



**SYRIAN ARAB REPUBLIC**  
Ministry of Electricity  
PUBLIC ESTABLISHMENT FOR  
TRANSMISSION OF ELECTRICITY  
**PETE**

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# **Transmission Grid Code**

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# **PETE**

# **Transmission Grid Code**

## **PREFACE**

# PETE TRANSMISSION GRID CODE

## CONTENTS

<b><u>Abbreviation</u></b>	<b><u>Section</u></b>	<b><u>Description</u></b>
G&D	Glossary and Definitions	Defines the important terms used in the Transmission Code
GC	General Conditions	Rules and provisions of a general application to the Transmission Code
PC	Planning Code	Planning requirements for connection to the transmission network
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	Transmission Metering Code	Metering of bulk (Wholesale) Movement of Power

## **1 GENERAL**

This preface to the PETE Transmission Grid Code (Transmission Code) is provided for users and prospective users for information only and does not constitute part of the Transmission Code.

The Transmission Code is designed to facilitate the safe, economic, equitable and efficient planning, development, operation, and maintenance of the interconnected transmission system in the Syrian Arab Republic for the benefit of all consumers in Syria. It contains the rules and procedure for the total power system in Syria including the power stations and the operation of the interconnectors to neighbouring utilities external to Syria. It covers the transmission network operated by PETE and, in specific contexts, the user networks connected to this transmission network including the distribution networks.

In preparing the Transmission Code, PETE has taken into account the requirements of open system access. In addition, by establishing the Buyer as an entity (which is a business activity within PETE), PETE has allowed for such future changes as the minister and/or the ERC may require in terms of an open market. Under the present arrangements it is anticipated that the Buyer will become the electricity market operator at such time as the electricity market becomes an open market.

ERC-Wherever this term is found in this grid code it means the ministry of electricity or the directorate of electricity sector regulatory. In the present structure of the electricity sector, the ERC does not exist as an entity. The functions of the ERC are treated by the directorate of electricity sector regulatory and private investment ESRPI and/or other entities to which the ministry finds necessary to assign those functions.

## **2 PURPOSE**

The Transmission Code is produced by PETE to enable it to meet its transmission license conditions and to maintain the integrity and security of the transmission system. Compliance with the Transmission Code is mandatory for all users of the transmission network.

The Transmission Code makes known the rules and procedures for the use of the transmission network and for connection to this network, along with the rules and procedures for the operation of the transmission system. In this respect, it seeks to avoid undue discrimination between users within the same user category.

### 3 SCOPE

The Transmission Code sets out the rules and procedure, which cover all users directly connected to the transmission network in Syria and those users that require wheeling across this network. It details the rules and procedures governing PETE's relationship with the different categories of user. The Transmission Code also specifies time critical procedures for both planning and operational purposes and covers both normal and exceptional circumstances.

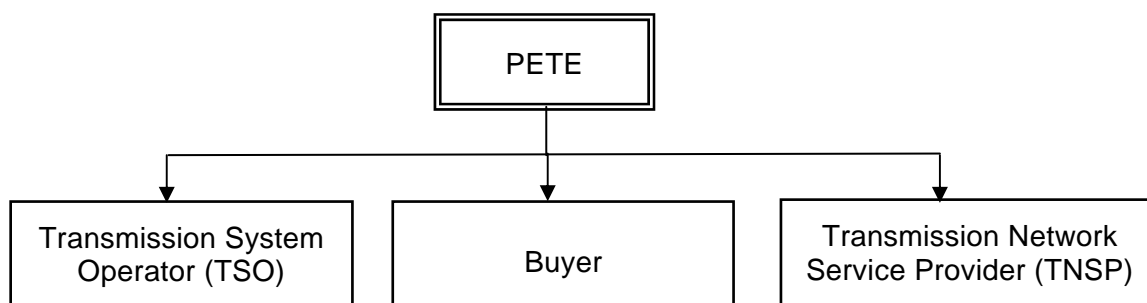
The Transmission Code also covers:

- The requirements with regard to the medium term development and operational planning of the transmission system including generation capacity planning.
- Technical standards relating to plant and apparatus.
- The connection of user plant and apparatus at a new connection point.
- The modification of user plant and apparatus at an existing connection point.

### 4 KEY ENTITIES

#### 4.1 PETE

PETE owns, operates, maintains and develops the transmission network. It is also responsible for the retail supply business in respect of principal consumers connected to its network. In the Transmission Code, as many of the procedures involved are time critical, references are made to key functions within PETE. This is to ensure that all users of the transmission network can write to that entity within PETE to exchange information. These entities are clearly defined in the glossary and definitions section of the Transmission Code. These entities are illustrated in Figure 1 below.



**Figure 1: PETE Entities**

- The transmission grid code is established based on the responsibilities of the entities, not on the organizational structure of PETE, that is to continue relying on this code despite any future changes on the organizational structure that may happen in the electricity sector in the future.

To assist the user of the Transmission Code these entities' are now described in more detail.

#### 4.1.1 Transmission System Operator (TSO)

The TSO entity in PETE is responsible for the overall security and reliability of the transmission system;

- (a) by coordinating the efficient and safe operation of the transmission system amongst all users; and
- (b) by liaising with the TNSP and Buyer.

The TSO is also responsible, in liaison with the **Buyer**, for generation scheduling & dispatch in accordance with the Transmission Code.

The main operational point of contact for users with the TSO is through the national control centre (NCC).

#### 4.1.2 Buyer

The **Buyer** entity in PETE is responsible for generation capacity planning based on an ERC approved planning criteria and the procuring of new power purchase agreements (PPAs) following the approval of the ERC and the ministry. In addition, it is responsible for the monitoring of existing PPAs and has the right to audit the scheduling, dispatch and operational planning of the transmission system operator (TSO) to ensure the equitable operation of the PPAs.

The **Buyer** entity is also responsible for interconnector trading and prepares, then submits the requirement for energy trading with all interconnected parties including Iraq, Jordan, Lebanon and Turkey and other interconnected countries .

At present, the **Buyer** entity is also responsible for the supply of wholesale energy to principal consumers and to the distribution network service provider.

### **4.1.3 Transmission Network Service Provider (TNSP)**

The TNSP entity in PETE is responsible for the development and maintenance of the transmission network. It is also responsible for those switching operations on the transmission network, in coordination with the TSO, which are required in order for it to perform its development and maintenance functions.

In addition, the TNSP network planner is responsible for master plan studies of the transmission network.

The TNSP is also required to provide non-discriminatory access to the users of the transmission network.

## **4.2 POWER PRODUCERS**

In the Transmission Code, power producers are those parties with generating units connected to the transmission network.

At present, there are broadly five categories of power producers:

- Public Establishment for Generation of Electricity (PEGE) is the entity; in the ministry of electricity; that owns and operates the majority of the power stations in the Country that are subject to central dispatch.
- Public sector power producers are those power producers rather than PEGE, that own and operate public sector power stations connected to transmission network that are subject to central dispatch .
- Independent Power Producers (IPPs) are those licensed entities independent of PEGE and the Government of Syria, that own and operate power stations that are subject to central dispatch.
- Principal consumers with self-generation connected to the transmission network not subject to central dispatch.
- Power stations with embedded generation, being generation connected to the distribution networks, that are not subject to central dispatch.

### **4.3 DISTRIBUTION NETWORK SERVICE PROVIDER (DNSP)**

Each DNSP in Public Establishment for Distribution of Electricity (PEDE) in the ministry of electricity is responsible for the planning, development, operation and maintenance of its distribution network and the retail supply of electricity in its prescribed area.

#### 4.4 PRINCIPAL CONSUMERS

This is any consumer that is directly connected to the transmission network.

#### 4.5 RETAIL SUPPLIERS

The distribution activities are carried out by the Public Establishment for Distribution of Electricity (PEDE) represented by its distribution companies.

At present, the retail supply function is carried out by the company to whose network a consumer is connected. For distribution network connected consumers, the supply function is carried out by the DNSP's in their respective areas. For the principal consumers, retail supply is performed by PETE's **Buyer** entity.

#### 4.6 INTERCONNECTED PARTIES

The commercial provisions relating to the connection and operation of an interconnector (being an external connection to PETE's transmission network) are set out in the relevant interconnector agreements between PETE and the relevant interconnected party.

The Transmission Code contains the operational rules and procedures that the transmission system operator (TSO) and interconnected parties will be required to follow to ensure that the security of the Syrian transmission system is maintained whilst complying with the interconnector agreement.

For the avoidance of doubt, the overriding duty of the TSO is to protect the integrity of the Syrian power system. Where this integrity is threatened by for example the instability of an interconnector, or excessive reactive or active power flows, or rapid changes in frequency in the interconnected parties power system, then the TSO is required to take such reasonable actions as a prudent utility operator would be expected to take. Such actions are required by the Transmission Code to be drilled using a simulator from time to time, in order that NCC staff are familiar with the actions they are required to take.

Thus, a key requirement for the handling of interconnector operations is to have operational coordination meetings with the interconnected party's system operator and to drill the procedures to be followed under different credible operational scenarios.



## **5 SECTIONS CONTAINED IN THE TRANSMISSION CODE**

The Transmission Code is divided into a number of specific sections for the convenience of the reader. Each section specifies the user groups that the section applies to. The sections contained in the Transmission Code are now summarised.

### **5.1 GLOSSARY AND DEFINITIONS**

This section contains all the glossary and definitions used within the Transmission Code.

For clarity, different parts of the overall 'Transmission System' are referred to by different names. The term 'Transmission System' means the PETE 'Transmission Network' and the power producer's power stations directly connected to the 'Transmission System', with their associated generation circuit HV network (even if these are privately owned by a power producer).

The term 'Transmission Network' itself broadly comprises all objects, other than power stations, that can be grouped into transmission 'circuits' or transmission 'substations' and provides the electrical highway required to transport energy from the power stations to the wholesale bulk supply points. Circuits are overhead lines and/or underground cable feeders, operating at transmission voltages. These are normally linked to and feed into or are themselves fed from transmission substations. The substations and switching stations can connect these circuits together and also control them.

The term 'Transmission Network' could also refer to a part of the Transmission System that is the responsibility of the PETE Network Planner. The term could also refer to a network, which is not part of the Transmission System, such as an interconnected parties' network.

Since the power stations and user equipment 'embedded' in the distribution network can affect the Transmission System, the term 'Power System' is used to cover both the Transmission System and the distribution systems.

### **5.2 GENERAL CONDITIONS**

The general conditions deals with those aspects of the Transmission Code not covered in other sections, including the resolution of disputes and the revision of the Transmission Code through a review panel.

### **5.3 PLANNING CODE**

The planning code deals with issues relating to the medium term development and expansion of generation capacity and the transmission network through the annual transmission and generation master plans.

Furthermore, it provides for the procedures involved for existing or new users intending to connect to the transmission network and the data to be provided to the TNSP network planner in order for the planner to assess the application.

### **5.4 CONNECTION CONDITIONS**

The connection conditions specify the minimum technical, design and certain operational criteria that must be complied with by directly connected users.

### **5.5 OPERATING CODES**

The operating codes comprise a number of sections, which govern the way in which the transmission system's operation is planned, programmed, notified, scheduled and then run in real time. This sequence starts with the forecasting of demand for the year ahead, in accordance with OC1. With the receipt of demand forecasts from users, the TSO coordinates requests for outages and matches these against forecast demand to produce the "Annual Maintenance Plan", under OC2.

In producing the Annual Maintenance Plan (of planned outages), the TSO also applies the generation reserve standards of OC3 and the demand control methods of OC4. Information is communicated and operations are coordinated in accordance with OC5 and the occurrence of significant incidents reported in accordance with OC6.

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

Any work to be carried out at a connection point is covered by the safety coordination procedures detailed under OC8. These permit users including the DNSPs and power producers, to operate using their own company's safety rules and provide a set of rules and procedures to accommodate any differences between these company rules and the TNSP's.

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

Monitoring and investigation of the performance of users equipment is covered by OC10 while commissioning and testing of equipment that has a significant impact on the transmission system is covered by OC11.

## **5.6 SCHEDULING AND DISPATCH CODES**

The Transmission 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 across the interconnectors. (SDC3).

## **5.7 METERING CODES**

The Metering Code (MC) sets out the way in which power and energy flows will be measured at the boundaries between different users. It is primarily intended for fiscal metering in the wholesale electricity market.

The Metering Code covers the bulk (wholesale) movement of power from its entry to the transmission network to its exit to the distribution companies or electricity retail suppliers and principal consumers with or without self-generation.

## Glossary and Definitions

Term	Definition
Automatic Generation Control or <b>AGC</b> / Local Frequency Control or <b>LFC</b>	The process by which a <b>Generation Unit's</b> output is automatically adjusted within a control range to maintain <b>Energy</b> interchanges through an <b>Interconnector (AGC)</b> and/or <b>System</b> frequency ( <b>LFC</b> ) to within stipulated limits.
Ancillary Services	A service as defined in an agreement, other than the production of <b>Energy</b> and/or provision of <b>Capacity</b> , which is used to operate a stable and secure <b>Power System</b> including <b>Automatic Generation Control, Reactive Power, Operating Reserve</b> , frequency control, voltage control and <b>Black Start</b> capability.
Apparatus	All <b>TNSP</b> equipment, or <b>DNSP</b> equipment, or <b>User</b> equipment, as the case may be, in which electrical conductors are used, supported or which they form a part. (See also <b>Plant</b> .) Certain requirements will be limited to <b>HV</b> apparatus for the purpose of specific sections of the Transmission Code.
Availability	The MW <b>Capacity</b> of a <b>Generating Unit</b> made available to the <b>NCC</b> across a specified time period by a <b>Power Producer</b> in an <b>Availability Notice</b> .
Availability Notice	A notice issued by a Power Producer to the <b>NCC</b> , in a form set out in SDC1, stating the <b>Availability</b> of a <b>CDGU</b> .
Black Start or <b>BS</b>	The procedure necessary for a <b>System</b> recovery from a <b>Total Blackout</b> or <b>Partial Blackout</b> .
Black Start (Power Station or Generating Unit)	A <b>Generating Unit</b> or <b>Power Station</b> that is registered with the <b>TSO</b> as having <b>Black Start</b> capabilities.
Business Day	Any day excluding Friday and Saturday when the commercial banks are open for business in Damascus.
Buyer	The <b>PETE</b> manager responsible for the bulk supply licensed activity that exclusively shall have the right to purchase electricity from <b>Interconnected Parties</b> and <b>Power Producers</b> . The buyer is also exclusively responsible for the wholesale selling of electricity to <b>Interconnected Parties, Distribution Network Service Providers</b> and <b>Principal Consumers</b> . The buyer is responsible for generation capacity planning and shall also have the right to audit the <b>Operational Planning Phase</b> and the <b>Scheduling</b> and <b>Dispatch</b> undertaken by the <b>TSO</b> to ensure equitable operation of the <b>PPAs</b> .
Capacity	The MW capacity, at a stated power factor, of a <b>Generating Unit</b> , available to be sent-out by that unit to the <b>Transmission System</b> .
Centrally Dispatched Generating Unit or <b>CDGU</b> .	A <b>Generating Unit</b> subject to <b>Dispatch</b> by the <b>TSO</b> .
Cold Standby	That state of readiness of a <b>CDGU</b> which is not currently <b>Synchronized</b> , whereby following a <b>Dispatch</b> instruction the <b>CDGU</b> can be <b>Synchronized</b> within up to 12 hours of the receipt of such <b>Dispatch</b> instruction.
Connection Agreement	An agreement between a <b>User</b> and the <b>TNSP</b> by which that <b>User</b> is connected to the <b>Transmission Network</b> at a <b>Connection</b>

**Point.**

Connection Point	The site, or in the case of a schematic diagram the node point, on the <b>Transmission Network</b> at which a <b>User</b> , including without limitation a <b>DNSP</b> , <b>Power Producer</b> , <b>Interconnected Party</b> or a <b>Consumer</b> , connects their <b>User Network</b> to the <b>Transmission Network</b> , under the terms of their <b>Connection Agreement</b> .
Consumer	A party, being a person or legal or corporate entity, to which <b>Energy</b> is supplied by the holder of a Retail Supply <b>License</b> for consumption by that party.
Control Phase	That period from the issue of the <b>Indicative Running Notification</b> through to real time.
Critical Incident	An <b>Incident</b> or series of <b>Incidents</b> which would in the reasonable opinion of the <b>TSO</b> , result in the <b>Transmission System</b> frequency or voltage exceeding the operational limits as contained in the PC.
Custody Transfer Agreement	An agreement between a <b>User</b> and the <b>Buyer</b> or <b>Retail Supplier</b> by which that <b>User</b> exports/imports <b>Energy</b> to/from the <b>Transmission Network</b> at a <b>Custody Transfer Point</b> .
Custody Transfer Point	The site on the <b>TNSP's Network</b> , or <b>DNSP's Network</b> , or a <b>User's Network</b> , where supplies of electrical <b>Energy</b> are metered to permit a transfer of custody of such electricity. The existence of a custody transfer point does not by itself create a <b>Connection Point</b> . It is a metering point, where the custody of the commodity (electricity) has been transferred from one party to another.
Deloading	The condition in which a <b>Generating Unit</b> has reduced or is not delivering <b>Active Power</b> and/or <b>Reactive Power</b> to the <b>System</b> to which it is <b>Synchronized</b> .
Demand	The demand for <b>Active</b> and/or <b>Reactive Power</b> by <b>Consumers</b> connected to the <b>Power System</b> .
Demand Control	The control by the <b>TNSP</b> , or a <b>DNSP</b> or a <b>Consumer</b> of <b>Demand</b> (as detailed in OC4).
Disconnection	The switching off by manual or automatic means for the purpose of <b>Demand Control</b> on the <b>Power System</b> or during the automatic operation of network protection devices.
Dispatch	The issue by the <b>NCC</b> of instructions for a <b>Generating Unit</b> to achieve specified <b>Load</b> and/or target voltage levels, within its <b>Generating Unit Capability Limits</b> , by a stated time.
Dispatcher	That person authorized by the <b>TSO</b> currently on shift-duty at the <b>NCC</b> and authorized to issue <b>Dispatch</b> instructions to <b>Power Producers</b> for the operation of <b>CDGUs</b> . This shift-duty will be covered on a 24 hour a day 7 days a week basis.
Distribution Network	The distribution networks owned by PEDE, comprising of namely 20 kV distribution circuits, 20 kV/LV substations and other associated <b>Plant</b> and/or <b>Apparatus</b> .
Distribution Network	The entity responsible for the operation, maintenance and planning of a <b>Distribution Network</b> and the associated <b>Plant</b> and

Service Provider or <b>DNSP</b>	<b>Apparatus</b> required for the purpose of providing distribution services to other <b>Users</b> of the <b>Power System</b> in accordance with <b>License</b> conditions.
Earth Fault Factor	At a selected location of a three-phase <b>System</b> and for a given <b>System</b> configuration, the ratio of the highest root mean square phase-to-earth fundamental frequency voltage on a healthy phase during phase-to-earth fault, to the root mean square phase-to-earth fundamental frequency voltage which would be obtained at the selected location without the fault.
Economic Capacity	That loading, as notified to the <b>TSO</b> by the <b>Power Producer</b> , that represents the optimum economic loading point for a <b>Generating Unit</b> , taking into account all variable operating costs.
Electricity Regulatory Commission or <b>ERC</b>	The Electricity Regulatory Commission of Syria responsible for the regulation of the electricity industry.
Electricity Law	The Electricity Law (No 32) for the year 2010 as amended from time to time.
Embedded Generation	A <b>Generating Unit</b> connected to a <b>Distribution Network</b> not subject to <b>Dispatch</b> by the <b>TSO</b> .
Energy (Active and Reactive)	Active energy is that energy during a time interval derived from the <b>Active Power</b> integrated over that time and measured in watt-hours or multiples thereof. Reactive energy is that energy during a time interval derived from the <b>Reactive Power</b> integrated over that time and measured in var-hours or multiples thereof.
Event	An unscheduled or unplanned (although it may be anticipated) occurrence on, or relating to, a <b>System</b> including faults, incidents and breakdowns, and adverse weather conditions being experienced.
Frequency Sensitive Mode	The operation of a <b>Centrally Dispatched Generating Unit</b> in a frequency sensitive mode that will result in <b>Active Power</b> output changing in direct response to changes in <b>Power System</b> frequency. The timing for such changes is detailed in OC3.
Generating Unit	Any <b>Apparatus</b> that produces electrical <b>Energy</b> . Such generating unit will include the mechanical prime mover (e.g. turbine or engine) in the case of conventional hydro or thermal plant or the equivalent principle means of converting another form of energy to electricity, in the case of unconventional generating unit s such as wind and solar energy.  In the case of a multi- generating Unit combined cycle block, a generating unit is an alternator plus its associated prime mover within the combined cycle block.
Generating Unit Capability Limits	A capability chart, registered with PETE, which shows the MW and War capability limits within which a <b>Generating Unit</b> will be expected to operate under steady state conditions. For information, a typical chart for a steam turbine prime mover <b>Generating Unit</b> is given in OC3.
High Voltage or <b>HV</b>	A nominal AC voltage exceeding <b>Low Voltage</b> .
Hot Standby	A <b>CDGU</b> available to <b>Synchronize</b> in accordance with a timescale specified in OC3.

Independent Power Producer or IPP	A non-governmental entity, which establishes a power station to sell electric power.
Indicative Running Notification or IRN	An advanced generation notice issued by 1000 hrs on the day ahead (SDO) of the <b>Scheduled Day</b> (SD1), in accordance with SDC1, detailing by <b>CDGU</b> the anticipated requirements from such <b>CDGUs</b> during the period covered by the indicative running notification.
Interconnector	A facility that interconnects the Syrian <b>Power System</b> to another power system external to Syria.
Interconnected Party	Any external party outside Syria which owns and operates a transmission network which is connected to the Syrian <b>Power System</b> .
Interconnector Agreement	Together the general trading agreements assigned to <b>PETE</b> by the Government of Syria for the export or import of <b>Energy</b> across an <b>Interconnector</b> and the provision of generation <b>Capacity</b> and transmission <b>Capacity</b> across an <b>Interconnector</b> including transmission wheeling facilities provided by PETE to the <b>Interconnected Party</b> .
Joint Power Coordination Centre	The coordination and supervision centre responsible for the joint coordination of the <b>Interconnectors</b> between Syria and neighbouring countries.
License	A license issued by the <b>ERC</b> to an entity in accordance with the <b>Electricity Law</b> .
Load	That <b>Active Power</b> and/or <b>Reactive Power</b> , as the case may be produced by a <b>Generating Unit</b> and all like terms, such as "Loading" shall be construed accordingly.
Long Term	A period of more than 10 years ahead.
Low Voltage or <b>LV</b>	A nominal AC voltage level not exceeding 1 000V between phases or 600V between a phase and earth or a phase and neutral.
Maximum Continuous Rating or <b>MCR</b>	The maximum loading of the <b>Generating Unit</b> concerned, as registered with <b>PETE</b> , under an agreement, at which the <b>Generating Unit</b> can operate continuously without any undue degradation of operational performance, in accordance with <b>Prudent Utility Practice</b> .
Medium Term	A period covering from 1 year ahead to 10 years ahead of the current year (Year 0).
Merit Order	The prioritized list, produced by PETE, of <b>CDGUs</b> declared Available in a weekly <b>Availability</b> Notice, which gives the order in which such <b>CDGUs</b> will be Loaded by the <b>NCC</b> in accordance with SDC1 and SDC2.
Minimum Generation	The minimum stable output (in whole MW) that a <b>CDGU</b> has registered with PETE.
National Control Centre or <b>NCC</b>	The <b>TSO's</b> national control centre, being responsible for the supervision of the Transmission System and for the issuing of <b>Dispatch</b> instructions to <b>CDGUs</b> and the coordinating of Transmission Network operations including safety coordination to the extent determined by the <b>TSO</b> .

	Note that in the Transmission Code the term national control centre ( <b>NCC</b> ) is used when real time information exchange is essential. In more general applications the term TSO is used. The TSO can be regarded as the manager of the <b>NCC</b> .
Network	The <b>TNSP Transmission Network</b> or <b>DNSP Distribution Network</b> or <b>User's Network</b> as the case may be. In certain instances (as in "all networks") it means all of these networks.
Non-Spinning Reserve	The component of the <b>Operating Reserve</b> not connected to the <b>Power System</b> but capable of serving <b>Demand</b> within a specified time.
Normal Operation	That <b>Power System</b> condition where the <b>TSO</b> reasonably expects that the <b>Demand</b> for that day will be met by the available generating <b>Capacity</b> with a contingency reserve without the need for load shedding.
Notice Submission Time	The time specified in SDC1 by which an <b>Availability Declaration</b> notice or a Scheduling and <b>Dispatch Parameters</b> notice or amendments to such notices shall be received by the <b>NCC</b> .
Open Access	The provision by a <b>Transmission Network Service Provider</b> or a <b>Distribution Network Service Provider</b> of access by <b>Users</b> including, for the avoidance of doubt, prospective <b>Users</b> to the <b>Power System</b> .
Operating Reserve	That generation <b>Capacity</b> in excess of <b>Power System Demand</b> required to provide for regulation, load forecasting error, equipment forced, and scheduled outages. It consists of <b>Spinning Reserve</b> and <b>Non-Spinning Reserve</b> .
Operation	The term operation means a previously planned and instructed action relating to the operation of any <b>Plant</b> or <b>Apparatus</b> that forms a part of the <b>Transmission System</b> . Such operation would typically involve some planned change of state of the <b>Plant</b> or <b>Apparatus</b> concerned, which the <b>NCC</b> requires to be informed of.
Operational Diagram	A schematic representation of all <b>User</b> and <b>TNSP Plant</b> and <b>Apparatus</b> and circuits at the <b>Connection Point</b> incorporating its numbering, nomenclature and labelling.
Operational Effect	The term operational effect means any effect on the operation of the relevant <b>System</b> which will or may cause the <b>Transmission System</b> or other <b>User Systems</b> 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 Planning Phase	The period from the issue of the <b>Indicative Running Notification</b> to the end of the 5 year period ahead of real time.
Partial Blackout	The situation existing on an <b>Islanded System</b> of the <b>Power System</b> , when all <b>CDGUs</b> in the <b>Islanded System</b> have disconnected from the <b>Islanded System</b> and there is no energy flowing across the <b>Islanded System</b> .
Peak Capacity	The maximum short duration loading of a <b>Generating Unit</b> in MW for a maximum period of one hour. The peak capacity shall be calculated on the basis of the <b>Generating Unit</b> being loaded to



	<b>Economic Capacity</b> 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 <b>Economic Capacity</b> .
Peak Demand	That half-hourly period when the <b>Power System Demand</b> achieves or is forecast to achieve, as the case may be, the highest <b>Demand</b> for that day.
PEDE	The Public Establishment for Distribution of Electricity and wholly owned by the Government of Syria and registered as a public establishment.
PEGE	The Public Establishment for Generation of Electricity and wholly owned by the Government of Syria and registered as a public establishment.
PETE	The Public Establishment for Transmission of Electricity and wholly owned by the Government of Syria and registered as a public establishment.
Plant	Fixed and movable equipment used in the generation and/or supply and/or transmission and/or distribution of electricity other than <b>Apparatus</b> . For the avoidance of doubt, equipment may be considered to be <b>Plant</b> even though it contains <b>LV</b> conductors that provide electrical power for that <b>Plant</b> item.
Point of Common Coupling	That point where the <b>User's Network</b> (being a <b>Network</b> with no other <b>User</b> ) is connected to the backbone <b>Transmission Network</b> or where the <b>User's Network</b> connects to another <b>User's Network</b> .
Power (Active and Reactive)	Active power is that instantaneous power derived from the product of voltage and current and the cosine of the voltage-current phase angle which is measured in watts or multiples thereof. Reactive power is that instantaneous power 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 Island	The condition that occurs when parts of the <b>Transmission Network</b> and associated <b>Distribution Network</b> including associated <b>Power Stations</b> become detached electrically from the rest of the <b>Transmission System</b> . This detached <b>System</b> with its associated <b>Generating Units, Networks</b> and local <b>Demand</b> is a power island.
Power Producer	The holder of a generation <b>License</b> or an exemption granted pursuant to the <b>Electricity Law</b> which owns and/or operates a <b>Generating Unit</b> which can be synchronized with the <b>Power System</b> . In certain instances in this Transmission Code, this term will include any other entities with <b>Self-generation</b> or <b>Embedded Generation</b> as the case may be.
Power Purchase Agreement or <b>PPA</b>	An agreement between a <b>Power Producer</b> and the <b>Buyer</b> by which the <b>Buyer</b> purchases <b>Energy</b> from that <b>Power Producer</b> for export on to the <b>Transmission Network</b> at a <b>Custody Transfer Point</b> .
Power Station	The <b>Power Producer's Generating Units</b> together with its associated auxiliary equipment, fuel, stores and stocks, buildings and property at or adjacent to the generating site and including

	<b>Plant and Apparatus</b> belonging to the <b>Power Producer</b> and required for the connection of these <b>Generating Units</b> to the <b>Power System</b> .
Power System	The interconnected power system within The Syrian Arab Republic consisting of both the <b>Transmission Network</b> and <b>Distribution Networks</b> and the <b>Power Stations</b> connected to these <b>Networks</b> and the <b>Interconnectors</b> .
Primary Reserve	Primary reserve is an automatic response by a <b>Synchronized CDGU</b> to a fall or rise in <b>Transmission System</b> frequency which require changes in the <b>CDGU's</b> output, to restore the frequency back to within target limits. Such response should be fully available within 10 seconds and sustainable for a further 20 seconds.
Principal Consumer	A <b>Consumer</b> that is directly connected to the <b>Transmission Network</b> , to which <b>Energy</b> is supplied by the holder of a bulk supply <b>License</b> for consumption by that <b>Consumer</b> .
Programming Phase	Part of the <b>Operational Planning Phase</b> being a period from 1 year ahead to the start of the <b>Control Phase</b> .
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.
Safety Rules	The rules for the establishment of a safe system of working on <b>Plant and Apparatus</b> . Such rules shall comply with the relevant <b>Electricity Law</b> and <b>Prudent Utility Practice</b> .
Schedule	A statement prepared by the <b>TSO</b> under SDC1 on a weekly basis setting out which <b>CDGUs</b> are to be <b>Dispatched</b> in accordance with the <b>Merit Order</b> to ensure sufficient generation to meet <b>Demand</b> with an appropriate <b>Operating Reserve</b> .
Scheduling	The process as set out in SDC1, of compiling a programme for the <b>Merit Order Dispatch of Centrally Dispatched Generating Units</b> to meet forecast <b>Demand</b> .
Schedule Day (SD)	The 24 hour period starting at 00:00 hrs (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, SD0 will be used to designate today or present time.
Scheduling and Dispatch Parameters (SDP)	The relevant data required by the <b>TSO</b> in carrying out the <b>Scheduling and Dispatch</b> of generation in accordance to SDC1.
SDP Notice	A notice issued by a <b>Power Producer</b> , in accordance to SDC1, stating the <b>SDP</b> data of a <b>CDGU</b> .
Secondary Reserve	The automatic response to <b>Transmission System</b> frequency changes which is fully available by 30 seconds from the time of frequency change to take over from the <b>Primary Reserve</b> , and which is sustainable for a period of at least 30 minutes.
Self-generation	An entity with self-generation that produces electricity for its own consumption but may import electrical energy when required or may export excess generation to the <b>Power System</b> , in accordance with its <b>Connection Agreement</b> and/or <b>Ancillary</b>

	<b>Services</b> agreement.
Significant incidents	Where an Event on the Transmission System has had or may have had a significant effect on the User Network or when an Event on the User Network has had or may have had a significant effect on the Transmission System or other User Networks, the Event shall be deemed a Significant Incident by the TSO in consultation with the User.
Spinning Reserve	Those loaded <b>Generating Units</b> , which form part of the <b>Operating Reserve</b> , that are <b>Synchronized</b> to the <b>Power System</b> and contribute to <b>Primary Reserve</b> or <b>Secondary Reserve</b> . A full explanation of this will be found in OC3.
Synchronized	The condition where a <b>Generating Unit</b> , or a <b>System</b> having generation already connected to it, is made ready to be connected to the <b>Power System</b> , and then connected, such that frequencies and phase relationships of that <b>Generating Unit</b> or <b>System</b> , as the case may be, are identical (within operational tolerances) to those of the <b>Power System</b> .
System	Any <b>User System</b> or the <b>Power System</b> or an interconnected system or the combination of these systems or parts thereof, as the case may be.
System Emergency	That actual condition of the <b>Power System</b> when, due to the occurrence of one or more incidents, a part or the whole of the <b>Power System</b> has experienced excessive frequency deviations or <b>Transmission</b> voltage deviations.
System Stress	That condition of the <b>Power System</b> when the <b>TSO</b> reasonably considers that a single credible incident would most probably result in a <b>System Emergency</b> condition. Typically such system stress would apply across the periods of system <b>Peak Demand</b> .
Total Blackout	The situation existing when all <b>CDGUs</b> in the <b>Power System</b> have disconnected from the <b>Power System</b> .
Transfer Level	The level of <b>Power</b> and/or <b>Energy</b> transfer that is agreed between two parties across an <b>Interconnector</b> . This may also include the provision of <b>Spinning Reserve</b> by one party to the other.
Transmission Network	The transmission <b>network</b> owned by <b>PETE</b> comprising of namely 400 kV, 230 kV and 66 kV transmission circuits, 400/230/66/20 kV substations and other associated <b>Plant</b> and/or <b>Apparatus</b> .
Transmission Network Service Provider or TNSP	The <b>PETE</b> manager responsible for the operation and maintenance of the <b>Transmission Network</b> and its associated <b>Plant</b> and <b>Apparatus</b> for the purpose of providing transmission services, including wheeling and access to Users of the <b>Power System</b> .
TNSP Network Planner	The <b>PETE</b> manager responsible for the planning and development of the <b>Transmission Network</b> in accordance with <b>License</b> conditions.
Transmission System	The interconnected transmission system within the Syrian Arab Republic consisting of the <b>Transmission Network</b> , the <b>Power Stations</b> and the <b>Interconnectors</b> with neighbouring countries connected to the <b>Transmission Network</b> .

Transmission System Operator or <b>TSO</b> .	The <b>PETE</b> manager responsible for the overall coordination of the operation, maintenance and development of the <b>Transmission System</b> amongst all the <b>Users</b> . The <b>TSO</b> is also responsible for generation scheduling & dispatch, in accordance with the Transmission Code and the monitoring, programming and control of the <b>Transmission System</b> in accordance with <b>License</b> conditions.
User	Any person or entity other than the <b>TSO</b> making use of the <b>Transmission System</b> , as more particularly identified in each section of the Transmission Code. In certain cases, this term means any person to whom the Transmission Code applies.
User Network	<p>A <b>Principal Consumer's</b> network or <b>Power Producer's</b> network not owned by the <b>TNSP</b> connected to the <b>Transmission Network</b> and including the <b>HV Apparatus</b> at the <b>Connection Point</b> owned by that <b>User</b>.</p> <p>In certain cases, this term may mean a combination of the <b>Distribution Network</b> and/or <b>Power Producer's</b> network connected to the <b>Transmission Network</b>.</p>
User System	All <b>Plant</b> and <b>HV Apparatus</b> , including the <b>User Network</b> and <b>Generating Units</b> , owned by the <b>User</b> to operate its facility.
Use of System Agreement	The agreement between <b>PETE</b> and a party directly connected to the <b>Transmission Network</b> for the provision of transmission wheeling facilities provided by <b>PETE</b> to that party.

## Glossary and Definitions For Metering Code

Associated User	When reference is made to a <b>User</b> who does not own the assets at a <b>Custody Transfer Point</b> but has a contractual interest in the test results or data flowing from the <b>Metering System</b> , then within this MC the term associated user is used to differentiate them from the <b>User</b> who owns electrical transmission or distribution equipment <b>at the Custody Transfer Point</b> .
Back-up Metering System	A <b>Metering System</b> that includes one <b>Meter</b> and may be installed by the <b>User</b> / buyer for the purpose of verifying the accuracy of the <b>Fiscal Metering System</b> . Such back-up metering systems shall meet the standards specified in the Metering Code.
Bulk Supply Licensee	Means the holder of the license that authorizes bulk supply, pursuant to articles 28 and 35 of the Electricity Law.
Data Collection System	The data collection system operated by the owner (seller), for use in the calculation of payments due for wholesale electricity supplied or received.
Export	The vector relationship between voltage and current as contained in Appendix A of this MC.
Fiscal Metering System	A <b>Metering System</b> , which consists of Main and Check <b>Meters</b> , and installed by the seller (the <b>Power Producer</b> or the <b>Bulk Supply Licensee</b> ) at a <b>Connection Point</b> or a <b>Custody Transfer Point</b> , for fiscal accounting, contractual and/or statistical purposes.
Import	The vector relationship between voltage and current as contained in Appendix A in this MC.
Meter	A device for measuring and recording units of <b>Active Energy</b> and/or <b>Reactive Energy</b> and/or <b>Power</b> and/or <b>Demand</b> .
Metering System	A <b>Meter</b> and the associated current transformers, voltage transformers, metering protection equipment including alarms, <b>LV</b> electrical circuitry, associated data collectors, data transmitters related to the measurement and recording and transmitting to the <b>Data Collection System Active Energy</b> and/or <b>Reactive Energy</b> and/or <b>Active Power</b> and/or <b>Reactive Power</b> import and/ or export information, as the case may be.
Retail Supplier	The holder of a retail supply <b>License</b> responsible for the purchase of wholesale <b>Energy</b> from the <b>Bulk Supply Licensee</b> for the retail sale of <b>Energy</b> to <b>Consumers</b> .

## General Conditions

### GC1 INTRODUCTION

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

### GC2 SCOPE

The **General Conditions** apply to **PETE** and all **Users** to whom the Transmission Code applies.

### GC3 OBJECTIVE

The objectives of the General Conditions are as follows:

- (a) To ensure, insofar as it is possible, that the various sections of the Transmission Code work together for the benefit of **PETE** and all **Users**.
- (b) To provide a set of principles governing the status and development of the Transmission Code and related issues as approved by the **ERC**.

### GC4 TRANSMISSION CODE REVIEW PANEL

**PETE** shall establish and maintain the "Review Panel" which shall be a standing body to carry out the functions as follows:

- (a) Keep the Transmission Code and its working under review.
- (b) Review all suggestions for amendments to the Transmission Code which the **ERC**, Review Panel member or **User** may wish to submit to **PETE** for consideration by the Review Panel from time to time.
- (c) Publish recommendations as to the amendments to the Transmission Code that **PETE** or the Review Panel feels are necessary or desirable and the reasons for these recommendations.
- (d) Issue guidance in relation to the Transmission Code and its implementation, performance and interpretation upon the reasonable request of any **User**.

- (e) Consider what changes are necessary to the Transmission Code arising out of any unforeseen circumstances referred to it by **PETE** under GC5 or derogations approved under GC6.

The Review Panel shall establish and comply with its own rules.

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

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

## **GC5 UNFORESEEN CIRCUMSTANCES**

If circumstances not envisaged in the provisions of the Transmission Code or divergent interpretations of any provisions included in the Transmission Code should arise, **PETE** 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, **PETE** shall in good faith determine what is to be done and notify all **Users** affected.

**PETE** shall promptly refer all such unforeseen circumstances and any determination to the Review Panel for consideration in accordance with GC6.

## **GC6 PROCEDURE FOR TRANSMISSION CODE REVIEW PANEL**

### **GC6.1 ALL REVISIONS TO BE REVIEWED**

All revisions to the Transmission Code must be reviewed by the Review Panel prior to application to the **ERC**. All proposed revisions from **Users**, the **ERC** or **PETE** should be brought before the Review Panel for consideration. The Review Panel will advise all **Users** and the **ERC** of all proposed revisions to the Transmission Code with notice of no less than 20 **Business Days** in advance of the next scheduled meeting of the Review Panel.

Following review of a proposed revision by the Review Panel, the Review Panel will apply to the **ERC** for revision of the Transmission Code based on the Review Panel recommendation. The Review Panel, in applying to the **ERC**, shall also notify each User, by a suitable publication, of the proposed revision and other views expressed by the Review Panel and

**Users** so that each **User** may consider making representations directly to the **ERC** regarding the proposed revision.

The **ERC** shall consider the proposed revision, other views, and any further representations and shall determine whether the proposed revision should be made and, if so, whether in the form proposed or in an amended form.

Having been so directed by the **ERC** that the revision shall be made, the Review Panel shall notify each **User**, in a manner approved by the **ERC**, of the revision at least 10 **Business Days** prior to the revision taking effect. The revision shall take effect with this Transmission Code deemed to be amended accordingly from and including the date specified in such notification or other such date as directed by the **ERC**.

## **GC6.2 DEROGATIONS**

If a **User** finds that it is, or will be, unable to comply with any provision of the Transmission Code, then it shall, without delay, report such non-compliance to **PETE** and shall make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable. Non-compliance may be caused by:

- (a) **Plant** and **Apparatus** already connected to the **Transmission System** which seeks derogation solely or mainly as a result of the issue of the Transmission Code or of a revision to the Transmission Code; or
- (b) **Plant** and **Apparatus** for which approval to connect to the **Transmission System** is being sought where the User can show that it had commenced equipment procurement prior to the issuance of the Transmission Code or a revision to the Transmission Code that caused this requirement for a derogation.

When a **User** in category GC6.2(a) 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 **PETE** a request for derogation from such provision in accordance with GC6.3 and shall provide the **ERC** with a copy of such application.

When a **User** in category GC6.2(b) believes either that it would be unreasonable (including on the grounds of cost and technical considerations) to require it to remedy such non-compliance then it can be granted an extended period to remedy such non-compliance, it shall promptly submit to **PETE** a request for derogation from such provision in accordance



with GC6.3 and shall provide the **ERC** with a copy of such application. The burden of proof shall rest with the **User** to show good reason why it cannot comply.

If **PETE** finds that it is, or will be, unable to comply with any provision of the Transmission 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 **PETE** requests a derogation, then **PETE** shall submit the information set out in GC6.3 to the **ERC**.

### **GC6.3 A REQUEST FOR DEROGATION BY A USER**

A request by a User for derogation from any provision of the Transmission Code shall contain:

- (a) the reference number and the date of the Transmission 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 Transmission 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, PETE shall promptly consider such a request provided that it considers that the grounds for the derogation are reasonable. PETE 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 **Transmission System**; or
- (b) impose unreasonable costs on the operation of the **Transmission System** or on an **Interconnected Party's System**.

To the extent of any derogation granted in accordance with GC6.3, **PETE** and/or the **User** (as the case may be) shall be relieved from any obligation to comply with the applicable

provision of the Transmission Code and shall not be liable for failure to so comply but shall comply with any alternative provisions identified in the derogation.

**PETE** 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 Transmission Code and the period of the derogation;
- (b) on request from any **User**, provide a copy of such register of derogations to such **User**; and
- (c) report monthly to the **ERC** on the status of the requests for derogations and on the progress of each User in achieving compliance.

The **ERC** may initiate at the request of **PETE** or a **User** a review of any existing derogations, and any derogations under consideration, where the **ERC** considers such a request is justified.

## **GC7 HIERARCHY**

In the event of any irreconcilable conflict between the provisions of the Transmission Code and any contract, agreement, or arrangement between **PETE** and a **User**, the following circumstances shall apply:

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

**GC8 ILLEGALITY AND PARTIAL INVALIDITY**

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

If part of a provision of the Transmission 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 Transmission Code.

**PETE** shall prepare a proposal to correct the default for consideration by the Review Panel.

**GC9 TIME OF EFFECTIVENESS**

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

**GC10 TRANSMISSION CODE NOTICES**

Any notice to be given under the Transmission Code shall be in writing and shall be duly given if signed by or on behalf of a person duly authorized 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.

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

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

Any notice required to be given by this Transmission 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 Syria, 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 TRANSMISSION CODE DISPUTES**

If any dispute arises between Users or between PETE and any User in relation to this Transmission 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 100 calendar days of the giving of a notice under the previous paragraph then the dispute shall be settled in accordance with the Electricity Law and the Special Regulation on settling disputes.

#### **GC12 TRANSMISSION CODE CONFIDENTIALITY**

Several parts of the Transmission Code specify the extent of confidentiality that applies to data supplied by Users to PETE. Unless otherwise specifically stated in the Transmission Code, PETE shall be at liberty to share all data with Users likely to be affected by the matters concerned. In all cases PETE is at liberty, and may be required, to share the data with the ERC.

#### **GC13 INTERPRETATION**

In this Transmission Code, unless the context otherwise requires:

- (a) references to "this Transmission Code" or "the Transmission Code" are reference to the whole of the Transmission Code, including any schedules or other documents attached to any part of the Transmission Code;
- (b) the singular includes the plural and vice versa;
- (c) any one gender includes the others;
- (d) references to code sections, paragraphs, clauses or schedules are to code sections, paragraphs, clauses or schedules of this Transmission Code;

- (e) code, paragraph and schedule headings are for convenience of reference only and do not form part of and shall neither affect nor be used in the construction of this Transmission Code;
- (f) 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 license shall be to that license as amended, modified or replaced from time to time and to any rule, document, decision or arrangement promulgated or established under that license;
- (g) references to the consent or approval of the ERC shall be references to the approval or consent of the ERC in writing, which may be given subject to such conditions as may be determined by the ERC, as that consent or approval may be amended, modified, supplemented or replaced from time to time and to any proper order, instruction or requirement or decision of the ERC given, made or issued under it;
- (h) all references to specific dates or periods of time shall be calculated according to the Gregorian calendar and all references to specific dates shall be to the day commencing on such date at 00:00 hours;
- (i) where a word or expression is defined in this Transmission Code, cognate words and expressions shall be construed accordingly;
- (j) references to "person" or "persons" include individuals, firms, companies, government agencies, committees, departments, ministries and other incorporated and unincorporated bodies as well as to individuals with a separate legal personality; and
- (k) the words "such as", "include", "including", "for example" and "in particular" shall be construed as being by way of illustration or emphasis and shall not limit or prejudice the generality of any foregoing words.

## Planning Code

### PC1 INTRODUCTION

The Planning Code (PC) specifies the requirements for the supply of information by Users of the Transmission Network. This information is required to enable the TNSP Network Planner and the TSO, whilst planning the Transmission Network, to take due account of User requirements. The PC also specifies the technical and design criteria, and the procedures to be followed by the TSO and TNSP in the planning of the Transmission Network.

Additionally, the PC provides for the supply of certain information by Users, on a routine basis, to permit the TNSP Network Planner to prepare reinforcement schemes as part of the Transmission Master Plan.

For the purpose of the Planning Code in relation to planning of the Transmission Network:

- "Master Plan" means the optimisation of the whole of the Transmission Network across a number of years taking account of known developments including generation developments and forecast changes in Demand.
- "Planning" means the optimisation of a specific sector or part of the Transmission Network.
- "Development" means a specific project linked with a specific part of the Transmission Network as a result of a User's Planning Code application.
- "Reinforcement" means a specific project resulting from changes in existing Demand which affects that specific part of the Network, such as results from Demand growth or changes in Capacity wheeled across the Transmission Network.

In general, the TNSP Network Planner will need to take account of all developments that are going to progress to firm projects, in accordance with the PC, and will also need to have a view of how these impact on the overall planning requirements under the Transmission Master Plan.

In addition, the PC includes the requirements for the Buyer to notify the TSO and TNSP Network Planner of its proposals for generation capacity development through a "Generation Master Plan".

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

Changes to the Transmission Network, involving its development or reinforcement, will arise for a number of reasons including, but not limited to:

- (a) The 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 Transmission Network by a User.
- (c) A development on a User's Network already connected to the Transmission Network.
- (d) The introduction of a new Connection Point or the modification of an existing Connection Point between a User's Network and the Transmission Network.
- (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 Transmission Network.
- (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.

Any change to the Transmission Network must be planned with sufficient lead-time to allow any necessary consents to be obtained and the 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 TNSP Network Planner.

## **PC2 OBJECTIVES**

The objectives of the Planning Code are to:

- Enable the Transmission Network to be planned, developed, reinforced, designed and constructed economically, reliably, safely and having regard to sustainable development and the minimising of environmental impact.
- Provide for the supply of information required by Users, in order for the TNSP Network Planners to carry out the planning of the Transmission Network.
- 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 Transmission Network.

- Formalise the exchange and specify the requirements of planning data between the TNSP and the Users (which will eventually form the basis of a connection offer and Connection Agreement).
- Provide for liaison between the Buyer and the TSO and TNSP with regard to the siting, planning and the procurement of new generation capacity.
- Provide the procedures for an application for new connections or modification to an existing Connection Point or CTP.
- Provide sufficient information for a User to assess the opportunities for connection and to plan and develop its User System so as to ensure full compatibility with the Transmission Network.

### **PC3        SCOPE**

The Planning Code applies to the TSO, TNSP, the Buyer and to Users which in the PC are:

- (a) Distribution Network Service Providers;
- (b) Power Producers;
- (c) Interconnected Parties; and
- (d) Principal Consumers.

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

It is the responsibility of each User to keep the TNSP Network Planner and/or the 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 receive the inputs from all Users whose developments impact upon the Transmission Network.

The production of the "Generation Master Plan", referred to in PC5.2, is the responsibility of the Buyer. All Power Producers will submit their proposals, including any modifications that impact upon Power Station performance to the Buyer in accordance with the Planning Code. Where changes are required to a Connection Point and/or Custody Transfer Point including changes in import/export levels, then such information shall also be notified to the TNSP Network Planner.



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

## **PC4 PLANNING CRITERIA**

The Transmission Network is planned by the TNSP Network Planner in consultation with the TSO, the ERC and Users to comply with the transmission planning criteria set out in PC4.1.

Generation capacity planning is undertaken by the Buyer in consultation with the ERC, TSO, TNSP Network Planner and Power Producers and in accordance with the generation planning criteria set out in PC4.2.

The operating conditions to be expected by Users under normal operating conditions, under System Stress conditions and under System Emergency conditions are detailed in the Connection Conditions.

### **PC4.1 TRANSMISSION NETWORK PLANNING CRITERIA**

#### **PC4.1.1 Technical Standards**

The TNSP Network Planner will apply the required technical standards in the planning and development of the Transmission Network and these shall be matched by Users in the planning and development of their own User Network that connects to the Transmission Network. This is particularly important at the interface between the two Networks.

#### **PC4.1.2 Contingency Criteria**

##### **(i) Primary Criterion**

The Transmission Network is to be designed and operated, so far as practicable, in accordance with the (n-1) primary criterion. Further contingency criteria such as probability criteria are only considered for the purpose of scenario analysis.

The (n-1) criterion is considered to be fulfilled, when following the first loss of a circuit forming part of the Transmission Network, and with all other circuits being available, the following conditions have been met. Namely, that there will not be:

- (a) any violation of the normal operational limits (such as voltage or equipment loading) which would jeopardise the safety and reliability of the system operation or will cause overloading of Apparatus or Plant;

- (b) supply interruptions to any User;
- (c) the need to change or suspend long-term contracts.;
- (d) loss of Power System stability; or
- (e) the need to run generation out of merit order.

The (n-1) criterion must be applied for all credible scenarios. Following the analysis of the loss of transmission circuits the TNSP Network Planner will also analyse the impact on the Transmission Network of the loss of any single Generating Unit and take remedial action if items (a) to (d) above apply.

#### **(ii) Secondary Criteria**

Having analysed the primary criterion the TNSP Network Planner will also be required to study secondary criteria involving the loss of a second circuit or the loss of a further Generating Unit or the failure of a section of busbar, to analyse what impact such a loss has on the Transmission Network. The TNSP Network Planner, using Prudent Utility Practice, will determine what action is required in the event that a secondary criterion occurs. Such action will require the TNSP Network Planner to take a view on the probability of such an event occurring. Where the impact of the secondary criteria is high, and the probability is, in the reasonable opinion of the TNSP Network Planner significant, then this should be noted in the Transmission Master Plan in order that the TSO can deal with this issue and the contingency planning required under the Transmission Code.

### **PC4.1.3 Performance Requirements**

#### **(i) Voltage Ranges**

The Transmission Network shall be planned such that the voltage shall remain within the specified limits under normal and (n-1) conditions (first circuit/Generating Unit outage).

#### **(ii) Short Circuit Levels**

Planned maximum short circuit fault levels shall not be greater than 95% of equipment ratings. In most cases, this corresponds to saying that, for three-phase or single-phase-to-earth faults, planned maximum short circuit fault levels shall not be greater than 95% of:

- (a) 40 kA for one second at 400 kV.
- (b) 40 kA for one second at 230 kV.

- (c) 31.5 kA for three seconds at 66 kV.
- (d) 25 kA for three seconds at 20 kV.

### **(iii) System Earthing**

The 400 kV, 230 kV and 66 kV sections of the Transmission Network are solid earthed systems. The line to earth voltage during single line to earth faults should not rise above 80% of the rated line to line voltage.

## **PC4.1.4 Modelling Assumptions**

### **(i) Demand**

All studies shall be carried out using appropriate Energy and peak Demand forecasts, and these shall be recorded in the Transmission Master Plan. The Transmission Network, as modelled for the different years, shall meet the Transmission Planning Criteria given in PC4 at system annual peak Demand and at minimum generation levels.

### **(ii) Generation Capacity**

Further studies shall be carried out in conjunction with the Generation Master Plan to determine that the Transmission Planning Criteria given in PC4 are met across all of the required future periods and also to determine the optimum siting for new or refurbished Generating Units.

### **(iii) Interconnectors**

The Transmission Network shall be capable of exchanging the required scheduled power through the Interconnectors. Where low frequency oscillation (between the different Power Systems) is deemed a credible risk the TSNP Network Planner will require the Buyer to ensure that Generating Units be fitted with power system stabilisers (PSS).

## **PC4.2 GENERATION CAPACITY PLANNING CRITERIA**

The Buyer, TNSP Network Planner and the Interconnected Party will apply the relevant technical, international and Transmission Code standards to the planning and development of the generation capacity and these shall be taken into account by Power Producers in the planning and development of their own Power Stations.

The Buyer shall be responsible for determining the generation capacity planning criterion to be used for the "Primary Criterion". This should be based on a model utilising a loss of load probability value determined by the Buyer and approved by the ERC. Typically, such a value will

be in days per year. 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 Power System or the loss of the largest Interconnector. Whichever criterion then indicates the largest need, in terms of the required new generation capacity, shall be the one used for that period.

In planning for new generation capacity, in any given time period, the Buyer will determine the maximum size of Generating Units that can be used on the Transmission Network in that time period, which thereby avoids mainly the need for excessive Spinning Reserve to cover the loss of that Generating Unit.

## **PC5 ANNUAL PLANNING REQUIREMENTS**

### **PC5.1 TRANSMISSION MASTER PLAN**

#### **PC5.1.1 TNSP to Prepare**

The TNSP Network Planner is required by the Planning Code to produce by 1 July each year a first draft of the "Transmission Master Plan" to inform Users of opportunities for connecting to and/or use of the Transmission Network. The final Transmission Master Plan issued in conjunction with the Generation Master Plan by 30 September each year will also take into account changes to existing or new Power Stations as approved by the Buyer. Such changes could be for reasons of extension, repowering or construction of a Power Station.

The Transmission Master Plan shall cover each of the ten succeeding calendar years and it will show the opportunities available for connecting to and use of the Transmission Network indicating those parts most suited to new connections and the transport of additional quantities of electricity. The TNSP Network Planner will also consult the ERC and TSO when preparing the Transmission Master Plan.

#### **(i) Routine Requirements**

To enable the Transmission Master Plan to be prepared each User is required to submit to its TNSP Network Planner "Standard Planning Data" and "Detailed Planning Data" as listed in Parts 1 and 2 of Appendix A to the PC. 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 TNSP Network Planner by 30 April of the current year, termed "Year 0", of each calendar year and it should cover each of the ten 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 there has been no change in the data (or in some of the data) from the previous time.

In the case of the DNSP, their respective network planners will prepare plans, utilising the data provided by Users connected to its Distribution Network, showing how they propose to develop this Distribution Network in accordance with PC5.

The TNSP Network Planner will notify each DNSP of any material modifications to the Transmission Network that affect that DNSP. This will be in order that agreement is reached with the DNSP over proposed changes that affect Connection Points or Custody Transfer Points.

## **(ii) Non-routine requirements**

Planning data submissions must be provided by a User or any proposed User when applying for new or modified arrangements for connection to or use of the Transmission Network. This section deals with the data required, pursuant to the Planning Code and data provided by a User at the time it notifies the TNSP 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 TNSP Network Planner. The notification must also include the date and time at which the change is expected to become effective. Information must refer to the remainder of the current year as well as to the ten succeeding years.

## **PC5.2 GENERATION MASTER PLAN**

### **PC5.2.1 Buyer to Prepare**

The Buyer in consultation with the ERC, TSO and TNSP Network Planner will prepare and publish in accordance with the requirements of this Planning Code, a "Generation Master Plan"<sup>1</sup>, being primarily a generation capacity plan, by 30 September annually showing in respect of the ten succeeding calendar years:

- (a) The projection of the seasonal maximum and minimum Demand for electricity in the Country and the corresponding Energy requirements for each year across the study period.

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<sup>1</sup> This should be a generation capacity plan. The transmission master plan will include new generation that has approval to proceed.

- (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 by Interconnected Parties with their power systems external to the Country.
- (d) The amount and nature of generation capacity it expects will be required to ensure that generation planning criteria are achieved.
- (e) General details of its current plans for securing that additional generation capacity.

#### **PC5.2.2 Users to Provide Details to the TNSP 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 by 30 April annually in connection with the Transmission Master Plan.

The TNSP Network Planner will then incorporate the proposed Network connections for these Power Stations in the Transmission Master Plan which will be passed to the Buyer to assist the Buyer, under PC5.2. Additional data will be supplied by the TNSP Network Planner on the request of the Buyer.

### **PC6 PLANNING DATA**

#### **PC6.1 DATA TO BE PROVIDED**

The PC requires two types of data to be provided:

- (a) Standard Planning Data.
- (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 to the PC.

#### **PC6.2 STATUS OF PLANNING DATA**

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 Preliminary Project Data, Committed Project Data and Contracted Project Data.

**(i) Preliminary Project Data**

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

Preliminary Project Data will normally contain only Standard Planning Data, unless Detailed Planning Data is specifically requested by the TNSP Network Planner and/or Buyer to permit more detailed Transmission Network studies to be carried out. Preliminary Project Data will most usually be associated with development studies.

**(ii) Committed Project Data**

When the offer for a Connection Agreement 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 under this PC, will become Committed Project Data once it has been approved by the TNSP as the case may be.

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

- (a) In the preparation of a Transmission Master Plan or a Generation Master Plan and if any further information is required to be provided with these master plans.
- (b) When considering and/or advising on applications (or possible applications). In such cases, the TNSP Network Planner may disclose Committed Project Data both orally and in writing to other Users making an application (or considering a possible application).
- (c) To the TSO for operational planning purposes.

- (d) By the Buyer to an Interconnected Party where it is necessary for that Interconnected Party to carry out work on its Network in connection with the User's application.
- (e) Under the terms of an Interconnection Agreement or Custody Transfer Agreement between the Buyer and a party external to the Country, to provide information on the power systems that are interconnected.

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

**(iii) Contracted Project Data**

The Connection Conditions require that, before an agreed connection to the Transmission Network may be physically established, any estimated value contained within the Committed 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 relating to the Transmission Network will form the background against which new connection applications from Users will be considered and against which planning of the Transmission Network shall be undertaken. Accordingly, Contracted Project Data will be treated as confidential except to the extent that the TNSP Network Planner or Buyer is obliged to disclose it under the following circumstances:

- (a) In the preparation of a Transmission Master Plan or a Generation Master Plan and if any further information is required to be provided with the master plans.
- (b) When considering and/or advising on applications (or possible applications). In such cases, the TNSP Network Planner may disclose Contracted Project Data both orally and in writing to other Users making an application (or considering a possible application).
- (c) To the TSO for operational planning purposes.
- (d) By the Buyer to an Interconnected Party where it is necessary for that Interconnected Party to carry out work on its Network in connection with the User's application.



- (e) Under the terms of an Interconnector Agreement or Custody Transfer Agreement between the Buyer and a party external to the Country, 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 PROCEDURES FOR CONNECTION TO AND USE OF THE TRANSMISSION NETWORK**

#### **PC6.3.1 Application Procedure for New Connection and Use of the Transmission Network**

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

- (a) a description of the User Network to be connected to the Transmission Network or of the modifications to User Network already connected to the Transmission Network. Both cases are termed "Development" in this Planning Code;
- (b) the relevant Standard Planning Data as listed in Part 1 of Appendix A; and
- (c) the desired completion date of the proposed Development.

#### **PC6.3.2 Consideration by the TNSP Network Planner**

In assessing the technical requirements of a User's connection, the **TNSP Network Planner** shall not unfairly discriminate between **Users** of a similar category, location or size. It should be noted that it will not be technically or economically practicable to achieve uniformity of method of connection at all times.

The **Transmission Network** voltage level at which a **User Network** owned or proposed by a **Power Producer** or Principal Consumer will be connected at and the busbar configuration which that **User Network** utilises will depend upon but shall not be limited to the following:

- (a) The size and number of the Generating Units comprised in the User Network.
- (b) The size of the MW Demand at the Connection Point.
- (c) Consistency with future development of the Transmission Network.

- (d) Proximity to the existing Transmission Network.
- (e) The cost of the proposed connection.

The Transmission Network voltage level at which a User Network owned or proposed by a DNSP will be connected at and the busbar configuration which that User Network utilizes will depend upon but shall not be limited to the following:

- (a) The size of the MW Demand at the Connection Point.
- (b) Consistency with future development of the Transmission Network.
- (c) Consistency with coordinated planning of the Transmission Network and the Distribution Network.
- (d) Proximity to the existing Transmission Network.
- (e) The cost of the proposed connection.

#### **PC6.3.3 Offer of Terms for Connection**

The TNSP Network Planner will, in accordance with the Transmission Code and having obtained the consent of the 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 Transmission Network. Such an offer will be made within 3 months of receiving a valid application complete with all the required data.

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

The offer must be accepted by the applicant User within the period stated in the offer, after which the offer automatically lapses. Acceptance of the offer renders the TNSP Network Planner's works related to that User Development committed and binds both parties to the terms of the offer.

Within 28 days (or such longer period as the TNSP 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.

Any significant changes to this information, compared with the preliminary data agreed by the TNSP Network Planner will need to be agreed by the appropriate TNSP Network Planner. However, it is not envisaged that this will be required if the results are within +/- 2.5% of the

figures approved by the TNSP Network Planner from the Preliminary Project Data. The TNSP Network Planner will be responsible under these circumstances for accepting the Users results and will notify the Buyer of any changes in the Users data where appropriate.

#### **PC6.4 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 TNSP Network Planner to carry out additional more extensive system studies.

In such circumstances, the TNSP Network Planner shall, within the original 3-month time scale as detailed in PC6.3.3, provide a preliminary offer indicating those areas that require more detailed analysis.

After receiving the preliminary offer, the User shall indicate whether it wishes the TNSP Network Planner to undertake the work necessary to proceed to make a revised and final offer within a 3-month time scale or such other time scale that both parties agree. Where the User and the TNSP Network Planner cannot agree on the time scale to produce the final offer, the matter will be referred to the ERC and the time scale consented by the ERC will be used.

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

#### **PC6.5 RIGHT TO REJECT AN APPLICATION**

The TNSP Network Planner shall be entitled to reject an application for connection and/or use of the Transmission Network:

- (a) if to do so would be likely to involve the TNSP Network Planner or the Buyer in breach of its duties under the Transmission Code or Electricity Law or of any regulations relating to safety or standards applicable to the Transmission Network; or
- (b) if the person making the application does not undertake to be bound, in so far as applicable, by the terms of the Transmission Code.

Any rejected applicants may appeal to the ERC for a final decision.

**PC6.6 CONNECTION AGREEMENT 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 Transmission Code;
- (b) details of any connection and/or Use of System charges;
- (c) details of any capital related payments arising from the necessary reinforcement or extension of the Transmission Network;
- (d) a "Site Responsibility Schedule" and Operational Diagram, 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 days of the acceptance of the offer (or such longer period as may be agreed in a particular case).

## **Planning Code - Appendix A**

### **Planning Data Requirements**

#### **Part 1**

##### **PC A1 STANDARD PLANNING DATA**

##### **PC A1.1 CONNECTION SITE AND USER SYSTEM DATA**

###### **PC A1.1.1 General**

All Users shall provide the TNSP Network Planner with details specified in sub-sections (i) and (ii) below relating to their User Network.

###### **(i) User Network Layout**

Users shall supply single line diagrams showing the existing and proposed arrangements of the main connections and primary systems showing equipment ratings and where available numbering and nomenclature.

###### **(ii) Short Circuit Infeed**

Users shall supply the following information:

- (a) maximum 3-phase short circuit current injected into the Transmission Network; and
- (b) minimum zero sequence impedance of the User Network at the point of connection with the Transmission Network.

##### **PC A1.2 DEMAND DATA**

###### **PC A1.2.1 General**

All Users with Demand in excess of 10 MW at the Connection Point shall provide the TNSP Network Planner with Demand, both present and forecast, as specified in this PC A1.2 provided that all forecast maximum Demand levels submitted to the TNSP Network Planner by Users shall be on the basis of corrected Average Hot and Average Cold Spell (AHS/ACS) Conditions.

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

**PC A1.2.2 Demand (Active and Reactive) Data Requirements**

Users shall provide the 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 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 Transmission Network.

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

**PC A1.2.3 Fluctuating Demand in excess of 10 MVA**

The following details are required by the TNSP Network Planner from the Users which are connected or intending to connect to the **Transmission Network**, concerning any fluctuating Demand in excess of 10 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 Active and Reactive Energy demanded per hour by the fluctuating load cycle; and
- (f) steady state residual Demand (Active Power) occurring between Demand fluctuations.

**PC A1.2.4 User's Abnormal Demand**

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

### **PC A1.2.5 Demand Side Management**

Any details of **Demand** management schemes utilised by the **User** including automatic under frequency load shedding schemes shall be provided to the **TNSP Network Planner** for every **Demand** block, together with its associated low frequency setting.

## **PC A1.3 GENERATING UNIT AND POWER STATION DATA**

### **PC A1.3.1 General**

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

### **PC A1.3.2 Power Station Data Requirements**

The data required relate to each point of connection to the Transmission Network, and shall include:

- (a) The Capacity of the Power Station in MW sent out for Peak Capacity, Economic Capacity and Minimum Generation.
- (b) Maximum auxiliary Demand (Active and Reactive Power) made by the Power Station at start up and normal operation.
- (c) The operating regime of Generating Units not subjected 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 TNSP Network Planner at the relevant Connection Points, except where such Generating Unit is subject to Central Dispatch.

In the case where Generating Units are not subject to Central Dispatch, the User must inform the TNSP 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 TNSP 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/ energy converter type;
- (b) Generating Unit type;
- (c) Generating Unit rating and nominal voltage (kVA @ power factor & V);
- (d) Generating Unit rated power factor;
- (e) Economic Capacity sent out (kW);
- (f) Maximum Continuous Rating generation (MCR) and Minimum Generation capability sent out (kW);
- (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 kW and kVar;
- (i) inertia constant (kW sec/kVA);
- (j) stator resistance;
- (k) short circuit ratio;
- (l) direct-axis transient reactance and time constant;
- (m) direct-axis sub-transient reactance and time constant;
- (n) generator transformer rated kVA, positive sequence reactance and tap change rate;
- (o) Generating Unit capability chart;
- (p) exciter and stabiliser;
- (q) Black Start capability;
- (r) de-clutchable capability;



- (s) multi-shifting capability;
- (t) AGC capability; and
- (u) supervisory control.

## Part 2

### PC A2 DETAILED PLANNING DATA

#### PC A2.1 CONNECTION SITE AND USER SYSTEM DATA

##### PC A2.1.1 General

When Detailed Planning Data are required under the PC, all Users shall provide the **TNSP Network Planner** with the details as specified in PC A2.1 unless the **TNSP Network Planner** advises in writing that this information or specified parts of this information are not required.

##### PC A2.1.2 Connection Point Network Lay-out

The **User** shall provide single line diagrams of existing and proposed arrangements of connections to the **Transmission Network** and primary circuits at the **Connection Point** of the **User Networks** including:

- (a) busbar layouts;
- (b) electrical circuitry (i.e. lines, cables, transformers, switchgear 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 Distribution Network or User's Network connected at 20 kV 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 (e.g. fixed or variable);
- (b) capacitive and/or inductive rating or its operating range in kvar;
- (c) details of automatic control logic, to enable operating characteristics to be determined by the TNSP Network Planner; and
- (d) the point of connection to the User 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 Transmission Network from its User Network at the Connection Point as follows:

- (a) the maximum 3-phase short-circuit infeed including infeeds from any Generating Unit connected to the User Network;
- (b) the additional maximum 3-phase short circuit infeed from any induction motors connected to the User Network; and
- (c) the minimum zero sequence impedance of the User System.

#### **PC A2.1.5 Lumped System Susceptance**

Details of equivalent lumped network susceptance of the User System at nominal frequency at the Connection Point. This should include 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 System; or
- (b) any susceptance of the User System inherent in the Active and Reactive Power Demand data given under PC A2.2.

#### **PC A2.1.6 Demand Transfer Capability**

Where the same Demand may be supplied from alternative Transmission Network points of supply, the proportion of Demand normally fed from each Transmission Network point and the arrangements (manual and automatic) for transfer under planned or fault outage conditions shall be provided.

**PC A2.1.7 System Data**

Each User with an existing or proposed Connection Point connected at 66 kV or above shall provide the following details relating to that Network:

**(i) Circuit parameters for all circuits:**

- (a) rated voltage (kV);
- (b) operating voltage (kV);
- (c) positive phase sequence reactance;
- (d) positive phase sequence resistance;
- (e) positive phase sequence susceptance;
- (f) zero phase sequence reactance;
- (g) zero phase sequence resistance; and
- (h) zero phase sequence susceptance.

**(ii) Inter-bus Transformers**

(between the User System at the Connection Point and the User's main Network)

- (a) rated kVA;
- (b) voltage ratio;
- (c) winding arrangements;
- (d) positive sequence reactance (max, min and nominal tap);
- (e) positive sequence resistance (max, min and nominal tap);
- (f) zero sequence reactance;
- (g) tap changer range;
- (h) tap change step size;
- (i) tap changer type: on Load or off circuit;
- (j) earthing arrangements; and
- (k) supervisory control.

**(iii) Switchgear**

(including circuit breakers, and disconnectors on all circuits connected to the Connection Point including those at Power Stations)

- (a) rated voltage (kV);
- (b) operating voltage (kV);
- (c) rated short-circuit breaking current, 3-phase (kA);
- (d) rated short-circuit breaking current, 1-phase (kA);
- (e) rated load-breaking current, 3-phase (kA);
- (f) rated load-breaking current, 1-phase (kA);
- (g) rated short-circuit making current, 3-phase (kA);
- (h) rated short-circuit making current, 1-phase (kA); and
- (i) supervisory control.

#### **PC A2.1.8 Protection Data**

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

- (a) a full description, including estimated settings based on clearance times given in CC5, for all relays and protection systems installed or to be installed on the User System;
- (b) a full description of any auto-reclosing facilities installed or to be installed on the User System, 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 System.

#### **PC A2.1.9 Earthing Arrangements**

Full details of the earthing on the User System, including impedance values of any neutral earthing resistors, reactors or capacitors.

**PC A2.1.10 Transient Overvoltage Assessment Data**

When undertaking insulation co-ordination studies, the TNSP Network Planner will need to conduct overvoltage assessments. When requested by the TNSP 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 TNSP 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 TNSP Network Planner with the Demand both present and forecast specified in this PC A2.2.

All forecast maximum Demand levels submitted to the TNSP Network Planner by Users shall be on the basis of average climatic conditions and in order for the TNSP Network Planner to be able to estimate the diversified total Demand at various times throughout the year, each User shall provide such additional forecast Demand data as the TNSP Network Planner may reasonable request.

**PC A2.2.2 User System Demand (Active and Reactive Power)**

The User shall provide forecast daily Demand profiles of up to ten years ahead net of the output profile of all Generating Units directly connected to the User System (but not subject to Dispatch by the TSO), hourly throughout the day as follows;

- (a) forecast peak Demand day on the User System (total Demand + distribution losses - generating output);
- (b) forecast peak Demand at day of summer maximum Power System Demand as indicated by the TSO;
- (c) forecast peak Demand at day of winter maximum Power System Demand as indicated by the TSO; and
- (d) forecast minimum Demand at day of minimum Power System Demand as indicated by the TSO.

### **PC A2.2.3 User Demand Control Data**

The potential reduction in Demand available from the User in kW and kvar, 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 that have a site rating Capacity of 10 MW and above shall provide the TNSP 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 MW; and the Power Station auxiliary Demand, if any, additional to the Generating Unit Demand, where the Power Station auxiliary Demand is supplied from the Transmission Network, 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 (MW);
- (e) short circuit ratio;
- (f) minimum direct-axis reactances (synchronous, transient and sub-transient);
- (g) minimum quadrature-axis reactances (synchronous, transient and sub-transient);
- (h) direct-axis open circuit and short circuit time constants (transient and sub-transient);
- (i) quadrature-axis open circuit and short circuit time constants (transient and sub-transient);
- (j) stator time constant;
- (k) stator resistance;
- (l) stator leakage reactance;

- (m) inertia constant (MWsec/MVA);
- (n) rated field current; and
- (o) 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 A2.3.4 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 Transmission Network through a transformer:

- (a) rated MVA;
- (b) voltage ratio;
- (c) positive sequence reactance (at max, min and nominal tap);
- (d) positive sequence resistance (at max, min and nominal tap);
- (e) zero phase sequence reactance;
- (f) tap changer range;
- (g) tap changer step size;
- (h) tap changer type: on load or off circuit; and
- (i) earthing arrangement.

#### **PC A2.3.5 Power Station Transformer Parameters**

The following parameters are required for the Power Station interbus transformer where a User's interbus transformer is used to connect the Power Station to the Transmission Network:

- (a) Rated MVA;
- (b) voltage ratio; and
- (c) zero sequence reactance as seen from the higher voltage side.

#### **PC A2.3.6 Excitation Control System Parameters**

The following parameters are required:

- (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;
- (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 the transfer functions of individual elements.

#### **PC A2.3.8 Governor Parameters - Non-reheat Steam and Gas Turbine units**

The following parameters are required for non-Reheat Steam Generating Units and Gas Turbine Generating Units including Generating Units within CCGT blocks:

- (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 units**

The following parameters are required for 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 Flexibility 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 Deloading from normal rated MW;
- (e) Regulating range; and
- (f) Load rejection capability while still Synchronised and able to supply Load.

## **PC A3 ADDITIONAL DATA**

### **PC A3.1 GENERAL**

Notwithstanding the Standard Planning Data and Detailed Planning Data set out in this Appendix, the TNSP Network Planner may require additional data from Users. This will be to represent correctly the performance of Plant and Apparatus on the Transmission Network where the present data submissions would, in the TNSP Network Planner's reasonable

opinion, prove insufficient for the purpose of producing meaningful system studies for the relevant parties.

As the TSO is responsible for the overall coordination of the Transmission Network, then any data required by it will be requested through the TNSP Network Planner. In addition, if the Buyer requires additional data then it will request such data through the TSO who will request data from the TNSP Network Planner if required to enable the TSO to provide such additional data to the 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 Transmission Network. They also set out the procedures by which the Transmission Network Service Provider (TNSP) will seek to ensure compliance with these criteria as a requirement for the granting of approval for the connection of a User to the Transmission Network.

The procedures by which the TNSP and Users may commence discussions on a Connection Agreement are reflected in the Planning Code section of this Transmission Code. Each Connection Agreement shall require Users to comply with the terms of the Transmission Code and the TNSP will not grant approval to connect the User Network to the Transmission Network 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 Network:

- (a) existing at the date when this Transmission Code comes into effect;
- (b) existing at the date of commencement of the TNSP'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 Transmission Network or the total System or on any User Network nor will it be subject itself to unacceptable effects by its connection to the Transmission Network.
- (b) The basic rules for connection treat all Users, within an equivalent category, in a non-discriminatory fashion.

### CC3 SCOPE

The Connection Conditions apply to the TSO, TNSP and to Users of the Transmission Network which in this CC are:

- (a) Power Producers;

- (b) Distribution Network Service Providers (DNSPs);
- (c) Interconnected Parties;
- (d) Principal 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 the application procedures for a Connection Agreement, become bound by this CC prior to their providing Ancillary Services and/or producing or consuming Energy.

## **CC4 TRANSMISSION SYSTEM PERFORMANCE CHARACTERISTIC**

### **CC4.1 FREQUENCY**

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

Under Normal Operation, frequency varies within a narrow band. However, under System Stress or System fault conditions the frequency can deviate outside the planned operating range for brief periods. Such conditions are summarised in Table CC4.1-1.

**Table CC4.1-1: Frequency Variations**

Under Normal Operation and interconnected with other systems	49.95 Hz to 50.05 Hz
Under Normal Operation but not interconnected with other systems	49.90 Hz to 50.10 Hz
Under System Stress	48.75 Hz to 51.25 Hz
Under extreme System fault conditions all Generating Units should have disconnected by these (high or low) frequencies unless agreed otherwise in writing with the TSO.	By a frequency greater than or equal to 51.5 Hz. By a frequency less than or equal to 47.5 Hz.

### **CC4.2 VOLTAGE**

#### **CC4.2.1 Steady State Voltage**

The Transmission Network under Normal Operation is designed to operate within specific ranges. However, under System Stress or System fault conditions the voltage range can go outside the specified ranges. These ranges are given in Table CC4.2-1.

The Transmission Network steady state voltages are nominally 400 kV, 230 kV and 66 kV.

**Table CC4.2-1: Voltage Variations**

Under Normal Operation	<p>For the 400 kV system: 380 kV (-5%) to 420 kV (+5%)</p> <p>For the 230 kV system: 207 kV (-10%) to 241.5 kV (+5%)</p> <p>For the 66 kV system: 59.5 kV (-10%) to 72.5 kV (+10%)</p>
Under System Stress or following System fault	Voltages can be expected to deviate outside the above limits by a further $\pm 5\%$ (excluding transient and sub-transient disturbances)

### CC4.2.2 Transient Voltage

Due to the effect of travelling waves on the Transmission Network as a result of 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  $\pm 20\%$  of nominal voltage. Connection Points close to a Network lightning strike will experience voltages higher than this.

Unless otherwise agreed by the TNSP, the basic insulation value (BIL) for User Apparatus shall be as follows:

- (a) For the 400 kV system, the BIL is 1425 kV.
- (b) For the 230 kV system, the BIL is 1050 kV.
- (c) For the 66 kV system, the BIL is 325 kV.

### CC4.2.3 Voltage Flicker

"Voltage Flicker" is a rapid change in voltage that is typically caused by User equipment that distorts or interferes with the normal sinusoidal voltage waveform of the Transmission Network. 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 (sudden fall) and the

corresponding voltage swell (sudden rise) when the Apparatus concerned is offloaded. Hence, the cause of the "Voltage Flicker".

Users are required to minimise the occurrence of Voltage Flicker on the Transmission Network as measured at the User's Connection Point. The Voltage Flicker limits are contained in the following documents:

- (a) IEC/TR3 61000-3-7 (1996) "Assessment of emission limits for fluctuating loads in MV and HV power systems".
- (b) IEC 868 / Engineering Recommendation P28 (pg 17) "Limits on voltage flicker short term and long term severity values".

In general, the total Voltage Flicker at a Point of Common Coupling shall not exceed:

- (a)  $\pm 1$  % of the steady state voltage level, when these occur repetitively; or
- (b)  $\pm 3\%$  of the steady state voltage level, when these occur infrequently.

In cases where, in the reasonable opinion of the TSO, variations in Demand or generating constitute a risk to Power System operation, strict conformity with the

IEC flicker curve will be required.

### **CC4.3 HARMONICS**

Harmonics are normally produced by User's Apparatus generating waveforms that distort the fundamental 50 Hz wave. Such harmonic generation can damage User Apparatus and can result in failure of Transmission Network Apparatus. The limits for harmonic distortion levels are given in the following documents:

- (a) BS EN 50160:2000 "Voltage characteristics of electricity supplied by public distribution systems".
- (b) UK Engineering Recommendation G5/4, February 2001 "Planning levels for harmonic voltage distortion and the connection of non-linear equipment to transmission systems and distribution networks".
- (c) IEC/TR3 61000-3-6 (1996) "Assessment of emission limits for distorting loads in MV and HV power systems".

In general, the maximum total levels of harmonic distortion on the System under Normal Operation conditions, planned outages and fault outage conditions (unless during System Stress) shall not exceed the values shown in the Table CC4.3-1.

**Table CC4.3-1: Harmonic Voltage Distortions**

<b>Voltage Level</b>	<b>Acceptable Harmonic Distortion Levels</b>
400 kV	a Total Harmonic Distortion of 1.5% with no individual harmonic greater than 1%
230 kV	a Total Harmonic Distortion of 2% with no individual harmonic greater than 1.5%
66 kV	a Total Harmonic Distortion of 3% with no individual harmonic greater of 2%.

**CC4.4 PHASE UNBALANCE**

Under Normal Operation, the maximum negative phase sequence component of the phase voltage of the Power System should remain below 1%.

**CC5 TECHNICAL CRITERIA FOR PLANT AND APPARATUS AT THE CONNECTION POINT****CC5.1 GENERAL**

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 TNSP Network Planner on request by the User through the Planning Code. Such information will include, but not be limited to, the following:

- (a) Load flow studies.
- (b) Short circuit studies.
- (c) Power 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.
- (f) Telecommunications network associated with the proposed Connection Point or Custody Transfer Point (CTP).

This section CC5.1 of the Connection Conditions contains general technical criteria that are applicable to all Users. More detailed technical criteria relating to a specific User is contained in subsequent sections within CC5.

**CC5.1.1 Technical Standards for Plant and Apparatus**

All Plant and Apparatus connected to or proposed for connection to the Transmission Network is required to meet certain minimum technical standards as detailed below, in the following order of preference:

- (a) Relevant current international and pan-Europe technical standards, such as IEC, ISO, EN.
- (b) Relevant current national standards such as ASMO (Syrian Standards), BSS, ASA, DIN.

Furthermore, Plant and Apparatus shall be designed, manufactured and tested in accordance with the quality assurance requirements of ISO 9001 or equivalent.

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 TNSP.

**CC5.1.2 Technical Criteria for Communications Equipment****(i) General**

Where for operational reasons the TSO determines that some means of routine and emergency communication between the TSO and the User is required, then the same shall be provided and maintained by the User.

The means of communications shall include but not be limited to the following:

- (a) Dedicated telephone line.
- (b) Dedicated fax line.
- (c) Email and/or internet.
- (d) On-line or dial up remote terminal units (RTU) for equipment such as AGC shall be specified by the TSO, typically, the protocols used shall comply with the following standards: IEC 60870-5 "Transmission Protocols" publications or other International Standards to be advised by the TSO and/or TNSP.

**(ii) Control Telephony**

"Control Telephony" is the method by which a User's Responsible Engineer or Operator and the TSO's Control Engineers speak to one another for the purpose of control of the Power System in both normal and emergency operating conditions. Control Telephony provides secure point to point telephony for routine control calls, priority control calls and emergency control calls.



The TSO shall install Control Telephony at the User location on User's charge where the User telephony equipment is not capable of providing the required facilities or is otherwise incompatible with the TSO's Control Telephony. Furthermore, voice logger recorders may be installed at the User's control room or at the NCC, at the TSO's discretion. The relevant details relating to the Control Telephony requirements are contained in the Connection Agreement.

**(iii) Facsimile Machines**

Each User and the TSO shall provide a facsimile machine or other electronic data exchange machines, as agreed between the parties in writing:

- (a) In the case of Power Producers, at each Power Station.
- (b) In the case of the DNSPs, at the respective Control Centres.
- (c) In case of Interconnected Parties, at the respective Control Centres.

Prior to the User connecting to the Transmission Network, there shall be an exchange of voice phone and fax/data exchange phone line numbers between the relevant User and the TSO. Each party shall inform the other party of any changes to the contact details at least a month in advance of such changes, otherwise and in case of failures concerned parties to be informed.

**(iv) Operational Monitoring and Control Equipment**

Where required, the TNSP shall provide "Supervisory Control And Data Acquisition" (SCADA) outstation RTU interface equipment. The User shall provide the relevant voltage, current, frequency, Active Power and Reactive Power measurement outputs and plant status indications and alarms to the CTP SCADA outstation interface equipment. In case the CTP is outside substation; the user shall provide these data to TNSP's SCADA outstation interface equipment as required by the TNSP and/or the TSO in accordance with the terms of the Connection Agreement.

Active Power and Reactive Power measurements and control from Generating Units and circuit breaker plus disconnector status indications, with alarms and analogues for that unit, must each be provided to the TSO on an individual unit basis in order that they can be associated with that Generating Unit.

The manner in which information is required to be presented to the SCADA interface equipment shall be set out in the Connection Agreement.

**(v) System Monitoring**

Monitoring equipment is provided on the Transmission System to enable the TSO to monitor the System dynamic performance. For example, to enable the TSO to monitor the individual

Generating Units, the TSO requires voltage and current signals from the secondary windings of Generating Unit circuit current transformers and voltage transformers. These signals shall be provided by the User to the SCADA interface equipment with the installation of the monitoring equipment being dealt with in the respective Connection Agreement.

### **CC5.1.3 Protection Criteria**

#### **(i) General**

In order that the TSO and the TNSP can coordinate the operation of the Transmission Network protection, it will be necessary for prospective Users to submit their protection scheme proposals to the TNSP Network Planner.

Users should request existing System protection details from the TNSP Network Planner, concerning the proposed Connection Point or CTP. The scheme proposed by the User should take into account any planned upgrades to the Transmission Network protection as notified by the TNSP Network Planner. Such schemes should also take into account any Interconnectors with neighbouring countries and other utilities when applicable, about which the TNSP will advise.

#### **(ii) Fault Clearance Times**

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 TNSP Network Planner on request.

Typical fault clearance times for main protection scheme(s) are as follow:

- (a) 80 ms for faults cleared by busbar protection at 400 kV, 230 kV and 66 kV.
- (b) 80 ms for faults cleared by distance protection on 400 kV, 230 kV and 66 kV overhead lines.

Total fault clearance time shall be from fault inception until the time to arc extinction, which therefore includes relay operation, circuit breaker operation and telecommunications signalling times.

Users will be expected to coordinate their protection times according to the clearance times given in CC5. Prospective Users whose proposed protection scheme cannot achieve these times, or whose Power Station cannot continue operations, whilst line faults on the Transmission System are cleared, may be required to resubmit their proposals for final approval by the TNSP Network Planner.

**(iii) Protection of Apparatus at the Connection Point**

The requirements for inter-tripping of protection Apparatus at the Connection Point shall be coordinated between the User and TSO and/or TNSP. This shall be specified in the respective Connection Agreement.

**CC5.2 TECHNICAL REQUIREMENTS FOR POWER PRODUCERS****CC5.2.1 Generating Unit Requirements**

This section sets out the technical and design criteria and performance requirements for parallel operation of Generating Units that are not energy constrained (due to shortages of primary fuel/energy).

**(i) General Requirements**

The general technical requirements for Generating Units are as follows:

- (a) Each connection between a Generating Unit and the Transmission Network must be controlled by a circuit breaker capable of interrupting the maximum short circuit current at the point of connection as determined by the TSO and/or the TNSP.
- (b) The TSO and/or the TNSP shall provide each Power Producer at each Connection Point where its Power Station is connected with the appropriate voltage signals to enable the Power Producer to obtain the necessary information to synchronise its Generating Units to the Power System.

**(ii) Performance Requirements**

The performance requirements for Generating Units are as follows:

- (a) Each Generating Unit must be capable of supplying rated power output (MW) at any point between the limits 0.80 power factor lagging and 0.95 power factor leading at the Generating Unit terminals.
- (b) Each Generating Unit must be capable of continuously supplying its registered output within the Power System frequency range given in CC4.1.
- (c) The output voltage limits of Generating Units must not cause excessive voltage variations in excess of  $\pm 10\%$  of their nominal values. Any necessary voltage regulating equipment should be installed by the User to maintain the output voltage level of its Generating Units.
- (d) The Active Power output under steady state conditions of any Generating Unit connected to the Transmission Network should not be affected by voltage changes

in the normal operating range. The Reactive Power output of a Generating Unit having a synchronous alternator must under steady state conditions, be fully available within the voltage range  $\pm 10\%$  of nominal voltage at the Connection Point.

- (e) A Generating Unit having a synchronous alternator must be capable of start-up when the block load on synchronising is no greater than 40MW:
  - From cold, within 12 hours.
  - From warm, within 6 hours.
  - From hot within 3 hours.
- (f) A steam-turbine or gas-turbine Generating Unit which has been synchronised must be capable of ramping up pursuant to a Dispatch instruction at a rate of at least 3% of MCR per minute.
- (g) A steam-turbine or gas-turbine Generating Unit must be capable of de-loading at a rate of at least 3% of MCR per minute.

### **(iii) Black Start Capability**

It is an essential requirement that the Transmission System must incorporate sufficient Black Start capability. This shall be achieved by allocating Black Start Power Stations at a number of strategic locations across the Country.

For each Power Station, TSO shall review, determine and inform the Buyer whether or not Black Start capability is required.

Wind generators are not entitled for Black Start.

### **(iv) Control Arrangements**

Generating Units that have contracted to the TSO to provide Ancillary Services must be capable of contributing such services as follows:

- (a) Spinning Reserve by supplying Active Power according to its operational capabilities as set out in the Connection Agreement. Spinning Reserve requirements shall be determined by the TSO on a regular basis.
- (b) The capability of contributing to frequency control or transfer control (AGC and LFC) shall be as set out in the Connection Agreement. The required participation shall be determined by the TSO on a regular basis.
- (c) Each Generating Unit must be capable of supporting voltage regulation at the Connection Point as detailed in its Connection Agreement.

Wind generators, due the type of primary energy used, will not contribute in the reserve supplying and frequency control.

Wind generators will participate into the Voltage Control, as described in point CC5.2.3 (ii)

#### **(v) Turbine Control System**

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

Each steam turbine and gas turbine Generating Unit must be fitted with a fast acting "Turbine Controller". The turbine speed control principle shall be that the Generating Unit output shall vary with rotational speed according to a proportional droop characteristic ("Primary Control"). Superimposed Load control loops shall have no negative impact on the steady state and transient performance of the turbines rotational speed control.

The Turbine Controller shall be sufficiently damped for both isolated and interconnected operation modes. Under all operation conditions, the damping coefficient of the Turbine Speed Control shall be above 0.25 for speed droop settings above 3% for gas turbines and 5% for steam turbines.

Under all system operation conditions, the Generating Unit speed shall not exceed 103% corresponding to 51.5 Hz.

For generator oscillations with frequencies below 2 Hz, the Turbine Controller shall have no negative effect on generator oscillation damping.

The Turbine Speed Controller and any other superimposed control loop (Load control, gas turbine temperature limiting control, etc.) shall contribute to the Primary Control to maintain the unit within the Generating Unit Capability Limits.

The Primary Control characteristics shall be maintained under all operational conditions. Additionally, in the event that a Generating Unit becomes isolated from the System but is still supplying Demand the Generating Unit must be able to provide Primary Control to maintain Frequency and voltage.

All steam turbine Generating Units must be fitted with a turbine controller, which is designed and operated to the requirements of IEC 60045.

All gas turbine Generating Units must be fitted with a turbine speed controller capable of power related speed droop characteristic of between 4% and 6%.

**(vi) Automatic Voltage Regulator**

A continuous 'Automatic Voltage Regulator' (AVR) acting on the excitation system is required to provide constant terminal voltage of the Generating Unit without instability over the entire operating range of the Generating Unit. Control performance of the voltage control loop shall be such that under isolated operating conditions the damping coefficient shall be above 0.25 for the entire operating range.

The Automatic Voltage Regulator (AVR) shall have no negative impact on generator oscillation damping. If required the appropriate Power System Stabiliser (PSS) shall be provided. Control principle, parameter setting and switch on/off logic shall be coordinated with the TSO and specified in the Connection Agreement. Operation of such control facilities shall be in accordance with the Scheduling and Dispatch Codes.

**(vii) Negative Phase Sequence Loadings**

Each Generating Unit shall be required to withstand, without tripping, the negative phase sequence loading experienced during clearance of a close-up phase-to-phase fault, by System back-up protection on the Transmission Network.

**(viii) Neutral Earthing**

At nominal System voltages of 66 kV and above the higher voltage windings of a transformer of a Generating Unit must be star connected with the star point suitable for connection to earth. The earthing and lower voltage winding arrangement shall be such as to ensure that the Earth Fault Factor shall be met on the Transmission System at nominal System voltages of 66 kV and above.

**(ix) Frequency Sensitive Relays**

The System frequency could rise to 51.5 Hz or fall to 47.5 Hz and Generating Units must continue to operate within this frequency range unless the TSO has agreed to any frequency-level relays and/or rate-of-change-of-frequency relays which shall trip such Generating Units within this frequency range, as stated in the Connection Agreement.

Power Producers shall be responsible for protecting all their Generating Units against damage should System frequency variations exceed 51.5 Hz or go below 47.5 Hz or such limits agreed with the TSO. In the event that such variations occur, the Power Producer shall disconnect the Generating Unit for reasons of safety of personnel, Apparatus, and/or Plant.

**CC5.2.2 Protection Arrangements**

Protection of Generating Units and their connections to the Transmission Network shall meet the minimum requirements given below.

**(i) Fault Clearance Times**

The fault clearance times from fault inception to the circuit breaker arc extinction shall be set out in accordance with the Connection Agreement.

Slower fault clearance times than given in CC5.1.4 may be specified in accordance with the Connection Agreement for faults on the Transmission System. Slower fault clearance times for faults on the Power Producer equipment may be agreed in accordance with the terms of the Connection Agreement but only if System requirements permit in the opinion of the TSO and/or TNSP. The probability that the fault clearance times stated in accordance with the Connection Agreement is exceeded by any given fault, shall be less than 5%.

To cater for the possibility that the above fault clearance times are not met as a result of failure in the operation of the main protection system(s), the Power Producer shall provide the necessary back up protection. The TNSP shall also provide backup protection which shall be coordinated to provide discrimination and protect equipment from damage.

**(ii) Circuit Breaker Fail Protection**

When the Generating Unit is connected to the Transmission Network at 400 kV, 230 kV or 66 kV and the Power Producer or the TNSP provides a circuit breaker, circuit breaker fail protection shall be provided by that party on the circuit breaker. In the event that the circuit breaker fails to interrupt the fault current following operation of its relay, the circuit breaker fail protection is required to initiate tripping of all the necessary electrically adjacent circuit breakers so as to interrupt the fault current within the subsequent 250 ms.

**(iii) Loss of Excitation**

The Power Producer must provide the necessary protection device to detect loss of excitation on a Generating Unit and initiate a Generating Unit trip.

**(iv) Pole Slipping Protection**

Where System requirements dictate, the TNSP and/or the TSO shall specify in the Connection Agreement a requirement for Power Producers to fit pole slipping protection on their Generating Units.

**(v) Work on Protection Apparatus at the Connection Point**

No busbar protection, circuit breaker fail protection relays, AC or DC wiring may be worked upon or altered by the TNSP personnel in the absence of a representative from the Power Producer.

## (vi) Relay Settings

Protection and relay settings shall be coordinated across the Connection Point in accordance with the Connection Agreement to ensure effective Disconnection of faulty Apparatus.

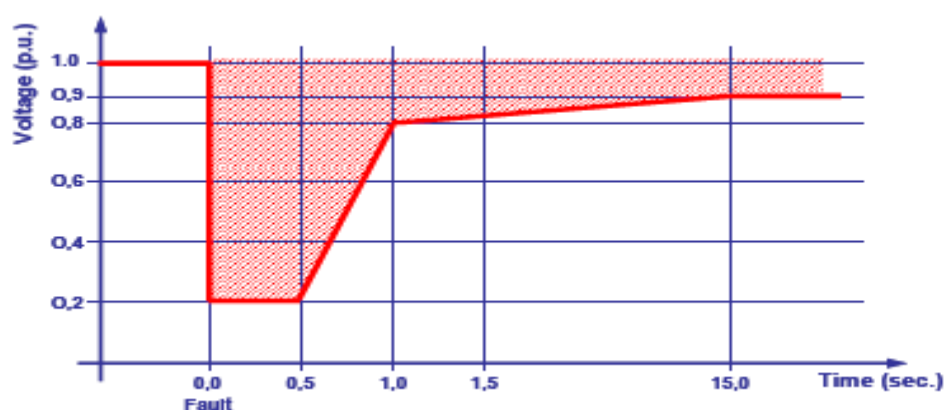
### CC5.2.3 Non-Synchronous generators special connection conditions

Wind Generators must fulfil all Connection Conditions otherwise specifically excluded in the text. In addition to them, Wind Generators must accomplish with the following aspects:

#### (i) Capacity to survive to the impact of short circuits in the grid

Wind Generators must survive to the impact into the Voltage profile during and immediately after any short circuit which is correctly isolated by protection schemes, even in the case of the second level protections.

Wind generators must survive to Voltage holes equal or less severe than



Where:

- The wind generators shall survive to a short circuit that is correctly eliminated by the back-up protections, under 0.5 seconds. This will generate a voltage hole with a minimum voltage of 20% of the nominal voltage of the connection point.
- The recovery of the voltage will be initiated immediately after the clearance of the fault in the system and 1.0 seconds after the short circuit the Voltage will be of 80% of the nominal or more. 15.0 seconds after the short circuit the voltage will be of 90% of the nominal or higher.



- Non-synchronous generators connected to the Transmission Grid in general and wind generators in particular, must survive to any incident of this severity or lower severity in voltage deep and duration.
- The wind generators shall recover, at least, the 90% of their generation before the incident in less than a minute after the short circuit.

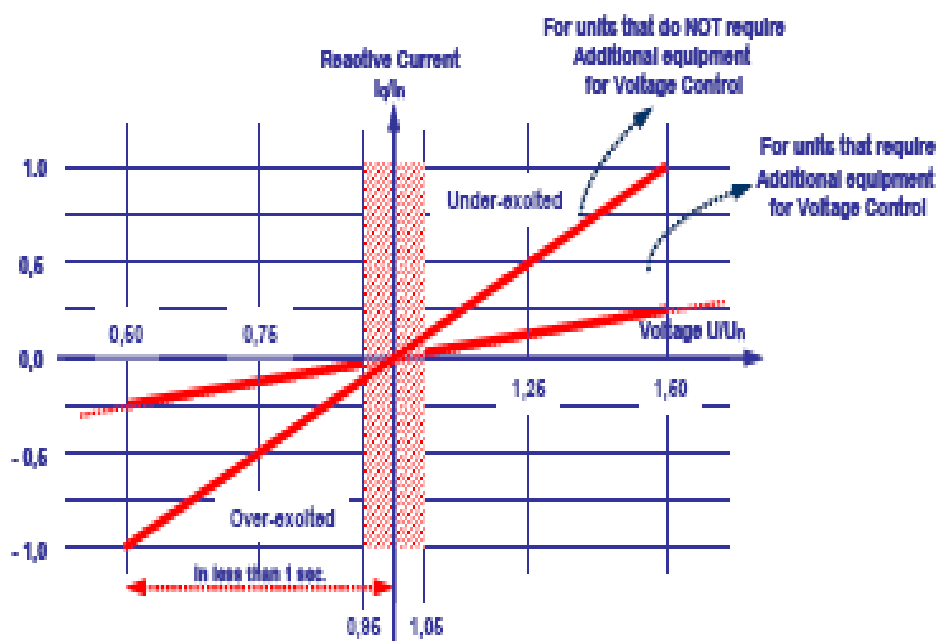
In addition to meeting the conditions specified above, each Non-Synchronous Generating Unit or wind turbine are required to withstand, without tripping, the negative phase sequence loading incurred by clearance of a close-up phase-to-phase fault at the Transmission System.

Wind Generating farms are asked to recover the 90% of the generation previous to the incident, not later than 2 minutes after the incident took place.

## (ii) Reactive Range & Voltage Control

Non-synchronous generators should be able to provide reactive as well as real power to the grid. It is understood that the inherent ability of a non-synchronous generator to produce and absorb reactive power is related to each machine's specific design. However, for generators that have a limited capability, auxiliary equipment can be provided to compensate allowing a pre-defined overall capability to be achieved.

The minimum requirements for a non synchronous machine in voltage control it is referred in the following picture where:



The figure shall be interpreted as:

- A dead band of ohv[ 5.0 % of the nominal voltage of the connection point is defined for normal operational conditions. Inside the dead band, two different alternative operative conditions can be allowed:
  - Constant Power factor. The wind generators will maintain while the grid voltage is inside the dead band. The constant power factor will be an operative signal defined by the System Operator, with the agreement of the Wind Farm owner.
  - Participate in Voltage Control as any other power generator in the system.
- Outside the dead band the non-synchronous generators shall participate in the recovery of the voltage. There are two different expectations according with the design of the non-synchronous machines:
  - Those machines prepared to control voltage, shall provide the maximum output possible (reactive current equal to nominal current) for voltages of 50% of the nominal in the connection point or more severe. The reaction time shall be less than 1 second. The sense of the current vector shall be the appropriate to correct the Voltage deviation.
  - Those machines NOT prepared to control voltage, shall provide, using external equipment, a maximum output equivalent to 25% of the nominal capacity of the units (Reactive current equal to half of the nominal current) for voltages of 50% of the nominal in the connection point or more severe. The reaction time shall be less than 1 second. The sense of the current vector shall be the appropriate to correct the Voltage deviation.

At the same time, wind generators shall remain transiently stable and connected to the System without tripping, for balanced Transmission Grid Voltage dips and associated durations anywhere on the band between the 90.0 % and the 110.0 % of the nominal Voltage at the connection point.

### **CC5.3 TECHNICAL REQUIREMENTS FOR A DNSP OR PRINCIPAL CONSUMER CONNECTION POINT**

#### **CC5.3.1 Protection Arrangements**

The protection requirements for a Connection Point for a DNSP or a Principal Consumer, must meet the minimum clearance time requirements as follows.

**(i) Fault Clearance Times**

Fault clearance times for faults on a DNSP Network or a Principal Consumer's Network at the Connection Point shall be as defined in the respective Connection Agreement.

The DNSP or Principal Consumer shall provide protection systems, which shall result in a fault clearance time as follows:

- (a) For Connection Points at 400 kV, 230 kV or 66 kV, back-up protection shall be provided by the DNSP or Principal Consumer, with a fault clearing time not slower than 400 ms for faults on the DNSP or Principal Consumer Network close to the Connection Point.
- (b) For Connection Points at 20 kV there shall be at least one main protection scheme and a back-up protection scheme provided by the DNSP or Principal Consumer. The main protection scheme shall have no intentional time delay. It shall have an operating time not more than 100 ms for a fault on the DNSP or Principal Consumer Network close to the Connection Point. In addition back-up protection shall be provided having an operating time not slower than 300 ms for faults on the DNSP or Principal Consumer Network close to the Connection Point.

**(ii) Relay Settings**

Protection and relay settings shall be coordinated across the DNSP or Principal Consumer Connection Point in accordance with the Connection Agreement to ensure effective Disconnection of faulted Apparatus.

**(iii) Frequency Sensitive Relays**

As required under the relevant sections of this Transmission Code, each DNSP or Principal Consumer shall make the necessary arrangements to facilitate the automatic low frequency Disconnection of Demand. The Connection Agreement shall specify the characteristics of low frequency Disconnection facilities (load shedding relays), the size of the discrete MW blocks and its association with the respective under frequency relay settings. The TSO shall from time to time review such arrangements under the procedures set out in OC4.

**CC5.4 TECHNICAL REQUIREMENTS FOR INTERCONNECTED PARTIES****CC5.4.1 Interconnectors to Neighbouring Countries**

All Apparatus, Plant and operation procedures at the Connection Point shall be in accordance with the Interconnector Agreement; "General Interconnection Agreement for the Electrical

Interconnection Among the Eight Electrical Power Utilities of Egypt, Iraq, Jordan, Lebanon, Libya, Palestine, Syria and Turkey" (EIJLLPST).

Where the relevant procedures and equipment requirements for the Connection Point are not provided under the Interconnector Agreement or any other bilateral agreements, such procedures and requirements shall comply with the relevant sections of this Transmission Code.

**(i) Protection Arrangements**

International interconnection with the EIJLLPST countries may result in a failure to achieve adequate protection coordination on the international interconnections. Therefore, protection measures are also required to be taken by the TNSP Network Planner for isolating the Transmission Network from the other EIJLLPST countries in case of uncleared external faults or the malfunction of Plant or Apparatus which could lead to a System Emergency condition.

When required under the relevant Interconnection Agreement, each Interconnected Party shall make the necessary arrangements to facilitate the automatic frequency rate of change or low frequency Disconnection of the Interconnector. The Interconnection Agreement shall specify the characteristics of these automatic Disconnection facilities. The TSO shall from time to time review such arrangements under the procedures set out in OC4 and the Interconnection Agreement.

**(ii) Area Separation by Frequency Deviations**

The Transmission Network shall be isolated from neighbouring interconnectors under the following conditions:

- (a) The link between Jordan and Egypt shall be tripped when Power System frequency measured at the interconnection point falls below 49.0 Hz.
- (b) The link between Jordan and Syria shall be tripped when Power System frequency measured at the interconnection point falls below 49.0 Hz.
- (c) The link between Lebanon and Syria shall be tripped when Power System frequency measured at the interconnection point falls below 49.4 Hz with 1.0 second time delay.

**(iii) Area Separation by Abnormal Transient Conditions**

The Transmission Network shall be isolated in case of abnormal transient conditions as follows:

- (a) The link between Syria and any neighbouring county shall be tripped when an "Out of Step" pole slipping condition is observed on this link.

- (b) The link between Syria and any neighbouring country shall be tripped when undamped or sustained inter-area oscillations with amplitudes exceeding the agreed limit are observed.

**(iv) Area Separation by Transmission Line Overloading**

The Transmission Network shall be isolated from any neighbouring country when the current flow across the 400 kV interconnector exceeds agreed values, the interconnector shall be tripped by over-current protection.

**CC6 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 Transmission Code. These shall include but not be limited to the requirements of OC5, OC8 and OC11.

**CC6.1 SITE RESPONSIBILITY SCHEDULE**

A schedule shall be agreed between the TNSP 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", "Ownership Diagram" and Operational Diagram will be agreed by the TNSP Network Planner and User.

These will indicate the operational boundaries and asset ownership boundaries, between the TNSP 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.

**CC7 CONNECTION PROCESS**

The design of connections between the Transmission Network and User Networks shall be in accordance with the technical standards determined by the TNSP in accordance with CC5.1.2.

Metering installations at the CTP with the DNSPs and Users shall be designed in accordance with the Metering Code and Power Purchasing Agreement Rules. Metering installations at the CTP with the Power Producers shall be designed in accordance with the relevant Metering Code and Power Purchasing Agreement Rules.

The TNSP Network Planner will after consultation with the User and data submitted under the PC shall determine the voltage at which the User will connect to the Transmission Network and the point of connection to the appropriate Network.

## **CC7.1 APPLICATION FOR CONNECTION DATE**

### **CC7.1.1 Procedure**

A User whose development is under construction in accordance with the relevant Connection Agreement who wishes to establish a connection with the Transmission Network, shall apply to the TNSP Network Planner 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 and safety regulations, as agreed with the TNSP where appropriate.
- (b) A proposed connection date.
- (c) Updated Contracted Project Data as per the PC where appropriate.
- (d) A proposed commissioning schedule, including commissioning tests, for the final approval of the TSO and/or the TNSP.

To allow adequate time for consideration of the request, the **User** shall make this application for a connection date at least 3 months prior to the proposed connection date. In most cases, a Test Panel in accordance with OC11 will be required.

### **CC7.1.2 PETE Work**

Typical time periods required by PETE to undertake the execution of Transmission Network expansion projects necessary for a new connection are defined by each case.

## **CC7.2 CONFIRMATION OF APPROVAL TO CONNECT**

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

- (a) the TNSP will inform the User whether the requirements of CC7.1 and the Connection Agreement have been satisfied; and
- (b) in consultation with the TSO, the TNSP will inform the User of the acceptability of the proposed commissioning programme.

Where approval is withheld, reasons shall be stated by the TNSP and/or the TSO.

## **Operating Code No. 1**

### **Demand Forecasting**

#### **OC1.1 INTRODUCTION**

Operating Code No. 1 (OC1) is concerned with Demand forecasting for operational purposes in order to match generation with Demand on the Power System.

OC1 outlines the obligations on the TSO and Users regarding the preparation of Demand forecasts of Active Energy, Active Power and Reactive Power on the Power System. It sets out the time scales within the Programming Phase in which Users shall provide forecasts of Energy and Demand to the TSO 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 Power System Demand. Accurate Energy forecasting is required for optimizing thermal fuel purchase and storage and hydro-electricity reservoir usage.

In this OC1, Year/Week 0 means the current year/week at any time, Year/Week 1 means the next year/week at any time and Year/Week 2 means the year/week after Year/Week 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) Programming Phase.
- (b) Control Phase.
- (c) "Post Control Phase" is the phase following real time operation.

In the Programming Phase, Demand forecasting shall be conducted by the TSO taking account of Demand forecasts furnished by Users who shall provide the TSO and/or TNSP with Demand forecasts and other information as outlined in this OC1 A and OC1.7.

In the Control Phase of Week 0, the TSO will conduct its own Demand forecasting taking into account any revised information provided by Users and the other factors referred to in OC1.5. This forecasted Power System Demand data would then be used by the TSO in the preparation of the Schedule for Week 1.

In the Post Control Phase, the TSO shall collate Demand forecasting data on the Power 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 NCC by Users for operational planning purposes in the Programming Phase; and
- (b) provide for the factors to be taken into account by the TSO when Demand forecasting is conducted in the Control Phase.

## **OC1.3 SCOPE**

OC1 applies to the TSO and Users which in OC1 are:

- (a) Transmission Network Service Provider;
- (b) Distribution Network Service Providers;
- (c) Principal Consumers where the TSO considers it necessary;
- (d) All Power Producers with CDGUs; and
- (e) All Power Producers with Generating Units connected to the Transmission Network not subject to Dispatch by the NCC, with total on-site generation capacity in excess of 5MW where the TSO considers it necessary.

## **OC1.4 PROCEDURE IN THE PROGRAMMING PHASE**

### **OC1.4.1 Information Flow and Co-ordination**

Users must provide the necessary information requested for in OC1.4.2 to the NCC at the time and in the manner agreed between the relevant parties to enable the TSO to carry out the necessary Demand forecasting in the Programming Phase.

In OC1.4.2, the TSO 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 known to the TSO.



In preparing the Demand forecast, the TSO 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 PC for new or modification to existing connections.

The TSO shall collate all data necessary and prepare the Demand forecast during the Programming Phase for Year 1 and submit copies to the Buyer by 1 January of Year 0. Additionally, where the Buyer reasonably requires additional information or assistance, the TSO shall provide such information or assistance requested in a reasonable timeframe.

#### **OC1.4.2 Information Providers**

##### **(i) Distribution Network Service Provider**

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

- (a) Based on the most recent historical Demand data, the DNSP shall inform the NCC of any anticipated changes in incremental Demand by  $\pm 1$  MW during Year 1 at the various Custody Transfer Points (CTPs) between the Transmission Network and Distribution Network due to planned changes in Consumer Demand or planned changes by the DNSP. The DNSP shall also consider any significant changes in Demand or generation output by Power Producers with Embedded Generation.
- (b) Where the NCC 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 NCC immediately of any significant changes to the data submitted above.

##### **(ii) Other Users**

The following Users shall submit to the NCC by the end of October each year electronic files, in a format agreed in writing by the NCC, detailing the following:

- (a) The relevant Principal Consumers shall inform the NCC of any planned changes that will alter the incremental Demand by  $\pm 1$  MW during Year 1 at the respective CTP.
- (b) Power Producers with CDGUs shall inform the NCC of any planned changes that will alter the incremental Demand by  $\pm 1$  MW during Year 1 at the respective CTP. Such

Demand could be associated with auxiliary and start-up loads supplied directly from the Power System.

- (c) Power Producers with Self-generation having direct connections to the Transmission Network shall inform the NCC of any planned changes that will alter the incremental Demand by  $\pm 1$  MW during Year 1 at the respective CTP and any relevant generation output information relating to its plant.
- (d) Where the NCC reasonably requires additional information or assistance, such Users shall provide the necessary information or assistance requested in a reasonable timeframe.
- (e) Such Users shall notify the NCC immediately of any significant changes to the data submitted above.

#### **OC1.5 PROCEDURE IN THE CONTROL PHASE**

The Control Phase occurs 1 week ahead of real time after the completion of Scheduling and the Indicative Running Notification (IRN) has been issued by the TSO under SDC1 to the respective Power Producers with CDGUs.

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

#### **OC1.6 PROCEDURE IN THE POST CONTROL PHASE**

The TSO 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 MW and Mvar of each Power Station with a MCR capacity of 5 MW and above will be monitored by the NCC in real time. The output in MW and Mvar of Power Stations with a MCR capacity of 2 MW and above but below 5 MW may be monitored by the NCC if the TSO, acting reasonably, so decides. In the case of hydro-Generating Units, the output will also include half-hourly kWh data where required by the TSO.

The NCC may request the Power Producer with Generating Units connected to the Transmission Network not subject to Dispatch 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 TSO's direct monitoring facilities. Such information shall be provided to the NCC in the manner and format approved by the TSO, within 3 Business Days from real time operation.

## **OC1.7 DEMAND FORECASTS**

The following factors shall be taken into account by the TSO when conducting Demand forecasting:

- (a) Historical generation output information pursuant to OC1.6 and SDC. The Active Power Demand and Active Energy forecasts in the Programming Phase shall be prepared by the TSO 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 Power System figure.
- (b) Historical Power System Demand profiles compiled by the TSO through SCADA, metered data, Energy sales data from the Buyer and information gathered during the Post Control Phase, OC1.6.
- (c) Power System Demand growth data provided by the TNSP Network Planner utilising economic rate indicators, market surveys, time series analysis etc..
- (d) Load factors known to the TSO in advance which may affect the Demand on the Power System, for example, public holidays.
- (e) Anticipated loading profiles of the CDGUs pursuant from the SDC.
- (f) Temperature corrected forecast - to arrive at such a forecast, the effect of temperature change above or below the seasonal average is taken into account.
- (g) 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.
- (h) Any significant Embedded Generation output information provided by the DNSP.
- (i) Any Interconnector export or import information collated by the NCC.

## **Operating Code No. 2**

### **Operational Planning**

#### **OC2.1 INTRODUCTION**

"Operational Planning" involves the TSO planning through the Operational Planning Phase in order to match generation Capacity with forecast Demand pursuant to OC1 together with the necessary generation to provide for the appropriate amount of Operating Reserve pursuant to OC3. This planning is essential so as to maintain the overall security and reliability of the Power System. Operational Planning takes into account:

- (a) Planned outages of Power Producers with CDGUs.
- (b) Planned outages and operational constraints on parts of the Transmission Network.
- (c) Significant planned outages on parts of the Distribution Network.
- (d) Planned outages of Principal Consumers.
- (e) Transfers of Energy through the Interconnectors.

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

OC2 is also concerned with the coordination between the TSO and TNSP through the various time scales of planned outages of Plant and Apparatus on the Transmission System.

The time scales involved in OC2 are in the Operational Planning Phase periods where "Year/Month 0" means the current year/month, "Year/Month 1" means the next year/month and "Year/Month 2" means the year/month after Year/Month 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 Transmission System.

### **OC2.3 SCOPE**

OC2 applies to the TSO and the following Users which in OC2 are:

- (a) All Power Producers with CDGUs;
- (b) All Power Producers with Generating Units connected to the Transmission Network not subject to Dispatch by the NCC, with total on-site generation capacity equal to or greater than 5 MW;
- (c) Principal Consumers;
- (d) Transmission Network Service Provider;
- (e) Distribution Network Service Providers; and
- (f) Interconnected Parties.

### **OC2.4 ANNUAL MAINTENANCE PLAN**

#### **OC2.4.1 Contents**

The TSO shall prepare a rolling "Annual Maintenance Plan" for Year 1 by the end of September of Year 0 which is reviewed annually. Copies of this document shall be submitted to the ERC for information.

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

- (a) Indicative Generation Maintenance Plan.
- (b) Provisional Generation Maintenance Plan.
- (c) Transmission Maintenance Plan.
- (d) consideration of any possible interruption to primary energy resources.
- (e) planned outages by other Users that will have an effect on the Transmission System.

The overall security and reliability of the Power System is maintained in the Annual Maintenance Plan whereby the outage requirements of the Users are coordinated. Furthermore, the document would have sufficient information to ensure that:

- (a) generation and transmission outages are planned to optimize resource utilization, unit commitment and the need for Ancillary Services to produce optimum operating costs at the required security and reliability levels;
- (b) any operational problems likely to be encountered are highlighted and alternative solutions considered and evaluated; and
- (c) the actions and emergency procedures issued to deal with possible abnormal System conditions are adequate and satisfactory.

#### **OC2.4.2 Maintenance Coordination Procedures**

To accomplish maintenance coordination, the following procedures shall be followed:

- (a) Planned outages of generating Capacity shall be coordinated between Users by the NCC. Generation Maintenance Plans and revisions will also be exchanged with Interconnected Parties by the NCC as required.
- (b) Planned outages of transmission Capacity, shall be coordinated between the Users by the NCC.
- (c) Planned outages of System voltage regulation equipment, such as automatic voltage regulators, synchronous condensers, shunt and series capacitors, reactors, etc. shall be coordinated as required between Users by the NCC.
- (d) Planned outages of telemetering and control equipment and associated communications channels shall be coordinated between Users by the NCC.

### **OC2.5 GENERATION MAINTENANCE PLAN**

#### **OC2.5.1 Outage Planning Procedures for Power Producers with CDGUs**

##### **(i) Indicative Generation Maintenance Plan**

In each calendar year, by the end of July of Year 0, each Power Producer with CDGUs will provide the NCC with an "Indicative Generation Maintenance Plan" (Indicative Plan) which covers Year 1 up to Year 5. The plan 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.
- (g) State whether the planned outage is due to statutory obligation (execution of maintenance held contracts), if so, the latest date the outage must be taken.

Between the end of July and end of September, in considering the overall maintenance coordination of the Transmission System, the TSO shall review the initial Indicative Plan submitted and may propose revisions to outage dates to the Power Producer for discussion and approval. Any final revisions to the Indicative Plan shall be mutually agreed between both parties and reflected in the Annual Maintenance Plan.

## **(ii) Provisional Generation Maintenance Plan**

In each calendar year, by the end of July of Year 0, each Power Producer with CDGUs will provide the NCC with a "Provisional Generation Maintenance Plan" (Provisional Plan) which covers Year 1 on a daily basis. The Provisional Plan shall be produced pursuant to Year 1 of the Indicative Plan and will contain more details regarding the outage and be submitted in an agreed format by the TSO comprising of:

- (a) Details of unit outages of CDGU.
- (b) Details of outages of other plant which would restrict CDGU Capacity.

These Power Producers shall also provide the NCC with information regarding the primary fuel used, supply and storage details, including any expected interruption to the fuel supply.

Between the end of July and end of September, in considering the overall maintenance coordination of the Transmission System, the TSO shall review the initial Provisional Plan submitted and may propose revisions to outage dates to the Power Producer for discussion and approval. Any final revisions to the Provisional Plan shall be mutually agreed between both parties and be reflected in the Annual Maintenance Plan.

Any further revisions to the Provisional Plan may be initiated by either the Power Producer or NCC as long as the Committed Generation Maintenance Plan has not yet been produced for that revised outage. The NCC shall consult all the relevant parties to ensure that any revisions to the outage dates shall be well coordinated amongst the parties.

## **(iii) Committed Generation Maintenance Plan**

A "Committed Generation Maintenance Plan" (Committed Plan) for Month 1 shall be produced by the NCC in the third week of Month 0 incorporating the most recent revisions to the Provisional Plan. This Committed Plan shall be used by the Power Producer and NCC in the

preparation of the Availability Notice and Indicative Running Notification respectively pursuant to SDC1.

Any request for a change to an outage either by the Power Producer or NCC once the Committed Plan has been issued shall be reflected in either the Availability Notice or Indicative Running Notification if mutually agreed by both parties.

## **OC2.6 TRANSMISSION MAINTENANCE PLAN**

### **OC2.6.1 General**

The "Transmission Maintenance Plan" will try to balance the requirements of the TNSP to maintain and preserve the reliability of Transmission Network assets with the short term security requirements of the TSO.

In each calendar year, by the end of July of Year 0, the TNSP will provide the NCC with a Transmission Maintenance Plan which covers Year 1 on a daily basis.

Between the end of July and end of September, in considering the overall maintenance coordination of the Transmission System, the TSO shall review the initial Transmission Maintenance Plan submitted and may propose revisions to outage dates to the TNSP for discussion and approval. Any final revisions to this plan shall be mutually agreed between both parties and reflected in the Annual Maintenance Plan.

Following the production of the final Transmission Maintenance Plan, the actual maintenance work will be carried out by the TNSP or its appointed contractors.

### **OC2.6.2 Protection Relay Maintenance Practices**

Users shall adopt the following practices in planning system protective maintenance on their Networks, which shall be incorporated into the Annual Maintenance Plan:

- (a) Testing of relay signal channels between Systems shall be jointly coordinated between Users by the NCC.
- (b) Any protective relay or any work on equipment that will reduce System protection, facilities or produce a risk of trip shall be coordinated by the User with the NCC as part of the Annual Maintenance Plan.



**OC2.7 OUTAGE PLANNING PROCEDURES FOR THE OTHER USERS**

This section applies to Power Producers not subject to Dispatch by the NCC, Principal Consumers and DNSPs. If any planned outages on these User Networks cause a 5 MW or more increase in Demand at the Connection Point, the Users shall inform the NCC at least 30 calendar days in advance.

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

- (a) Details of proposed outages on their User Networks which may affect the performance of the Transmission System.
- (b) Details of any trip testing and risk of trip.
- (c) Other information where known which may affect the reliability and security of the Transmission System.

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

**OC2.8 OUTAGE PLANNING PROCEDURES FOR INTERCONNECTED 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 NCC informed of anything that they become aware of that could affect the Syrian Transmission System in accordance to Prudent Utility Practice.

In addition, Interconnected Parties shall keep the NCC informed of any changes to the MW export or MW import due to changes in generation Capacity or transmission Capacity under the Interconnector Agreement.

Any planned maintenance on the Interconnector or associated Apparatus shall be coordinated in accordance to the procedures outlined in the Interconnector Agreement.

## **Operating Code No. 3**

### **Operating Reserve**

#### **OC3.1 INTRODUCTION**

The Transmission System is required to be operated by the TSO with sufficient Operating Reserve to account for such factors as planned and unplanned outages on the overall System, frequency regulation and transmission voltage control requirements. The Operating Reserve shall also include some form of "Contingency Reserve" to cater for uncertainties in the CDGU's Availability, weather forecast and inaccuracies in Demand forecasts.

Operating Reserve is the additional output from Generating Units in order to contribute to containing and correcting any System frequency fall to an acceptable level. Operating Code No. 3 (OC3) sets out the different types of reserves that make up the Operating Reserve that the TSO might use in the Control Phase in order to maintain the required levels of security and reliability.

Some form of Demand Control can also be utilized by the NCC to provide the Operating Reserve. However, such reduction in Demand shall be covered under OC4. This OC3 is only concerned with the addition or reduction of output from CDGUs to provide the necessary Operating Reserves requirements of the Transmission System.

#### **OC3.2 OBJECTIVES**

The objective of OC3 is to set out and describe the types of reserves which may be utilized by the TSO pursuant to the Scheduling and Dispatch Codes (SDC). The TSO shall also take into account of any reserves which may be available across any Interconnector.

#### **OC3.3 SCOPE**

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

- (a) Power Producers with Centrally Dispatched Generating Units (CDGUs); and
- (b) Interconnected Parties.

## **OC3.4 COMPONENTS OF OPERATING RESERVE**

In carrying out the Scheduling process in accordance with SDC1, the TSO will use the Demand forecasts prepared under OC1 and then match available generation to Demand forecast plus Operating Reserve. These reserves are essential for the stable operation of the Transmission 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 Reserve.

### **OC3.4.1 Spinning Reserve**

Spinning Reserve is the additional output from Synchronized CDGUs, which must be realizable in the Control Phase 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.

#### **(i) Primary Reserve**

Primary Reserve is an automatic response by a Synchronized CDGU to a fall or rise in Transmission System frequency which require changes in the CDGUs output, to restore the frequency back to within target limits.

The "Positive Primary Response" is the automatic increase in Active Power output of a Generation Unit in response to a System frequency fall in accordance with the primary control capability and additional mechanisms for acquiring Active Power (for example, condensate stop).

The "Negative Primary Response" (High Frequency Response) is the automatic decrease in Active Power output of a Generation Unit in response to a System frequency rise in accordance with the primary control capability and additional mechanisms for reducing Active Power generation (for example, fast valving).

This change in Active Power output must be in accordance with the provisions of the relevant PPA or Connection Agreement which will provide the "Transient Primary Response" from  $t = 0$  s up to  $t = 10$  s and the "Steady State Response" from  $t = 10$  s up to  $t = 30$  s.

Primary Reserve is provided by CDGUs which are already Synchronized to the Transmission System.

**(ii) Secondary Reserve**

The automatic response to Transmission 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. This increase in generation output must be in accordance with the provisions of the relevant PPA or Connection Agreement.

Secondary Reserve is provided by CDGUs which are already Synchronized to the Transmission System.

**OC3.4.2 Non-spinning Reserve**

Non-spinning Reserve is the component of the Operating Reserve not connected to the Transmission 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 in relation to any CDGU that is declared available, in an Availability Notice, where it is ready to be Synchronized and attain an instructed Load within 30 minutes and subsequently maintained such Load continuously by that CDGU.

**(ii) Cold Standby**

Cold Standby is a condition of readiness in relation to any CDGU that is declared available, in an Availability Notice, to start, synchronize and attain target Loading all within a period of time stated in the Availability Notice, typically within up to 12 hours.

**OC3.5 ALLOCATION OF OPERATING RESERVE**

Operating Reserve will be allocated in accordance with the Schedule for that Schedule Day in accordance with SDC1. Operating Reserve shall be provided to cover Demand variations to follow the daily Demand characteristics, to cope with various types of contingencies and to establish System control such as frequency control and area exchange control.

### **OC3.5.1 Spinning Reserve**

#### **(i) General**

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 Synchronized Generating Unit;
- (b) the loss of the largest transmission circuit; or
- (c) the loss of an Interconnector that is importing Energy to the Country.

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.

The TSO has to allocate sufficient Spinning Reserve to be distributed among the various types of Generation Units in the Transmission System. The critical factor in stabilizing the drop or rise in System frequency and time taken to normalize it will depend on the level of response from the Primary Reserve and Secondary Reserve.

The allocation of Operating Reserve among the thermal Generation Units shall be based on Merit Order with due consideration to the overall System security. All Power Producers shall provide Operating Reserve in accordance with this code and the respective PPA or Connection Agreements.

Users shall inform the NCC immediately if they anticipate any unavailability or limited availability, to provide the necessary Operating Reserve as indicated in the Availability Notice or Indicative Running Notification or Interconnector Agreement. Any changes of control modes and parameter settings (droop, dead bands, etc.) must be first agreed with NCC and any such action has to be properly recorded.

#### **(ii) Primary Reserve**

Primary Reserve shall be allocated according to operational requirements as follows:

- (a) When the Transmission System is operating isolated from Interconnectors, the Primary Reserve shall be such, that in the case of the tripping of the highest loaded Generating Unit there will be no load-shedding. The allocation of reserve shall be

according to generation costs under full consideration of "Reserve Release Characteristics".

- (b) When the Transmission System is interconnected with one Interconnector only, the Primary Reserve shall be such, that in the case of a single circuit tripping of this tie-line, there will be no load shedding in the Transmission System. The allocation of reserve shall be according to generation costs under full consideration of the "Reserve Release Characteristics".
- (c) When the Transmission System is interconnected with more than one Interconnector, the Primary Reserve shall be such, that in case of tripping of the two largest units within the interconnected EIJLST System there will be no load-shedding. In that case, the Primary Reserve provided in Syria shall be that amount calculated according to the formula stated in the Interconnector Agreement. The allocation of such reserve shall then be in accordance to generation costs under full consideration of "Reserve Release Characteristics".

### **(iii) Secondary Reserve**

Sufficient Secondary Reserve shall be provided according to operational requirements as follows:

- (a) When the Transmission System is operated isolated from neighboring Interconnectors, the Secondary Reserve shall cope with daily Demand requirements and frequency control requirements.
- (b) When the Transmission System is operated interconnected with neighboring Interconnectors, the Secondary Reserve shall provide sufficient margin to control tie-line flows especially under all types of contingency situations.

### **(iv) System Interconnection Aspects (Iraq / Jordan / Lebanon / Turkey)**

When the Transmission System is operated in parallel with the EIJLST countries, interconnected via Iraq, Jordan, Lebanon and Turkey, the respective transfer capabilities shall be determined from time to time with consideration given to operation constraints described in the preceding sub-sections. Update of such transfer limits is especially required when new power plants and transmission lines are commissioned in any of the EIJLST countries in accordance to the relevant procedures in the Interconnector Agreement.

### **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.

Non-spinning Reserve can be allocated to any Generating Unit as long as these Generating Units have not been allocated as part of the Spinning Reserve and can be made available and Synchronized within 30 minutes.

The Non-Spinning Reserve allocation shall be determined from time to time by the TSO in accordance with the SDC, OC3 and OC4 (whereby the amount of Demand Control available is also taken into consideration).

## **OC3.6 DATA REQUIREMENTS**

### **OC3.6.1 General**

The response capability data required for each CDGU's Spinning 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.
- (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.

### **OC3.6.2 Normalized Primary Response Characteristic**

"Normalized Primary Response Characteristic" means the Primary Reserve response pattern on the basis of a normalized input signal. The normalized input signal shall be determined individually for each Generating Unit and is defined by the speed response of the unit under assumed island conditions supplying a constant power load. The Load step (increase of MW load) applied shall be such that with the "Average Load-Related Primary Control Droop" setting and under the consideration of the "Total Speed/Load-Related Dead Band", the response of the

Generating Unit shall result in the Normalized Primary Response Characteristic. This must be in accordance with the provisions of the relevant PPA or the Connection Agreement.

If the Normalized Primary Response Characteristic varies with the Generating Unit Loading, at least three Normalized Primary Response Characteristics shall be provided by the Power Producer.

**(i) Primary Response Performance Index**

The "Primary Response Performance Index" (PRPI) is defined as the product of the "Transient Primary Response Coefficient" (TPRC) and the "Steady State Primary Response Coefficient" (SSPRC) according to:

$$PRPI = TPRC \times SSPRC$$

**(ii) Transient Primary Response Coefficient (TPRC)**

The TPRC is defined by the weighted sum of the Generating Unit Power increase released in the first 10 seconds according to:

$$TPRC = \sum_{ti} RES_{ti} \times a_{xi}$$

Where:  $ti = 1$  to 10 seconds with the consideration of the corresponding weighting factors  $a_{xi}$  as specified in the Connection Agreement.

**(iii) Steady State Primary Response Coefficient (SSPRC)**

The SSPRC is defined by the weighted sum of the Generating Unit Power increase released from 10 to 30 seconds according to:

$$SSPRC = \sum_{ti} RES_{ti} \times b_{xi}$$

Where:  $ti = 10$  to 30 seconds with the consideration of the corresponding weighting factors  $b_{xi}$  as specified in the Connection Agreement.

**(iv) Average Load-Related Primary Control Droop**

The Average Load-Related Primary Control Droop ( $\sigma$ , Load-related steady-state regulation) of the governing system is defined as the ratio of the governor input ( $\Delta n$ ) related to the rated speed  $n_n$  to the equally related value ( $\Delta P_G$ ) of the generator power output,  $P_G$ .

$$\sigma = \text{abs}(\Delta n / \Delta P_G) \times (P_n / n_n)$$



### (v) Total Speed/Load-Related Dead Band

The Total Speed/Load-Related Dead Band ( $d_p$ , p.u.) of the speed governing system is defined as the amount of speed change ( $\Delta n$ ) which is necessary to produce a change of the generator output ( $\Delta P_G$ ) from one direction into the opposite direction, according to:

$$d_p = \Delta P_G / P_{GN} = u_n \times 100 / \sigma$$

With:  $u_n = \Delta n_G / n_N$

## OC3.7 USE OF OPERATING RESERVE

### OC3.7.1 Within the Transmission System

A CDGU Dispatched to meet or restore Operating Reserve will be in accordance with the TSO'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 TSO shall issue a new Indicative Running Notification to CDGUs to replace this Cold Standby, if in the opinion of the TSO this is necessary in accordance with the Transmission Code.

### OC3.7.2 Across the Interconnectors

Any requirements for the provision of Spinning Reserve for the interconnected System by the TSO shall be calculated in accordance to the formula stated in the Interconnector Agreement.

Where the use of an Interconnector is considered to be necessary to restore Operating Reserve on the Transmission System then this will be determined by the TSO, in accordance with the procedures in the Interconnector Agreement.

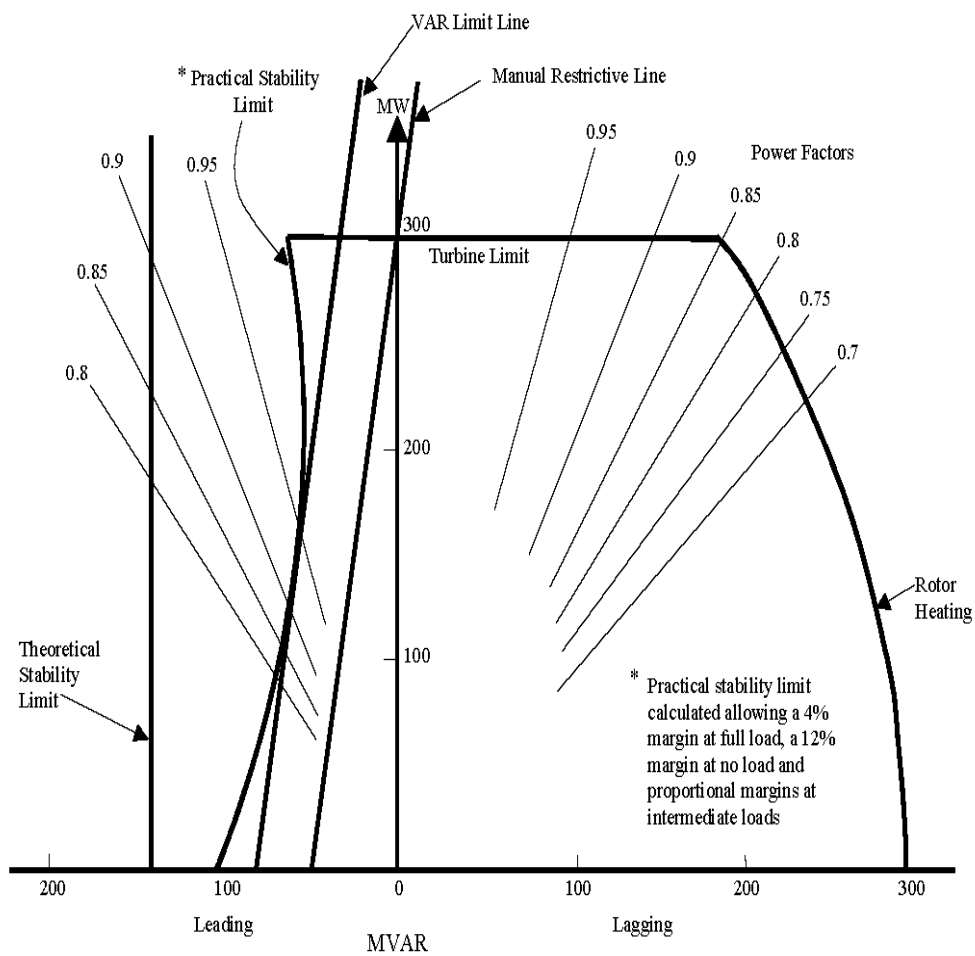
Where an Interconnected Party requires the use of the TSO's Operating Reserve to meet a sudden failure or shortage on its system then the TSO will take the necessary action to assist and restore the necessary Operating Reserve within the interconnected System in accordance with OC3, as if the loss of reserve had been due to problems within the Transmission 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 TSO and compensated as "Inadvertent Energy" in accordance to the procedures in the Interconnector Agreement.

## OC3-APPENDIX A

## 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 TSO and Users to initiate reductions in Demand in the event of insufficient generation Capacity, transfer of Demand, breakdown or operational problems in whole or part of the Transmission System leading to the possibility of frequency variations outside the limits given in the Planning Code. In addition, these provisions may be used by the TSO to prevent an abnormal overload of Apparatus within the Transmission System, or prevent a voltage collapse.

The procedures for effective and well-coordinated Demand reduction to avoid or relieve operational problem in the Transmission System are described in this OC4.

#### **OC4.2 OBJECTIVES**

The objective of OC4 is to establish procedures to enable the TSO to achieve a reduction in Demand in a manner that is equitable to all Consumer groups and is in accordance with TSO's License conditions, ERC directives where applicable and Electricity Sector Laws.

#### **OC4.3 SCOPE**

OC4 applies to the TSO and Users which in OC4 are:

- (a) Transmission Network Service Provider;
- (b) Distribution Network Service Providers;
- (c) Principal Consumers;
- (d) Power Producers connected to the Transmission Network; and
- (e) 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 TSO.
- (c) "Consumer Demand management" initiated by the TSO.

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 Transmission System.

Where the Transmission 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 TSO can restore interconnection of the Power Islands, and/or restoration of any external Interconnector that was disconnected during the incident.

#### **OC4.5 IMPLEMENTATION OF DEMAND CONTROL**

##### **(i) General**

During the implementation of Demand Control, Scheduling and Dispatch in accordance with the principles in the Scheduling and Dispatch Code (SDC) may cease and will not be re-implemented until the TSO decides that Normal Operation can be resumed. The TSO will inform Power Producers with CDGUs when normal Scheduling and Dispatch in accordance with the SDC is to be re-implemented, which shall be as soon as is reasonably practicable.

Where time permits, the TSO will, insofar as it is reasonably practicable, inform all affected Users that Demand Control is planned to be exercised in accordance OC4.7.

##### **(ii) Guidelines**

In implementing any form of Demand Control, the general guidelines adopted by the TSO shall be as follow:

- (a) All Spinning Reserve and emergency generating capability should be utilized to the extent practicable before resorting to any Demand reduction.
- (b) The main objectives in the application of under frequency relays are to reduce Demand, to sectionalize parts of the Transmission Network, or to isolate generation to aid in the early restoration of service and to minimize the loss of generating capability as a result of a major disturbance.

- (c) It is preferable to reduce Demand in an emergency for a short period of time to aid in maintaining or re-establishing the interconnection, rather than risk operating for an extended period of time with low frequency and voltage.
- (d) Sufficient Demand must be shed, either by automatic or manual means, so that the remaining Demand in any isolated area does not exceed the available generating capability in that area.
- (e) Automatic shedding of Demand wherever possible is preferred to manual shedding because of the speed with which Demand can be shed. The percentage of Demand to be shed by automatic procedures may vary between areas. The amount and location of the Demand to be shed should be determined on the basis of studies relating to the specific area.

### **(iii) Equitable Demand Reduction**

The TSO, in consultation with the Users, will endeavour, as far as practicable, to spread Demand reductions equitably.

In case of protracted generation shortage or overloading on parts of the System, large imbalances of generation and Demand may cause excessive power transfers across the Transmission System. Should such transfers affect the stability of the Transmission System or increases the risk of damage to transmission Apparatus, the pattern of Demand reduction shall be adjusted to secure the System, notwithstanding the inequalities of Disconnection that may arise from such adjustments.

## **OC4.6 IMPLEMENTATION OF AUTOMATIC UFLS SCHEME**

### **OC4.6.1 General**

Demand may be disconnected automatically by under frequency relays at selected locations on the Transmission System in the event of a sudden fall in frequency, in order to restore the balance between available generator Peak Capacity and real-time system Peak Demand. Such an arrangement will be coordinated by the TSO as part of an overall scheme. The TSO, in consultation with Users, will determine the appropriate low frequency settings and percentage Demand to be disconnected at each stage of Disconnection.

The areas of Demand affected by this automatic UFLS scheme should be such that it allows the Demand relief to be applied uniformly throughout the Transmission System by the TSO taking

into account any operational constraints on the Transmission System and priority of Consumer groups.

#### **OC4.6.2 Procedure**

The following procedures are to be followed by the TSO in the implementation of the automatic UFLS scheme on the Power System:

- (a) Each DNSP shall make available up to 58% of its peak Demand for the automatic UFLS scheme through the installation of under frequency relays to limit the consequence of a major loss of generation etc.
- (b) The Demand on the Transmission 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 TSO in consultation with the relevant DNSP on a rota basis insofar as possible and not unduly discriminate against or unduly prefer any one group of Consumers or other Users. The TSO will also take into account of constraints on the Transmission System when determining the size and location of Demand reduction by UFLS.
- (c) Following frequency recovery after the activation of the UFLS scheme, should the System condition still be critical, the NCC may request the DNSP and/or User to implement manual Demand Disconnection of additional Demand to permit restoration of the Demand disconnected earlier.
- (d) Demand disconnected by the UFLS scheme can only be restored on the instruction of the NCC. For the avoidance of doubt, Demand disconnected by the automatic operation of the under frequency scheme can only be restored following the specific approval of the NCC.
- (e) When a restoration instruction is given by the NCC, it should be carried out systematically by the User and all operations reported back to the NCC in accordance with instructions from the NCC.
- (f) Power Producers with CDGUs may disconnect from the System either manually or automatically in accordance with their Connection Agreements.
- (g) When automatic or manual Disconnection occurs on the Distribution Network, the DNSP shall inform the NCC within 5 minutes of such action and shall also provide details of the actual Demand disconnected.

## **OC4.7 IMPLEMENTATION OF DEMAND CONTROL INITIATED BY THE TSO**

### **OC4.7.1 Procedure**

The TSO will arrange to have available manual or automatic SCADA Demand reduction and/or Disconnection schemes to be employed throughout the Transmission 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.

Apart from Disconnection, a Demand reduction scheme may involve 5% or 10% voltage reductions at certain sections of the Transmission Network through 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 of doubt, CDGUs; the TSO may, in the event of fuel shortages and/or water shortages at hydro-CDGUs, utilise OC4.7 to initiate Demand Disconnections in order to conserve primary fuel and/or water. The programming of these rota-Disconnections will be in accordance with OC4.7.5(v).

### **OC4.7.2 Issue of Warnings**

Warnings shall be issued by the NCC by telephone/fax to Users as appropriate. When the estimates of the Demand and generation availability for the following week indicate a potentially critical situation, warnings should be issued as soon as possible, bearing in mind that adequate notice has to be given to Consumers.

During periods of protracted generation shortage exceeding several days, for whatever cause, warnings shall be issued. This is to be based on the best information available at that time and shall indicate the amount of Demand reduction anticipated. Confirmation or modification of the warning should be issued as and when appropriate.

It may also be necessary for the NCC 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 Apparatus of Power Stations or in a particular section of the Transmission Network.

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 NCC shall issue the appropriate modification or cancellation by telephone or by other appropriate means.

### **OC4.7.3 Purpose of Warnings**

The purpose of issuing 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/reduction is both prompt and effective.

Demand reduction will, however, be required without warning if unusual and unforeseeable circumstances create severe operational problems. The warnings are to enable the Users to assess the urgency of their demand Disconnection/reduction requirements.

### **OC4.7.4 Types of Warnings**

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

The colour-coded warning system is applicable during situations of serious protracted supply shortages.

#### **(i) Yellow Warning**

A "Yellow" warning will be issued by the NCC to Users when there is reason to believe that the risk of serious system disturbances is abnormally high. During the period of a "Yellow" warning, the Users affected will be alerted and maintained in the condition in which they are best able to withstand System disturbances, for example, Power Producers with the means of safeguarding the station auxiliary supplies will bring them into operation. The Power Producer control room and substation staff should be standing by to receive and carry out switching instruction from the NCC or to take any authorised independent action where required.

#### **(ii) Orange Warning**

An "Orange" warning will be issued during periods of protracted generation shortage to provide guidance to the DNSPs in the utilisation of their resources for implementing Disconnections or Demand reductions as outlined in the "Demand Reduction Plan". The NCC shall provide the estimated quantum of Demand reductions required together with the time and duration of the Demand reductions likely to be enforced are to be included in the warnings.

#### **(iii) Red Warning**

A "Red" warning will be issued to indicate that Demand reduction or Disconnection under controlled conditions is imminent. DNSPs will take such preparatory action as is necessary to



ensure that at any time during the period specified Disconnection/reduction of Demand can be applied promptly and effectively.

#### **OC4.7.5 Conditions Requiring Controlled Demand Reduction**

##### **(i) General**

The NCC will initiate and instruct controlled Demand reduction to Users by telephone and, subsequently, in writing.

Voltage reduction pursuant from OC4.7.1 shall normally precede any Disconnection stages. However, should circumstances arise which, in the judgement of the TSO, required more drastic action, Demand Disconnection instruction may be issued to the DNSP and subsequently, in writing, at the same time or in place of voltage reduction stages.

##### **(ii) Temporary Generation Shortage or Transmission System Overloading**

Whenever possible, "Yellow" and "Orange" warnings should be given to Users as early as possible. Arrangements should be made to import more power from the neighbouring EIJLST countries.

Except when protracted generation shortage is expected, voltage reduction will be instructed to prevent the Power System frequency falling below 49.5 Hz or to prevent the import from neighbouring EIJLST countries exceeding the pre-agreed value.

The NCC shall instruct Demand Disconnection that has been pre-arranged into groups. The quantum of Demand Disconnection will depend on the severity of the operational problem.

When the System is normalised, the NCC will initiate Demand restoration.

##### **(iii) Protracted Generation Shortage or Transmission System Overloading**

Protracted loss or deficiency of generation must be met by the Disconnection of Consumers. Rota Disconnection plans shall be in accordance with OC4.7.5(v) and will be implemented on instructions from the NCC. The procedures for warning and Demand reduction instructions shall be in accordance with this OC4.7.

The procedures are as follows:

- (a) The NCC shall give warning as early as possible to the Users for them to assess their Demand reduction and/or Demand Disconnection plan.

- (b) On the day during which Demand Disconnection is required, the NCC will confirm by telephone or fax to Users to initiate the Demand Disconnection stating the quantum, time and duration when such Disconnection is required.
- (c) The DNSPs may rotate the Demand Disconnection to Consumers as long as the quantum of the Demand disconnected and the time of the Disconnection is as per advised by the NCC.
- (d) The NCC shall be kept informed of the quantum of the Demand disconnected and the time of the Disconnection.
- (e) Demand restoration shall only be carried out with the agreement of the NCC, which shall be kept informed by the User about the restoration actions carried out.

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

#### **(iv) Demand Reduction Plans**

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

The TSO together with the DNSPs will prepare the "Demand Reduction Guidelines". This manual will be updated as and when required and a copy shall be submitted to the ERC. The TSO together with DNSPs shall prepare the "Demand Reduction Plans" for appropriate levels of Demand Disconnection or reduction based on the approved guidelines. These plans shall be revised as and when required.

#### **(v) Rota Disconnection Plans**

The DNSPs will prepare "Rota Disconnection Plans" for levels of Demand Disconnection in accordance with the Demand Reduction Plans drawn up by the TSO. These plans will be reviewed at least bi-annually in consultation with the TSO.

**(vi) Situations Requiring Rapid Demand Reduction**

In certain circumstances, Demand reduction at User Networks may not be adequate for relieving dangerous Transmission System conditions. In such circumstances:

- (a) the UFLS scheme may take over as described in OC4.6; or
- (b) the NCC may instruct block load shedding (for example, tripping of feeders and/or transformers at substations).

**(vii) Scheduling and Dispatch During Demand Control**

During Demand Control, Scheduling and Dispatch in accordance with the SDC may be suspended. The TSO should import as much power as possible through the Interconnectors to increase the security of the Transmission System before initiating the Demand Control exercise.

**OC4.8 IMPLEMENTATION OF CONSUMER DEMAND MANAGEMENT**

Where a Principal Consumer agrees in writing with the TSO to provide Demand Control, i.e. 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 NCC, then such Users may remain connected to the Transmission System when other Users are disconnected.

Such "Consumer Demand Management" could involve:

- (a) transferring of loads fed from the Transmission System to a busbar fed from its own back-up or standby Generating Units; or
- (b) disconnecting non-essential load on its Network.

**OC4.9 DEMAND RESTORATION**

When conditions permit, Demand restoration shall be initiated under instructions from the NCC. 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 with OC7.

## **Operating Code No. 5**

### **Operational Liaison**

#### **OC5.1 INTRODUCTION**

Operating Code No. 5 (OC5) sets out the requirements for the exchange of information in relation to the Operations and/or Events on the Transmission System or a User Network which have had or may have an Operational Effect on the Transmission System or other User Networks.

In order to maintain co-ordination of operation in the Power System, the NCC, Power Producers and DNSPs need to maintain communications and exchange information regarding the status of their respective systems during Normal Operations as well as during emergency situations. The procedures and requirements of this operational liaison are described in this section.

#### **OC5.2 OBJECTIVES**

The objectives of OC5 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 Transmission System and/or User Networks 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 NCC and each category of User; and
- (c) to detail the general procedures that will be established to authorize personnel who will initiate or carry out Operations on the User Networks.

#### **OC5.3 SCOPE**

OC5 applies to the TSO and Users which in OC5 are:

- (a) Transmission Network Service Provider;
- (b) Distribution Network Service Providers;

- (c) Power Producers with CDGUs;
- (d) All Power Producers with Generating Units connected to the Transmission Network not subject to Dispatch by the NCC, with total on-site generation capacity equal to or greater than 10 MW;
- (e) Principal Consumers; and
- (f) Interconnected Parties.

#### **OC5.4 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 Transmission System. Such Operation would typically involve some planned change of state of the Plant or Apparatus concerned, which the TSO requires to be informed of.

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

The term Operational Effect means any effect on the operation of the relevant Network which will or may cause the Transmission System or other User Networks 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**

Users shall inform the TSO of its nominated persons and/or contact locations and the communication channels to be used in accordance with the Connection Conditions (CC) and the provisions of OC5.

In general, all Users shall liaise with the TSO 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 TSO. As the nature and configuration of communication equipment required may vary between each category of User connected to the Transmission System, it will be necessary to clarify the requirements in the respective Connection Agreements.

Information between the TSO and the Users shall be exchanged following a reasonable request from either party.

In the case of an Operation or Event on the User Network which will have or may have an Operational Effect on the Transmission System or other User Networks, the User shall notify the NCC in accordance with OC5.6. The NCC 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 Transmission System which will have or may have an Operational Effect on any User Networks, the NCC 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 TSO 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 TSO or Users may be required under OC5 are:

- (a) Implementation of planned outage of Plant or Apparatus pursuant to OC2.
- (b) The operation of circuit breaker or isolator/disconnector.
- (c) Voltage control.

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

- (a) 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) Severe 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 inadvertent protection operation.

### **OC5.6.1 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 to 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, otherwise, 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.

### **OC5.6.2 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 possible 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 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 Transmission System has had or may have had a significant effect on the User Network or when an Event on the User Network has had or may have had a significant effect on the Transmission System or other User Networks, the Event shall be deemed a Significant Incident by the TSO in consultation with the User.

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

## **OC5.8 EXCHANGE OF INFORMATION**

### **OC5.8.1 With Interconnected Parties**

Knowledge of conditions in adjacent Systems is essential for good operation. Information should be transmitted to all parties associated with the operation of the interconnected System, to

provide them with the opportunity to correctly assess any situation, and give the appropriate operating instructions.

Meetings shall be held to discuss long-range plans and develop strategies for inter-area operation. Communication between "System Operators" within the interconnected Systems shall be through the Joint Power Coordination Centre. System Operators shall notify their counterpart of changes in their respective Systems such as:

- (a) System Plant and/or Apparatus operating near critical levels.
- (b) Abnormal voltage conditions or problems.
- (c) Changes or degradation in protection relays.
- (d) Changes in maintenance which may have an effect on interconnected operation.
- (e) Generation or transmission outages.
- (f) New facilities.
- (g) Changes in communication media or routes.
- (h) Severe weather.

#### **OC5.8.2 With Other Parties**

To ensure that communication networks are working properly and that timely exchange of information is taking place, specific procedures shall be implemented by the NCC between the communication centers of Power Producers, the TNSP, DNSPs and Interconnected Parties within the interconnected Power System. These procedures should identify what information is to be exchanged with a schedule and timescales associated with that exchange. However, any exchange of information between the Interconnected partners shall be through the NCC and/or the TSO.



## **Operating Code No. 6**

### **System Fault and Incident Reporting**

#### **OC6.1 INTRODUCTION**

Operating Code No. 6 (OC6) is to set out the requirements for reporting, in writing, those Events termed Significant Incidents which were initially reported verbally under OC5 and to fulfill any legal obligations or License condition 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 TSO and/or NCC.

#### **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 TSO of those Significant Incidents reported verbally under OC6.

#### **OC6.3 SCOPE**

OC6 applies to the TSO and Users which in OC6 are:

- (a) Transmission Network Service Provider;
- (b) Distribution Network Service Providers;
- (c) all Power Producers with CDGUs;
- (d) all Power Producers with Generating Units connected to the Transmission Network not subject to Dispatch by the NCC, with total on-site generation capacity equal to or greater than 10 MW;
- (e) Principal Consumers; and

- (f) Interconnected Parties.

#### **OC6.4 PROCEDURE FOR REPORTING SIGNIFICANT INCIDENTS**

The term "Significant Incident" is as defined in OC5.7.

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

- (a) Operation of Plant and/or Apparatus either manually or automatically.
- (b) Voltage outside statutory limits.
- (c) Frequency outside statutory limits.
- (d) System instability.

The TSO 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 TSO and User shall promptly inform each other in writing.

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

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

#### **OC6.5 SIGNIFICANT INCIDENT REPORT**

##### **OC6.5.1 Form of Report**

A report shall be in writing and contain:

- (a) confirmation of the notification given under OC5;
- (b) a more detailed explanation or statement relating to the Significant Incident from that provided in the notification given under OC5; 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 directly involved.
- (d) Brief description of Significant Incident under investigation and corrective actions if applicable.
- (e) Conclusions and recommendations of corrective actions if applicable.

Other details that may be required are:

- (a) MW Demand and/or MW generation interrupted and duration of interruption.
- (b) Generating Unit - Frequency response (MW correction achieved following the occurrence of the Significant Incident).
- (c) Generating Unit - Mvar performance (change in output following the occurrence of the Significant Incident).
- (d) Estimated time or actual time and date of return to service.

#### **OC6.5.2 Timing of Report**

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

In general, the NCC 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. A formal written report shall be submitted in line with OC6.5.1 within 3 Business Days.

If the Significant Incident occurred on the Transmission System, the NCC 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 requires more than 3 Business Days to report the occurrence of a Significant Incident, the User may request additional time from the TSO to carry out the relevant investigations.

## **OC6.6      PROCEDURE FOR JOINT INVESTIGATION**

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 ERC 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 10 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 Transmission System by the TSO in accordance with the principles and procedures set out in the Transmission 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 Transmission System will together produce unacceptable system operating conditions, such as frequency or transmission voltage deviations, outside the operational limits given in the Connection Conditions (CC).

Critical Incidents can be caused by natural events, such as storms, floods or earthquakes 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 NCC 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 TSO 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 Power System;
- (b) the separation into one or more Power Islands of the Transmission System with associated loss of synchronization due to the unexpected tripping of parts of the Transmission System; or
- (c) the voltage collapse of a transmission circuit or a transmission group.

#### **OC7.2 OBJECTIVES**

The primary objective of OC7 is to ensure that in the event of Power Island operation or a Total Blackout or Partial Blackout normal supplies are restored to all Consumers as quickly and as

safely as practicable in accordance with Prudent Utility Practice. It outlines the general restoration strategy which shall be adopted by the TSO in this event.

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

### **OC7.3 SCOPE**

OC7 applies to the TSO and Users which in OC7 are:

- (a) Transmission Network Service Provider;
- (b) Distribution Network Service Providers;
- (c) Power Producers with CDGUs;
- (d) Power Producers with Black Start sets;
- (e) Principal Consumers identified by the TSO who may be involved in the restoration or re-synchronization process; and
- (f) Interconnected Parties.

OC7 also applies to the TNSP in coordination with the TSO on Transmission System restoration or re-synchronization matters.

### **OC7.4 PROCEDURES**

Due to the distributed geographic positions of Generating Units, Interconnectors and Consumers in the Country, Power Islands can occur on the Transmission System at any time. Consequently it is necessary for the TSO to prepare a "Transmission 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 TSO's instructions will risk further disruptions to the Transmission System.

### **OC7.4.1 Transmission System Restoration Plan**

The "Transmission 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 Transmission 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-energizing of Demand blocks.

The generic tasks to be outlined in the Transmission System Restoration Plan are:

- (a) The re-establishment of full communications between parties.
- (b) The determination of the status of the post Critical Incident system including the status and condition of HV Apparatus and Plant.
- (c) Procedures to cover loss of communications during emergency conditions.
- (d) Instructions by the NCC to the relevant parties.
- (e) Mobilization and assignment of priorities to personnel.
- (f) Preparation of Power Stations and the Transmission System for systematic restoration.
- (g) Re-energization of Power Islands using Black Start Stations if necessary.
- (h) Re-synchronization of the various Power Islands to restore the interconnected Transmission System.
- (i) An audit of the Transmission System after restoration to ensure that the overall Transmission 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 Transmission System Restoration Plan will be developed and maintained by the TSO in consultation with the TNSP and other Users as appropriate. The TSO will issue the Transmission System Restoration Plan and subsequent revisions to Users and other relevant parties.

### **OC7.4.2 General Restoration Procedures**

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

In general the procedures to be followed are as outlined in OC7.4 and the Transmission System Restoration Plan, but where necessary the TSO can vary these procedures in real-time where, under System Stress conditions, the TSO in its reasonable opinion considers that such a change is required. Users and the TNSP are required to comply with the TSO's instructions, issued through the NCC unless to do so would endanger life or would cause damage to Plant or Apparatus on the User Network.

During Total Blackout or Partial Blackout and during restoration, the Transmission System may be operated outside the voltage and frequency range under Normal Operation. Scheduling and Dispatch in accordance with the SDC shall be suspended and re-implemented under the instructions of the NCC.

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

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

- (a) Data arriving at the NCC indicates a Transmission System split or the existence of a risk to Plant or Apparatus which requires that Plant or Apparatus be offloaded or shutdown which itself constitutes a Critical Incident.
- (b) Receiving 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 TSO with the TNSP and DNSP shall ensure that a systematic restoration process is conducted by energizing each Power Island in such a way as to avoid Load rejection by the CDGUs concerned. When energizing a substation that has "Gone Black", isolation of certain outgoing feeders at that substation may be necessary to prevent an excessive Load on CDGUs connected to that Power Island or the Transmission System as the case may be, upon re-energization. Where a Power Island has "Gone-Black", meaning that no CDGUs are operating to supply Consumer Demand, then the TSO may need to call on the services of Black Start Stations to re-establish voltage and frequency in that Power Island.



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

- (a) The NCC establishes its communication channels for the Power Island concerned.
- (b) The NCC sectionalizes the Transmission System into pre-determined Power Islands.
- (c) An "All Open Strategy" is adopted for 400 kV and 230 kV "Passive" circuits at transmission substations.
- (d) A "Selective Open Strategy" is adopted for 400 kV or 230 kV "Active" circuits at transmission substations.
- (e) A "Feeding Strategy" is adopted for the Black Start Power Stations.
- (f) A "Cross Feeding Strategy" is adopted for utilizing Black Start Power Stations to support the startup of other Power Stations in the same Power Island.
- (g) Power Producers utilizing wind generation shall be instructed by the NCC to disconnect from the Transmission System.
- (h) Special Consumers such as "heavy industrial systems" shall be instructed not to connect to the Transmission System.

#### **OC7.4.5 Re-energization and Demand restoration**

Re-energizing of transmission substations and Power Islands will involve the balancing of available generation Capacity to System Demand. It is the responsibility of the NCC 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 approach is not followed, this can result in load-rejection by a CDGU.

Re-energization procedures should address the following issues:

- (a) CDGU maximum Load pickup shall not be exceeded by the NCC.
- (b) Long transmission lines should be energized with shunt reactors in circuit to obtain maximum compensation.
- (c) Demand shall be predicted and also monitored in real time by the NCC and DNSPs to determine when additional transmission circuits can be re-energized.

Wherever practicable, High Priority Consumers such as hospitals, national and international airports shall have their Demand restored first. During restoration of Demand, the Transmission System frequency shall be monitored to maintain it above 49.5 Hz and the voltage maintained to prevent voltage collapse. Such a priority list, as contained in the Transmission System Restoration Plan shall be prepared on the basis of Consumer categories and the Power Islands by the TSO in consultation with the DNSP and be for the approval of the ERC.

When System conditions permit, Demand restoration will be initiated under the instructions of the NCC.

#### **OC7.4.6 Synchronization of Power Islands**

Once each Power Island is restored and the overall System conditions, including frequency and voltage permit, they shall be synchronized under the instructions of the NCC. The synchronizing points shall be established by the TSO.

The NCC and TNSP shall maintain full details of their responsibility for each Power Island that they are responsible for, which will be determined by the TSO.

#### **OC7.5 TRANSMISSION SYSTEM SPLIT DUE TO UNEXPECTED TRIPPING**

Where the Transmission System becomes split, it is important that any Power Islands that exist are re-synchronized as soon as practicable to the main Transmission System. 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 TSO 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 CC.

To assist this process, the TSO, through the NCC will prepare Demand data for each major transmission group on a weekly basis. This information will be updated annually. The NCC will prepare plans, for the TSO'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 Transmission System interconnection due to a shortage of Operating Reserve.

Where Power Islanding occurs under System Stress, then the NCC and DNSP should also have available "Rota Disconnection Plans" to avoid disconnected Consumers from being without

supplies for extended periods. If applicable, such plans produced pursuant to OC4 may be utilized.

Where from analysis the TSO considers that certain transmission groups are at risk of extended periods of load shedding, then the TSO shall:

- (a) submit details of these issues to the 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.

## **OC7.6 COMMUNICATION CHANNELS**

The TSO 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.

## **OC7.7 TRAINING AND TESTING**

### **OC7.7.1 Transmission System Restoration Plan Familiarization 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 Transmission 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 instructions issued by the TSO.

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

### **OC7.7.2 Transmission System Restoration Test**

The TSO shall in consultation with each User and TNSP on at least one occasion each year, carry out a "Transmission 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 co-operate with any such testing.

## **Operating Code No. 8**

### **Safety Coordination**

#### **OC8.1 INTRODUCTION**

Operating Code No. 8 (OC8) specifies the Safety Rules criteria to be applied by the TSO to meet its License conditions or other legal requirements. The Safety Rules contain principles and procedures to be adopted by the relevant party to ensure safe operation of the Transmission Network and safety of personnel working on the Network.

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

#### **OC8.2 OBJECTIVE**

The objectives of OC8 are to:

- (a) Establish the requirement on the TSO, TNSP and Users (or their contractors) to operate the Transmission Network or User Network respectively in accordance with approved safety regulations.
- (b) Ensure safe working conditions for personnel working on or in close proximity to Plant and Apparatus on the Transmission Network or personnel who may have to work at or use the equipment at the interface between the Transmission Network and a User Network.

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

#### **OC8.3 SCOPE**

OC8 applies to the TSO and Users which in OC8 are:

- (a) Distribution Network Service Providers;

- (b) Power Producers with CDGUs;
- (c) All Power Producers with Generating Units connected to the Transmission Network not subject to Dispatch by the TSO, with total on-site generation capacity equal to or greater than 5 MW;
- (d) Principal Consumers;
- (e) Interconnected Parties;
- (f) TNSP where safety coordination is required between the TNSP and another User;  
and
- (g) Any other party (such as contractors working in the vicinity of the Transmission Network ) as reasonably specified by the TSO.

Within OC8 on matters of safety, any User may consult the TSO concerning the required procedures under OC8.

#### **OC8.4 PROCEDURES**

OC8 does not seek to impose a particular set of Safety Rules on the TSO and Users. The Safety Rules to be adopted and used by the TSO and each User shall be those chosen by each party's management. Such Safety Rules and associated safety instructions shall comply with the relevant Electricity Law, as amended from time to time.

The TSO is responsible for the overall safety coordination on all works carried out on the Transmission Network and as such the NCC shall be the first point of contact for all Users intending to work at their respective Connection Points. The NCC would then coordinate with the TNSP or other Users where applicable. Furthermore, such information is required by the TSO in order to maintain the security and reliability of the Transmission System.

##### **OC8.4.1 Defined Terms**

Users should bear in mind that in OC8 only, in order that OC8 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 OC8. Users should, therefore, exercise caution in relation to this term when reading and using OC8.

In OC8 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 immobilizing 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 TNSP 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 TNSP 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:
- immobilized 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 NCC or that User as the case may be.
- (d) "Safety Precautions" for the purpose of the coordination of safety relating to HV Apparatus shall mean Isolation and/or Earthing.

### **OC8.4.2 Approval of Local Safety Instructions**

In accordance with the timing requirements of its Connection Agreement, each User will supply to the NCC 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 TSO 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 set of 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 in accordance to OC8.

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

### **OC8.4.3 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 NCC by Users.

Each Safety Coordinator shall be authorized by a User, as the case may be, as competent to carry out the functions set out in OC8 to achieve safety from the Transmission Network. Existing Users have 90 calendar days to so notify the NCC from the date of publication of the Transmission Code. Only persons with such authorization shall carry out the provisions of OC8.

Contact between Safety Coordinators and the NCC will be made via normal operational channels and accordingly separate telephone numbers for Safety Coordinators shall be provided to the NCC. At the time of making contact, each User will confirm to the NCC that they are authorized 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 NCC which 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 utilizing the "Record of Safety Precautions" ("ROSP") between Users through the NCC.

The NCC 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 TNSP or User is acting for the Requesting Safety Coordinator. Appendix B sets out "ROSP-I," which will be used when the NCC is acting for the Implementing Safety Coordinator. Pro-formas of ROSP-R and ROSP-I will be provided for use by the NCC.

The format used adopted by Users will 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-I 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-I 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 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 TNSP or NCC 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 NCC for its approval of its proposed prefix.
- (b) The NCC 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 25 calendar days), respond in writing to the User with its approval or disapproval.
- (c) If the NCC disapproves, it shall explain in its response why it has disapproved and will suggest an alternative prefix.
- (d) Where the NCC has disapproved, then the User shall either notify the NCC in writing of its acceptance of the suggested alternative prefix or it shall apply in writing to the NCC 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 NCC giving the details of the required work location and the requested Isolation point, where known. The NCC will contact the other User's Implementing Safety Coordinator, to agree the Safety Precautions carried out. This agreement will be recorded in the respective "Safety Logs".

A Safety Log is a chronological record of messages relating to safety coordination sent and received by each Safety Coordinator under this OC8.

It is the responsibility of the NCC 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 NCC is of the reasonable opinion that it is 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 In the Event of Disagreement**

In any case where the Requesting Safety Coordinator and/or the Implementing Safety Coordinator are unable to agree with the NCC 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 Transmission Network 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 shall, on the instructions of the NCC, 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 immobilizing 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 TNSP 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 TNSP 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:
- immobilized 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 TNSP 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-I forms.

Where Safety Procedures are being provided to enable work to be carried out on both sides of the Connection Point, 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-I form being completed by each User, with each Safety Coordinator issuing one ROSP number and advising the NCC accordingly.

Once the Safety Precautions have been established, the Implementing Safety Coordinator shall complete parts 1.1 and 1.2 of a ROSP-I form recording the details specified in OC8.5.3 and OC8.5.4. Where Earthing has not been requested, 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-I form.

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

The Requesting Safety Coordinator is then free to authorize 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-I forms 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 forming part of the Safety Precautions as part of the returning of the HV Apparatus to service until it is confirmed 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.

## **OC8.7      ROSP CHANGE CONTROL**

Nothing in OC8 prevents the NCC, TNSP 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 Transmission Code deals.

## **OC8.8      TESTING AFFECTING ANOTHER SAFETY COORDINATOR'S NETWORK**

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 authorize 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 authorized 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 authorized until the proposed test has been completed (or cancelled) and the Requesting Safety Coordinator has through the NCC 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 Coordinator must agree through the NCC 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 NCC 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 NCC 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**

In 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 NCC without delay of this fact, and if requested, the reasons why.

**OC8.9 SAFETY LOGS**

The NCC, TNSP 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.

**OC8 - APPENDIX A**

ROSP NUMBER \_\_\_\_\_ CONTROL CENTRE/SITE \_\_\_\_\_

**RECORD OF SAFETY PRECAUTIONS (ROSP-R)****(Requesting Safety Coordinator's Record)****PART R1****R1.1 HV APPARATUS IDENTIFICATION**

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

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Further Safety precautions required on the Requesting Safety Coordinator's Network as notified by the Implementing Safety Coordinator.

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**R1.2 SAFETY PRECAUTIONS ESTABLISHED****(a) ISOLATION**

State the Location(s) at which Isolation has been established (whether on the Implementing Safety Coordinator's Network or on the Network of another User connected to the Implementing Safety Coordinator'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.

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**(b) EARTHING**

State the Location(s) at which Earthing has been established (whether on the Implementing Safety Coordinator'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.

\_\_\_\_\_

\_\_\_\_\_

**R1.3 ISSUE**

I have received confirmation from \_\_\_\_\_ ( name of the Implementing Safety Coordinator) 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 Coordinator)

at \_\_\_\_\_ (time) on \_\_\_\_\_ (Date)

**PART R2****R2.1 CANCELLATION**

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

Signed \_\_\_\_\_ (Requesting Safety Coordinator)

at \_\_\_\_\_ (time) on \_\_\_\_\_ (Date)

**OC8 - APPENDIX B**

ROSP NUMBER \_\_\_\_\_ CONTROL CENTRE/SITE \_\_\_\_\_

**RECORD OF SAFETY PRECAUTIONS (ROSP-I)****(Implementing Safety Coordinator's Record)****PART I1****I1.1 HV APPARATUS IDENTIFICATION**

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

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Recording of notification given to the Requesting Safety Coordinator concerning further Safety Precautions required on the Requesting Safety Coordinators Network.

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**I1.2 SAFETY PRECAUTIONS ESTABLISHED****(a) ISOLATION**

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

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**(b) EARTHING**

State the Location(s) at which Earthing has been established (whether on the Implementing Safety Coordinators 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, immobilized and locked, other safety procedures applied, as appropriate.

\_\_\_\_\_

\_\_\_\_\_

**I1.3 ISSUE**

I have received confirmation from \_\_\_\_\_ (name of the Requesting Safety Coordinator) 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 \_\_\_\_\_ (Implementing Safety Coordinator)

at \_\_\_\_\_ (time) on \_\_\_\_\_ (Date)

**PART I2****I2.1 CANCELLATION**

I have confirmed to \_\_\_\_\_ (name of the Requesting Safety Coordinator) that the Safety Precautions set out in paragraph 1.2 are no longer required and accordingly this ROSP is cancelled.

Signed \_\_\_\_\_ (Implementing Safety Coordinator)

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 OBJECTIVE**

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 TSO, to reduce any risk of error that might affect site and personnel safety.

#### **OC9.3 SCOPE**

OC9 applies to the TSO and Users which in OC9 are:

- (a) Transmission Network Service Provider;
- (b) Distribution Network Service Providers;
- (c) All Power Producers with CDGUs;
- (d) All Power Producers with Generating Units connected to the Transmission Network not subject to Dispatch by the TSO, with total on-site generation capacity equal to or greater than 10 MW;
- (e) Principal Consumers; and
- (f) Interconnected Parties.

#### **OC9.4 PROCEDURES FOR NUMBERING AND NOMENCLATURE**

The User shall propose details of the numbering and nomenclature to be applied at the relevant Connection Point for the approval of the TSO.

The User will be responsible for the provision and erection of clear, weather proof 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 by the TSO.

#### **OC9.4.1 New Plant and Apparatus**

When a 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 by that User to the TSO and to other affected Users.

The notification shall be made in writing to the TSO and affected Users and will consist of the latest revision of the Operational Diagram pursuant to the 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 owners involved.

This notification shall be made by the User to the other affected Users at least 90 calendar days (or such shorter period as TSO may agree) in advance prior to the installation of the proposed Plant and Apparatus. The affected User 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 owners, the TSO, acting reasonably, shall determine the appropriate numbering and nomenclature.

#### **OC9.4.2 Existing Plant and Apparatus**

When the TSO or a 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 affected Users.

The notification shall be made in writing to the affected Users 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 affected Users shall respond within 30 calendar days upon receipt of this notification. In the event that an agreement cannot be reached between the Users, the TSO, acting reasonably, shall determine the appropriate numbering and nomenclature if this change is deemed necessary by the TSO.

## **Operating Code No. 10**

### **Testing and Monitoring**

#### **OC10.1 INTRODUCTION**

To ensure that the Transmission System is operated efficiently to network planning standards and to meet legal requirements, the TSO may organize and carry out testing and/or monitoring of the effect of a User's Network on the Transmission 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 TSO in the PC and CC.

Operating Code No. 10 (OC10) specifies the procedures to be followed by the TSO in coordinating and the TNSP 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 SDC1.
- (c) Testing carried out on CDGUs to ensure that the CDGUs are available in accordance with their Availability declaration, under the Scheduling and Dispatch Code (SDC) 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.
- (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 OBJECTIVE**

The objectives of OC10 are:

- (a) To specify the TSO's requirements to test and/or monitor the Transmission System or User's Network 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 TNSP can provide those Ancillary Services which they are either required or have agreed to provide.
- (e) To enable the TSO to comply with its License conditions and other legal requirements.

### **OC10.3 SCOPE**

OC10 applies to the TSO, Buyer and Users which in OC10 are;

- (a) Transmission Network Service Provider;
- (b) Distribution Network Service Providers;
- (c) All Power Producers with Generating Units connected to the Transmission Network;
- (d) All Power Producers with Embedded Generation, with total on-site generation capacity equal to or greater than 10 MW;
- (e) Principal Consumers; and
- (f) Interconnected Parties.

The TNSP may act on behalf of the TSO in carrying out the relevant testing and/or monitoring on User Networks.

### **OC10.4 PROCEDURES RELATING TO QUALITY OF SUPPLY**

The TSO and/or Buyer may from time to time determine the need to test and/or monitor the quality of supply at various points on its Transmission System.

The requirement for specific testing and/or monitoring may be initiated by the TSO on receipt of complaints by a User as to the quality of supply on its Transmission System or by the TSO where in the reasonable opinion of the TSO, such tests are necessary.

In certain situations, the TSO may require the testing and/or monitoring to take place at the point of connection of a User with the Transmission System. This may require the User to allow the TSO 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 Network where the TSO deems necessary; such right to be exercised reasonably following a written notice to the User.

After such testing and/or monitoring has taken place, the TSO will advise the User involved in writing within 90 calendar days 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 Transmission Code, the User will be informed accordingly in writing.

The TSO shall agree with the User a suitable timeframe to resolve those problems on its User Network, failing to do so may lead to the de-energization of the User Network as indicated in the terms of the Connection Agreement.

#### **OC10.5 PROCEDURE RELATING TO CONNECTION POINT PARAMETERS**

The TSO from time to time may monitor the effect of the User Network on the Transmission System.

This monitoring will normally be related to the amount of Active Power and/or Reactive Power swing or voltage flicker and any harmonics generated by the User Network and transferred across the Connection Point.

The TSO 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**

The TSO will monitor on behalf of the Buyer the performance of:



- (a) CDGUs against the parameters registered as Generation Scheduling and Dispatch parameters under SDC1 and other appropriate agreements.
- (b) Compliance by Power Producers with the PC and CC.
- (c) The provision by Power Producers of Ancillary Services which they are required or have agreed to provide.

In the event that a CDGU fails persistently, in the TSO's reasonable view, to meet the parameters registered as Generating Unit Scheduling and Dispatch parameters under SDC1 or a Power Producer fails persistently to comply with the PC, CC and in the case of response to frequency, SDC3 or to provide the Ancillary Services it is required, or has agreed to provide, the TSO or TNSP shall notify the relevant User giving details of the failure and of the monitoring that the TSO or TNSP has carried out.

The relevant User shall, as soon as possible, provide the TSO or TNSP, 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 TNSP 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 TSO 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 10 calendar days of notification of the failure by the TSO to the Power Producer, the TSO 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 TSO will notify a Power Producer with CDGUs that it proposes to carry out any relevant tests at least 48 hours prior to the time of the proposed test. The TSO will only make such a notification if the relevant Power Producer has declared the relevant CDGU available in an Availability declaration in accordance with the SDC at the time at which the notification is issued. If the TSO 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 Transmission 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 TSO under the SDC which shall meet the requirements set out in the PC and 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 minutes during which period the Transmission 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 TSO or TNSP, and the GDGU will pass the test if it is within  $\pm 2.5\%$  of the capability registered under the PC which shall meet the requirements set out in the CC (with due account being taken of any conditions on the Transmission System which may affect the results of the test). The relevant Power Producer must, if requested, demonstrate, to the TSO or TNSP's reasonable satisfaction, the reliability and accuracy of the equipment used in recording the performance.

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 out 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 TSO or TNSP, as appropriate, and the CDGU will pass the test if the Generation Scheduling and Dispatch parameter(s) under test are within  $\pm 2.5\%$  of the declared value being tested unless the following

Generation Scheduling and Dispatch parameters are being tested, in which case the CD Genset will pass the test if:

- (a) in the case of achieving Synchronization, Synchronization is achieved with  $\pm 5$  minutes of the time it should have achieved Synchronization;
- (b) in the case of Synchronizing and Loading, the Loading achieved is within an error level equivalent to  $\pm 2.5\%$  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  $\pm 3$  minutes of the time it should have reached such output and breakpoint(s) from Synchronization calculated from its contracted run-up rates; or
- (d) in the case of meeting Deloading rates, if the CDGU achieves Deloading within  $\pm 5$  minutes of the time, calculated from registered Deloading rates.

Due account will be taken of any conditions on the Transmission System which may affect the results of the test. The relevant Power Producer must, if requested, demonstrate, to the TSO or TNSP's reasonable satisfaction, the reliability and accuracy of the equipment used during the tests.

### **OC10.7.3 Availability Declaration Testing**

The TNSP may at any time, following the instructions from the TSO, 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 TSO. 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 Transmission 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 TSO or TNSP relating to the Availability Test.

The TSO, after consulting with the TNSP, 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 SDC and in compliance with the PC and CC.

The performance of the CDGU will be recorded by the TNSP 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 Transmission System frequency and other parameters deemed necessary by the TSO or TNSP 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 Transmission System has been carried out, the measured response in MW/Hz is within  $\pm 2.5\%$  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 TSO; and
- (c) where monitoring of the "limited high frequency response" to frequency change on the Transmission System has been carried out, the measured response is within the requirements of the SDC 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 TSO or TNSP with reasonable satisfaction the reliability of any equipment used in the test.

#### **OC10.7.5 Black Start Testing**

The TSO may require a Power Producer with a Black Start Station to carry out a test ("Black Start Test") on a CDGU 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 Test") in order to demonstrate that a Black Start Station has a Black Start capability.

Where the TSO requires a Power Producer with a Black Start Station to carry out a BS Generating Unit Test, the TSO or TNSP 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.

All Black Start Tests shall be carried out at the time specified by the TSO or TNSP and shall be undertaken in a manner approved by the TSO or TNSP.

**(i) BS Generating Unit Test**

Where local conditions require variations in this procedure the Power Producer shall submit alternative proposals, in writing, for the TNSP's or TSO'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 Synchronized and Loaded.
- (b) All the auxiliary gas turbines and/or auxiliary diesel engines in the Black Start Station in which that BSGU is situated, shall be shut down.
- (c) The BSGU shall be de-Loaded and de-Synchronized 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-energize 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.
- (f) The relevant BSGU shall be Synchronized to the Transmission System but not Loaded, unless the appropriate instruction has been given by the TSO or TNSP 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 (i.e. BSGU) and all the auxiliary gas turbines and/or auxiliary diesel engines at the Black Start Station, shall be shut down.

- (b) The relevant BSGU shall be Synchronized and Loaded.
- (c) The relevant BSGU shall be de-Loaded and de-synchronized.
- (d) All external alternating current electrical supplies to the unit board of the relevant BSGU 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-energize either directly, or via the station board, or the unit board of the relevant BSGU.
- (f) The provisions of (e) and (f) in section (i) above shall thereafter be followed.

#### **OC10.7.6 Failure of Test**

If the CDGU concerned fails to pass the test the Power Producer must provide the TSO or TNSP, 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 calendar days of the test. If a dispute arises relating to the failure, the TSO or TNSP, 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 TSO or TNSP to carry out a re-test after a 48 hours notice. This 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 Transmission Code dispute resolution procedure, contained in the General Conditions, for a ruling in relation to the dispute, which ruling shall be binding. The 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 calendar days submit in writing to the TSO or TNSP, 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 SDC and would pass the test. The TSO or TNSP, 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.

## **Operating Code No. 11**

### **System Tests**

#### **OC11.1 INTRODUCTION**

Operating Code No. 11 (OC11) sets out the responsibilities and procedures for arranging and carrying out "System Tests" which have or may have a significant impact upon the Transmission 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 Transmission System or User Networks. In addition it includes commissioning and/or acceptance tests on Plant and Apparatus to be carried out by the TSO or by Users which may have a significant impact upon the Transmission System, other User Networks or the wider System.

To minimize disruption to the operation of the Transmission System and to other User Networks, it is necessary that these tests be subjected to central coordination and control by the TSO through the NCC.

Testing of a minor nature carried out on isolated Systems or those carried out by the TSO or TNSP in order to assess compliance of Users with their design, operating and connection requirements as specified in this Transmission Code and in their Connection Agreement are covered by OC10.

#### **OC11.2 OBJECTIVE**

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 minimize the possibility of damage to Plant and/or Apparatus and/or the security of the Transmission System supply or overall System.
- (b) Set out procedures to be followed for the establishment and reporting of System Tests.

**OC11.3 SCOPE**

OC11 applies to the TSO and Users which in OC11 are:

- (a) Transmission Network Service Provider;
- (b) Distribution Network Service Providers;
- (c) All Power Producers with CDGUs;
- (d) All Power Producers with Generating Units connected to the Transmission Network not subject to Dispatch by the TSO, with total on-site generation capacity equal to or greater than 10 MW;
- (e) Principal Consumers; and
- (f) Interconnected Parties.

**OC11.4 PROCEDURE FOR ARRANGING SYSTEM TESTS**

System Tests which are reasonably expected to have a "minimal effect" upon the Transmission System, User Networks 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 the CC.

**OC11.4.1 Test Proposal Notice**

The level of Demand on the Transmission 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 Transmission 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 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 TSO 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.
- (b) Var limiter tests.
- (c) Main steam valve tests.
- (d) Load rejection tests.
- (e) On-Load protection testing.

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 TSO wishes to undertake a System Test, the TSO shall be deemed to have received a proposal of that test through procedures internal to the TSO and shall itself then comply with OC11.4.1.

The TSO 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, may be affected by this test.

#### **OC11.4.2 Test Panel**

Following receipt of the Test Proposal Notice, the TSO 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 TSO shall form a "Test Panel" which shall be headed by a suitably qualified person referred to as the "Test Coordinator" appointed by the TSO.

The Test Panel may also be composed 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 TSO, 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 arbitration provisions of the relevant agreements shall apply.
- (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 TSO) 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 TSO 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 TSO. 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 TSO and copied to the Buyer where appropriate. The results of the tests shall be provided to the relevant parties by the TSO 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 NCC of the Availability of any of their CDGU in an Availability Notice;
- (b) the daily notification to the NCC of whether there is any CDGU which differs from the last Generating Unit's Scheduling and Dispatch Parameters (SDP), in respect of the following Schedule Day by each Power Producer in a SDP Notice;
- (c) the weekly notification of Power export availability or import requests and price information by Interconnected Parties to the Buyer;
- (d) the submission of certain Network data to the NCC, 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 NCC, as applicable by each Distribution Network Service Provider (DNSP) 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, TNSP and Users to the NCC of Demand Control information (in accordance with OC4);
- (g) the production by the Buyer of a Merit Order for use by the TSO in the production of the Schedule;
- (h) the production by the TSO of the Schedule, to include agreement between the TSO and the Buyer of the Schedule and the Transfer Levels, and subsequent issue by the TSO of an "Indicative Running Notification" (IRN) on a weekly basis as a statement of which CDGU may be required with any amendments to this IRN being delivered on a daily basis; and

- (i) agreement on Power and Energy flows between Syria and Interconnected Parties by the TSO following discussions with the Buyer.

### **SDC1.2 OBJECTIVE**

To enable the Buyer and TSO to prepare a schedule based on a least cost dispatch model (or models) which, amongst other things, models variable costs, power purchase agreements, fuel take-or-pay costs and is used in the Scheduling and Dispatch process and thereby ensures:

- (a) the integrity of the interconnected Transmission Network;
- (b) the security and quality of supply;
- (c) that there is sufficient available generating Capacity to meet 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) optimize the total cost of Power System operation;
- (f) optimum the use of generating and transmission capacities; and
- (g) to maintain sufficient fuel stocks and to meet fuel-contract minimum-take by the end of the calendar year and in accordance with monthly, weekly and daily nominations.

This Schedule will contain 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.

### **SDC1.3 SCOPE**

SDC1 applies to the Buyer, TSO and to Users which in SDC1 are:

- (a) Power Producers with a CDGU;
- (b) Power Producers with Black Start (BS) Generating Units or BS Power Stations;
- (c) Interconnected Parties;
- (d) Consumers who can provide Demand Control in real time;

- (e) The Transmission Network Service Provider (TNSP);
- (f) Distribution Network Service Providers (DNSPs);
- (g) Consumers with HV Networks to which Generating Units are connected; and
- (h) Principal Consumers who can provide Demand Control in real time.

## **SDC1.4 PROCEDURE**

### **SDC1.4.1 Preparation of the Week Ahead Plan**

At the week ahead stage, a Merit Order will be prepared by the Buyer and an "Energy Balance Statement", which will be compiled to illustrate the fuel 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 TSO, where appropriate, to determine the running hours of CDGUs.

Using the Merit Order and Energy Balance Statement obtained from the Buyer, a preliminary Schedule will be compiled by the TSO.

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 TSO and will show how the CDGUs are proposed to be Dispatched and loaded at the morning and evening 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 TSO, in accordance with the Buyer's 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 Sunday 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 Buyer once a week for the week commencing on the following Sunday from the submitted CDGU information (such as generation tariffs, fuel-take or pay data, cost of purchase from Interconnected Parties and Availability declarations made in a week ahead Availability Notice).

In compiling the Merit Order and Energy Balance Statement, the Buyer will take account of and give due weight to the factors listed below (where applicable):

- (a) Availability of a CDGU as declared in a week ahead Availability Notice.
- (b) Thermal optimisation, including any operational restrictions or Generating Unit operational inflexibility.
- (c) Minimum and maximum fuel-take for thermal CDGU (to be optimised where necessary by the TSO).
- (d) Start-up price of each thermal-CDGU.
- (e) Availability of Capacity and Energy from Interconnected Parties.
- (f) Requirements by the Competent Authorities Government of Syria to prioritize use of certain fuels and water resources.

After the completion of the Merit Order and Energy Balance process, the Merit Order and Energy Balance Statement shall be submitted to the TSO by 10:00 hours Tuesday (Week 0) in respect to Week 1.

## **(ii) Unconstrained Schedule**

The TSO 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 Power 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 TSO for voltage control and Mvar reserves.
- (b) In respect of a CDGU the MW values registered in the current Scheduling and Dispatch Parameters (SDP).
- (c) The need to provide an Operating Reserve, as specified in OC3.

- (d) CDGU stability, as determined by the TSO following advice from the Power Producer and registered in the SDP.
- (e) The requirements for maintaining frequency and transfer 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 TSO'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 Buyer).

**(iii) Constrained Schedule**

From the Unconstrained Schedule, the TSO will prepare a "Constrained Schedule", which will optimize overall operating costs and maintain a prudent level of Power System security, in accordance with Prudent Utility Practice.

The Constrained Schedule shall take into account of:

- (a) Transmission 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 TSO under OC7 for the possible islanding of the Power System that require additional Generating Units to be Synchronised as a contingency action.
- (e) Any stability issues created by intermittent generation such as wind-generation that require such Generating Units to be constrained off.

The optimized Constrained Schedule will then be notified for information to the Buyer by 10:00 hours Wednesday of Week 0 for final verification and issue of the Indicative Running Notifications for Week 1 to the Power Producers by 10:00 hours Thursday of Week 0. The Constrained Schedule, with a no-objection from the Buyer, shall form the basis of the "Final Schedule" that now follows.

**(iv) Final Schedule**

Before the issue of the Indicative Running Notifications, the TSO 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 NCC after the commencement of the Scheduling process.
- (b) Changes to the TSO's Demand forecasts (for example due to unexpected weather).
- (c) Changes to the Transmission 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 TSO of the changes in capability of a Generating Unit to provide additional services as described in SDC2.
- (e) Changes to any conditions that in the reasonable opinion of the TSO could impose increased risk to the Power System and could therefore require an increase in the Operating Reserve.
- (f) Known or emerging limitations and/or deficiencies of the Scheduling process.

**SDC1.4.2 Content and Issue 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.

The TSO, through the NCC will, using all reasonable endeavours, issue a weekly Indicative Running Notification by email, internet posting, electronically or fax to Power Producers with CDGUs by 10:00 hours each Thursday of Week 0 for the week ahead of Week 1 based on the Final Schedule.

The Indicative Running Notification received by each Power Producer with a CDGU shall contain information relating to its CDGU only.



**SDC1.4.3 Weekly Notification by Power Producers**

Appendix A and Appendix B to this SDC1 sets out the data to be supplied by a Power Producer with a CDGU to the NCC in respect of each of its CDGUs by not later than the Notice Submission Time of 10:00 hours on the Monday of Week 0 in respect to Week 1.

**SDC1.4.4 Day Ahead Amended Availability Notice**

Each Power Producer shall, by no later than 10:00 hours each day, notify the NCC of any changes anticipated in respect of the Availability declared in the week ahead Availability Notice of each of its CDGUs, by means of an "Amended Availability Notice", in the form set out in Appendix D to this SDC1.

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 MW stated in the Amended Availability Notice must be to zero 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 NCC 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 15 degrees Celsius. The Power Producer shall specify a "Temperature Correction Factor" to the NCC to enable corrections to be made according to actual temperature.

In relation to a CDGU with a take-or-pay contract, a minimum MWhr Take (for the Schedule Day) shall be submitted, by Notice Submission Time, in the form set out in Appendix B to this SDC1.

**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 Buyer.

The Power Producer shall use reasonable endeavours to ensure that it does not at any time declare by issuing to the NCC or allowing to remain outstanding an Amended Availability Notice or a SDP Notice which declares the Availability or SDP of a CDGU at levels or values different from those that the CDGU could currently achieve.

A Power Producer must inform the NCC as soon as it becomes aware that any of its CDGU are unable to meet the Spinning Reserve capability previously notified to the NCC. Such notification must be made by submitting a SDP Notice in the form given in Appendix A of this SDC1. The NCC will, without delay, notify the TSO of any such information.

When a revised Amended Availability Notice comes into effect for a synchronized CDGU then any increase or decrease in Generating Units Load, as the case may be, will be undertaken at the Loading or Deloading rate specified in the Generating Unit's latest SDP 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 synchronized to the Power System at that specified time.

If at any time when a CDGU is synchronized to the Power 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**

The weekly data requirements are summarized as follows:

Sunday	Monday	Tuesday	Wednesday	Thursday	Sunday
Week 0 <b>SD1</b>	Week 0 <b>SD2</b>	Week 0 <b>SD3</b>	Week 0 <b>SD4</b>	Week 0 <b>SD5</b>	Week 1 <b>SD1</b>
Power Producers prepare SDP and Availability Notices	TSO receives SDP and Availability Notices by 10:00 hours	Buyer issues Merit Order to TSO	TSO prepares a Constrained Schedule and discusses with Buyer	TSO issues IRN	TSO issues Dispatch instructions

In this SDC1, Week 0 means the current week at any time, Week 1 means the next week at any time and Week 2 means the week after Week 1.

**(i) Generating Units Scheduling and Dispatch Parameters (SDPs)**

The weekly Availability, cost information, and revisions to SDPs for a CDGU in respect of the week beginning on the Schedule Day commencing on Sunday (Week 1 SD1) shall be submitted by the Power Producer by the Notice Submission Time of 10:00 hours Monday (Week 0 SD2). 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 Monday (Week 0 SD2), each Power Producer shall in respect of each CDGU submit to the NCC any revision to the Generating Units parameter for such CDGU to apply throughout the next following week beginning on the Schedule Day falling on the following Sunday (Week 1 SD1).
- (b) By not later than the Notice Submission Time of 10:00 hours Monday (Week 0 SD2), each Power Producer shall in respect of each thermal-CDGU submit to the NCC any revisions to fuel stocks to apply throughout the next following week beginning on the Schedule Day falling on the following Sunday (Week 1 SD1).

**SDC1.4.7 Generating Station Works Consumption**

Once per week each Power Producer shall, in respect of each of its Power Stations, submit in writing to the NCC 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 week.)

**SDC1.5 USER NETWORK DATA****(i) Week Ahead Notice**

To enable the TSO to prepare the Constrained Schedule it is necessary for all Users with HV Networks (including the TNSP and DNSPs) to provide data on any changes to its Network that, in the TSO'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 Monday (Week 0 SD2), each User with a HV Network will submit to the NCC in writing, confirmation of the following in respect of the next availability period (Week 1 SD1 to SD7):

- (a) Constraints on a User's Network, which restrict in any way the operation of a CDGU, which the TSO may need to take into account in preparing the Constrained Schedule.
- (b) User requirements for voltage control and MVar, which the NCC may need to take into account for Power System security reasons.
- (c) Any work or tests that involve protection systems with a risk of inadvertent tripping of a CDGU or a CDGU being constrained.

At any time between the Notice Submission Time of 10:00 hours Monday (Week 0 SD2) and 10:00 hours on Thursday (Week 0 SD5), each User with a HV Network must submit to the NCC in writing any revisions to the information submitted under SDC1.5 or under a previous submission under this SDC1.5.



**SDC1-APPENDIX A**  
**PUBLIC ESTABLISHMENT FOR TRANSMISSION OF ELECTRICITY**  
**NATIONAL CONTROL CENTER**

**GENERATION SCHEDULING AND DISPATCH PARAMETERS**

DATE:

DAY:

TIME:

Power Station	
Unit No.	
Expected Synchronizing Time	
Loading (Dispatch) Time	
Min. Load MW/MVAR	
Max. Load MW/MVAR	
Raise Rate MW/Min.	
Lower Rate MW/Min.	
Spinning Reserve	
Expected time to be Full Load	
For each CDGU with a fuel take or pay agreement:	
Min. Take (MWhr) per Schedule Day	
Max. Take (MWhr) per Schedule Day	

Signature:



**SDC1-APPENDIX B**  
**PUBLIC ESTABLISHMENT FOR TRANSMISSION OF ELECTRICITY**  
**NATIONAL CONTROL CENTER**  
**WEEKLY AVAILABILITY NOTIFICATION**

Date:

Day:

Time:

Power Station	Unit	Fuel Type	Available	Not Available				Reduction in Availability	Cause
				From		To			
				Time	Date	Time	Date		

Signature:



**SDC1-APPENDIX C**  
**PUBLIC ESTABLISHMENT FOR TRANSMISSION OF ELECTRICITY**  
**NATIONAL CONTROL CENTER**

**GENERATION SCHEDULING AND DISPATCH PARAMETERS**  
**REVISION NOTICE**

DATE:

DAY:

TIME:

Power Station	
Unit No.	
Availability MW	
Spinning Reserve MW	
Contracted Price SYP/MWH	
Reason In Case Of Changing The Price	

Signature :



**SDC1-APPENDIX D**  
**PUBLIC ESTABLISHMENT FOR TRANSMISSION OF ELECTRICITY**  
**NATIONAL CONTROL CENTER**

**NOTIFICATION OF REVISED AVAILILTY**

<b>Date</b>	
<b>Day</b>	
<b>Time</b>	
<b>Power Station</b>	
<b>Unit No.</b>	
<b>Type Of Fuel</b>	
<b>Availability</b>	
<b>Type Of Outage/ Maintenance</b>	<b>Scheduled, Emergency, Unscheduled</b>
<b>Duration</b>	
<b>Cause</b>	
<b>Start Time</b>	
<b>End Time</b>	
<b>Decrease In Availability</b>	

**Signature :**





**SDC1 -APPENDIX E**  
**PUBLIC ESTABLISHMENT FOR TRANSMISSION OF ELECTRICITY**  
**NATIONAL CONTROL CENTER**

**FUEL STOCK AT THERMAL POWER STATION**

<b>Date</b>	
<b>Day</b>	
<b>Time</b>	
<b>Power Station</b>	
<b>Storage Fuel Quantity (Ton)</b>	
<b>Average Daily Consumed Quantity (Ton\Day)</b>	
<b>Actual Consumed Quantity (Ton)</b>	
<b>Remaining Fuel Quantity (Ton)</b>	

**Signature :**



## SDC1-APPENDIX F

### PUBLIC ESTABLISHMENT FOR TRANSMISSION OF ELECTRICITY

### NATIONAL CONTROL CENTER

### WATER SUPPLY (HYDRO POWER STATIONS)

Date	
Day	
Time	
Power Station	
Water Level ( m )	
Average Daily Consumed Quantity ( m <sup>3</sup> \ Day)	
Actual Consumed Quantity (m <sup>3</sup> )	
Remaining Water level (m)	

Signature :

## **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 NCC to issue Dispatch instructions to Power Producers in respect of their CDGUs.
- (b) The procedure for the Buyer to coordinate and manage trading with Interconnected Parties.
- (c) The procedure for optimization of overall Power System operations by the TSO for the Scheduled Day.

#### **SDC2.2 OBJECTIVE**

The procedure for the issue of Dispatch instructions to Power Producers by the TSO through its NCC is intended to enable (as far as possible) the NCC to continuously meet the Power System Demand utilizing the Merit Order derived from SDC1, with an appropriate margin of reserve, whilst maintaining the integrity of the Power System together with the necessary security and quality of supply. It is also intended to allow the NCC to maintain a coordinating role over the System as a whole, maximizing System security on the 400 kV, 230 kV and 66 kV Networks, while optimizing generation costs to meet Power System Demand.

#### **SDC2.3 SCOPE**

SDC2 applies to the Buyer, TSO, and to all Users which in SDC2 are:

- (a) Power Producers having Centrally Dispatched Generating Units (CDGUs);
- (b) Interconnected Parties;
- (c) TNSP;
- (d) DNSPs; and

- (e) Principal Consumers who can provide Demand Control in real time.

## **SDC2.4 PROCEDURE**

### **SDC2.4.1 Information Used**

The information which the Buyer, and TSO shall use in assessing weekly or daily, as appropriate, which CDGU to Dispatch will be the Availability Notice, the Merit Order as derived under SDC1 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 NCC by the Power Producers, and to the 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 TSO in compiling the schedules under SDC1.

Additional factors that the TSO 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 Buyer for an increase or decrease in Transfer Level.
- (e) Requests from the Buyer for a change to the operation of a specific CDGU.
- (f) Changes in the required level of Operating Reserve, as defined by the TSO.
- (g) System faults.
- (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 TSO being unable to differentiate on the basis of the factors identified in SDC1, then the TSO will first select for Dispatch the one which is in the TSO's reasonable judgement the most appropriate at that time within the philosophy of this Transmission Code.

#### **SDC2.4.2 Re-Optimization of the Constrained Schedule**

The TSO will run Dispatch software to re-optimize the Constrained Schedule when, in its reasonable judgement, a need arises. It is therefore essential that Users keep the NCC informed of any changes in Availability or changes in SDP, when they occur. It is also essential that the Users keep the NCC informed of any Power Station or Network changes or deviations from their ability to meet their Transfer Level.

### **SDC2.5 DISPATCH INSTRUCTIONS**

#### **SDC2.5.1 Introduction**

Dispatch instructions relating to the Scheduled Day can be issued by the NCC at any time during the period beginning immediately after the issue of the Indicative Running Notification in respect of that Scheduled Day. The NCC may, however, issue Dispatch instructions in relation to a CDGU prior to the issue of an Indicative Running Notification containing that Generating Unit.

The NCC will make available the latest Indicative Running Notification to the Power Producers as soon as is reasonably practicable after any re-optimization of the Constrained Schedule.

The NCC Dispatcher will issue Dispatch instructions directly to the Power Station's "Responsible Shift Engineer" for the Dispatch of each CDGU. On agreement with the TSO, the NCC'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 SDP.

The TSO will use all reasonable endeavours to meet the Transfer Level requested by the Buyer.

#### **SDC2.5.2 Scope of Dispatch Instructions for CDGUs**

In addition to instructions relating to the Dispatch of Active Power, Dispatch instructions, unless otherwise instructed by the NCC 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 Synchronize.
- (b) Provision of Operating 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'.
- (l) Details of adverse conditions, such as bad weather.

### **SDC2.5.3 Form of Instruction**

Dispatch instructions will be given electronically from the NCC where possible. Instructions will require formal acknowledgement by the Power Producer and electronic recording at NCC.

Other instructions will be given by telephone or fax and will require similar acknowledgement from the Power Producer.

### **SDC2.5.4 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 NCC.
- (b) Each Power Producer must utilize the relevant Dispatch parameters when complying with Dispatch instructions.
- (c) In the event that a Power Producer is unable to comply with Dispatch instructions, it must notify the Dispatcher immediately.

## **SDC2.6 EMERGENCY CONDITIONS**

To preserve Power System security under System Stress or emergency conditions, the NCC, may issue emergency instructions to Power Producers. This may request action outside of the Scheduling and Dispatch Parameters, other relevant data or notice to Synchronize. A Power Producer is required to use all reasonable endeavours to comply with such emergency instructions, but when unable to do so the Power Producer must inform the NCC immediately.

## **SDC2.7 TRADING WITH INTERCONNECTED PARTIES.**

The Buyer is responsible for the buying or selling of Active Energy with Interconnected Parties, including trading which has not been agreed in advance.

The TSO may purchase Active Energy from any source on request from the Buyer to meet the Demand of the Power System.

Implementation of contracts and Near Term operational arrangements on buy-sell and exchange of Active Energy between Interconnected Parties is carried out by the TSO, following notification of the agreement of the Buyer.

## **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 NCC will use to direct the control of the Power System frequency, the "Frequency Control". In addition, it sets out the procedure by which the NCC will direct international transfer levels of Energy and Active Power the "Transfer Control" 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 NCC.
- (c) Demand Control, carried out by the NCC.
- (d) Management of the Transfer Levels between the Power System and Interconnected Parties by the NCC.

The requirements for frequency control are determined by the consequences and effectiveness of Scheduling and Dispatch and by the effect of transfers across the Power System and synchronous operation with Interconnected Parties. SDC3 is therefore complementary to SDC1 and SDC2.

#### **SDC3.2 OBJECTIVE**

The procedure for the NCC Dispatcher to direct Frequency Control is intended to enable the TSO to meet statutory requirements for Power System Frequency Control, wherever applicable.

#### **SDC3.3 SCOPE**

SDC3 applies to the TSO, 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 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 capability available.

#### **SDC3.4.2 Instructions**

Coordination of instructions will be the responsibility of the NCC. The NCC 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. Generator Units operating in Frequency Sensitive Mode will be instructed by the NCC Dispatcher to operate taking due account of the target frequency notified by the TSO.

#### **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) Synchronization and generation from standstill.
- (b) Generation from zero generated output.
- (c) Increase in generated output.

The TSO will agree the low frequency relay settings to be applied to CDGUs with the Power Producer each month. 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 TSO must be informed immediately.

**SDC3.4.4 Low Frequency Relay Initiated Response from Demand**

The NCC may use Demand with the capability of low frequency relay initiated Demand reduction for establishing its requirements for frequency control. The TSO will specify the low frequency relay settings and the amount of Demand reduction to be available on a monthly basis. Users will comply with these instructions, except for safety reasons. If the User is unable to comply for safety reasons then the TSO must be informed immediately.

**SDC3.5 ELECTRIC TIME**

Time error correction (between local mean time and electric clock time) shall be performed by the TSO by making an appropriate offset to the target Power System frequency.

The TSO 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 predetermined limits.

**SDC3.6 TRANSFER REGULATION**

NCC must carry out Transfer Regulation to a tolerance of  $\pm 20$  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 50 MW, the NCC must take such steps as are reasonably necessary to correct the error within 15 minutes utilizing the current generation Schedule, or such other means as the NCC considers appropriate.

## Metering Code (MC)

### MC1 INTRODUCTION

This Metering Code (MC) sets out the way in which power and energy flows will be measured at the boundaries between different users. It is primarily intended for fiscal metering in the wholesale electricity market.

The Metering Code is required to cover the bulk (wholesale) movement of power from its entry to the transmission network to its exit to the distribution companies or electricity retail suppliers and principal consumers with or without self-generation.

This Metering Code (MC) sets out or refers to the requirements for the metering of **Custody Transfer Points** on the **Transmission System**. It caters for the **Fiscal Metering System**. The Metering Code is required to cover the bulk (wholesale) supply of **Energy** and **Power** entering from **Power Producers' Connection Points** and exiting from the **Transmission Network** to the **DNSPs** or electricity **Retail Suppliers** and **Principal Consumers** (with or without **Self-generation**) through their respective **Connection Points**.

The **Bulk Supply Licensee** has the right to appoint an entity to be responsible for an appropriate fixed period to act on its behalf to carry out the **Metering** functions.

### MC2 OBJECTIVES

The objectives of the Metering Code are to establish:

- The standards to be met in the provision, location, installation, operation and maintenance of **Metering Systems**.
- The standards to be met by the **Bulk Supply Licensee** and **Users** who have or plan to have access to the **Transmission Network**.
- The responsibilities of the **Bulk Supply Licensee** and **Users** in relation to ownership and management of **Metering System** and provision and use of metering data.
- The responsibilities of the **Bulk Supply Licensee** and **Users** in relation to the storage of metering data.

**MC3 SCOPE**

The Metering Code applies to the **Bulk Supply Licensee** and **Users** which in this MC are:

- (a) **Transmission Network Service Provider (TNSP);**
- (b) **Distribution Network Service Providers (DNSPs);**
- (c) **Principal Consumers** with and without **Self-generation** directly connected to the **Transmission Network**;
- (d) **Power Producers** directly connected to the **Transmission Network**; and
- (e) **Retail Suppliers.**

For the purpose of this MC, “directly connected” means that the **User** has a **Connection Point** that directly connects its installation to the **Transmission Network**.

**MC4 GENERAL REQUIREMENTS**

**Fiscal Meters** (Main & Check) shall be installed to measure **Active Energy** and **Active Power** and **Reactive Energy** and **Reactive Power** import and/or export, at **Custody Transfer Points** on the **Transmission Network**. This will comprise both **Import** and **Export** metering when reasonably required by the **Bulk Supply Licensee**.

Such data will be recorded half-hourly in on-site data registers and be collected automatically including batch download by the **Data Collection System**. The data register shall have adequate capacity to store three months on site data to allow for any interruptions to the automatic **Data Collection System**.

**Fiscal Meters** shall be checked by the **Bulk Supply Licensee** every 5 years in accordance with MC 5.8.3 to ensure that meters are operated within the acceptable accuracy limits specified in this MC so that the **Users** are able to prepare, calculate, assess and validate, and keep appropriate records concerning and where appropriate, challenge, invoices on a prompt, comprehensive and accurate basis.

Where a **User** or **Associated User** reasonably believes that any of the **Fiscal Meters** used for its data collection is operating outside the accuracy limits required by the MC, it may request accuracy checks in accordance with MC 5.8.3.

If a contract between relevant **Users** has additional requirements for **Metering Systems** or requirements in relation to **Meters**, those requirements shall, so long as they do not prevent compliance with this MC, apply in addition to the requirements of the MC.

Data from **Fiscal Meters** required under this MC shall be collected by the data collectors through the **Data Collection System** operated by the owner (seller).

## MC5 METERING

This section describes the requirements for **Meters** and **Metering Systems** in relation to **Custody Transfer Points (CTP)** for all **Users** with access to the **Transmission Network** as defined in this MC.

### MC5.1 PURPOSE OF METERING

**Fiscal Metering Systems** (Main & Check) shall be installed and maintained to measure the active and reactive energy and record the half-hourly demand and **Power** transferred to and from the **Transmission Network** at the **CTP** for each **User**. The Main **Fiscal Meter** will be the primary source of data for billing purposes. **Check Fiscal Meter** will be relied on for billing purposes in case of fault on **Main Meter**. **Backup Metering Systems** may be installed by the **User/ buyer**, if the **User/ buyer** needs to validate the records from the **Fiscal Metering Systems**. **Back-up Metering System** is not considered for billing purposes.

**Fiscal** and **Back-up Metering Systems** procured, installed, operated and maintained for the purpose of this MC shall meet the standards of accuracy and calibration in relation to **Meters** and **Metering Systems** as set out in this MC.

### MC5.2 LOCATION

The **Fiscal Meters** will be located as close as practicable to the **Connection Point** (HV bushing of generator step-up transformer for power plant, and low voltage side of the substation transformer for bulk supply 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 **Bulk Supply Licensee** and agreed by the **User**.

Such loss adjustments may include transformer and line loss compensation resulting from the distance of the **Fiscal Metering System** at the **CTP** from the physical location of the **Connection Point**.

### MC5.3 OWNERSHIP AND PURCHASE OF METERS

The seller (**Power Producer** or **Bulk Supply Licensee**) shall be responsible for the initial design, installation, testing, commission and operation of its own **Fiscal Metering System** excluding the CTs and VTs, which shall be subject to Connection Agreement conditions. Any auxiliary internal consumption meter shall be responsibility of power producer.

The relevant **User** shall be responsible for installing and maintaining his own **Back-up Metering System** at the **CTP**, unless the **User** agrees with the **Bulk Supply Licensee** otherwise.

At a **CTP**, the **User**, who owns the substation where the metering equipment is to be located, shall provide the **Bulk Supply Licensee** with:

- (a) 24 hour access and adequate space for metering and communications device;
- (b) reliable power supplies; and
- (c) instrument transformers, i.e. current transformer (CT) and voltage transformer (VT) complying with this MC.

**Table MC-1: Overall Accuracy of Metering System**

Condition	Limits of Error at Stated Power Factor for Active Power and Energy Measurement			
Current Expressed as a Percentage of Rated Measuring Current	Power Factor	Limits of Error for Connections		
		>40 MVA	>10–40 MVA	≤10 MVA
120% to 10% inclusive	1	±0.5%	±1.0%	±2.0%
Below 10% to 5%	1	±0.7%	±1.5%	±2.5%
Below 5% to 1%	1	±1.5%	±2.5%	±3.5%
120% to 10% inclusive	0.5 lag	±1.0%	±2.0%	±3.0%
120% to 10% inclusive	0.8 lead	±1.0%	±2.0%	±3.0%
120% to 10% inclusive	0.8 lag	±1.0%	±2.0%	±3.0%
Condition	Limits of Error at Stated Power Factor for Reactive Power and Energy Measurement			
Current Expressed as a Percentage of Rated Measuring Current	Power Factor	Limits of Error for Connections		
		>40 MVA	>10–40 MVA	≤10 MVA
120% to 10% inclusive	0	±4.0%	±4.0%	±4.0%
120% to 20% inclusive	0.866 lag	±5.0%	±5.0%	±5.0%
120% to 20% inclusive	0.866 lead	±5.0%	±5.0%	±5.0%

Any remote communications to the metering equipment and **Meters**, and connection equipment will be the responsibility of the **TNSP**.

#### **MC5.4 METERING INFORMATION REGISTER**

The **Bulk Supply Licensee** will maintain a register of all **Fiscal Meters** for fiscal settlement purposes at all **Custody Transfer Points**. This register will contain, but not be limited to:

- (a) A unique meter identification/serial number.
- (b) Location of the **Fiscal Meters** and **Metering Systems**.
- (c) The owner of **Fiscal Meters**.
- (d) The identification of the **User** concerned.
- (e) **Meter** manufacturer, type and model.
- (f) The specification of metering equipment including accuracy.

- (g) The adjustment factors including circuit losses to be applied.
- (h) **Metering System** function (Main, check, export, import).

Where the data in the metering information register indicates that the **Fiscal Meters** do not comply with the requirements of this MC, the **Bulk Supply Licensee** will advise the relevant **Users** of the non-compliance and such **User** will rectify this situation forthwith unless a derogation is granted under the GC6.2.

## **MC5.5 ACCURACY OF METERING**

### **MC5.5.1 Applicable Standards**

The accuracy of the various items of measuring equipment comprising **Meters** and **Metering Systems** shall conform to the relevant IEC standards or any equivalent Syrian standards. The following IEC standards approved for use with this MC are:

- (a) IEC Standard 62053-22 – Alternating current static meters for active energy (classes 0.2 S and 0.5 S).
- (b) IEC Standard 62053-21 - Alternating current static meters for active energy (classes 1 and 2).
- (c) IEC Standard 62053-11 – Alternating current electromechanical meters for active energy (classes 0.5, 1 and 2).
- (d) IEC Standard 62053-23 – Alternating current static meters for reactive energy (classes 2 and 3).
- (e) IEC Standard 60044 Part 1 – Current transformers.
- (f) IEC Standard 60044 Part 2 – Voltage transformers.
- (g) IEC Standard 60044 Part 3 – Combined transformers.
- (h) IEC Standard 62056-21 – Data exchange for meter reading – direct local data exchange.

All **Meters** and **Metering Systems** shall comply with the relevant standards. Where relevant standards change from time to time, the **Bulk Supply Licensee** will review such changes and recommend to the **ERC** the extent to which any changes should be implemented.

Where a **User** proposes to utilise equipment that does not meet these standards, then a derogation submission must be made to the **Bulk Supply Licensee** in accordance with GC6.2.

### MC5.5.2 Overall Accuracy Requirements for Fiscal Metering System

The accuracy of various items of measuring equipment comprising **Meters** and **Metering Systems** shall conform to the relevant IEC standards as listed in MC5.5.1. Accuracy requirements for the purpose of this MC are defined by circuit capacity, rated in MVA. Circuit capacity shall be determined by the lowest rated primary plant of the circuit i.e., transformer, lines etc. and must be based on the primary plant maximum continuous ratings. The rating and accuracy requirements of **Metering System** should anticipate any future increase in rating of the primary plant. Where summation metering is used, the accuracy requirements shall be the sum of the circuit capacities of the feeders it is metering.

For the measurement of **Active Energy, Reactive Energy, Power** and **Demand**, the **Metering Systems** 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 recognized national or international standard and shall be approved by ERC.

### MC5.5.3 Metering Equipment Accuracy Class

The accuracy class or equivalent is based on the MVA 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		
	>40 MVA	>10–40 MVA	≤10 MVA
Capacity of Connection			
Current Transformers (Note 1 & 2)	0.2S	0.5S/0.5	0.5
Voltage Transformers	0.2	0.5	1
Active Energy and Power Meters (Note 2 & 3)	0.2S	0.5S/0.5	1
Reactive Energy and Power Meters	2	2	2

Note 1: Current transformers shall meet the class accuracy requirements irrespective of CT secondary ratings.

Note 2: For new connections offers made by the **TNSP** after the date of approval of the first issue of the MC then the higher accuracy class shall be used (in the >10-40 MVA range where there is a choice).

Note 3: A Meter accuracy class of 0.5 may be used where energy transfers to be measured by the entry/exit Meter during normal operating conditions is such that the metered current will be above 5% of the Rated Measuring Current for periods equivalent to 10% or greater per annum (excluding periods of zero current).



## **MC5.6 BACK-UP METERING SYSTEM**

The **User** may under its own initiative and cost install, own, test, operate and maintain the **Back-up Metering System**. The **Back-up Metering System** will comply with the requirements set out in this MC for **Fiscal Metering System**.

## **MC5.7 ACCESS TO METERING DATA**

With respect to **Fiscal Metering**, only the owner of the **Metering System** will change data and settings within their respective metering equipment and only with the written agreement and where required the presence of the representative of the **Users**. Any such changes will be notified to the **Bulk Supply Licensee** settlements unit within 3 **Business Days** after the change.

With respect to **Fiscal Metering**, the owner of the **Metering Systems** will allow reading of the **Meters** by the **Bulk Supply Licensee** and by the **User** whose consumption is measured by the **Metering Systems**.

Access to **Meter** data by any **User** to the **Fiscal Metering Systems**, including the provision of any remote access equipment required, will be at that **User's** cost, unless agreed otherwise in writing by the parties concerned.

## **MC5.8 CALIBRATION AND TESTING OF METERING SYSTEM**

### **MC5.8.1 Initial Calibration**

All new **Fiscal Meters** shall undergo relevant certification tests. All initial calibration of **Meters** shall be performed in a recognized test facility. These tests shall be performed in accordance with the relevant IEC standards and shall confirm that **Meter** accuracy is within the limits stated in MC5.5. A unique identifiable calibration record shall be provided before the connection is made live.

New voltage transformers and current transformers shall be calibrated prior to installation on any site. **Meter** owners shall provide manufacturer's test certificates to **ERC** and the **Bulk Supply Licensee** to show compliance with the accuracy standards.

### **MC5.8.2 Commissioning**

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 **Bulk Supply Licensee** and any **Users** of the details of the new **Metering System** 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 the nominated representative of at least one other **User**. Such testing shall be in accordance with Appendix A of this MC.

All **Meters**, current transformers and voltage transformers shall be tested by an authorized body in accordance with the relevant IEC standards and to meet the accuracy required by MC5.5. and shall be approved by the **ERC**.

### **MC5.8.3 Other Tests Including Periodic Tests**

The owner of a **Fiscal Metering System** will undertake calibration testing upon request by the **Bulk Supply Licensee**, relevant **User** or **Associated User**. In addition the owner will undertake routine testing of the **Meters** every 5 years and of the CTs and VTs every 10 years. If the **Meters** are adjusted to compensate for errors in the CTs and VTs then the CTs and VTs will also be tested every 5 years.

Where, following a test, the accuracy of the **Metering System** is shown not to comply with the requirements of this MC, the owner will at its own cost:

- (a) consult with the **Bulk Supply Licensee** and the **Associated Users** in regard to the errors found and the possible duration of the existence of the errors; and
- (b) make repairs to the Metering System to restore the accuracy to the required standards.

The cost of routine testing must be met by the owner of the **Metering System**.

The cost of calibration testing must be met by the party requesting the test unless the test shows the accuracy of the **Metering System** does not comply with the requirements of this MC, in which case the cost of the tests must be met by the owner of the **Metering System**, in addition to the costs that the owner must now incur to restore the **Metering System** to compliance with the MC.

With regards to all testing in Syria by a third party including workshops or test stations, such work will only be undertaken by an authorized testing body approved by the **ERC**. Where a **User** undertakes testing of its own **Fiscal Metering**, then such testing may be witnessed by a representative from the **Bulk Supply Licensee**, if the **Bulk Supply Licensee** and/or an **Associated User** makes a written request to do so. Certification that the **Fiscal Metering**

complies with the MC will be sent to the **Bulk Supply Licensee** and the party that has requested the tests within 5 **Business Days** of the completion of such tests.

Where a **Fiscal Metering System** is found to be faulty or following tests under MC5.8 or to be non-compliant or outside the accuracy of the MC, then the **Bulk Supply Licensee** and all **Users** and **Associated Users** that have an interest in this **Metering System** shall also be informed of the failure. Such notification shall include the plans by the owner to restore the **Metering System** to compliance with the MC 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 System** was faulty or non-compliant.

#### **MC5.9 SECURITY**

The owner of **Fiscal Metering System** will ensure that the equipment is 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 **Bulk Supply Licensee** and **User** unless agreed otherwise by them. Where equipment or areas cannot be practically sealed, **Fiscal Metering System** 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 System** will ensure that an adequate level of security is applied to the **Metering System**.

## METERING CODE – APPENDIX A

### MC A1 COMMISSIONING TESTS

This Appendix A 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 and continuity, together with such other tests that would normally be conducted in accordance with **Prudent Utility Practice**. In addition during the commissioning of new or modified parts of the installation including the meter, voltage transformer, current transformer and data recorders then these shall be confirmed as being in accordance with the approved drawings to avoid equipment with for example a wrong ratio or a wrong specification being inadvertently connected.

#### MC A1.1 MEASUREMENT TRANSFORMERS

For all installations with new/replaced measurement transformers the **Bulk Supply Licensee** and/or **User** shall ensure that from site and/or factory 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.
- (d) For installations with existing measurement transformers the **Bulk Supply Licensee** and/or **User** shall ensure that, wherever practically possible, items 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 A1.2 MEASUREMENT TRANSFORMER LEADS AND BURDENS

For all installations the **Bulk Supply Licensee** and/or **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.

- (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 METERING**

### **MC A2.1 GENERAL TESTS AND CHECKS**

The following may be performed on-site or elsewhere (for example, factory, meter test station, laboratory, etc.):

- (a) Record the Metering System 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 (for example, CT/VT operated metering).
- (d) Check that all cabling and wiring of the new or modified installation is correct and is clearly marked and/or colour coded.
- (e) Confirm that meter registers advance (and that output pulses are produced for Meters which are linked to separate outstations) for import and where appropriate export flow directions. Confirm Meter operation separately for each phase current and for normal polyphase current operation.
- (f) Where separate outstations are used confirm the Meter to outstation channel allocations and that the Meter units per pulse values or equivalent data are correct.
- (g) Confirm that the local interrogation facility (Meter or outstation) 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 Meter/outstation is set to UTC +2 within  $\pm 5$  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 **Metering System** 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 determined separately as detailed under MC A1.1 above.
- (g) Record values of the Meter(s)/outstation(s) 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 IMPORT AND EXPORT

A standard method of labeling **Meters**, test blocks, etc. is necessary; based on the definitions for **Import** and **Export** the required labeling shall be as follows.

For the flow of **Active Energy**, **Meters** or meter registers shall be labeled **Import** or **Export** according to Table MC-3.

Within the context of this MC 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 utilized for registering the **Import** of **Reactive Energy** shall be labeled **Import** and those for registering the **Export** of **Reactive Energy** shall be labeled **Export**, in accordance with Table MC-3.