increase or decrease in Transfer Level;

(e) requests from the Single Buyer for a change to the operation of a specific CDGU;

(f) changes in the required level of Operating Reserve, as defined by the GSO;

(g) System faults; and

(h) changes in the weather;

These factors may result in some CDGUs being Dispatched out of Merit Order.

In the event of two or more CDGUs having the same Merit Order price set and the GSO being unable to differentiate on the basis of the factors identified in SDC1, then the GSO will first select for Dispatch the one which is in the GSO's reasonable judgement the most appropriate at that time within the philosophy of this Grid Code.

SDC2.3.2 Re-Optimisation of the Constrained Schedule

The GSO will run Dispatch software to re-optimise the Constrained Schedule when, in its reasonable judgement, a need arises. It is therefore essential that Users keep the SSDC informed of-any changes in Availability or changes in Generating Unit Capability Limits, when they occur. It is also essential that the Users keep the

SSDC informed of any Power Station or Network changes or deviations from their ability to meet their Transfer Level or meet their regional Demand without delay.

SDC2.4 DISPATCH INSTRUCTIONS

SDC2.4.1 Introduction

Dispatch instructions relating to the Scheduled Day can be issued by the SSDC at any time during the period beginning immediately after the issue of the Indicative Running Notification in respect of that Scheduled Day. The SSDC may, however, issue Dispatch instructions in relation to a CDGU prior to the issue of an Indicative Running Notification containing that Generating Unit.

The SSDC will make available the latest Indicative Running Notification to the Power Producers as soon as is reasonably practicable after any re-optimisation of the Constrained Schedule.

The SSDC Dispatcher will issue Dispatch instructions directly to the Power Station's "Shift Chargehand" for the Dispatch of each CDGU. On agreement with the GSO, the SSDC's Dispatcher may issue Dispatch instructions for any CDGU which has been declared available in an Availability Notice even if that Generating Unit was not included in an Indicative Running Notification.

Dispatch instructions will take into account Availability Notice and Generating Unit Operating Characteristics.

The GSO will use all reasonable endeavours to meet the Transfer Level requested by the Single Buyer.

SDC2.4.2 Scope of Dispatch Instructions for CDGUs

In addition to instructions relating to the Dispatch of Active Power, Dispatch instructions, unless otherwise instructed by the SSDC Dispatcher shall be deemed to include an automatic instruction of Spinning Reserve, the level of which is to be provided in accordance with the Generating Unit Capability Limits.

In addition to instructions relating to the Dispatch of Active Power, the Dispatch instructions may include:

(a) time to Synchronise;

(b) provision of Spinning Reserve;

(c) provision of Non-Spinning Reserve;

(d) Reactive Power (instructions may include Mvar output, target voltage levels, tap changes, maximum Mvar output, or maximum Mvar absorption);

(e) operation in Frequency Sensitive Mode;

(f) operation at Maximum Continuous Rating (MCR) or Peak Capacity;

(g) future Dispatch requirements;

(h) request for details of Generating Units step-up transformer tap positions;

(i) instructions for tests;

(j) emission or environmental constraints;

(k) operation as a "Transfer Level Control Generating Unit"; and

(l) details of adverse conditions, such as bad weather.

In addition to the above, the GSO may also issue such other instructions as in its reasonable opinion are required.

SDC2.4.3 Form of Instruction

Dispatch instructions may be given by telephone, facsimile or electronic message from the SSDC. Instructions will require formal acknowledgement by the Power Producer and recorded by the SSDC Dispatcher in a written Dispatch log. When appropriate electronic means are available, Dispatch instructions shall be confirmed electronically. Power Producers shall also record all Dispatch instructions in a written Dispatch log.

Such Dispatch logs and any other available forms of archived instructions, for example, telephone recordings, shall be provided to the Regulator's investigation team pursuant to OC6 when required. Otherwise, written records shall be kept by all parties for a period not less than 4 years and voice recordings for a period not less than 3 months.

SDC2.4.4 Action required from Power Producers

The following actions are required by each Power Producer;

(a) each Power Producer will comply with all Dispatch instructions correctly given by the SSDC;

(b) each Power Producer must utilise the relevant Dispatch parameters when complying with Dispatch instructions; and

(c) in the event that a Power Producer is unable to comply with Dispatch instructions, it must notify the Dispatcher immediately.

SDC2.5 EMERGENCY CONDITIONS

To preserve Grid System security under System Stress or emergency conditions, the SSDC, or RDC (which would be required if, for example, the SSDC loses communication with Users) may issue Emergency Instructions to Power Producers. This may request action outside of the Scheduling and Dispatch Parameters, other relevant data or notice to Synchronise.

A Power Producer is required to use all reasonable endeavours to comply with Emergency Instructions, but when unable to do so the Power Producer must inform the SSDC or RDC, as the case may be, immediately.

SCHEDULING AND DISPATCH CODE No. 3

FREQUENCY AND TRANSFER CONTROL

SDC3.1 INTRODUCTION

Scheduling and Dispatch Code No.3 (SDC3) sets out the procedure that the SSDC will use to direct the control of the Grid System frequency, the "Frequency Control". In addition, it sets out the procedure by which the SSDC will direct international transfers of Energy and Active Power which is the Transfer Levels across the Interconnectors. These will be controlled by;

(a) the automatic response of CDGUs in Frequency Sensitive Mode;

(b) the Dispatch of CDGUs by the SSDC or RDCs;

(c) Demand Control, carried out by the RDCs; and

(d) the management of the Transfer Levels between the Grid System and Interconnected Parties by the SSDC.

The requirements for Frequency Control are determined by the consequences and effectiveness of Scheduling and Dispatch and by the effect of transfers across the Grid System and synchronous operation with Interconnected Parties. SDC3 is therefore complementary to SDC1 and SDC2.

SDC3.2 OBJECTIVES

The procedure for the SSDC Dispatcher to direct Frequency Control is intended to enable the GSO to meet Grid Code requirements for Grid System Frequency Control, wherever applicable.

SDC3.3 SCOPE

SDC3 applies to the GSO, and Users, which in SDC3 means;

(a) Power Producers with CDGUs;

(b) Power Producers with Generating Units directly connected to the Transmission Network;

(c) TNSP;

(d) Interconnected Parties; and

(e) DNSPs and Large Consumers with the capability of reducing Demand as described by OC4.

SDC3.4 PROCEDURE

SDC3.4.1 Frequency Response from Power Stations.

At Power Stations designated 'Regulating Power Stations' each CDGU must use all reasonable endeavours to be available for primary frequency regulation.

Each CDGU with the capability of providing secondary frequency regulation must have this (;Spability available.

SDC3.4.2 Instructions

Coordination of instructions will be the responsibility of the SSDC. The SSDC Dispatcher will issue instructions to the relevant Power Producers when there is a requirement, or change in requirement for a CDGU to operate in a Frequency Sensitive Mode. Generating Units operating in Frequency Sensitive Mode will be instructed by the RDC Dispatcher to operate taking due account of the target frequency notified by the GSO.

SDC3.4.3 Low Frequency Relay Initiated Response from CDGUs

CDGUs with the capability of low frequency relay initiated response may be used in the following modes:

(a) Synchronisation and generation from standstill;

(b) generation from zero generated output;

(c) increase in generated output.

The GSO will agree the low frequency relay settings to be applied to CDGUs with the Power Producers. Power Producers will comply with these low frequency relay settings, except for safety reasons. If the Power Producer is unable to comply for safety reasons then the GSO must be informed immediately.

SDC3.4.4 Low Frequency Relay Initiated Response from Demand

The SSDC may use Demand with the capability of low frequency relay initiated Demand reduction for establishing its requirements for frequency control. The GSO will specify the low frequency relay settings and the amount of Demand reduction to be made available. Users will comply with these instructions, except for safety reasons. If the User is unable to comply for safety reasons then the GSO must be informed immediately.

SDC3.5 ELECTRIC TIME

Time error correction (between local mean time and electric clock time) shall be performed by the GSO by making an appropriate offset to the target Grid System frequency.

The GSO shall be responsible for:

(a) monitoring and recording of electric time error;

(b) instructing actions to correct electric time error; and

(c) maintaining (as far as it is able) the electric time error within ± 20 seconds.

DC3.6 TRANSFER REGULATION

SSDC must carry out "Transfer Regulation" to a tolerance of ± 20 MW of the **Transfer Level** with a regulation error measured at the MW going through zero at least once in every 10 minute period.

If, at any time, **the Transfer Level** error exceeds 20 MN, the **SSDC** shall take such steps as are reasonably necessary to correct the error within 15 minutes utilising any means the **SSDC** considers appropriate.

Metering Code

MC1 INTRODUCTION

This Metering Code (MC) sets out or refers to the requirements for the metering of Transmission Network Custody Transfer Points, Generating Units and Generator Circuits on the Grid System. It caters for both Fiscal Metering and Operational Metering.

MC2 OBJECTIVES

The Metering Code describes the metering requirements in relation to Users who have, or plan to have access to the Transmission Network.

MC3 SCOPE

The Metering Code applies to the GSO and all Users of the Transmission Network. In the Metering Code, Users are defined as:

(a) Transmission Network Service Provider (TNSP);

(b) Distribution Network Service Providers (DNSPs);

(c) Power Producers with Generating Units directly connected to the Transmission Network;

(d) Power Producers with Centrally Dispatched Generating Units;

(e) Large Consumers directly connected to the Transmission Network; and

(f) Interconnected Parties.

For the purpose of this Metering Code, "directly connected" means that the User has a Connection Point that directly connects its installation to the Transmission Network.

MC4 GENERAL REQUIREMENTS

Fiscal Metering shall be required to measure Active Energy and Active Power and Reactive Energy and Reactive Power at Custody Transfer Points. This will comprise both Import and Export metering when reasonably required by the GSO. Such data will be recorded half-hourly in on-site data registers 'and collected automatically be the Data Collection System. The data register shall have adequate capacity to store 45 days on site data to allow for any interruptions to the automatic Data Collection System

Operational Metering will be required to measure Active and Reactive Power and monitor Generator Circuits and/or CDGUs as reasonably determined by the GSO. In the case of hydro-CDGUs the Operational Metering will also measure Active Energy produced.

Data from **Fiscal Metering** required under this Metering Code shall be collected from the data collectors through the **Data Collection System.** Such data shall be held and transmitted in a form approved by the **GSO. Operational Metering** data will be collected by the **GSO's** SCADA system unless the **GSO** reasonably determines otherwise.

MC5 METERING

This section describes the metering requirements in relation to **Custody Transfer Points (CTP)** for all **Users** with access to the **Transmission Network.**

MC5.1 PURPOSE OF METERING

Fiscal Metering shall be installed and maintained to measure and record the half-hourly **Active** and **Reactive Energy** transferred to and from the **Transmission Network** at the **CTP** for each **User.** The **Fiscal Metering** shall be the primary source of data for billing purposes. The **Fiscal Metering** shall comprise of a main **Meter** to measure and record the required data and a check **Meter** to validate the readings from the main **Meter** and as back-up metering at all **Transmission Network CTPs.**

MC5.2 LOCATION

The **Fiscal Metering** will be located as close as practicable to the **Connection Point.** Where there is a material difference in location, an adjustment for losses between the **CTP** and the **Connection Point** will be calculated by the relevant **TNSP** and agreed by the **GSO** and the **User.**

MC5.3 OWNERSHIP

MC5.3.1 General

Subject to subclause MC5.3.2, the **TNSP** that owns the **Transmission Network** equipment for importing and or exporting through a **CTP** will design, supply, install, test, own, operate and maintain the **Fiscal Metering** at that **CTP.**

If, at a **CTP,** the **TNSP** does not own the substation or premises where the metering equipment is to be located, then the owner of the substation or premises will provide:

(a) 24 hour access and adequate space for metering and communications equipment;

(b) reliable power supplies; and

(c) CT and VT instrument transformers complying with this Metering Code.

Any remote communications to the metering equipment and **Meters,** and connection equipment will be the responsibility of the **TNSP.**

MC5.3.2 Another Party May Own Metering If Agreed In Writing Between Pmtles

For Fiscal Metering in respect of a connection between a Transmission Network and a User's Network, the TNSP referred to in clause MC5.3.1 will be the Fiscal Metering owner, unless otherwise agreed in writing between the relevant parties.

MC5.4 METERING INFORMATION REGISTER

The GSO will maintain a register of all Fiscal Metering for fiscal settlement purposes at all Custody Transfer Points. This register will contain, but not be limited to:

(a) the name of the Transmission Network Service Provider or Power Producer concerned;

(b) the owner of Fiscal Meters;

(c) the identification of the Consumer or the Distribution Network Service Provider concerned;

(d) a description of metering equipment including accuracy;

(e) location of the Fiscal Metering; and

(f) the adjustment factors including circuit losses to be applied.

Where the data in the metering information register indicates that the Fiscal Metering does not comply with the requirements of this Metering Code, the GSO will advise the Users of the non-compliance and the User will rectify this situation forthwith unless a derogation is granted under the Metering Code.

MC5.5 ACCURACY OF METERING AND DATA EXCHANGE

MC5.5.1 Applicable Standards

The following standards are approved for use with this Metering Code.

(I) Meteringhstallation

(a) IEC Standard 60687 – Alternating current static watt-hour meters for active energy (classes 0.2 S and 0.5 S);

(b) IEC Standard 61036 – Alternating current static watt-hour meters for active energy (classes 1 and 2);

(c) IEC Standard 60521 – Alternating current watt-hour meters (classes 0.5, 1 and 2);

(d) IEC Standard 61268 – Alternating current static var-hour meters for reactive energy (classes 2 and 3);

(e) IEC Standard 60044 Part 1 - Current transformers;

(f) IEC Standard 60044 Part 2 - Voltage transformers; and

(g) IEC Standard 60044 Part 3 - Combined transformers.

(II) Data Exchange

(a) IEC Standard 62056 - Data exchange for meter reading, tariff and load control.

Where a User proposes to utilise equipment that does not meet these standards, then a derogation submission must be made in accordance with the General Conditions of the Grid Code.

MC5.5.2 Overall Accuracy Requirements for Fiscal Metering

For the measurement of Active Energy, Reactive Energy, Power and Demand, the Metering Installation shall be designed and the metering equipment shall be tested and calibrated to operate within the overall limits of error set out in Table MC-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 MC-1 :Overall Accuracy of Metering Installation

Condition	Limits of Error at Stated Power Factor for Active Power and Enernv Measurement				
Current Expressed as a Percentage of Rated Measuring Current	Power Factor	Limits of Error for Connections			
		>50 MVA	>10-50 MVA	>1-10 MVA	<=1 MVA
120% to 100o inclusive	1	±0.5%	±1.00o	±2.0%	±3.0%
Below 10% to 5%	1	±0.7%	±1.5%	±2.5%	±3.5%
Below 5% to 1%	1	±1.5%	±2.5%	±3.5%	±4.0%
120% to 100o inclusive	0.5 lag	±1.00o	±2.00o	±3.0"o	±3.5%
120% to 10% inclusive	0.8 lead	±1.0%	±2.0%	±3.0%	±3.5%
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			
		>50 MVA	>10-50 MVA	>1-10 MVA	<=1 MVA
120% to 100o inclusive	0	±4.0%	±4.0%	±4.00o	±4.0%
1200o to 20% inclusive	0.866 lag	±5.0%	±5.0%	±5.0'lo	±5.0%
1200o to 200o inclusive	0.8661ead	±5.0%	±5.0%	±5.()%	±5.()%

MC5.5.3 Metering Equipment Accuracy Classes

The accuracy class or equivalent, is based on the WA capacity of the connection at the Connection Point and shall as a minimum be as shown in Table MC-2.

Table MC-2: Equipment Accuracy Classes

Equipment Type	Equipment Accuracy Class For Connections			
	>50 MVA	>10-50 MVA	>1-10 MVA	<•1 MVA
Current Transformers (Note 1)	0.2S	0.2S	0.5	0.5
:Voltage Transfonncrs	0.2	0.5	I	I
Active Energy and Power Meters (Note 2)	0.2S	0.2S	*0.SS*	*O.SS*
Reactive Energy and Power Meters	2	2	2	2

Note 1: Cutl'9nt transformers shall meet the clals accwacy requitements imlspectlve of CT secondaty ratings.

Note 2: A Mater accuracy class of 0.5 may be used where -.gy lranlfers to be measured by th8 Import/Export Mater during normal operaUng condillons ls such that the metered current wiM be above 5% of the Rated Measuring Cutl'9nl for periods equivalent to 10% or greater per annum (excluding periods of zero current).

MC5.6 ADDITIONAL METERING

Where a User intends to install additional Metering Installation at a Custody Transfer Point, the User may under its own Initiative and cost install, own, test, operate and maintain that additional Metering Installation. This additional Metering Installation shaft comply with the requirements set out in this Metering Code for Fiscal Metering.

MC5.7 ACCESS TO METERING DATA

With respect to any Fiscal Metering, only the owner of the Metering Installation wiff change data and settings within their respective metering equipment and only with the agreement of the Associated Users. Any such changes will be notified to the GSO's settlements unit within 3 Business Days after the change.

With respect to any Fiscal Metering, the owner of the Metering Installation will alow reading of the Meters by the GSSP for the GSO and by the Associated User whose consumption is measured by the Metering Installation.

Access to Meter data by any User other than the owner of the Metering Installation, including the provision of any remote access equipment required, will be at that User's cost, unless agreed otherwise inwriting by the parties concerned.

MC5.8 TESTING

The owner of a Fiscal Metering installation will undertake calibration testing upon request by the Associated User. In addition the owner will undertake routine testing of the Meters every year and of the CTs and VTs every 5 years.

Where, following a test, the acancy of the Metering Installlltlon is shown not to comply with the requirements of this Metering Code, the owner will at its own cost:

(a) consult with the GSO and the Assoclllted UMrs with regards to the errors found and the possible duration of the existence of the errors; and

(b) make repairs to the Maring Installation to restore the accuracy to the required standards.

The cost of routine testing must be met by the owner of the Meteringhstallation.

The cost of calibration testing must be met by the party requesting the test unless the test shows the accuracy of the Metering Installation does not comply with the requirements of this Metering Code, in which case the cost of the tests must be met by th8 owner of the Metering Installation, in addition to the costs that the owner must now incur to restore the Metering Installation to compliance with the Metering Code.

h regard to all testing, such work will only be undertaken by a person holding a valid Certificate of Registration as an Electrical Services Contractor issued under the Ordinance with endorsement for meter testing, which may include a TNSP or User or their contractors. Where a UMr is the owner of Fiscal M.terlng and undertakes testing of this Fiscal Metering, then such testing may be witnessed by a representative of the GSO, TNSP and/or Associated User, if the GSO, TNSP and/or an Associated User makes a written request to do so.

Where such a test is undeken outside the routine pre-planned maintenance periods, then the User concerned shaH provide a minimum of 5 Business Days notice of such tests to the GSO and any Associated User. Where such a test is part of the routine pre-planned maintenance process then the User conmed shall provide a minimum of 20 Business Days notice of such tests to the GSO and any Associated User.

Notification that the Fiscal Metering complies with the Metering Code will be sent to the GSO and the party that has requested the tests within 3 Business Days of the completion of such tests.

Where a Fiscal Metering installation is found to be faulty, or following tests under this MC5.8 or to be non-compliant or outside the accuracy of the Metering Code, then the GSO and all Users and Anoclated Users that have an interest in this Meteringhstallation shall also be informed of the failure. Such notification shall include the plans by the owner to restore the Metering Installation to compliance with the Metering Code and the procedures to be followed to determine any estimated readings during the period, including any revised readings that were provided during the period that the Metering Installation was faulty or non-compliant.

Such routine tests shall be carried out in accordance with Prudent Utlllty Practice utilising procedures approved by the Regulator.

MC5.9 SECURITY

The owner of Fiscal Metering will ensure that the equipment is securely sealed and that its links and secondary circuits are sealed where practical. The seals will only be broken in the presence of representatives of the Associated User unless agreed otherwise by them. Where equipment or areas cannot be practically sealed, Fiscal Metering labels must be displayed and staff must be instructed to take due care with regard to maintenance of the security and accuracy of this equipment.

The owner of Fiscal Metering will ensure an adequate level of security is applied to the Metering Installation.

MC5.10 DISPUTES

Disputes concerning this Metering Code will be dealt with in accordance with the procedures set out in the General Conditions of the Grid Code.

MC5.11 COMMISSIONING METERING INSTALLATIONS

Where commissioning is required owing to the installation of new metering equipment or a modification of existing metering equipment, the relevant User must notify the GSO and any Associated Users of the details of the new Metering Installation or changes to the existing system at least 1 calendar month prior to the commissioning date. Where there is a change to a previously notified commissioning date, the User must notify the other parties of such change.

With respect to the preceding paragraph, the User will, prior to the completion of commissioning, undertake testing in accordance with clause MC5.8 to ensure that the metering complies with the requirements of clause MC5.5 and that such testing is witnessed by at least one Associated User, unless agreed otherwise in writing, by all other Associated Users. Such testing shall be in accordance with Appendix A of this MC.

MC5.12 OPERATIONAL METERING

Operational Metering is required for the real time operation of the Grid System. Because operational requirements differ from fiscal requirements, Operational Metering does not necessarily have the same requirement for accuracy of measurement that Fiscal Metering has. However, Operational Metering is critical for the efficient, safe and timely operation of the Grid System by the GSO.

Therefore, the GSO has the right to install Operational Metering so as to provide such operational information in relation to each Generating Unit and each Power Station as the GSO may reasonably require to perform its duties in accordance with' the Grid Code, ordinances and license conditions.

Such information required by the GSO, in acCQfdance with this..MCS.12, shall be limited to that required for support and implementation._of the relevant unit dynamic modelling and spinning reserve monitoring. Such information shall be presented continuously to SCADA, event recorders and/or such other equipment as may be developed by the GSO. The GSO shall not use such information for any purpose other than specified herein and shall hold all such information confidential.

METERING CODE - APPENDIX A

MC A1 COMMISSIONING TESTS

This Appendix sets out those tests and checks that shall be included in the metering commissioning programme. Metering equipment shall in addition have basic tests carried out on earthing, insulation, together with other tests that would normally be conducted in accordance with Prudent Utility Practice.

MC A1.1 MEASUREMENT TRANSFORMERS

For all installations with new/replaced measurement transformers the User shall ensure that from site tests and inspections the following are confirmed and recorded:

(a) Details of the installed units, including serial numbers, rating, accuracy classes, ratio(s),

(b) CT ratio and polarity for selected tap,

(c) VT ratio and phasing for each winding, and

(d) For installations with existing measurement transformers the User shall ensure that, wherever practically possible, a, b and c 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 then the reason must be recorded on the commissioning record and details must be obtained from any relevant other party.

MC A12 MEASUREMENT TRANSFORMER LEADS AND BURDENS

For all installations the User shall wherever practically possible:

(a) Confirm that the VT and CT connections are correct,

(b) Confirm that the VT and CT burden ratings are not exceeded, and

(c) Determine and record the value of any burdens (including any non-Fiscal Metering burdens) necessary to provide evidence of the overall metering accuracy.

MC A2 A2 METERING

MC A2.1 GENERAL TESTS AND CHECKS

The following may be performed on-site or elsewhere (e.g. factory, meter test station, laboratory, etc.).

(a) Record the Metering Installation details required by the Data Collection System.

(b) Confirm that the VT/CT ratios applied to the Meter(s) agree with the site measurement transformer ratios.

(c) Confirm correct operation of Meter test terminal blocks where these are fitted (e.g. CTNT operated metering).

(d) Check that all cabling and wiring of the new or modified installation is correct.

(e) Confirm that meter registers advance (and that output pulses are produced for Meters which are linked to any separate RTU) for import and where appropriate export flow directions. Confirm Meter operation separately for each phase current and for normal poly-phase current operation.

(f) Where separate RTUs are used, confirm the Meter to RTU channel allocations and that the Meter units per pulse values or equivalent data are correct.

(g) Confirm that the local interrogation facility (Metering Installation) and local display etc, operate correctly.

MC A2.2 SITE TESTS

The following tests shall be performed on site:

(a) Check any site cabling, wiring, connections not previously checked under clause MC A2.1 above.

(b) Confirm that the Metering Installation is set to UTC +8 within ± 5 seconds.

(c) Check that the voltage and the phase rotation of the measurement supply at the Meter terminals are correct.

(d) Record Meter start readings (including date and time of readings).

(e) Wherever practicable, 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 Meteringhstallation is correct.

(f) Where for practical or safety reasons the previous site test (e) above 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 detennined separately as detailed under MC A1.1 above.

(g) Record values of the Metering Installations displayed or stored data (at a minimum one complete half-hour value with the associated date and time of the reading) on the commissioning record.

(h) Confirm the operation of metering equipment alarms (not data alarm or flags in the transmitted data).

MC A3 LABELLING OF METERS FOR IMP()RT AND EXPORT

A standard method of labelling Meters, test blocks, the display or etc. is necessary. Based on the definitions for Import and Export the required labelling shall be as follows.

MC A3.1 ACTIVE ENERGY

Meters or meter registers shaR be labelled Import or Export from the User's perspective according to Table MC-3.

MC A3.2 REACTIVE ENERGY

Within the context of this Metering Code the relationship between the Import and Export of Active Energy and Reactive Energy can best be established by means of the power factor. The following Table MC-3 gives the relationship:

Table MC-3: Reactive Energy Import/Export Convention

Flow of Active Energy	Power Factor	Flow of Reactive Energy
Import	Lagging	Import
Import	Leading	Export
Import	Unity	Zero
Export	Lagging	Export
Export	Leading	Import
Export	Unity	Zero

Meters or meter registers for registering the Import of Reactive Energy shall be labelled Import and those for registering the Export of Reactive Energy shall be labelled Export, in accordance with Table MC-3.

For the avoidance of doubt, Export (in relation to a Transmission Network) is the flow of Active Energy as viewed by the Power Producer or a DNSP where the Export is away from the Power Producer's or DNSP's Networt.

Dated this 5th day of December, 2003.

ABDUL GHAFUR BIN SHARIFF,
Clerk to Maj/is Mesyuarat Kerajaan Negeri

MFPU/E/003