JAMAICA PUBLIC SERVICE COMPANY LIMITED

TRANSMISSION CODE

SEPTEMBER 2011

Acknowledgements

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LIST OF REVISIONS

Current Rev.	Date	Page affected	Prepared by	Checked by (technical)	Checked by (quality assurance)	Approved by
			REVISION HISTORY			
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CONTENTS

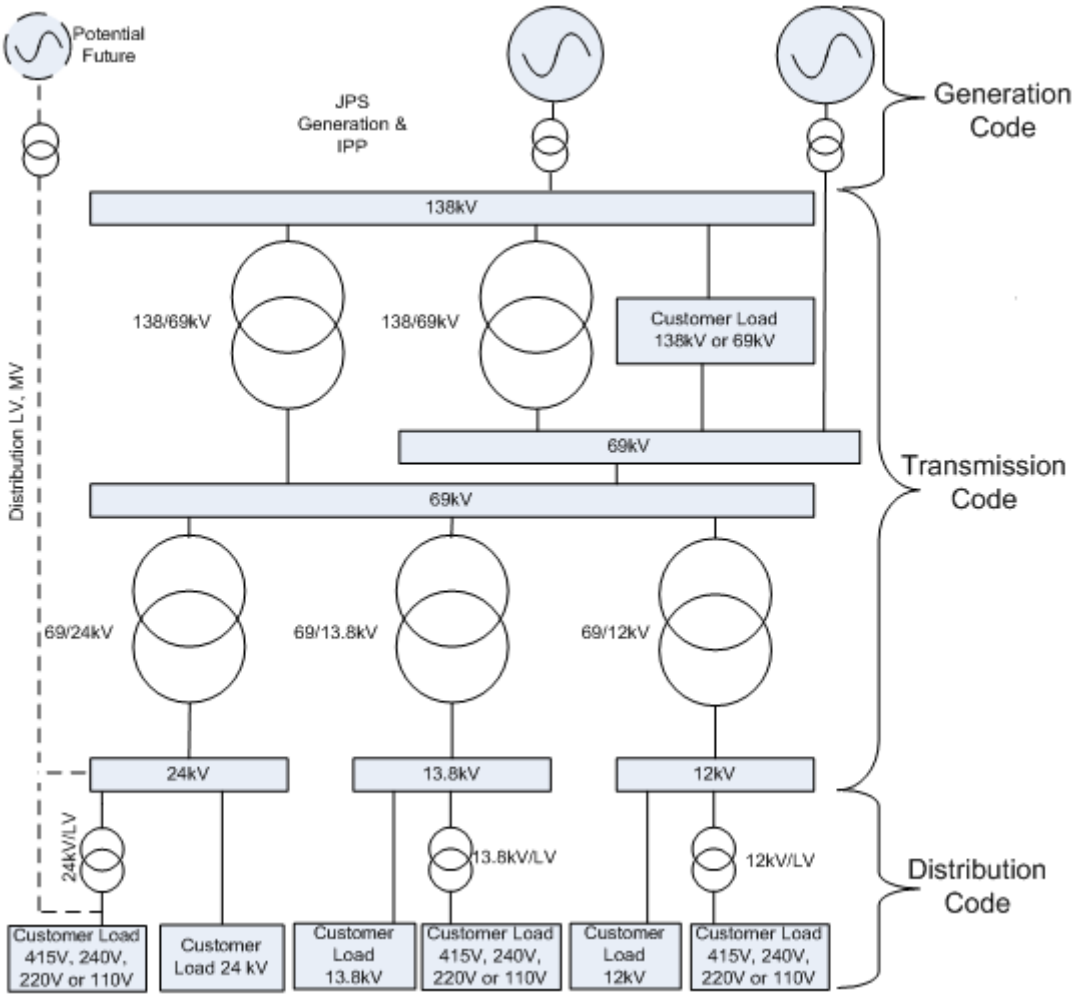
PREFACE

[1] The *Transmission Code* is designed to permit the development, maintenance and operation of an efficient, co-ordinated and economical *Transmission System* in Jamaica, to facilitate the *Transmission System* being made available to persons authorised to supply or generate electricity and is conceived as a statement of what is optimal (particularly from a technical point of view) for all *Users* and the *Grid Operator* itself in relation to the planning, operation and use of the *Transmission System*. It seeks to avoid any undue discrimination between Users and categories of Users.

[2] The procedures and principles governing the *Grid Operator's* relationship with all *Users* of the *Transmission System* are set out in the *Transmission Code*. The *Transmission Code* specifies day-to-day procedures for both planning and operational purposes.

[3] The *Transmission Code* is designed to be used in conjunction with the Generation and *Distribution Codes* which serve a similar purpose for the Generation and Distribution Systems and have a similar structure.

[4] The *Transmission Code* shall cover the 138kV and 69kV system including the secondary circuit breakers and up to the outgoing isolators at Transmission Substations transforming to 24kV, 13.8kV and 12kV. The *Distribution Code* shall cover the System from the point of the outgoing isolators on the Transmission Substations as described above, to the point of connection with the Customer's system. The *Generation Code* covers the *Generator* Connections to the *Transmission* or *Distribution Systems*. The responsibility boundary between the *Generator* and the *Grid Operator* shall be the High Voltage side of the Generating Unit Step-up (GSU) transformer. The diagram below illustrates the various boundaries.



Boundaries between the Transmission, Distribution and Generation Codes

[5] The Transmission Code is divided into the following sections:-

i) General Conditions which are intended to ensure, so far as possible, that the various sections of the Transmission Code work together and work in practice and which include provisions relating to the establishment of a Transmission Code and Distribution Code Review Panel and other provisions of a general nature including Dispute Resolution and data confidentiality;

ii) A Planning Code which sets out:

- the responsibilities of the Grid Operator (JPS), Users and Generators with respect to the planning of the Transmission System;
- the technical studies and planning procedures to ensure that the Transmission System is planned in compliance with statutory requirements and

- the planning data required to be supplied by Users and Generators to the Grid Operator and by the Grid Operator to Users and Generators to enable the system to be planned to meet statutory requirements.

iii) A Connection Code which specifies the minimum technical, design and operational criteria which must be complied with by Users connected to or seeking connection with the *Transmission System*;

iv) An Operations Code dealing with the day-to-day procedures which shall be required to facilitate efficient, safe and coordinated *System* operation and shall include:

- Demand forecasts;
- Operational Planning and data provision including long term outage planning coordination.
- Operating margin;
- Demand Control;
- Safety Co-ordination;
- Contingency Planning;
- Incident Information Supply;
- Operational Communication;
- Numbering and Nomenclature of HV Apparatus;
- System Tests; and
- Testing, Monitoring and Investigation
- Maintenance Requirements

v) A Data Registration Code which sets out a unified listing of all data required by the Grid Operator from Users, and by Users from the Grid Operator

vi) A Metering Code shall include reference to metering equipment requirements and performance which shall include:

- Current and Voltage Transformers
- Connection Points
- The System for the collection of meter readings whether manual or automatic

- Standards
- Accuracy
- Calibration and Sealing
- Inspection and Testing

[6] This Introduction is provided to Users and to prospective Users for information only and does not constitute part of the Transmission Code.

TRANSMISSION GLOSSARY AND DEFINITIONS

TGD 1. INTRODUCTION

TGD 1.1 Understanding

TGD 1.1.1 This Glossary and Definitions section applies to all chapters of the *Transmission Code*. Any words not defined here shall have such meanings as ascribed under the relevant statute and regulations; or such meanings as normally ascribed and accepted within the power industry; where no definition exists under the relevant statute, regulation or the power industry, the meaning as defined in the Oxford English Dictionary using the context as found in this *Transmission Code.*

TGD 2. GLOSSARY

Glossary of Terms		
AC		Alternating Current
Act		The Electricity Lighting Act (ELA)
Active Power		The time average of the instantaneous power over one period of the electrical wave, measured in Watts or multiples thereof. For AC circuits or Systems, it is the product of the root-mean-square (RMS) or effective value of the voltage and the RMS value of the in-phase component of the current. In a three phase system, it is the sum of the *Active Power* of the individual phases.
Advanced Metering Infrastructure (AMI)		Metering Systems that measure, collect and analyse energy usage, from advanced electricity meters using various communication channels either on request or on a pre-defined schedule. The infrastructure includes hardware, software and communications.
All-Island Electric Licence		The licence granted to *JPS* by the Ministry of Mining and Energy following recommendations pursuant to Sect. 4 of the *OUR* Act 2000 to generate, transmit, distribute and supply electricity in the island of Jamaica for public and private purposes.
Apparatus		*Equipment* in which electrical conductors are used supported or of which they may form part
Authority for Access		Authority granted to a person(s) by the *Grid Operator* to enter its site without supervision.
Average Conditions		That combination of observed values of weather conditions averaged over a long period of time.
Black Start		The procedure necessary to recover from a *Total* or Partial *System* Shutdown

Breaking Capacity		A value of prospective current that a switching device is capable of breaking at a stated voltage under prescribed conditions of use and behaviour
BSJ		Bureau of Standards, Jamaica
Circuit Breaker		A mechanical switching device, which is capable of making, carrying, and breaking current under normal circuit conditions and also capable of making, carrying for a specified time, and breaking current under specified abnormal circuit conditions, such as a short circuit.
Code Change Register		Register of all changes to the *Transmission* and *Distribution Codes* as set out in TGC . 10.7
Code Review Panel		The panel established with the functions and duties set out in TGC .. 10.2
Co-Generator		A facility which simultaneously provides electrical and thermal energy from a singular fuel source for its process requirements as well as electrical output to the *System*
Completion Date		The date of energisation of the *Connection Point*.
Connection Agreement		An agreement made between the *Grid Operator* and a *User* or *Generator* setting out the terms and conditions relating to the use of the *Connection Point*.
Connection Point		The point on the *Transmission System* at which a *User* or *Generator* is connected to the *Transmission System*.
Connection Related Planning Studies		Power flow simulations, short circuit and stability studies performed as necessary to determine the requirements for the connection of loads to the *System* to ensure the security and reliability of the *System*
Connection Site		The physical site belonging to the *Grid Operator*, *Generator* or *User* where a *Connection Point* is located.
Contingency Reserve		The margin of generation over forecast demand which is required in the period from 24 hours ahead down to real time to cover against uncertainties in *Generator* availability and against both weather forecast and demand forecast errors
Control Person		A person who has been nominated by an appropriate officer of the *Grid Operator* or a *User* to be responsible for controlling and co-ordinating safety activities necessary to achieve safety from the system.
Critical Fault Clearing Time (CFCT)		The maximum fault duration (time) for which the *System* remains transiently stable
Current Transformer (CT)		A device which has its primary winding connected in series with the current to be measured and a secondary winding which provides a current proportional to the primary current at a range suitable for measurement or control.
Customer Demand		The reduction in the supply of electricity to a Customer or

Management		the disconnection of a Customer in a manner agreed between a Customer and *JPS*.
Customers		Any person or entity supplied with electricity service under a contract with the *Grid Operator*.
DC		Direct Current
Demand		The Demand of MW or MVar of electric power (ie both Active and Reactive power respectively) unless otherwise stated
Derogation		A waiver issued by the *OUR* after consultation with the *Grid Operator*, suspending the *Grid Operator*'s or a *User*'s obligations to implement or comply with the requirements of the *Transmission Code*.
Discount Rate		The percentage by which the value of a cash flow in a *Discounted Cash Flow* (DCF) valuation is reduced for each time period by which it is removed from the present
Discounted Cash Flow		A method of evaluating an investment by estimating future cash flows and taking into consideration the time value of money.
Dispute		Any controversy or difference between the *Grid Operator* and a *User or a Generator* in connection with, or arising out of, any clause in the *Transmission Code*.
Dispute Notice		A written notice issued by either Party to a *Dispute* outlining the matter in *Dispute*.
Distribution Code		Operating rules and technical procedures for running the *Distribution System*.
Distribution System		That part of the electric *System* that operates below 69kV from the point of the outgoing isolators of a *Feeder - Circuit Breaker* (recloser) at transmission substations transforming to 24kV, 13.8kV and 12kV, consisting of *Apparatus* and meters owned and operated by the *Grid Operator* used in connection with the distribution of electricity
Earth Fault Factor		At a selected location of a three-phase *System* (generally the point of installation of equipment) and for a given *System* configuration, the ratio of the highest root mean square phase-to earth power frequency voltage on a sound phase during a fault to earth (affecting one or more phases at any point) to the root mean square phase-to-earth power frequency voltage which would be obtained at the selected location without the fault.
Embedded Generating Plant		A generating plant that is connected to a *Distribution System* that has no connection to the Transmission *System*.
Embedded Generating Unit		An individual generator which is part of an *Embedded Generating Plant*.

Embedded Generator		A person or entity that generates electricity using an *Embedded Generating Plant*
Emergency Operation Centre		The main control centre for the operation of the System during emergency conditions (post hurricane restoration)
Entry Point		The point at which *User*s connect to the *Transmission System* where power flows into the *Transmission System*.
Equipment		*Plant* and/or *Apparatus*
Exit Point		The point at which *User*s connect to the *Transmission System* where power flows out of the *Transmission System*
Fault Level		The expected current, expressed in kA or Fault MVA, which will flow into a short circuit at a specified point on the *Distribution System* or any *User*s *System*.
Feeder		Means an MV electric line(s) and associated MV equipment at a nominal *voltage* level of 4kV, 6.9kV, 12kV, 13.8kV and 24kV which the *Grid Operator* uses to distribute electricity
Force Majeure		Causes beyond the reasonable control of and without the fault or negligence of the party claiming *Force Majeure*. It shall include failure or interruption of the delivery of electric power due to causes beyond that Party's control, including acts of God, wars, sabotage, riots, hurricanes and other actions of the elements, civil disturbances and strikes.
Generating Unit		Any electric power generating plant or *Apparatus*, whether privately or *JPS* owned, delivering electrical energy to the *System* Grid.
Generation Code		. The guiding principles, operating procedures and technical standards governing operation of the Jamaican power system and all interconnected *Generating Units*, as from time to time revised with the approval of the *OUR*.
Generation Code Review Panel		A panel responsible for keeping the Generation Code and its working under review and shall report to the OUR on its dealings and recommend amendments to the Generation Code for the OUR's approval
Generator		Owner and/or operator of an electricity generating facility, supplying power to the *Grid Operator* via the Transmission *System*, including *JPS* itself.
Grid Operator		*JPS* who is the person or entity responsible for prudent and efficient management of the *System* and in that capacity, for dealing with all *Generators, Embedded Generators and Users* in a consistent and non-discriminatory manner.
Guaranteed Standards		As required by Condition 17 of the *Licence*
HV		The parts of the System operating at 69kV and above

Incident		An unscheduled or unplanned (although it may have been anticipated) occurrence on the *Transmission* or *Distribution System* including, without limiting that general description, faults, incidents and breakdowns and adverse weather conditions being experienced.
Incident Centre		A centre established as determined by the *Grid Operator* following a *Significant Incident* to provide a focal point for communication and the dissemination of information between *Grid Operator* and senior management representatives of relevant *User*s.
Interconnection Agreement		An agreement between the *Grid Operator* and a *Generator* or *User* providing for the connection of the *Generator* or *User* plant to the Transmission *System*
IPP		Independent Power Producer.
Joint System Incident		An *Incident* which, in the opinion of the *Grid Operator* or a *User*, has or may have a serious and/or widespread effect on the *Transmission System*, *Distribution System* or on a *User* System.
JPS		Jamaica Public Service Company Limited.
JPS Guide To The Interconnection Of Distributed Generation		The document prepared by JPS that establishes the criteria and requirements for the interconnection of Embedded Generators, as revised from time to time
Large Customer		*Customers* who by virtue of the magnitude or characteristics of their demand are connected directly to the Transmission *System*.
Least Cost Transmission Expansion Plan		The plan prepared by *JPS* in accordance with Condition 21 of its *Licence*.
Least Cost Distribution Expansion Plan		The plan prepared by *JPS* in accordance with Condition 21 of its *Licence*
Licence		The All-Island Electric *Licence* 2001 issued to *JPS*.
Local Safety Procedures		Procedures at each *Connection Point* approved by the *Grid Operator* or the relevant *User* setting out the methods to achieve safety for those working on *Plant* and *Apparatus* to which their *Safety Rules* apply.
LV		The parts of the System operating at 415V and less
Making Capacity (of a switching device or a fuse)		A value of prospective fault current that a switching device is capable of making at a stated voltage under prescribed conditions of use and behaviour
Metering Point		The point of connection of the terminals of a whole current meter or the point of the *Current Transformer*s for CT metering.
MV		The parts of the *System* operating at voltages above 415V and below 69kV

N-1		The loss of any single element (such as an electric line, transformer etc) from the *Transmission System* or *Distribution System*
Operating Reserve		Generating capability in MW above firm *System* Demand available to provide for regulation, load forecasting error, equipment forced and scheduled outage. It consists of Spinning and Non *Spinning Reserve* (*Generation Code*).
Operation		A scheduled or planned action relating to the operation of the *System*..
Operation Diagram		Diagrams which are a schematic representation of the HV *Apparatus* and the connections to all external circuits at a *Connection Site* (Point), incorporating its numbering, nomenclature and labelling.
Operational Effect		Any effect on the operation of the *Transmission System* which will or may cause the Transmission *System* or the *User*'s system, as the case may be, to operate adversely from the way in which they would or may have operated in the absence of that effect.
Operational Interface		The common boundaries of the *User* and *Grid Operator Connection Sites*
Operating Margin		The Operating Margin is the amount of reserve, provided by *Generating Units* or by *Demand* Control, available over and above that required to meet the expected Demand. It is required to limit and then correct Frequency deviations that may occur due to an imbalance between total Generation Capacity output and Demand.
OUR		Office of Utilities Regulation. Established under and by virtue of the Office of Utilities Regulation Act
Overall Standards		As required by Condition 17 of the *Licence*
Plant		Fixed and moveable items used in the generation, transmission or distribution of electricity other than *Apparatus*
Point of Common Coupling (PPC)		The closest point on the *Grid Operators* side of the *User's connection point* where another *User* is or could be connected.
Power Island		A group of *Generators* together with complementary local Demand, disconnected from any other power source or the *Total System*.
Power Purchase Agreement (PPA)		An Agreement between the *Grid Operator* and a *Generator* in respect of the generation and sale of electricity by the *Generator* to the *Grid Operator*.
Power Quality Policy		The *Grid Operator's* policy document that outlines the parameters, standards and normal operating limits relevant to power quality, to be developed by the Grid Operator,

		approved by the OUR and as amended from time to time.
Prudent Utility Practice		The practices generally followed by the electric utility industry in respect to the design, construction, operation, and maintenance of electric generating, transmission, and distribution facilities, including, but not limited to, the engineering, operating, and safety practices generally followed by such utility industries.
Reactive Power		The component of electrical power representing the alternating exchange of stored energy (inductive or capacitive) between sources and loads or between two systems, measured in VAR, or multiples thereof. For AC circuits or systems, it is the product of the RMS voltage and the RMS value of the quadrature component of alternating current. In a three phase system, it the sum of the *Reactive Power* of the Individual phases.
Rural Electrification Project		Works undertaken by the Rural Electrification Programme Limited (REP) under Condition 26 of the *Licence*.
Safety Coordinator		A person nominated by the *Grid Operator* and each *User* in relation to a *Connection Point* to be responsible for the coordination of safety precautions when work is to be carried out which requires the provision of safety precautions on *Apparatus*.
Safety Management System		The procedure adopted by the *Grid Operator* or *User* to ensure the safe *Operation* of the *System* and the safety of personnel required to work on the *System*.
Safety Rules		The rules or procedures of the *Grid Operator* or *User* to ensure safety of persons working on or testing *Apparatus* from the dangers inherent in working on or testing *Apparatus* that forms part or is connected to the *Transmission* or *Distribution Systems*.
SCADA		Supervisory Control And Data Acquisition.
SF6		Sulphur Hexaflouride Gas used for the insulation of *HV* and MV *Equipment*
Significant Incident		An incident which in the opinion of *JPS* or a *User* has had a significant effect on the *Transmission System* or the *User System* respectively
Site Common Drawings		Drawings prepared for each *Connection Site* (Point) which incorporate *Connection Site* layout drawings, electrical layout drawings, common protection/control drawings and common services drawings.
Site Investigation Tests		Tests conducted in relation to *Plant*, *Apparatus* and Operational Procedures at Generation Facilities and *User* sites or to monitor and assess the characteristics of *Plant*.
Spinning Reserve		Unloaded generating capacity in MW which is synchronized and ready to serve additional Demand.(See

		Generation Code).
Standard Offer Contract		Standardised *Interconnection Agreement* for *Embedded Generators* owning renewable type generating facilities rated up to 100kW
System		The interconnection facilities and any other transmission or distribution facilities on the *Grid Operator*' side of the *Connection Point(s)* through which the electrical energy output from the *Generating Unit*(s) will be distributed by the *Grid Operator* to *User*s of electricity. (See *Generation Code*).
System Control		The administrative and other arrangements established to maintain as far as possible the proper safety and security of the *System*.
System Control Centre		The System Control Centre of the *Grid Operator* located in Kingston, Jamaica, or such other control centre designated by the *Grid Operator* from time to time (but not more than one at any time) from which the *Grid Operator* shall issue dispatch instructions to the *Generators.*
System Incident		An event on a part of the *System* or a *User System* that has an adverse effect on the rest of the System or other *User System*
System Incident Communications Procedures		Procedures agreed between the *Grid Operator* and *User*s to ensure secure communications during *System Incident*s.
System Restoration Strategy		The strategy setting out the procedures for the restoration of the *System* following a Major *Incident*.
System Test		A test or series of tests involving the simulation of conditions or the controlled application of unusual or extreme conditions which may have an impact on the *Transmission, Distribution* or *User System*s.
Ten Minute Reserve		An additional amount of *Operating Reserve* sufficient to reduce generation deficiency within ten minutes following the loss of generating capacity (See *Generation Code*).
Test Document		The document prepared by the *Test Panel* setting out all aspects for the management and implementation of a test.
Test Panel		A panel established to prepare a detailed programme for the conduct of an operational test or Site Investigation and to prepare a formal *Test Document*.
Test Request		A document setting out the detailed proposal for an operational test or *Site Investigation Test*
Total System		The *Transmission and Distribution Systems* together with all *User Systems*.
Total System Shutdown		The situation when all generation connected to the *Total System* has ceased and the *Total System* has ceased to function.

Transmission Code		Operating rules and technical procedures for running *JPS*' Transmission *System*.
Transmission Code Technical Standards		Technical specifications applicable/implemented to govern the technical development and operation of the Transmission *System*
Transmission Constraint		A limitation on the use of the *System* due to lack of transmission capacity or other system conditions.
Transmission Security Standards		The standards set out in this Code by which the *Grid Operator* shall plan and operate the *Transmission System* to ensure a reliable and secure supply of electricity to *Customers*.
Transmission Site		The term "Transmission Site " means a site owned (or occupied pursuant to a lease, licence or other agreement) by the *Grid Operator* in which there is a *Connection Point*. For the avoidance of doubt, where a site is owned by a *User* but occupied by the *Grid Operator*, the site is a Transmission Site .
Transmission System		That part of the electric *System* from the high side of the Generator Step Up (GSU) Transformer that operates at 69kV or higher, and includes the *Equipment* on the secondary side of transformers at transmission substations transforming to 24kV, 13.8kV and 12kV up to the outgoing Isolators of the *Feeder* - *Circuit Breaker* (recloser), and consists of electric lines, equipment and meters owned and operated by the *Grid Operator* in connection with transmission of electricity.
Under Frequency Relay		An electrical measuring relay intended to operate when its characteristic quantity (frequency) reaches the relay settings by a decrease in frequency.
User(s)		Term used to refer to any person using the *JPS Transmission System,* as more particularly identified *i*n *e*ach section of the *Transmission Code* concerned. In the Preface and General Conditions the term means any person (other than *JPS*) to whom the *Transmission Code* applies.
User Site		The term "*User* Site " means a site owned (or occupied pursuant to a lease, *Licence* or other agreement) by a *User* in which there is a *Connection Point* . For the avoidance of doubt, where a site is owned by the *Grid Operator* but occupied by a *User* the site is a *User* Site
User(s)' System		The transmission system or distribution system owned and operated by a *User*.
Voltage Transformer (metering)		A device which has its primary winding connected in shunt with the power circuit to be measured and a secondary winding which provides a voltage proportional to the primary voltage at a range suitable for measurement or

		control.
X/R Ratio		The amount of reactance X divided by the amount of resistance R which is the same as the tangent of an angle created by reactance and resistance in a circuit.

TRANSMISSION GENERAL CONDITIONS

TGC 1. INTRODUCTION

TGC 1.1 JPS Licence Obligations

TGC 1.1.1 This *Transmission Code* has been prepared by the Jamaica Public Service Company Limited ("*JPS").*

TGC 1.1.2 Under Condition 22 of its *Licence JPS* is required to have in force at all times and implement and comply with a *Generation Code*: Amongst other requirements relating to the dispatch and scheduling of generators, the *Licence* requires the *Generation Code* to be:

TGC 1.1.3 "…..consistent with internationally required technical standards and which is in accordance with prudent utility practice;

a. Covering all material technical aspects relating to connection to and the operation and use of the *System* (and insofar as they affect the *System*, the operation of electric lines and electrical plant connected to that *System*);

b. Setting out the rules and procedures which govern the dispatch and scheduling of generator maintenance;

c. Setting out the rules and procedures which provide for the safe and secure operation of the *System;* and

d. Which is designed to ensure:

i. The development, maintenance and operation of an efficient, coordinated and economical system for the generation and transmission of electricity; and

ii. The promotion of the security of the system as a whole."

TGC 1.1.4 The rules and procedures for Item (b) above are set out in the *Generation Code.* However Items (a), (c) and (d) are not addressed fully in the *Generation Code.* This *Transmission Code* seeks to address these aspects of the *Licence* with respect to the *Transmission System*.

TGC 1.1.5 Condition 21 of the *Licence* sets out certain requirements on *JPS* to have in place long term planning procedures and to produce a *Least Cost Expansion Plan.* The *Transmission Code* shall set out the procedures to be used by *JPS* and *Users* in producing the long term plans.

TGC 1.2 Interpretation

TGC 1.2.1 In this Code;

a. words and expressions printed in italics are listed in the Transmission Glossary *and* Definitions and shall, unless the context otherwise requires or is not consistent therewith, bear the respective meaning set out therein; In the *Transmission Code*:

b. a table of contents, a preface and headings are inserted for convenience and reference purposes only and shall not be used in construing the *Transmission Code* or be deemed to be in any way an indication of the meaning of the paragraphs to which they relate;

c. unless the context otherwise requires, all references to a particular paragraph, sub-paragraph, Appendix or Schedule shall be a reference to that paragraph, sub-paragraph Appendix or Schedule in or to that part of the *Transmission Code or relevant Distribution or Generation Codes* in which the reference is made;

d. unless the context otherwise requires, the singular shall include the plural and vice versa, references to any gender shall include all other genders and references to persons shall include any individual and any other entity, in each case whether or not having a separate legal personality;

e. references to the words "include" or "including" are to be construed without limitation to the generality of the preceding words;

f. unless there is something in the subject matter or the context which is inconsistent therewith, any reference to a Law or any Section of or Schedule to, or other provision of a Law shall be construed at the particular time, as including a reference to any modification, extension or re-enactment thereof then in force and to all instruments, orders and regulations then in force and made under or deriving validity from the relevant Law;

g. references to "in writing" or "written" include typewriting, printing, lithography and other modes of reproducing words in a legible and non-transitory form;

h. a cross-reference to another document or part of the *Transmission Code* shall not of itself impose any additional or further or co-existent obligation or confer any additional or further or co-existent right in the part of the text where such cross-reference is contained;

i. nothing in the *Transmission Code* is intended to or shall derogate from *JPS* statutory or licence obligations; and

j. References to Transmission Standards, System Operation Policy and Procedures and Engineering Instructions refer to Transmission Standards, System Operation Policy and Procedures and Engineering

Instructions of JPS unless otherwise stated and include all revisions and any succeeding documents that may be approved from time to time.

TGC 1.2.2 ("*JPS*") has responsibilities under this *Transmission Code* in two distinct capacities. These are as follows:

a. *JPS* is responsible for prudent and efficient management of the Jamaica Electricity *System* by virtue of its holding of *the Licence*. This Code applies the term "*Grid Operator*" whenever referring to *JPS* in this capacity;

b. As the owner of power stations, *JPS* is also subject to the rights and obligations in this *Transmission Code* as it applies to *Independent Power Producers* ("*IPP"*) and *Co-generation* facilities. Any reference to "*Generators*" in this *Transmission Code* should be interpreted to include *JPS* in this capacity.

TGC 2. SCOPE

TGC 2.1.1 This *Transmission Code* sets out the procedures and principles governing the *Grid Operator*'s relationship with all *User*s of the *Grid Operator*'s *Transmission System*.

TGC 2.1.2 The *Transmission Code* shall be complied with by the *Grid Operator* and existing and potential *Generators* and *Users* connected to or seeking to connect to the *System*.

TGC 3. GENERAL REQUIREMENTS

TGC 3.1.1 This *Transmission Code* contains the procedures to provide an adequate, safe and efficient service to all parts of Jamaica, taking into account a wide range of operational circumstances. It is however necessary to recognise that the *Transmission Code* cannot address every possible situation. Where such unforeseen situations occur the *Grid Operator* shall act as a reasonable and prudent operator in the pursuance of any or a combination of the following General Requirements:

a. To protect the safety of the public and employees;

b. The need to preserve the integrity of the *System*;

c. To prevent damage to the *System;*

d. Compliance with conditions under its *Licence;*

e. Compliance with the *Act;*

f. Compliance with the *Distribution Code; and*

g. Compliance with the *Generation Code.*

TGC 3.1.2 *Users* shall provide such reasonable co-operation and assistance as the *Grid Operator* reasonably request in pursuance of the General Requirements.

TGC 4. COMMUNICATION BETWEEN GRID OPERATORS AND USERS

TGC 4.1.1 Unless otherwise specified in the *Transmission Code*, communication between the *Grid Operator* and the *Users* shall be as agreed from time to time between the *Grid Operator* and the *User*.

TGC 5. DATA ACCURACY

TGC 5.1.1 The accuracy of Data provided by *Users* under this *Transmission Code* is the responsibility of the *User*. The *Grid Operator* shall take reasonable and prudent actions based on the information provided and shall not be responsible for the consequences which arise from such actions based on information from *Users*.

TGC 6. CONFIDENTIALITY

TGC 6.1.1 All information provided to the *Grid Operator* marked as “Confidential” shall be treated in accordance with *Licence* Condition 7.

TGC 7. SYSTEM CONTROL

TGC 7.1.1 Where a *User*’s system (or part thereof) is, by agreement, under the control of the *Grid Operator*, then for the purposes of communication and co-ordination in operational timescales the *Grid Operator* may (for those purposes only) treat that *User*’s *System* (or part thereof) as the *Grid Operator*’s *System* but between the *Grid Operator* and *User*, it shall remain to be treated as the *User*’s system.

TGC 8. MAINTENANCE STANDARDS

TCC 8.1.1 All *Plant* and *Apparatus* on the *System* shall be operated and maintained in accordance with *Prudent Utility Practice* and in a manner that shall not pose a threat to the safety of employees or the public.

TGC 8.1.2 The *Grid Operator* shall establish a *Transmission System* Maintenance Policy which shall be reviewed and approved by the *OUR*.

TGC 9 COMPETENCY OF STAFF

TGC 9.1.1 The *Grid Operator* shall have in place training polices that serve to ensure that persons operating, maintaining, testing and controlling the *Grid Operator Transmission* and *Distribution Systems* are competent for the tasks to be undertaken. The policies shall include refresher training at appropriate intervals to maintain the currency of the training.

TGC 9.1.2 All persons operating, maintaining, testing and controlling the *Grid Operator Transmission* and *Distribution Systems*, shall have received appropriate training to ensure competency for the tasks that they will be undertaking and

refresher training at appropriate intervals to maintain the currency of the training.

TGC 9.1.3 The *Grid Operator* shall maintain records of training given and issue certificates indicating the areas of competency of the persons trained.

TGC 10. TRANSMISSION CODE REVIEW

TGC 10.1 Requirement for a Code Review Panel

TGC 10.1.1 The *Grid Operator* shall establish and maintain a *Code Review Panel*, which shall be a standing body charged jointly with keeping the *Transmission Code* and the *Distribution Code* and their working under review. The Panel shall provide copies of the minutes of its meetings to the *OUR*

TGC 10.2 Duties of the Code Review Panel

TGC 10.2.1 As part of its mandate, the Panel shall have the following duties:

a. Ensure that all operational procedures and requirements governed by the *Transmission Codes* remain up to date;

b. Ensure that the *Transmission Code* and *Distribution Code* are consistent in their approach and are developed in a consistent manner;

c. Review all proposals for amendments to the *Distribution Code* and *Transmission Code* which the *Grid Operator*, the *Generators*, other *Users* or the *OUR* from time to time may wish to submit to the Panel for consideration;

d. Following any unforeseen circumstances referred to it by the *Grid Operator* consider whether the actions taken by the *Grid Operator* were justified and what changes, if any, are necessary to the *Distribution* and *Transmission Codes*;

e. Following any *Dispute*s being referred to the *OUR* for determination the Panel shall consider whether such determinations require a revision to the *Transmission Code* or *Distribution Code*; and

f. Present recommendations to the *OUR* as to amendments to the *Transmission* and *Distribution Codes* that the Panel considers warranted and the reason for such changes.

TGC 10.3 Composition

TGC 10.3.1 The Panel shall be appointed by the Grid Operator, and shall consist of the following persons:

a. One person representing the *Grid Operator's System Control* Centre;

b. One person representing the *Grid Operator's Transmission System*;

c. One person representing the *Grid Operator's Distribution System*;

d. One person representing *JPS* owned *Generators* who is also a member of the *Generation Code Review Panel*;;

e. Two persons representing the *IPPs* and *Co-Generators,* one of whom is also a member of the *Generation Code Review Panel* and one of whom should be an *Embedded Generator*; and

f. One person representing *Users* of the *System*.

TGC 10.3.2 The *Grid Operator* shall appoint the chairperson of the Panel.

TGC 10.4 Rules and Procedures for Conduct of Business

TGC 10.4.1 The Panel shall establish and comply at all times with its own rules and procedures governing the conduct of its business, including terms of appointments and retirement of members, which the *OUR* shall approve.

TGC 10.4.2 The Panel shall meet at least once per calendar year.

TGC 10.4.3 If the Panel on any matter presented before it is unable to reach unanimous agreement or consensus, that matter shall be referred to the *OUR* for determination. Any such referral to the *OUR* shall set out the cause of disagreement and the views held by the respective members.

TGC 10.5 Technical Standards Subcommittee

TGC 10.5.1 The Technical Standards classified in this code as *Transmission Code Technical Standards* form part of the *Transmission Code* and any revision to or amendment of these standards shall require the agreement of the *Code Review Panel* and the approval of the *OUR*.

TGC 10.5.2 The *Code Review Panel* shall form a subcommittee from members of the *Code Review Panel*, other parties and experts as the *Code Review Panel* considers appropriate to manage the development of these standards as may be required from time to time.

TGC 10.6 Transmission Code Technical Standards

TGC 10.6.1 The following *Transmission Code Technical Standards* are the sections of the Engineering Standards, System Operation Policy and Procedures and *JPS* Policies that are directly referenced by this *Transmission Code* and therefore impose *Transmission Code* obligations. Changes to these standards shall be in line with TGC 10.5

a. *JPS* Protective Relaying Philosophy & Practices

b. Engineering Instruction 1.11 - Planned Outage Procedure;

c. System Operation Policy and Procedure 14 - Planned Outage Procedure T & D;

d. System Operation Policy and Procedure 19 - Planned Outage Procedure.

e. Engineering Instruction 4.7 Revenue Metering.

f. System Operation Policy and Procedure No 2 ‘Operational Standards of Security of Supply

g. Engineering Instruction No 1.6 – Load Shedding associated with Generating Plant Deficiency; and

h. System Operation Policy and Procedure No 11 – Controlled Load Shedding.

i. Engineering Instruction 2.2 – Hurricanes, Earthquakes and Civil Disturbances – Procedure for the Protection of Company Plant and Property.

j. Engineering Instruction 2.8 – Reporting of Damage to Major Substation Plant.

k. System Operation Policy and Procedure No 5 – Action to be taken in the event of a Serious Breakdown of the *System*.

TGC 10.7 Revisions of the code

TGC 10.7.1 The *Grid Operator* shall, as required, prepare and issue amended versions of the *Distribution Code* and *Transmission Code* containing such amendments as have been agreed by the Panel and approved by the *OUR*.

TGC 10.7.2 All changes to the codes shall be logged in the *Code Change Register* which shall indicate the section amended and the reason for the change. The *Code Change Register* shall be restarted should the code be revised in its entirety.

TGC 10.7.3 The *Grid Operator* shall retain a list of all *Users* that have made a written request to be informed of changes to the *Transmission Code* and *Distribution Code* and shall inform such *Users* in writing of any changes.

TGC 10.7.4 Revised codes shall be published on the *Grid Operator*’s website along with the *Code Change Register*.

TGC11. FORCE MAJEURE

TGC 11.1.1 All *Users* should note that the provisions of the *Transmission Code* may be suspended in whole, or in part, pursuant to any directions or orders given by the *OUR* in situations of *Force Majeure*.

TGC 12. NON-COMPLIANCE

TGC 12.1 Granting of Derogations

TGC 12.1.1 The *OUR* may, after consultation with the *Grid Operator*, issue *Derogation*s suspending the *Grid Operator*’s or a *User*’s or a Generator’s obligations to implement or comply with the *Transmission Code* to such an extent as may be specified in the *Derogation*s ; provided that the exercise of the power to

issue such Derogation is consistent with the provisions of the Office of Utilities Regulation Act.

TGC 12.1.2 In the event that such a *Derogation* is granted, the *Grid Operator* or *User* shall take all necessary action to ensure full compliance with the obligation for which the *Derogation* has been issued as soon thereafter as is practical and within any timescale laid down in the *Derogation* and shall immediately notify the *OUR* when the non-compliance has been rectified.

TGC 12.2 Request for Derogation

TGC 12.2.1 A request for *Derogation* from any provision in the *Transmission* or *Distribution Codes* shall contain the following information:

a. The clause against which the present or predicted non-compliance is identified;

b. The reason for non-compliance with the provision;

c. Identification of the *Apparatus* in respect of which a *Derogation* is being sought;

d. Whether the *Derogation* sought is permanent or for a delay in achieving compliance; and

e. If a delay in achieving compliance is being sought, the date by which the non-compliance will be remedied.

TGC 12.3 Derogation for Existing Apparatus not in Compliance

TGC 12.3.1 It may be the case that not all *Apparatus* in use as at the date of adoption of this *Transmission Code* will be able to meet the Technical Standards defined by this Code. In some cases, it may not be economical or technically necessary to upgrade such existing *Apparatus* to the required Technical Standards.

Where this is the case consideration should be given to a time bound *Derogation* for all or part of the existing *User's System* or *System*.

TGC 13. DISPUTE RESOLUTION

TGC 13.1 Mutual Discussion

TGC 13.1.1 If a *Dispute* or difference of any kind whatsoever (the "*Dispute*") between the *Grid Operator* and a *User or a Generator* in connection with, or arising out of, any clause in this *Transmission Code*, either party may issue to the other party a written notice (the "*Dispute Notice*") outlining the matter in *Dispute*. Following issuance of a *Dispute Notice* both parties shall discuss in good faith and attempt to settle the *Dispute* between them.

TGC 13.1.2 Either party to the *Dispute* may submit the *Dispute* to the *Code Review Panel*, which shall consider the clauses in question and shall, at its sole

discretion, revise the code in accordance with DGC10. Any such revision of the *Distribution Code* shall determine the outcome of the *Dispute.*

TGC 13.2 Determination by the OUR

TGC 13.2.1 Subject to TGC13.1.2 and any legally binding agreement between the parties, if the *Dispute* cannot be settled within 30 days after issue of the *Dispute Notice*, either party shall have the right to refer the *Dispute* to the *OUR* for resolution. In this case the procedure shall be as follows:

TGC 13.2.2 The request for referral shall be made in writing to the *OUR* and a dated copy of the original *Dispute Notice* between the Parties shall be attached.

TGC 13.2.3 Upon receipt of a request for referral, the *OUR* shall write to both parties acknowledging that the *Dispute* has been referred to the *OUR* for determination.

TGC 13.2.4 Following receipt of *OUR* acknowledgment, each party shall have five (5) working days to submit their reason(s) as to the cause of the *Dispute* in writing to the *OUR*.

TGC 13.2.5 No later than ten (10) working days after the *OUR* has received each party's reason(s) in writing, the *OUR* shall write to each Party setting out how the *OUR* intends to resolve the *Dispute* and indicate a date by which its determination on the *Dispute* may be expected which in any case shall not exceed three months.

TGC 13.2.6 The determination by the *OUR* shall be legally binding on both parties, subject to the right of either party to appeal such determination which shall be exercised in accordance with the provisions of the *Licence.*

TGC 14. REQUIREMENT FOR INSPECTION

TGC 14.1.1 All *Plant* and *Apparatus* that will form part of the *Transmission System* will only become part of the *Transmission System* following inspection and approval by the Government Electrical Inspectorate.

TRANSMISSION PLANNING CODE

TPC 1. INTRODUCTION

TPC 1.1 Purpose and Scope

TPC 1.1.1 Under Condition 21 of the *Licence*, *JPS* is required to have in place procedures for planning the expansion of the *Transmission System* and for the production of the *Least Cost Expansion Plan*.

TPC 1.1.2 This chapter of the *Transmission Code* specifies the criteria and procedures to be applied by *JPS* in its capacity of *Grid Operator* in the planning and development of the *Transmission System*. It furthermore provides for accountability for *Transmission System* planning and development and sets the required standards and targets. It also specifies the reciprocal obligations and interactions between *Users* of the *Transmission System* in respect of the planning process.

TPC 1.1.3 The development of the *Transmission System* may occur for a number of reasons, including but not limited to:

a. changes to customer requirements or networks;

b. the introduction of a new transmission substation or point of connection or the modification of an existing connection between a *User* and the *Transmission System;*

c. the cumulative effect of a number of developments as referred to above;

d. the need to reconfigure, decommission or optimise parts of the existing network.

TPC 1.1.4 The time required for the planning and development of the *Transmission System* will depend on the type and extent of the necessary reinforcement and/or extension work, the need or otherwise for statutory planning consent, the associated possibility of the need for public participation and the degree of complexity involved in undertaking the new work while maintaining satisfactory security and quality of supply on the existing *Transmission System.*

TPC 1.1.5 This *Planning Code* applies to the following:

a. The *Grid Operator*;

b. *Generators* insofar as the provisions of this Code are not in conflict with the provisions of the *Generation Code,* and

c. *Users* connected to the *Transmission System* including *JPS* in its capacity as operator of the *Distribution System*.

TPC 1.2 Planning Process

TPC 1.2.1 The *Grid Operator* shall follow a planning process divided into major activities as follows:

a. Identification of the need for expansion or modification of the *Transmission System*;

b. Formulation of alternative options to meet this need;

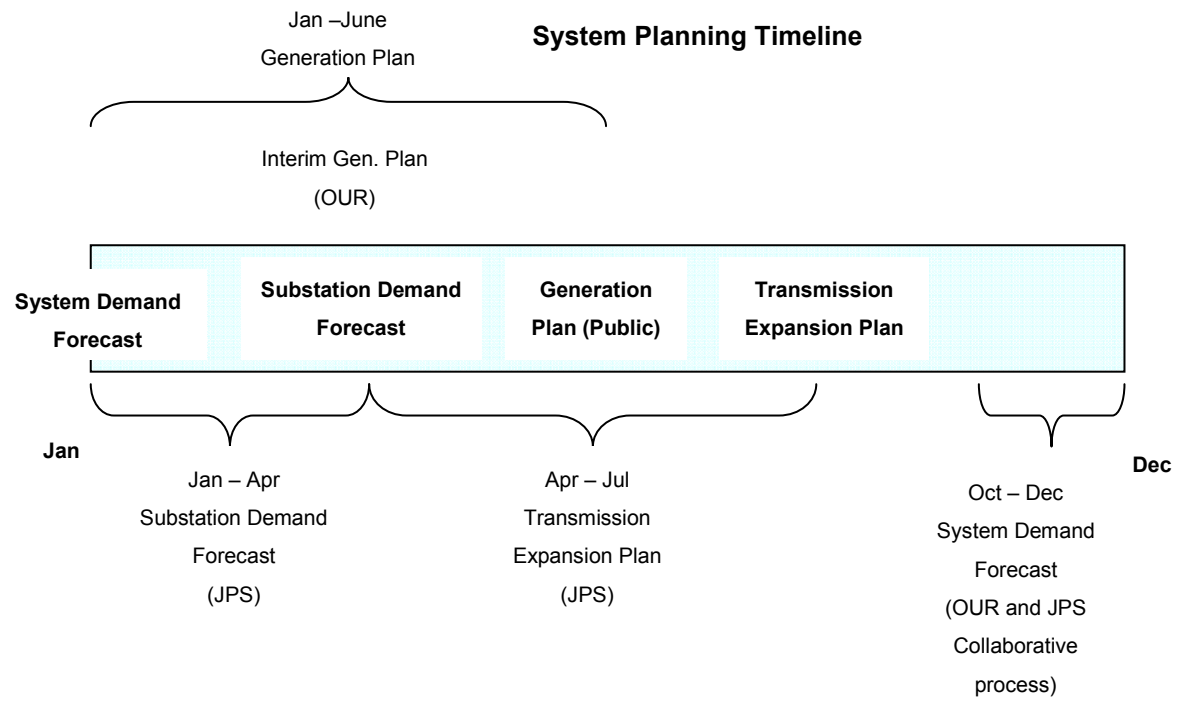
c. Study of these options to ensure compliance with agreed technical limits and justifiable reliability and quality of supply standards;

d. Costing of these options and determination of the preferred option on the basis of procedures consistent with *Prudent Utility Practice*;

e. Approval of the preferred option in line with JPS financial authorisation levels and initiation of execution.

TPC 1.3 Planning Timescales

TPC 1.3.1 The planning process above should operate on an annual cycle. The cycle commences with the development of the system demand forecast in Q4 (year n), then the development of the Substation Demand Forecast in Q1 (year n+1), and is completed with the production of the *Least Cost Expansion Plan* in Q3 (year n+1).



TPC 1.3.2 *Connection Related Planning Studies* shall be undertaken outside the above process, but new load information will be used to inform the demand forecasts. The timescales required to undertake the new connection studies necessary to plan the system vary depending on the driver for the studies and the ability to obtain consented routes.

TPC 2. TRANSMISSION SYSTEM SECURITY STANDARDS

TPC 2 of the Planning Code sets out the *Transmission Security Standards* against which the *Grid Operator* will plan the *Transmission System.*

TPC 2.1 Normal Conditions

TPC 2.1.1 The *Grid Operator* shall plan, design and operate the *Transmission System* such that under normal steady state conditions, prior to any fault, there shall not be:

a. *Equipment* loadings exceeding the pre-fault rating;

b. Voltages outside ± 5% of nominal values on all 69 kV and 138 kV buses;

c. Voltages outside ± 5% of nominal values on *Generator* buses; or

d. *System* instability.

TPC 2.2 Contingency Conditions

The *Grid Operator* shall plan, design and operate the *Transmission System* such that the system is secured against the following contingencies:

TPC 2.2.1 Single Forced Outage

The loss of any single transmission element or interbus transformer, except in cases of radial lines, shall not affect the system's ability to adequately supply the required demand of its sub-station(s).

TPC 2.2.2 Generator Outage

The loss of any single transmission element connecting a *Generator* to the *Transmission System* shall not result in a loss of generation greater than 60 MW. This implies that connections for *Generators* of greater than 60 MW shall be designed on the *N-1* principle.

TPC 2.3 Voltages

TPC 2.3.1 Under contingency conditions voltages shall be maintained as follows:

a. Voltages at all *Generator* terminal buses are to be within ± 5% of nominal voltage; and

b. Voltages at all 69 kV and 138 kV buses are to be within ± 10% of nominal voltages.

TPC 2.4 Load Power Factor

TPC 2.4.1 The system will be planned for a normal load power factor of 0.95 with a voltage planning criteria of ±5% for normal operation and ±10% for contingency conditions.

TPC 2.5 Thermal Loadings

TPC 2.5.1 Under contingency conditions, transmission line loading of up to 110% of rated continuous rating for 30 minutes (Emergency Rating) may be used. 138/69 kV Interbus Transformer loadings may not exceed nominal rating.

TPC 2.6 Spinning Reserve

TPC 2.6.1 The Grid Operator shall have in place a *Spinning Reserve* policy, subject to review by the OUR, at all times. The policy shall seek to ensure that the spinning reserve margin is adequate to cover the loss of a small generator without the loss of load. Loss of large generators could result in loss of demand, which under these circumstances shall not be deemed to be a breach of the transmission security standards. For further details of the *Spinning Reserve* Policy refer to the *Grid Operator*'s System Operation Policy No 8. Loss of demand under these circumstances shall not be deemed to be a breach of the *Transmission Code*.

TPC 2.7 Fault Levels

TPC 2.7.1 The maximum fault levels in the system should be below 80% of the rated interrupting capacity of the circuit breakers determined using the generators' transient impedances.

TPC 2.8 Frequency Criteria

TPC 2.8.1 A range of ± 0.2 Hz is considered acceptable for frequency variation. In case of outage of some elements, the system may resort to under frequency load shedding scheme to control the frequency.

TPC 2.9 Network Stability

TPC 2.9.1 The system should remain stable following a 3-phase fault resulting in the tripping of a single faulted element and with a fault clearance time of 5 cycles at the 138 kV voltage level.

TPC 3. PROCEDURES

TPC 3.1 General

TPC 3.1.1 The *Grid Operator* shall conduct *Transmission System* planning studies consistent with the planning process to ensure the Safety, Reliability, Security, and Stability of the *Transmission System* for the following:

a. Preparation of the *Transmission Least Cost Expansion Plan* for submission to the *OUR*;
b. Evaluation of *Transmission System* reinforcement projects; and
c. Evaluation of any proposed *User* Development, which is submitted to the *Grid Operator* in accordance with an application for an *Interconnection Agreement* or an Amended *Interconnection Agreement*.

TPC 3.1.2 The *Transmission System* planning studies shall be conducted to assess the impact on the *Transmission System* of any Demand Forecast or any proposed addition or change of *Equipment* or facilities in the *Transmission System* and to identify corrective measures to eliminate the deficiencies in the *Transmission System*.

TPC 3.1.3 The *Transmission System* planning studies shall be conducted periodically as required to assess:

a. The behaviour of the *Transmission System* during normal and Outage-contingency conditions; and
b. The behaviour of the *Transmission System* during the electromechanical or electromagnetic transient induced by disturbances or switching operations.

TPC 3.1.4 The *Transmission System* technical studies to be conducted (by the *Grid Operator*) are set out below.

TPC 3.2 Load Flow Studies

TPC 3.2.1 Load flow studies shall be performed to evaluate the behaviour of the *Transmission System* for the existing and planned *Transmission System* facilities under forecasted maximum and minimum Load conditions over a planning horizon of up to 10 years. These studies will determine the impact on the *Transmission System* of the connection of new Generating Plants, Loads, or transmission lines.

TPC 3.2.2 Load/power flow simulations shall be conducted in line with the planning criteria, to include both normal and contingency conditions. The results of the studies will provide, information regarding equipment loading (lines or transformers) and bus voltages together with any deficiencies in reactive support.

TPC 3.2.3 Sensitivity analyses shall also be carried out to determine the impact that any proposed changes will have on the operation of the *Transmission System* at other times than peak and minimum loads.

TPC 3.2.4 For new transmission lines, any condition within the planning criteria that produces the maximum power flows through the existing and new lines shall be identified and evaluated in order to determine any remedial measures necessary.

TPC 3.3 Short Circuit Studies

TPC 3.3.1 Short circuit studies shall be performed to evaluate the effect on *Transmission System Equipment* associated with the connection of new Generating Plants, transmission lines, and other facilities that will result in increased fault duties for *Transmission System Equipment*. These studies shall identify the *Equipment,* such as switchyard devices and substation buses, that could be permanently damaged when the current exceeds the *Equipment* design limit. The studies shall also identify the circuit breakers, which may fail when interrupting possible short circuit currents.

TPC 3.3.2 Short Circuit studies are also required to allow for the correct setting of protection relays on which depends the stability of the *Transmission System* under fault conditions.

TPC 3.3.3 Three-phase and single phase short-circuit studies shall be performed for all busbars on the *Transmission System* for different feasible generation, load, and system circuit configurations. These studies shall identify the most severe conditions that the *Transmission System Equipment* may be exposed to. Alternative *Transmission System* circuit configurations shall be studied to reduce the short circuit currents within the limits of existing *Equipment*. Such changes in circuit configuration shall be subjected to load flow and stability analysis to ensure that the changes do not cause steady-state load flow or stability problems.

TPC 3.3.4 The results shall be considered satisfactory when, at the planning stage, the short-circuit currents are within 80% of the design limits of *Equipment* and the proposed *Transmission System* configurations are suitable for flexible and safe operation.

TPC 3.4 Transient Stability Studies

TPC 3.4.1 Transient Stability studies shall be performed to verify the impact of the connection of new Generating Plants, transmission lines, and substations and changes in *Transmission System* circuit configurations on the ability of the *Transmission System* to seek a stable operating point following a transient disturbance. Transient Stability studies shall simulate the outages of critical *Transmission System* facilities such as major transmission lines and large *Generating Units*. The studies shall demonstrate that the *Transmission System* performance is satisfactory if:

a. The *Transmission System* returns to a stable condition after any Single Outage Contingency for all forecasted Load conditions; and

b. The *Transmission System* remains controllable by other means, such as operator intervention and automatic tripping of demand or

generation after multiple outage contingencies within the planning criteria.

TPC 3.4.2 Transient Stability studies shall be conducted for all new transmission lines or substations and for the connection of new *Generating Units* equal to or larger than [60] MW connected to the *Transmission System*. In other cases, the *Grid Operator* shall determine the need to perform transient Stability studies.

TPC 3.5 Steady-State Stability Analysis

TPC 3.5.1 Transient stability is the inherent ability of a power system to remain stable and maintain network synchronism when subjected to severe disturbances. The starting point of the stability studies is the steady-state conditions (determined by the load flow study). System parameters that can be derived from a steady-state stability study includes the rotor (stability phase) angle of *Generators*, real *(MW)* and reactive *(MVAR)* power flows, and bus voltages.

TPC 3.5.2 Stability Studies shall be carried out to check the dynamic performance of the *Transmission System* in the following circumstances:

a. load shedding by under-frequency relays following tripping of large *Generators*:
   i) Normal system operation with the network intact, for both the day and evening peak;
   ii) After system separation occurs, and
   iii) *System* minimum load condition.

b. slow clearance of faults due to mal-operation of the protection systems, and

c. the loss of strategic Transmission circuits including transformers.

TPC 3.5.3 The ability of the system to withstand the most severe fault shall be tested. The most onerous fault is defined as the application of a solid three phase fault or a single line to ground fault close to the main generating stations. The *Critical Fault Clearing Time (CFCT)* should also be examined to determine the response of the system to a prolonged fault.

TPC 3.5.4 The stability studies shall identify solutions, such as the installation of power system stabilizers or the identification of safe operating conditions.

TPC 3.6 Voltage Stability Analysis

TPC 3.6.1 Periodic studies shall be performed to determine if the *Transmission System* is vulnerable to voltage collapse under heavy loading conditions. A voltage collapse can proceed very rapidly if the ability of *System*'s *Reactive Power* supply to support system voltages is exhausted. The studies shall identify solutions such as the installation of dynamic and static *Reactive Power* compensation devices to avoid vulnerability to voltage collapse. In addition, the studies shall identify safe *Power System* operating conditions where

vulnerability to voltage collapse can be avoided until solutions are implemented.

TPC 4. DATA REQUIREMENTS

TPC 4.1 General

TPC 4.1.1 A critical part of all the studies mentioned above is the large volume of input data that is required by each study. This data set is necessary for the development of accurate mathematical models that can mimic the system real-time response.

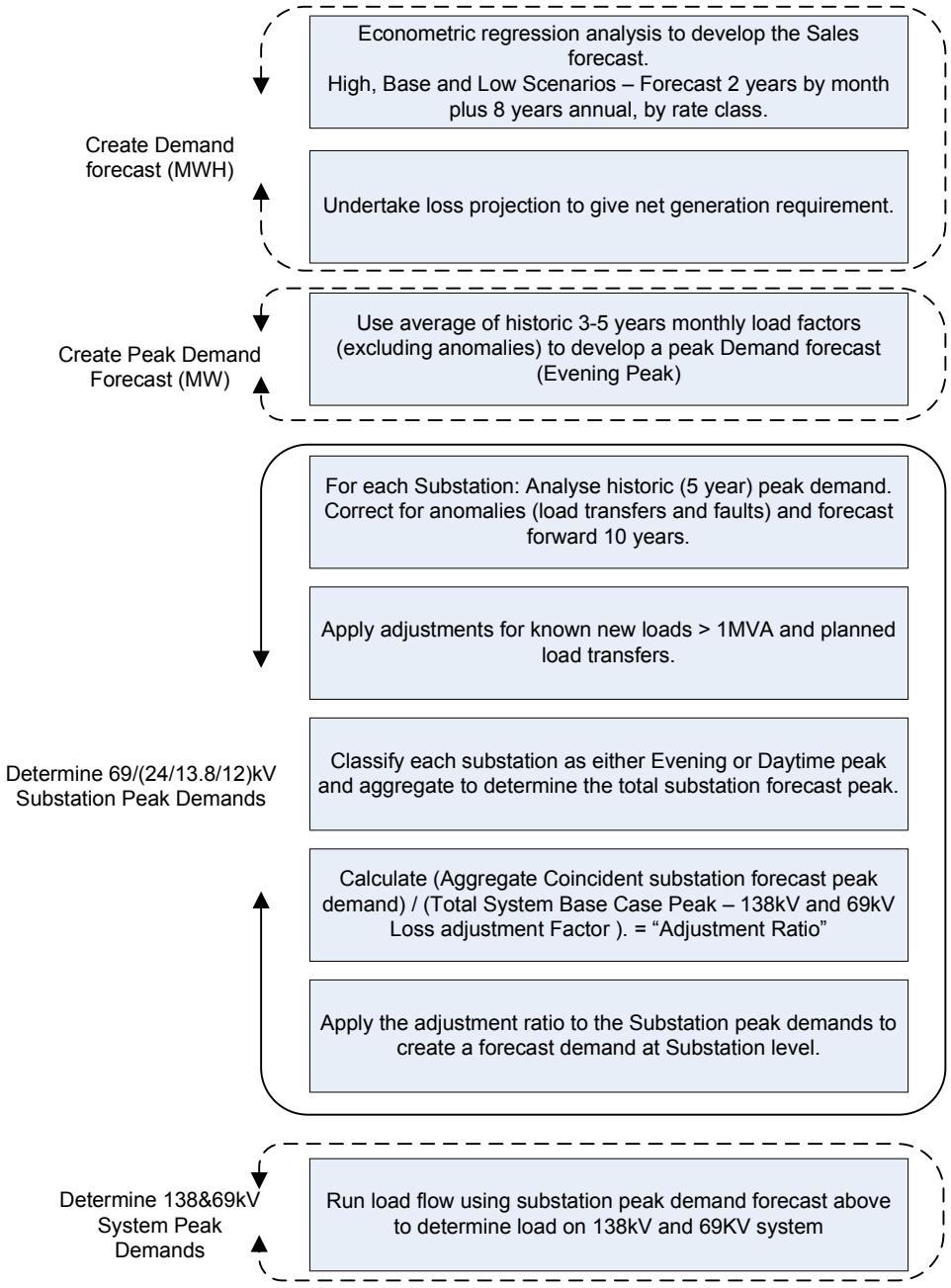
TPC 4.2 Demand forecast

TPC 4.2.1 In order to carry out load flow studies, substation loads can be represented by their constant real *(MW)* and reactive *(MVAR)* power requirements. However, voltage and transient stability studies require complex models for substation loads. In the absence of these complex models the *Grid Operator* shall continue to use the constant power model for its transient and voltage stability studies

TPC 4.2.2 Demand forecast are required to enable the network to be developed in a coordinated and economic manner. A consumption forecast using an econometric regression methodology is considered suitable for this. This forecast of unit consumption is then to be developed into a peak demand forecast for each substation: this demand data shall then be used in the system studies outlined in TPC 3 above.

TPC 4.2.3 The overall process for development of the grid wise forecast is illustrated below. This process is undertaken on an annual basis.

System and Substation Demand Forecast Process



TPC 4.3 Economic Generation Dispatch

TPC 4.3.1 Based on information obtained from the *Generation Least Cost Expansion Plan* regarding the installation of new and the retirement of existing plants, unit commitment and economic dispatch is performed to give a typical loading profile of existing and proposed generators for each year. Cases are simulated for the base year with existing generations and for each year that new plants will be added to the system.

TPC 4.3.2 The case simulations shall include, but not be limited to:

a. All base load plants available;
b. One large base load plant out of service; and
c. Two large base load plants out of service.

TPC 4.4 Transmission System Data

TPC 4.4.1 The *Grid Operator* shall have available all the *Equipment* data relevant to the *Transmission System* itself. This network data is set out in section TDRC 6 of the Data Registration Code and includes the following:

TPC 4.4.2 Transformers

The primary input data for transformers includes MVA rating, primary and secondary winding voltages, windings connection, sequence impedances, *X/R Ratio*, tap ranges, tap settings, emergency ratings.

TPC 4.4.3 Transmission Lines

Transmission lines are generally represented by single-phase models with equivalent series impedances (resistance-inductance combinations) between line terminals and equivalent shunt admittances at each terminal. The primary input data required among other things are line voltage, conductor type, type of construction, thermal ratings, emergency rating, sequence impedances.

TPC 4.4.4 Generators

Generators are modelled by their real and reactive power capabilities for steady state analysis. For dynamic analysis more detailed mathematical models are required for generators, exciters and governor control systems.

The generators are represented by their mathematical model which includes the synchronous, transient and sub transient reactance and inertia constants.

The excitation and governor control systems are modelled by their type 1 excitation and type 10 general-purpose governor control model respectively.

TPC 4.4.5 Other Parameters

In order to carry out Transient and Dynamic Stability Studies, data are required on the settings of over-current, distance, under-frequency and under-voltage relays. Data are also required for circuit breaker operating time.

Transient and dynamic stability studies require information on relay and breaker times and operating sequences.

In order to develop a reliability data bank, outage rates and durations for all major equipment are also necessary.

TPC 4.5 User System Data

TPC 4.5.1 In the context of this *Planning Code, User* means a customer load connected directly to the *Transmission System* at 69 kV or 138 kV. The data submission requirements for *Generators* are set out in Section 1 of the Connection Conditions of the *Generation Code.*

TPC 4.5.2 Any *User* applying for connection or a modification of an existing connection to the *Transmission System* shall submit to the *Grid Operator* the data required for the *Transmission System* studies in accordance with TPC 4.4 above. These data requirements are also set out in the *Connection Code* herein.

TPC 4.5.3 All *Users* shall also notify the *Grid Operator* of any changes that take place in the parameters of his equipment at the *Connection Point.*

TPC 4.5.4 *Users* shall also submit in writing to the *Grid Operator* each year in week [4] his best estimate of Energy and Demand at his *Connection Point(s)* projected for the five (5) succeeding years.

TPC 4.5.5 The *Grid Operator* shall make available to *Users* or potential *Users* such Planning data as will enable such *Users* to determine the effect on their systems of *Transmission System* developments.

TPC 5. ECONOMIC EVALUATION CRITERIA

TPC 5.1 General

TPC 5.1.1 The *Transmission System* planning process set out in this Code may give rise to a number of options for modification and/or expansion to resolve a specific problem.

TPC 5.1.2 Economic assessment of each of these technical solutions shall be carried out to determine which of the options selected will provide the best solution to the problem. The *Grid Operator* shall carry out a cost/benefit analysis of the respective options, by comparing the benefits that each options offer, relative to each other and the investment cost that they incurred when compared to:

a. energy not served, due to equipment loadings and voltage violations;
b. demand and energy loss reduction; and
c. social impact.

TPC 5.1.3 Unless other methods are agreed with the *OUR*, the *Grid Operator* shall utilise a *Discounted Cash Flow* method to decide between alternative projects. The appraisal will normally cover a 40 year investment period unless the nature of the assets to be installed requires an alternative period.

TPC 5.1.4 The value of expected unserved energy used in the economic evaluation of options shall be as determined by the *OUR.*

TPC 5.1.5 A relevant applicable discount as approved by the *OUR from time to time* shall be used when analysing proposed investments.

TRANSMISSION CONNECTION CODE

TCC 1. INTRODUCTION

TCC 1.1 General

TCC 1.1.1 This Transmission Connection Code specifies the normal method of connection to the *Transmission System* and the minimum technical, design and operational criteria which must be complied with by any User or prospective User. For the purpose of the Transmission Connection Code, User refers to both *Generator*s and *Large Customers* connected to the Transmission *System*.

TCC 1.1.2 In addition, details specific to each *User's* connection may be set out in a separate *Connection Agreement/Interconnection Agreement* or in some cases a *Power Purchase Agreement*. The Connection Conditions set out in this Transmission Connection Code are complementary to these Agreements. Conditions of *PPA's* established before the Code shall prevail.

TCC 1.1.3 All interconnection costs and responsibility shall normally be borne by the *User* connected to the *Transmission System*, unless specified otherwise by an *Interconnection Agreement*, or policy, or as dictated by the *OUR*.

TCC 1.2 Objective

TCC 1.2.1 The objective of the Transmission Connection Code is to ensure that by specifying minimum technical, design and operational criteria the basic rules for connection to the *Transmission System* shall enable *JPS* in its capacity as *Grid Operator* to comply with its statutory and *Licence* obligations.

TCC 1.2.2 This Connection Code applies to *JPS* in its capacity as *Grid Operator* and to the following:

a. *Generators* connected to the *Transmission System*;

b. *JPS* in its capacity as *Distribution System* operator at the *Connection Point*s to the *Transmission System*;

c. *Large Customers* directly connected to the *Transmission System*, and

TCC 2. METHOD OF CONNECTION

TCC 2.1 General

TCC 2.1.1 The *Grid Operator* in consultation with the *User* shall determine the optimum connection method on the basis of several technical and economic factors including:

a. Geographical considerations including proximity to the *Transmission System*;

b. Generating Facility MW capacity and/or maximum Demand to be supplied;

c. Supply voltage;

d. Reliability considerations;

e. Standby or auxiliary power requirements;

f. Substation configuration; and

g. Costs.

TCC 2.1.2 It should be noted that it will not be technically or economically practicable to achieve uniformity of the method of connection. In all cases however, *Prudent Utility Practice* will influence the method adopted.

TCC 2.1.3 The provisions relating to connecting to the *Transmission System* are contained in each *Connection Agreement* and *Power Purchase Agreement* with a *User* and include provisions relating to both the submission of information and reports relating to compliance with the relevant *Connection Agreement* and *Power Purchase Agreement* for that *User*, *Safety Rules*, commissioning programmes, *Operation Diagrams* and approval to connect.

TCC 2.1.4 Prior to the Completion Date under the *Connection Agreement*, the following are to be submitted by the *User*:

a. updated Planning Code data with any estimated values assumed for planning purposes confirmed or, where practical, replaced by validated actual values and by updated estimates for the future and by updated forecasts for items such as Demand;

b. details of the protection arrangements and settings including a Protection and Control Single Line Diagram;

c. copies of all *Safety Rules* and Local Safety Instructions applicable at *User*s Sites which shall be used at the *Grid Operator*/*User* interface;

d. information to enable the *Grid Operator* to prepare Site Responsibility Schedules on the basis of the provisions set out in Appendix A;

e. an *Operation Diagram* for all HV *Apparatus* on the *User* side of the *Connection Point*;

f. the proposed name of the *User* Site (which shall not be the same as, or confusingly similar to, the name of any *JPS* Site or of any other *User* Site);

g. a list of Safety Co-ordinators;

h. a list of the telephone numbers for *Joint System Incident*s at which senior management representatives nominated for the purpose can be contacted and confirmation that they are fully authorised to make binding decisions on behalf of the *User*;

i. a list of managers who have been duly authorised to sign Site Responsibility Schedules on behalf of the *User*; and

j. information to enable *Grid Operator* to prepare *Site Common Drawings.*

TCC 3. POWER QUALITY STANDARDS

TCC 3.1 Power Quality

TCC 3.1.1 For the purpose of this Connection Code, Power Quality shall be defined as the quality of the voltage, including its frequency and the resulting current, that are measured in the *Transmission System* during normal conditions. The standards applicable to Power Quality are set out in the *Grid Operator's Power Quality Policy*, and *JPS* System Operation Policy No 2 'Operational Standards of Security of Supply' which shall be approved by the OUR and amended from time-to-time. For ease of reference sections of the *JPS* System Operation No 2 are summarised below.

TCC 3.1.2 A Power Quality problem exists when at least one of the following conditions is present and significantly affects the normal operation of the *System*:

a. The System Frequency has deviated outside the acceptable tolerance of the nominal value of 50 ±0.2 Hz

b. Voltage magnitudes are outside their allowable range of variation;

c. Harmonic Frequencies are present in the *System*;

d. The Magnitude of the phase voltages are unbalanced.

e. The phase displacement between the voltages is not equal to 120 degrees;

f. Voltage Fluctuations cause Flicker that is outside the allowable Flicker Severity limits; or

g. High-frequency Over-voltages are present in the *Transmission System*.

TCC 3.2 Frequency Variations

TCC 3.2.1 The frequency of the *Transmission System* shall be nominally 50 ± 0.2 Hz and consistent with *JPS System* Operation Policy No 2. The *Grid Operator* may reset the target frequency based on system conditions between 49.5 Hz and 50.5 Hz.

TCC 3.2.2 Under some conditions the *System* frequency could rise to 52.5 Hz or fall to 48.0 Hz and this shall be taken into account in the design of *Plant* and *Apparatus*.

TCC 3.3 Voltage Variations

TCC 3.3.1 The voltage on the *Transmission System* at each *Connection Site* with a *User* shall normally remain within ±5% of the nominal value. The minimum voltage is -10% and the maximum voltage is +10% but voltages between +5% and +10% shall not last longer than 15 minutes unless abnormal conditions prevail.

TCC 3.3.2 The voltage on the lower voltage side of transformers at *Connection Site*s with *User*s shall normally remain within the limits ±5% of the nominal value unless abnormal conditions prevail.

TCC 3.4 Voltage Waveform Quality

TCC 3.4.1 All *Plant* and *Apparatus* connected to the *Transmission System*, and that part of the *Transmission System* at each *Connection Site*, should be capable of withstanding distortions as outlined in the *Grid Operator's Power Quality Policy*

TCC 3.5 Exceptional Conditions

TCC 3.5.1 Some events such as system faults which involve the HV network (*Transmission System*) or a generating plant or faults that lead to loss of more than one generating set in the *System* or where a *Significant Incident* has occurred or during constrained operating conditions such as light load conditions and shortage of *Active/Reactive power*, can result in variations outside the normal power quality standards as outlined in sections TCC 3 and its sub-sections. During these events, the *Grid Operator* shall be relieved of its obligation to comply with the *System* conditions referenced in the aforementioned sections, subject to the approval or the *OUR*.

TCC 4. PLANT AND APPARATUS RELATING TO CONNECTION SITES

TCC 4.1 General Requirements

TCC 4.1.1 All *Plant* and *Apparatus* relating to the *User*/*Grid Operator at the Connection Point*, shall be compliant with the conditions in TCC 4 and its sub-sections

The design of connections between any *Generating Unit* and the *Transmission System* shall be as set out in Section 1 Connection Conditions of the *Generation Code*. The design of connections between the *Transmission System* and *Large Customers* shall be in accordance with Condition 24 of the *Licence* and this Code.

TCC 4.2 Substation Plant and Apparatus

TCC 4.2.1 All circuit breakers, switch disconnectors, Earthing Devices, power transformers, *Voltage Transformers*, reactors, *Current Transformers*, surge arresters, bushings, neutral *Equipment*, capacitors, line traps, coupling devices, external insulation and insulation co-ordination at the *User/JPS Connection Point* shall be constructed, installed and tested in accordance with the current edition at the time of construction of the following codes and standards, or their international equivalents and *Prudent Utility Practice*:

ACI American Concrete Institute

ANSI American National Standards Institute

ASCE American Society for Civil Engineers

ASME American Society for Mechanical Engineers

ASNT American Society for Non-Destructive Testing

ASTM American Society for Testing Materials

AWS American Welding Society

BSJ Bureau of Standards Jamaica

IEC International Electromechanical Commission

IEEE Institute of Electrical and Electronic Engineers

ISO International Organization for Standardization

NBCJ National Building Code of Jamaica

NEC National Electric Code

NEMA National Electric Manufacturers Association

NEPA National Environment and Planning Agency (Jamaica)

NESC National Electric Safety Code

NETA National Electric Testing Association

NFPA National Fire Protection Association

OSHA Occupational Safety and Health Administration

SSPC Steel Structures Painting Council

UL Underwriters Laboratory

TCC 4.2.2 *Plant* and *Apparatus* shall be designed, manufactured and tested in premises certified in accordance with the quality assurance requirements of ISO 9001 or equivalent.

TCC 4.3 Generator Connection Points

TCC 4.3.1 The requirements for the design of *Connection Points* between *Generators* and the *Transmission System* are set out in the *Generation Code*. For information the following two sections are extracted from the *Generation Code*.

TCC 4.3.2 The voltage level at which the *Generating Unit*(s) are connected to the *Transmission* or *Distribution System* shall be dependent on but not limited to the size and number of units and the other factors that determine the *Connection Point*. Subject to other technical considerations, *Generating Units* with a Rated Capacity of 10 MW or above shall be connected to the *Transmission System* at 69 kV or 138 kV. *Generating Units* with a Rated Capacity of below 10 MW may be connected to either the *Transmission System* at 69 kV or 138 kV or the primary *Distribution System* at 24 kV or less. The chosen method of connection shall be determined by the *Grid Operator* on the grounds of *System* security, stability and safety.

TCC 4.3.3 All Substations shall have the capability to disconnect or separate, from the *Transmission System*, any transmission line and/or *Generating Unit* which is interconnected to the Substation. For reasons of ensuring safety and reliability of operation, generating substations with more than three transmission lines or *Generating Units* interconnected to them shall be of a "breaker and a half' configuration. The Substation shall be equipped with all requisite protection measures necessary to meet the *Grid Operator's* System protection standards as set out in Section 1.2.4. of the *Generation Code*.

TCC 4.4 Connection Points to Distribution System or Large Customers

TCC 4.4.1 Protection Arrangements

Protection of *Distribution Systems* and *Large Customers* directly supplied from the *Transmission System* must meet the minimum requirements referred to below:

TCC 4.4.2 The clearance times for faults on the *Transmission System* or equipment directly connected to the *Transmission System* from fault inception to circuit breaker arc extinction, shall be set out in a *Connection Agreement* where applicable but shall not be slower than:

a. 100 ms for faults cleared by busbar protection at 69 kV and 138kV; and

b. 100 ms for faults cleared by ultra-high speed directional comparison protection on 69 kV and 138 kV overhead lines.

Slower fault clearance times for faults may be agreed but only if *System* requirements permit.

TCC 4.4.3 For the event of failure of the protection systems provided to meet the above fault clearance time requirements, back-up protection shall be provided by the

User. The *Grid Operator* shall also provide back-up protection on the *System*, which shall result in a fault clearance time slower than that specified for the *User* back-up protection so as to provide discrimination.

TCC 4.4.4 For connections with the Transmission *System*, the back-up protection shall be provided by the *User* with a fault clearance time not slower than 350ms for faults on the *User Apparatus*.

TCC 4.4.5 Fault Disconnection Facilities

Where no *Grid Operator* circuit breaker is provided at the *User Connection Point*, the *User* must provide the *Grid Operator* with the means of tripping all the *User* circuit breakers necessary to isolate faults or *System* abnormalities on the *Transmission System*. In these circumstances, for faults on the *User System*, the *User* protection should also trip higher voltage *Grid Operator* circuit breakers.

TCC 4.4.6 Automatic Switching Equipment

Where automatic reclosure of circuit breakers controlled or operated by the *Grid Operator* is required following faults on the *User System*, automatic switching equipment shall be provided as necessary.

TCC 4.4.7 Relay Settings

Protection and relay settings shall be co-ordinated across the *Connection Point* to ensure effective disconnection of faulty *Apparatus*. The process for the coordination of relay settings shall be defined by the *Grid Operator.*

TCC 4.4.8 Work on Protection Equipment

Where the *Grid Operator* owns the busbar at the *Connection Point*, no busbar protection, *AC* or *DC* wiring (other than power supplies or *DC* tripping associated with the *User*s *Apparatus*) shall be worked upon or altered by *User* personnel in the absence of a representative of the *Grid Operator*.

TCC 4.4.9 Neutral Earthing

At 138 kV the higher voltage windings of three phase transformers and transformer banks connected to the *Transmission System* must be star connected with the star point suitable for connection to earth. The earthing and lower voltage winding arrangement shall be such as to ensure that the *Earth Fault Factor* requirement shall be met on the *Transmission System*.

TCC 4.4.10 *Under Frequency Relays*

As required under the *Operations Code*, suitable arrangements shall be made to facilitate automatic low frequency disconnection of Demand. Technical requirements relating to *Under Frequency Relay*s are listed in Appendix D.

TCC 4.5 Configuration of Substations

TCC 4.5.1 All Substations shall have the capability to disconnect or separate from the *Transmission System*, any transmission line and/or *Generating Unit* which is interconnected to the Substation.

TCC 4.5.2 For reasons of ensuring safety and reliability of operation, Substations with more than three transmission lines or *Generating Units* interconnected to them shall be of a "breaker and a half' configuration. The Substation shall be equipped with all requisite protection measures necessary to meet the *Grid Operator*'s *System* protection standards as set out in TCC 4.6 and in the document ‘ Protective Relaying Philosophy and Practices’ issued by *JPS* Protection and Control Department.

TCC 4.6 Protection Requirements

TCC 4.6.1 The protective systems to be applied to *Generating Units* are set out in the *Generation Code*. and shall, as a minimum, have protection against the following incidents unless specifically agreed with the *Grid Operator*:

a. Loss of excitation;

b. Under excitation;

c. Unbalanced load operation;

d. Stator phase faults and earth faults;

e. Reverse power protection;

f. Main *Generating Unit* Step-up Transformer (GSU) phase and earth faults, HV and LV;

g. Station service transformer phase and earth faults, HV and LV;

h. Transformer tank sudden pressure;

i. Backup protection in the event that external phase and earth faults are not cleared by remote protection system;

j. Backup protection in the event of circuit breaker failure to operate;

k. Generating Unit over and under frequency;

l. *Generator* over speed;

m. Stator over temperature;

n. Rotor over temperature; and

o. Restricted earth fault;

TCC 4.6.2 The Protective systems to be applied to the *User's Equipment* at the *Connection Point* shall be designed, coordinated, and tested to achieve the desired level of speed, sensitivity, and selectivity in fault clearing and to minimize the impact of faults on the *Transmission System*.

TCC 4.6.3 The *Grid Operator* and the *User* shall be solely responsible for the protection systems of electrical equipment and facilities at their respective sides of the *Connection Point*.

TCC 4.6.4 The Fault Clearance Time shall be specified in the *Connection Agreement*. The Fault Clearance Time for a fault on the *Transmission System* where the *User's Equipment* is connected, or on the *User System* where the *Grid Operator*'s *Equipment* is connected, shall not be longer than:

a. 100 ms for 138 kV; and

b. 120 ms for 69 kV.

TCC 4.6.5 Where the *User*'s *Equipment* is connected to the *Transmission System* and a circuit breaker is provided by the *User* (or by the *Grid Operator*) at the *Connection Point* to interrupt fault currents at any side of the *Connection Point*, a circuit breaker fail protection shall also be provided by the *User* (or the *Grid Operator*).

TCC 4.6.6 The circuit breaker fail protection shall be designed to initiate the tripping of all the necessary electrically-adjacent circuit breakers and to interrupt the fault current within the next 250 milliseconds, in the event that the primary protection System fails to interrupt the fault current within the prescribed Fault Clearance Time.

TCC 4.6.7 Where the automatic reclosure of a circuit breaker is required following a fault on the *User System*, automatic switching *Equipment* shall be provided in accordance with the requirements specified in the *Connection Agreement*.

TCC 4.6.8 The reliability of the protection scheme to initiate the successful tripping of the circuit breakers that are associated with the faulty *Equipment* shall be consistent with Prudent Utility Practices

TCC 4.6.9 The *Grid Operator* may require specific *User*s to provide other protection schemes, designed and developed to maintain Grid Security, or to minimize the risk and/or impact of disturbances on the Grid.

TCC 5. SITE RELATED CONDITIONS

TCC 5.1 General

TCC 5.1.1 In the absence of agreement between the parties to the contrary, construction, commissioning, control, operation and maintenance responsibilities follow ownership.

TCC 5.2 Responsibilities For Safety

TCC 5.2.1 Before connection to the *Transmission System* the *Grid Operator* and the *User* shall enter into a written agreement as to the *Safety Rules* to be used for work on *Plant* and/or *Apparatus* at the *Connection Point*.

TC C 5.3 Site Responsibility Schedules

TCC 5.3.1 In order to inform site operational staff and the *Grid Operator's* Control Engineers of agreed responsibilities for *Plant* and/or *Apparatus* at the *Operational Interface,* a Site Responsibility Schedule shall be produced for *Grid Operator* and *User*s with whom they interface.

TCC 5.3.2 The format, principles and basic procedure to be used in the preparation of Site Responsibility Schedules are set down in Appendix A.

TCC 5.4 Operation Diagrams

TCC 5.4.1 An *Operation Diagram* shall be prepared by the *User* for each *Connection Site* at which a *Connection Point* exists in accordance with Appendix B.

TCC 5.4.2 The *Operation Diagram* shall include all HV *Apparatus* and the connections to all external circuits and incorporate numbering, nomenclature and labelling, as set out in the Operations Code. At those *Connection Site*s where *SF6* gas-insulated metal enclosed switchgear and/or other SF6 gas-insulated HV *Apparatus* is installed, those items must be depicted within an area delineated by a chain dotted line which intersects SF6 gas-zone boundaries. The nomenclature used shall conform with that used on the relevant *Connection Site* and circuit.

TCC 5.4.3 The *Operation Diagram* (and the list of technical details) is intended to provide an accurate record of the layout and circuit interconnections, ratings and numbering and nomenclature of HV *Apparatus* and related *Plant*.

TCC 5.5 SF6 Gas Zone Diagrams

TCC 5.5.1 An SF6 Gas Zone Diagram shall be prepared for each *Connection Site* at which a *Connection Point* exists where SF6 gas-insulated switchgear and/or other SF6 gas-insulated HV *Apparatus* is utilised. They shall use, where appropriate, the graphical symbols shown in Appendix B. The nomenclature used shall conform with that used in the relevant *Connection Site* and circuit.

TCC 5.6 Preparation of Operation and SF6 Gas Zone Diagrams

TCC 5.6.1 Each party shall provide to the other Party an *Operation Diagram* and details of the SF6 Gas Zones on its side of the *Connection Point*. The Party owning the *Connection Site* is then responsible for the preparation of a composite *Operation Diagram* and SF6 Gas Zone diagrams for the site.

TCC 5.7 Changes to Operation and SF6 Gas Zone Diagrams

TCC 5.7.1 When either Party has decided that it wishes to install new HV *Apparatus* or it wishes to change the existing numbering or nomenclature of its HV *Apparatus*

at a *Connection Point* it shall one month prior to the installation or change, send to the other Party a revised *Operation Diagram* of that Site, incorporating the new HV *Apparatus* to be installed and its numbering and nomenclature or the changes, as the case may be.

TCC 5.8 Validity

TCC 5.8.1 The composite *Operation Diagram* prepared by the *Grid Operator* or the *User* shall be the definitive *Operation Diagram* for all operational and planning activities associated with the *Connection Site*. If a *Dispute* arises as to the accuracy of the composite *Operation Diagram*, a meeting shall be held at the *Connection Site*, as soon as reasonably practicable, between *Grid Operator* and the *User*, to endeavour to resolve the matters in dispute.

TCC 5.9 Site Common Drawings

TCC 5.9.1 *Site Common Drawings* shall be prepared for each *Connection Site* and shall include *Connection Site* layout drawings, electrical layout drawings, common protection/control drawings and common services drawings.

TCC 5.9.2 In the case of a *User* Connection Site, the *Grid Operator* shall prepare and submit to the *User*, *Site Common Drawings* for the *Grid Operator* side of the *Connection Point* in accordance with the requirements of the *Connection Agreement*.

TCC 5.9.3 The *User* shall then prepare, produce and distribute, using the information submitted by the *Grid Operator Site Common Drawings* for the complete *Connection Site* in accordance with the requirements of the *Connection Agreement*.

TCC 5.9.4 In the case of a *Grid Operator* Site, the *User* shall prepare and submit to the *Grid Operator Site Common Drawings* for the *User* side of the *Connection Point* in accordance with the requirements of the *Connection Agreement*.

TCC 5.9.5 The *Grid Operator* shall then prepare, produce and distribute, using the information submitted by the *User*, *Site Common Drawings* for the complete *Connection Site* in accordance with the requirements of the *Connection Agreement*.

TCC 5.10 Changes to Site Common Drawings

TCC 5.10.1 When the *Grid Operator* or a *User* becomes aware that it is necessary to change any aspect of the *Site Common Drawings* at a *Connection Site* it shall notify the other Party and amend the common site drawings in accordance with the procedure set out in TCC 5.9

TCC 5.10.2 If the change can be dealt with by notifying the other Party in writing of the change and for each party to amend its copy of the *Site Common Drawings* then each party shall so amend.

TCC 5.11 Validity of Site Common Drawings

TCC 5.11.1 The *Site Common Drawings* for the complete *Connection Site* prepared by the *User* or the *Grid Operator* as the case may be, shall be the definitive *Site Common Drawings* for all operational and planning activities associated with the *Connection Site*. If a *Dispute* arises as to the accuracy of the *Site Common Drawings*, a meeting shall be held at the Site, as soon as reasonably practicable, between the *Grid Operator* and the *User*, to endeavour to resolve the matters in dispute.

TCC 5.12 Access

TCC 5.12.1 The provisions relating to access to *Grid Operator* Sites by *User*s, and to *User* Sites by the *Grid Operator* shall be set out in each *Connection Agreement* with the *Grid Operator* and each *User*.

TCC 5.12.2 In addition to those provisions, where a *Grid Operator* Site contains exposed HV conductors, unaccompanied access shall only be granted to individuals holding an *Authority for Access* issued by the *Grid Operator*.

TCC 5.13 Maintenance Standards

TCC 5.13.1 All *Plant* and *Apparatus* at the *Connection Point* shall be operated and maintained in accordance with *Prudent Utility Practice* and in a manner that shall not pose a threat to the safety of any personnel or cause damage to the *Plant* and *Apparatus* of the *Grid Operator* or the *User*.

TCC 5.13.2 The *User* shall maintain a log containing the test results and maintenance records relating to its *Plant* and *Apparatus* at the *Connection Point* and shall make this log available when requested by the *Grid Operator*.

TCC 5.13.3 The *Grid Operator* shall maintain a log containing the test results and maintenance records relating to its *Plant* and *Apparatus* at the *Connection Point* and shall make this log available when requested by the *User*.

TCC 5.14 Site Operational Procedures

TCC 5.14.1 *The Grid Operator* and *Users* at a *Connection Point* shall make available staff to take necessary Safety Precautions and carry out operational duties as may be required to enable work/testing to be carried out and for the *Operation* of *Plant* Connected to the *Transmission System*.

TCC.6 COMMUNICATIONS AND CONTROL

TCC.6.1.1 In order to ensure control of the *Transmission System*, telecommunications between *Users* and the *Grid Operator* must be established if required by the *Grid Operator*.

TCC.6.1.2 Control Telephony is the method by which a *User* Responsible Engineer/Operator and the *Grid Operator*'s Control Engineers speak to one another for the purposes of control of the *Transmission System* in both normal and emergency operating conditions.

TCC 6.1.3 At any *Connection Point* where the *User* telephony equipment is not capable of providing the required facilities or is otherwise incompatible with the *Grid Operator*'s control telephony, the *User* shall install appropriate telephony equipment to the specification of the *Grid Operator*. Details of and relating to the control telephony required shall be set out in the *Connection Agreement*.

TCC 6.1.4 The *Grid Operator* shall provide Supervisory Control and Data Acquisition (*SCADA*) outstation interface equipment. The *User* shall provide such voltage, current, frequency, *Active Power* and *Reactive Power* measurement outputs and plant status indications and alarms to the *Grid Operator SCADA* outstation interface equipment as required by the *Grid Operator* in accordance with the terms of the *Connection Agreement*. The manner in which information is required to be presented to the outstation equipment is set out in Appendix C.

APPENDIX A

SITE RESPONSIBILITY SCHEDULES

TCC APPENDIX A - SITE RESPONSIBILITY SCHEDULES

At all *Connection Site*s the following Site Responsibility Schedules shall be drawn up using the pro-forma attached or with such variations as may be agreed between the *Grid Operator* and *User*s, and in the absence of agreement the pro-forma attached shall be used:

i) Schedule of HV *Apparatus*

ii) Schedule of *Plant*, LV *Apparatus*, services and supplies;

iii) Schedule of telecommunications and measurements *Apparatus*.

Other than at *Generating Unit* and Power Station locations, the schedules referred to in (ii) and (iii) above may be combined.

Each Site Responsibility Schedule for a *Connection Site* shall be prepared by the *Grid Operator* in consultation with other *User*s at least 2 weeks prior to the *Completion Date* under the *Connection Agreement* for that *Connection Site*. Each *User* shall, in accordance with the timing requirements of the *Connection Agreement*, provide information to the *Grid Operator* to enable it to prepare the Site Responsibility Schedule.

Each Site Responsibility Schedule shall detail for each item of *Plant* and *Apparatus*;

i) Item of *Equipment* – Using the agreed Numbering and Nomenclature in accordance with TOC 10.

ii) *Equipment* Owner – This identifies the party that owns the *Equipment* under common law;

iii) *Safety Rules* – This identifies whether the *Grid Operator's* or *User's Safety Rules* shall be applied to the *Equipment*.

iv) Operational Procedures – This identifies whether *Grid Operator* or *Users* personnel shall be responsible for *Operations* on the *Equipment*. Note that if this is *Grid Operator*, it does not preclude the *Grid Operator* from authorising *Users* personnel from acting on it behalf and vice versa.

v) Control Responsibility – This identifies whether the *System Control* used shall be the *Grid Operators* or the *Users*.

vi) Maintenance Responsibility – This identifies whether the *Grid Operator* or the *User* is responsible for the inspection and maintenance of the *Equipment*.

vii) Access and Security – This identifies whether the *Grid Operator* or the *User* shall be responsible for the establishment and maintenance of perimeter fencing and any manned access security for the protection of the public and to prevent malicious entry. Access to operational areas of the site shall be restricted to persons duly authorised in accordance with the prevailing *Safety Rules*.

The HV *Apparatus* Site Responsibility Schedule for each *Connection Site* must include lines and cables emanating from the *Connection Site*.

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

When a Site Responsibility Schedule is prepared it shall be sent by *Grid Operator* to the *User*s involved for confirmation of its accuracy.

The Site Responsibility Schedule shall then be signed on behalf of *Grid Operator* by the Manager responsible for the area in which the *Connection Site* is situated and on behalf of each *User* involved by its Responsible Manager, by way of written confirmation of its accuracy. Once signed, two copies shall be distributed by *Grid Operator*, not less than two weeks prior to its implementation date, to each *User* which is a party on the Site Responsibility Schedule, accompanied by a note indicating the issue number and the date of implementation.

Attachment to Appendix A: PRO FORMA for SITE RESPONSIBILITY SCHEDULE

COMPANY……..

***CONNECTION SITE*……**

Item of Equipment	Equipment Owner	Safety Rules	Operational Procedures	Control Responsibility	Maintenance Responsibility	Access and Security	Comments

Signed on behalf of the Grid Operator…… **Date……..**

Signed on behalf of the User……

APPENDIX B

PROCEDURES RELATING TO OPERATION DIAGRAMS

TCC APPENDIX B - PROCEDURES RELATING TO OPERATION DIAGRAMS

Basic Principles

a. Where practicable, all the HV *Apparatus* on any *Connection Site* shall be shown on one *Operation Diagram*. Provided the clarity of the diagram is not impaired, the layout shall represent as closely as possible the geographical arrangement on the *Connection Site*.

b. Where more than one *Operation Diagram* is unavoidable, duplication of identical information on more than one Operation Diagram must be avoided.

c. The *Operation Diagram* must show accurately the current status of the *Apparatus*, e.g. whether commissioned or decommissioned. Where decommissioned, the associated switchbay shall be labelled "spare bay".

d. Provision shall be made on the *Operation Diagram* for signifying approvals, together with provision for details of revisions and dates.

Apparatus to be shown on Ownership Diagrams

1. Busbars
2. Circuit Breakers
3. Disconnector (Isolator) and Switch Disconnectors (Switching Isolators)
4. Disconnectors (Isolators) - Automatic Facilities
5. Bypass Facilities
6. Earthing Switches
7. Maintenance Earths
8. Overhead Line Entries
9. Overhead Line Traps
10. Cable and Cable Sealing Ends
11. *Generating Unit*
12. *Generator* Transformers
13. Generating Unit Transformers, Station Transformers, including the lower voltage circuit-breakers
14. Synchronous Compensators
15. Static Var Compensators
16. Capacitors (including Harmonic Filters)
17. Series or Shunt Reactors
18. Grid Transformers
19. Tertiary Windings
20. Earthing and Auxiliary Transformers
21. Three Phase VTs
22. Single Phase VT & Phase Identity
23. High Accuracy VT and Phase Identity
24. Surge Arrestors/Diverters
25. Neutral Earthing Arrangements on HV Plant
26. Fault Throwing Devices

27. Quadrature Boosters
28. Arc Suppression Coils
29. *Current Transformer*s (where separate *Plant* items)
30. Wall Bushings

Use of Approved Graphical Symbols

All graphical symbols to be used in the *Operation Diagram*s shall be approved by the *Grid Operator*.

APPENDIX C

SCADA INTERFACING

TCC APPENDIX C- SCADA INTERFACING

This Appendix sets out the technical requirements for connections to the *Grid Operator's* Supervisory Control and Data Acquisition system outstation in terms of electrical characteristics.

GENERAL REQUIREMENTS

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

Digital Inputs

Digital inputs cover both single and double points for connection to digital input modules on the *Grid Operators* outstation equipment. The *Equipment* contacts shall be free of potential, whereas the input circuitry of the outstation are common to the negative 48 volt potential.

Single Points

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

Double Points

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

Energy Meter Inputs

Energy meter input pulses for connection to pulse counting input modules on the *Grid Operator's* outstation equipment must operate for a minimum of 100ms to indicate a predetermined flow of MWh or MVArh. The contact must open again for a minimum of 100ms. The normal state of the input must be open.

Analogue Inputs

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

Command Outputs

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

APPENDIX D

TECHNICAL REQUIREMENTS FOR UNDER FREQUENCY RELAYS

TCC APPENDIX D - TECHNICAL REQUIREMENTS FOR UNDER FREQUENCY RELAYS

The *Connection Agreement* shall specify the manner in which Demand at the User's Site, subject to Automatic Load Disconnection (separate from the Grid Operator's under frequency load shedding scheme), shall be actuated by Under-frequency Relays.

[1] *Under Frequency Relay*s shall have a frequency setting range of 46.0 to 52.0Hz and be suitable for operation from a nominal AC input of 63.5, 110 or 240V.

[2] The following general parameters on the requirements of approved Frequency Relays for automatic installations is given as an indication to the provisions that may be included in a *Connection Agreement*:

a. Frequency settings: 46-52Hz in steps of 0.01Hz;

b. Measurement period: Within a minimum selectable settings range of 3 to 7 cycles;

c. Operating time: Between 100 and 160ms dependent on measurement period setting;

d. Voltage lock-out: 20 to 90% of nominal voltage;

e. Facility stages: Four stages of frequency operation;

f. Output contacts: Two output contacts per stage.

[3] The voltage supply to the Under Frequency Relays shall be derived from the Transmission *System* at the supply point concerned so that the frequency of the *Under Frequency Relay*s input voltage is the same as that of the primary *System*. This requires either:

a. the use of a secure supply obtained from voltage transformers directly associated with the *Transmission System* interconnection transformer(s) concerned, the supply being obtained where necessary via a suitable automatic voltage selection scheme; or

b. the use of the substation 110V phase-to-neutral selected auxiliary supply, provided that this supply is always derived at the *Connection Point* concerned and is never derived from a standby generator or from another part of the *User System*.

[4] The tripping facility should be engineered in accordance with the following reliability considerations:

a. Dependability: Failure to trip at any one particular demand shedding point shall not harm the overall operation of the scheme. However, many failures would have the effect of reducing the amount of Demand under low frequency control. An overall reasonable minimum requirement for the dependability of the Demand shedding scheme is 96%, i.e. the average probability of failure of each Demand shedding point should be less than 4%. Thus the Demand under low Frequency control shall not be reduced by more than 4% due to relay failure.

b. Outages: Low frequency Demand shedding schemes shall be engineered such that the amount of Demand under control is as specified by the *Grid Operator* and is not reduced unacceptably during equipment outage or maintenance conditions.

TRANSMISSION OPERATIONS CODE

TOC 1. INTRODUCTION

This Operations Code is concerned with:

I) *Demand* forecasts;

II) Operational Planning and Data Provision;

III) Operating Margin;

IV) *Demand* Control;

V) Safety Co-ordination;

VI) Contingency Planning;

VII) *Incident* Information Supply;

VIII) Operational Liaison;

IX) Numbering and Nomenclature of *Apparatus*; and

X) Testing, Monitoring and Investigation.

TOC 1.1 Scope

This Operations Code applies to the *Grid Operator* and the following *User*s:

I) *Generators*;

II) *User*s connected directly to the *Transmission System*

TOC 2. DEMAND FORECASTS

TOC 2.1 Introduction

TOC 2.1.1 TOC 2 outlines the obligations on the *Grid Operator* and *User*s regarding the preparation of forecasts of both Active Demand and Reactive Demand on the *Transmission System*. TOC 2 sets out the timescales within which *User*s shall provide forecasts of both Active *Demand* (MW) and Reactive *Demand (MVar)* to the *Grid Operator*, and the timescales within which the *Grid Operator* shall provide forecasts to *User*s. These demand forecasts are required for certain operational purposes, specifically:

a. the Operational Planning Phase requires annual forecasts of both Active *Demand* and Reactive *Demand* on the *Transmission System* for the succeeding 2 years;

b. the Programming Phase requires weekly forecasts of both Active *Demand* and Reactive *Demand* on the *Transmission System* for the period 1 to 8 weeks ahead; and

c. the Control Phase requires daily forecasts of *Demand* data on the *Transmission System* for the day ahead.

TOC 2.1.2 TOC 2 deals with the provision of *Demand* Control data in timescales consistent with the Operational Planning Phase, the Programming Phase, and the Control Phase.

TOC 2.2 Objective

The objectives of TOC 2 are as follows:

a. to specify the requirement for the *Grid Operator* and *User*s to provide unbiased forecasts of both Active *Demand* and Reactive Demand on the *Transmission System* within specified timescales. These forecasts are used by the *Grid Operator* for Operational Planning purposes, and in the Programming Phase, and the Control Phase;

b. to describe information to be provided by *User*s to the *Grid Operator* in the post Control Phase; and

c. to describe certain factors to be taken into account by the *Grid Operator* and *User*s when preparing forecasts of both Active *Demand* and Reactive *Demand* on the *Transmission System*.

TOC 2.3 Data required by the Grid Operator and Users of the Grid – Operational Planning Phase

TOC 2.3.1 No later than the end of October each year, the *Grid Operator* shall notify each *User* in writing of the forecast information listed below for each of the following 2 Operational Years:

a. the date and time of the forecast annual peak Active *Demand* and Reactive *Demand* on the *Transmission System* at annual maximum Demand conditions; and

b. the date and time of the forecast annual minimum Active *Demand* and Reactive *Demand* on the *Transmission System* at average minimum *Demand* conditions.

TOC 2.3.2 By the end of January of each year, each *User* shall provide to the *Grid Operator* in writing, the forecast information listed below for each of the succeeding 2 Operational Years:

a. Each Directly Connected *Customer* and Distribution *Customers* with demands in excess of 5 MVA shall provide forecast profiles of hourly *Active Power Demand*, at the *Connection Point*, for the day of that *User*'s maximum *Demand* and for the day specified by the *Grid*

Operator as the day of forecast annual peak Demand. These forecasts shall reflect annual maximum *Demand* conditions;

b. Each Directly Connected *Customer* shall provide forecasts of their annual Active *Demand* requirements, at the *Connection Point*, for *Average Conditions*;

c. Each Directly Connected *Customer,* at the *Connection Point*, shall provide forecasts of the profile of hourly Active *Demand* for the day specified by the *Grid Operator* as the day of forecast minimum Demand at *Average Conditions*.

d. *User* forecasts of both Active *Demand* and Reactive *Demand* on the *Transmission System* provided to the *Grid Operator* in accordance with TOC 2 must reflect the *User*'s best estimates of its forecast requirements.

e. The *Grid Operator* shall use the information supplied to it to prepare forecasts of both Active *Demand* and Reactive *Demand* on the *Transmission System* for use in the Operational Planning Phase.

TOC 2.4 Data required by the Grid Operator - Programming Phase

TOC 2.4.1 For the period of 1 to 8 weeks ahead each *User* directly connected to the *Transmission System* and identified *Customers* with changes in excess of 5 MVA shall supply to the *Grid Operator* in writing by 13:00 hours each Thursday hourly profiles of Demand for *Active Power (MW)* and *Reactive Power* (MVAR) at a *Connection Point*.

TOC 2.4.2 The *Grid Operator* shall use the information supplied to it in preparing its forecasts of *Demand* for *Active Power* and *Reactive Power* on the *Transmission System* for the purposes of the Programming Phase.

TOC 2.5 Control Phase

TOC 2.5.1 Each *User* shall notify the *Grid Operator* of any *Demand* Control which may result in a *Demand* change of 5 MVA or more averaged over any hour on any *Connection Point* which is planned after 10:00 hours, and of any changes to the planned *Demand* Control notified to the *Grid Operator* prior to 10:00 hours as soon as possible after the formulation of the new plans.

TOC 2.6 Post Control Phase

TOC 2.6.1 Each *User* shall supply MW profiles for the previous calendar day of the amount and duration of *Demand* reduction achieved from the use of *Demand* Control of 1 MW or more on an hourly basis;

TOC 2.7 Grid Operator Forecasts

TOC 2.7.1 The following factors shall be taken into account by the *Grid Operator* when carrying out *Demand* forecasting in the Programming and Control Phases:

a. Historic *Demand* data including *Transmission System* Losses;

b. Weather forecasts and the current and historic weather conditions;

c. The incidence of major events or activities which are known to *Grid Operator* in advance;

d. *Demand* Control of 1 MW or more; and

e. Other information supplied by *User*s.

TOC 2.7.2 The *Grid Operator* shall produce forecasts of *Demand* using a forecasting methodology taking into account the above factors to produce, by statistical means, unbiased forecasts of *Demand* including that to be met by Generating *Plant*.

TOC 3. OPERATIONAL PLANNING AND DATA PROVISION

TOC 3.1 Introduction

TOC 3.1.1 TOC 3 of the Operations Code is concerned with the co-ordination of the release of *Generating Units* and the Transmission *System* for construction, repair and maintenance.

TOC 3.1.2 In general terms there is a preferred time period for planned outages of *Generating Units*, and parts of the *Transmission* and *Distribution Systems* in accordance with TOC 3. These preferred time periods are determined by reference to the excess of the total capacity of Generating *Plant* available over the sum of Demand plus the Operating Margin at the relevant time.

TOC 3.1.3 In the Operational Planning Code, "Year 0" means the current calendar year at any time, “Year 1” means the next calendar year at any time, “Year 2” means the calendar year after Year 1, and so on.

TOC 3.2 Objective

TOC 3.2.1 The objective of the Operational Planning Code is to ensure, as far as possible, that the *Grid Operator* co-ordinates, optimises and approves Outages of *Generating Units* taking into account *Transmission* and *Distribution System* Outages in order to minimise the number and effect of constraints on the *Transmission System* and in order to ensure that, so far as possible, forecast Demand plus the Operating Margin is met.

TOC 3.2.2 The *Grid Operator* shall, in relation to all matters to be undertaken pursuant to this Operational Planning Code, including the co-ordination of *Generator* Outages, act reasonably and in good faith in the discharge of its obligations.

TOC 3.3 Planning of Generation Outages

TOC 3.3.1 The planning of *Generator* outages is subject to the provisions of the *Generation Code*. The three (3) year *Generator* outage planning cycle is summarised below in TOC 3.3.2, TOC 3.3.3 and TOC 3.3.4

TOC 3.3.2 The *Grid Operator* shall develop overall generation maintenance plans for three (3) Years in advance. The plans which must incorporate statutory maintenance requirements shall be reviewed annually and updated as may be necessary.

TOC 3.3.3 *Generators* are required to submit to the *Grid Operator* on or before the first day of July of each Year a rolling three (3) Year plan for the scheduled maintenance requirement for their facility beginning in January of the following Year.

TOC 3.3.4 The *Grid Operator* shall endeavour to schedule Outages in a non-discriminatory manner as far as System security constraints allow. Both the *Grid Operator* and *Generator* shall make best efforts to ensure that interconnection and other related facilities are maintained within the periods stipulated for scheduled maintenance of the *Generating Unit*.

TOC 3.4 Planning of Transmission System Outages

The procedure set out below is to be followed in each calendar year.

TOC 3.4.1 The planning of *Transmission System* Outages is dependent on the schedule of *Generator* Outages.

TOC 3.4.2 The *Grid Operator* shall plan *Transmission System* Outages required in Years 2 and 3 as a result of construction or refurbishment works taking due account of known requirements. It is not anticipated that any detail of maintenance outages on the *Transmission System* will be available 2 or 3 years ahead.

TOC 3.4.3 The planning of *Transmission System* Outages required in Years 0 and 1 ahead shall, in addition, take into account *Transmission System* Outages required as a result of maintenance.

TOC 3.4.4 *Transmission System* Outages and *Generating Unit* Outages shall be co-ordinated so that, in general, *Generating Unit* Outages shall take precedence over *Transmission System* Outages but subject always, in any particular case, to the *Grid Operator's* discretion to determine otherwise on the basis of reasons relating to the proper operation of the *Transmission System*.

TOC 3.4.5 By the end of October in each year the *Grid Operator* shall draw up a draft *Transmission System* Outage plan covering the period Years 2 and 3 for the *Grid Operator* internal use and shall notify each *User* in writing of those aspects of the draft plan which may operationally affect such *User* including, in particular, proposed start dates and end dates of relevant *Transmission System* Outages. A copy of the draft transmission outage plan shall be submitted to the OUR annually. The *Grid Operator* shall indicate to a *Generator* restrictions on the Scheduling and Despatch of *Generating Units* to allow the security of the *Transmission System* to be maintained in accordance with the *Licence* .

TOC 3.5 Medium Term Operational Planning - Planning for Year 1

TOC 3.5.1 The plan for Year 2 produced pursuant to TOC 3.4.5 above shall become the draft *Transmission System* Outage plan for Year 1 when, by the passage of time, Year 2 becomes Year 1. Each calendar year the *Grid Operator* shall update the draft *Transmission System* Outage plan for Year 1 and shall, in addition, take into account Outages required as a result of maintenance work.

TOC 3.5.2 By the end of September each year *User*s shall submit to the *Grid Operator* details of any maintenance outages required at the *Connection Point* for the following Year 1. Maintenance outages scheduled by the *Grid Operator* shall also be included in the transmission outage plan.

TOC 3.5.3 By the end of October each year the *Grid Operator* shall issue the final *Transmission System* Outage plan for Year 1. A copy this *Transmission System* Outage Plan shall be submitted to the OUR annually TOC 3.5.4 The *Grid Operator* shall notify each *User* in writing of those aspects of the plan which may operationally affect such *User* including, in particular, proposed start dates and end dates of relevant *Transmission System* Outages. The *Grid Operator* shall also indicate where a need exists to use emergency switching, emergency load management or other measures including restrictions on the Scheduling and Despatch of *Generating Units* to allow the security of the *Transmission System* to be maintained.

TOC 3.6 Short Term Operational Planning

TOC 3.6.1 The *Transmission System* Outage plan for Year 1 issued under TOC 3.5 shall become the final plan for Year 0 when by the passage of time Year 1 becomes Year 0. The *Grid Operator* shall keep the *Transmission System* Outage Plan updated during Year 0 to take account of fault outages and changes to outage durations of both *Generator* and *Transmission System Equipment.*

TOC 3.7 Programming Phase

TOC 3.7.1 Each Friday the *Grid Operator* shall update the *Transmission System* Outage plan for the following one week period beginning at 13:00 hours on the Friday.

TOC 3.7.2 The *Transmission System* Outage plan for the week ahead shall determine the *Transmission Constraints* which impact on the Unit Commitment Schedule which the *Grid Operator* prepares each working day in accordance with Clause 3.5.1 of the *Generation Code*.

TOC 3.7.3 In the preparation of the Unit Commitment Schedule, the *Grid Operator* shall take into consideration, but not limited to, the following factors pertinent to the Unit Commitment Schedule::

a. forecasted Demand and geographical Demand distribution;

b. each *Generator*'s declaration of each *Generating Unit*(s) MW capability and availability;

c. *Generator*'s contracted operating characteristics;

d. contracted and declared Heat Rate Curves;

e. fuel prices and constraints;

f. *System* reserve requirements;

g. *System* Stability implications and frequency and voltage control; and

h. *Transmission System* constraints.

TOC 3.7.4 The *Grid Operator* shall notify each *User* in writing of those aspects of the plan which may operationally affect such *User* including in particular proposed start dates and end dates of relevant *Transmission System* Outages. The *Grid Operator* shall also indicate where a need exists to use emergency switching, emergency load management or other measures including restrictions on the Despatch of *Generating Units* to allow the security of the *Transmission System* to be maintained.

TOC 3.7.5 During the Programming Phase each *User* and the *Grid Operator* shall inform each other immediately if there is any requirement to depart from the Outages and actions determined and notified under this subsection.

TOC 3.7.6 The programming of outages shall also be subject to the following *JPS* internal policy documents:

a. Engineering Instruction 1.11 - Planned Outage Procedure;

b. *System* Operation Policy and Procedure 14 - Planned Outage Procedure T & D; and

c. System Operation Policy and Procedure 19 - Planned Outage Procedure.

For reference purposes these Procedures are reproduced in Appendix A.

TOC 3.7.7 These Procedures outline notice requirements for the submission of outage requests to the *Grid Operator*. The provisions in this Operational Planning Code shall not supersede the requirement to submit an outage request within the timescales specified in the said Procedures.

TOC 3.7.8 The fact that a transmission outage appears in the Year 1 Transmission Outage Programme does not preclude the requirement to submit an outage request in accordance with the internal Procedures.

TOC 4. OPERATING MARGIN

TOC 4.1 Introduction

TOC 4.1.1 TOC 4 of the Operations Code sets out the types of reserves making up the Operating Margin that the *Grid Operator* may use in the Control Phase.

TOC 4.2 Operating Margin Constituents

TOC 4.2.1 The Operating Margin comprises *Contingency Reserve* plus *Operating Reserve*.

TOC 4.2.2 *Contingency Reserve* is the margin of Generation Capacity required in the period from 24 hours ahead down to real time, over and above the forecast Demand. It is provided by *Generating Units* that are not required to be Synchronised but which must be held Available to Synchronise within a defined timescale.

TOC 4.2.3 *Operating Reserve* provides spare Generation Capacity for Frequency control in real time (*Spinning Reserve*) and quick time contingency (10_minutes Reserve) and is provided by *Generating Units* that are either Synchronised or can be Synchronised within minutes. *Contingency Reserve* and *Operating Reserve* provide against uncertainties in Availability of *Generating Units* and in Demand forecasts. *Operating Reserve* consists of *Spinning Reserve* and *10-minute Reserve*.

TOC 4.3 Contingency Reserve

TOC 4.3.1 The *Grid Operator* shall determine the amount of *Contingency Reserve* required for each hour up to 24 hours ahead, taking due consideration of relevant factors, including but not limited to the following;

a. Availability and historical reliability performance of individual *Generating Units;*

b. Notified Risks of Trip of individual *Generating Units*; or

c. Demand forecasting uncertainties.

TOC 4.4 Operating Reserve

TOC 4.4.1 The *Grid Operator* shall determine the amount of *Spinning Reserve* and *10-Minute Reserve* that must be available to it from *Generating Units* at any time to ensure *System* security. The *Grid Operator Operating Reserve* policy shall take due consideration of relevant factors, including but not limited to the following:

a. the magnitude of the largest *Active Power* infeed from *Generating Units;*

b. the predicted Frequency drop following loss of the largest infeed as may be determined through simulation using a dynamic model of the *Total System*;

c. the extent to which Demand Control can be implemented;

d. *Significant Incidents* that may justify provision of additional *Operating Reserve*;

e. the cost of providing *Operating Reserve* at any point in time; and

f. ambient weather conditions, insofar as they may affect, directly or indirectly, *Generating Unit* and/or *Transmission System* reliability.

TOC 4.4.2 The *Grid Operator* shall keep records of the *Operating Reserve* policy and of significant alterations to it as determined by the above and any other factors.

TOC 4.5 Procedures

TOC 4.5.1 The Procedures used by the *Grid Operator* to determine the *Operating Margin* are set out in the following documents:

a. The *Generation Code* including the Schedules; and

b. System Operation Policy and Procedure No 8 – Operating *Spinning Reserve*.

TOC 5. DEMAND CONTROL

TOC 5.1 Introduction

TOC 5.1.1 TOC 5 is concerned with the provisions made by the *Grid Operator* and procedures to be followed by the *Grid Operator* and *User*s to permit a reduction in Demand in the event that there is insufficient Generation available to meet Demand in all or any part of the *Transmission System* and/or in the event of problems on the *Transmission System*, including, without limitation, in the event of both a steady state shortfall of generation and a transient shortfall of generation following a sudden loss of generation.

TOC 5.2 Objectives

TOC 5.2.1 The objectives are as follows;

a. To identify different methods of Demand Control and the procedures governing their implementation; and

b. to clarify the obligations of the *Grid Operator* and *User*s as regards the development of procedures, and exchange of information, required for the implementation of Demand Control.

TOC 5.2.2 The *Grid Operator* shall ensure that all parties affected by Demand Control are treated equitably and that Demand Control is used as a last resort.

TOC 5.3 Methods of Demand Control

TOC 5.3.1 Demand Control is implemented in a number of ways, including;

a. Shedding of Demand by automatic *Under-Frequency Relays*;

b. Emergency Manual Demand Shedding; and

c. Planned Rota Demand Shedding.

TOC 5.3.2 The obligations of the *Grid Operator* and *User*s in respect of these means of Demand Control are set out below in TOC 5.4, TOC 5.5 and TOC 5.6. All

plans and implementation of Demand de-energisation shall give due consideration to critical *Customers*.

TOC 5.4 Shedding of Demand by Automatic Under-Frequency Relays

TOC 5.4.1 The Grid Operator shall use Automatic Demand shedding by *Under-Frequency Relays* to address short-term imbalances in the Generation Capacity and Demand situation, following the tripping of Generation beyond the *Spinning Reserve* value. It is a method of safeguarding the stability of the *Transmission System* when other actions, such as the use of the Operating Margin, have failed to stabilise or hold the Frequency within required Operating Limits.

TOC 5.5 Emergency Manual Demand Shedding

TOC 5.5.1 The *Grid Operator* may implement Emergency Manual Demand Shedding to maintain the stability of the *Transmission System*, to cover a developing Generation shortfall or to relieve overloads or depressed voltages in the *Transmission System* or a part of it.

TOC 5.6 Planned Rota Demand Shedding

TOC 5.6.1 In the event of a sustained period of shortfall in the Generation and Demand balance, either for the *Transmission System* as a whole or for significant parts of the *System*, the *Grid Operator* shall implement manual shedding of Demand on a rota basis.

TOC 5.6.2 When implementing Planned Rota Demand Shedding the *Grid Operator* shall use reasonable measures to ensure that available power is shared among affected parties on an equitable basis subject to consideration of critical customers. Groups of *Customers* can be de-energised for periods of up to [4] hours, after which their supplies shall be re-energised and another group of *Customers* de-energised.

TOC 5.7 Procedures

TOC 5.7.1 The procedures for manual load shedding and the settings for *Under-Frequency Relays* are set out in the following documents which are included as Appendices:

a. The *Generation Code* Chapter 4 (Appendix A);

b. Engineering Instruction No 1.6 – Load Shedding associated with Generating Plant Deficiency (Appendix B); and

c. System Operation Policy and Procedure No 11 – Controlled Load Shedding (Appendix C).

TOC 6. SAFETY CO-ORDINATION

TOC 6.1 Introduction

TOC 6.1.1. TOC 6.1 requires that an approved *Safety Management System* is applied by the *Grid Operator* to meet statutory and other requirements.

TOC 6.1.2 TOC 6.1 specifies the procedures to be used by the *Grid Operator* and *Users* for the establishment, and maintenance of switching and clearance procedures to ensure that work on *Apparatus* on the *System* or a *User's System* can be carried out safely. It applies only when work and/or testing, other than the *System Tests* covered by TOC 11, is to be carried out and where the safety of personnel or plant requires the *Grid Operator* and a *User* or *Users* to liaise.

TOC 6.1.3 TOC 6.1 does not define the *Safety Rules* to be adopted by the *Grid Operator* or any *User* but sets out the requirement to prepare procedures, which shall govern the interface between them. In particular it lays down the rules for agreeing the safety procedures (the *Local Safety Procedures*) which shall be adopted on either side of a *Connection Point* between the *Grid Operator* and any *User*.

TOC 6.1.4 Where the provisions of TOC 6.1 require a party to approve the *Local Safety Procedures* of another *Party*, such approval does not imply that the approving *party* takes any responsibility for the adequacy of the *Local Safety Procedures*. The approval in such case only implies that there is nothing in the *Local Safety Procedures* that negates or frustrates any provision of the *Local Safety Procedures* of the approving *Party* for the relevant *Connection Point*.

TOC 6.2 Objective

TOC 6.2.1 The objective of TOC 6.2 is to ensure that the safety procedures adopted on either side of a *Connection Point* work together in such a way as to ensure the safety of personnel, and/or *Plant* at any time that work and/or testing is carried out at or near the *Connection Point.*

TOC 6.3 Co-ordination of Local Safety Procedures

TOC 6.3.1 Prior to the energising of a new *Connection Point* (or, for a *Connection Point* which has been energised before the procedure set out in TOC 6.3 has been adopted, as soon as reasonably practicable), *the Grid Operator* and the relevant *User* shall each supply the other with a copy of the *Local Safety Procedures* which it intends to adopt on its side of the *Connection Point*.

TOC 6.3.2 The party from whom approval is sought shall, within 7 days of receipt of the *Local Safety Procedures*, send written comments to the issuing party giving:

a. its approval of the *Local Safety Procedure*; or

b. its reasons for refusing to give approval and the changes which it would wish to see to enable it to grant approval.

c. If the party from whom approval is sought requires more stringent Isolation and/or Earthing provisions then, to the extent that these provisions are not unreasonable, the other *Party* shall make such changes to its *Local Safety Procedures* as soon as is reasonably practicable.

TOC 6.3.3 If, subsequent to the approval of any *Local Safety Procedure*s, the issuing party wishes to change any provision of the procedure, it shall prepare a version of the procedure showing the original text and clearly indicating the changes required to this text and shall seek approval of this procedure as if this procedure had not previously been approved.

TOC 6.3.4 If an approved *Local Safety Procedures* has been found to be unsound, revisions to this procedure, only to the extent that these are required to ensure the safety of personnel or *Plant*, may be implemented immediately, subject, only to the *Safety Co-ordinators* of the other party or parties having been informed of these changes and having confirmed that the changes do not increase the risk to their own personnel and/or plant and are understood.

TOC 6.4 Safety Co-ordinators

TOC 6.4.1 Prior to the energising of a new *Connection Point* (or, for a *Connection Point* which has been energised before the procedure set out in TOC 6.4 has been adopted, as soon as reasonably practicable), the *Grid Operator* and the relevant *User* shall, in respect of this *Connection Point*, each appoint a person to act as *Safety Co-ordinator* and a second person to act as *Safety Co-ordinator* at any time that the first named person is unavailable.

TOC 6.4.2 The *Grid Operator* and the relevant *User* shall each inform the other, in writing and without delay, of the identity of the persons appointed by them as *Safety Co-ordinators*. In the event of an intention to replace the person appointed as *Safety Co-ordinator* the other party to the *Connection Point* shall be notified of the identity of the new *Safety Co-ordinator* without delay.

TOC 6.4.3 The *Safety Co-ordinators* shall be responsible for co-ordination of all matters concerning safety across the *Connection Point*, including but not limited to, the approval of *Local Safety Procedures*. A *Safety Co-ordinator* may be responsible for more than one *Connection Point* site.

TOC 6.5 Isolation and Earthing

TOC 6.5.1 Without prejudice to the need to prepare and agree *Local Safety Procedures* for use at each *Connection Point* site, it would be expected that Isolation and Earthing principles no less stringent than those outlined in TOC 6.5.2 and TOC 6.5.3 shall be adopted.

TOC 6.5.2 Isolation Device

a. Where Isolation is achieved by means of an Isolation Device, the isolating position shall be maintained in such a way as to minimise the

risk of inadvertent, accidental or unauthorised operation and that when put in this position, a notice or "tag" to this effect shall be attached.

b. Clearance to work on any *Apparatus* which requires this Isolation to be achieved shall only be issued when the procedure above has been completed.

TOC 6.5.3 Earthing Device

a. Where Earthing is achieved by means of an Earthing Device, the Earthing position shall be maintained in such a way as to minimise the risk of inadvertent, accidental or unauthorised operation and that when put in this position, a notice or "tag" to this effect shall be attached.

b. Clearance to work on any *Apparatus* that requires this Earthing to be achieved shall only be issued when the procedure above has been completed.

TOC 7. CONTINGENCY PLANNING

TOC 7.1 Introduction

TOC 7.1.1 This Contingency Planning Code requires the *Grid Operator* to develop a strategy to be implemented in Emergency Conditions such as a *Total System Shutdown* or major *System Incidents*.

TOC 7.1.2 The Grid Operator shall have adequate policies and procedures in place to respond to a *Total System Shutdown* or major *System Incident* that will have widespread implications for electricity supply to the population. *Users* shall be aware of these policies and procedures, and cooperate fully in their implementation, through which the *Grid Operator* can return the *Transmission System* to normal operating conditions.

TOC 7.2 Objective

TOC 7.2.1 The objectives of TOC 7 are:

a. to require the *Grid Operator* to develop a general restoration strategy to adopt in the event of *Total System Shutdown* or major *System Incident;*

b. to require the *Grid Operator* to produce and maintain comprehensive *System* restoration procedures covering *Total System Shutdowns* and major *System Incidents*;

c. to provide for the cooperation of *Users* with the formulation and execution of *System* restoration procedures;

d. to provide for the development and implementation of communications between the *Grid Operator* and *Users* when dealing with a *System Incident*; and

e. to ensure the *Grid Operator* and *User* personnel who will be involved with the implementation of *System* Restoration Procedures, are

adequately trained and familiar with the relevant details of the procedures.

TOC 7.3 Scope

TOC 7.3.1 In addition to the *Grid Operator*, TOC7 applies to:

a. *Generators*;

b. *Large Customers*.

TOC 7.4 System Restoration Strategy

TOC 7.4.1 The *Grid Operator* shall develop a *System Restoration Strategy* to be implemented in Emergency Conditions such as *Total System Shutdown* or a major *System Incident* and other major *System Incident*s. The overall objectives of the *System Restoration Strategy* shall be as follows:

a. restoration of the *Transmission System* and associated Demand in the shortest possible time, taking into account *Generator* capabilities, and *Transmission System* operational constraints;

b. re-synchronisation of parts of the *Transmission System* which have lost synchronism with each other; and

c. to provide for effective communication routes and arrangements to enable senior management representatives of the *Grid Operator* and *Users*, who are authorised to make binding decisions on behalf of the *Grid Operator* or a *User* to communicate with each other during a *System Incident*.

TOC 7.4.2 The *System Restoration Strategy* shall provide for the detailed implementation of the following:

a. notification by the *Grid Operator* to *Users* that a *Total System Shutdown* or a major *System Incident* has occurred and that the *Grid Operator* intends to implement *System* restoration procedures;

b. identification of separate groups (*Power Islands*) of *Generators* together with complementary local Demand; and

c. step by step integration of these *Power Islands* into larger sub-*System*s to return the *Transmission System* to normal operating conditions.

TOC 7.4.3 The *System Restoration Strategy* shall also provide for the issue of any dispatch instructions necessitated by the *System* conditions prevailing at the time of the *System Incident*.

TOC 7.5 System Restoration Procedures

TOC 7.5.1 In the event of emergency conditions such as a *Total System Shutdown* of the *Transmission System,* the *Grid Operator* shall issue an Alert as set out in

TOC 7.6 to notify *Users* that it intends to implement *System* Restoration Procedures. The *Grid Operator* shall notify *Users* prior to the commencement of the *System* restoration procedures of the particular *System Restoration Strategy* to be implemented for that *System Incident*.

TOC 7.5.2 The *System* restoration procedures shall be developed and maintained by *Grid Operator* in consultation with other *Users* as appropriate in accordance with *Prudent Utility Practice*.

TOC 7.5.3 The *Code Review Panel* shall ensure that appropriate *System* restoration procedures are in place.

TOC 7.5.4 The System Restoration Procedures shall provide for:

a. procedures to establish an *Emergency Operation Centre* immediately following a major *System Incident*;

b. a decision on the location of the *Emergency Operation Centre*; and

c. the operational responsibilities and requirements of an *Emergency Operation Centre*, noting that such an *Emergency Operation Centre* shall be the focal point for communication and the dissemination of information between *Grid Operator* and senior management representatives of relevant *Users*.

TOC 7.5.5 The complexities and uncertainties of recovery from a *Total System Shutdown* of the *Transmission System* require the *System* restoration procedures to be sufficiently flexible so as to accommodate the full range of prevailing *Generator* and *Transmission System* operational possibilities and constraints.

TOC 7.6 User responsibilities

TOC 7.6.1 Each *User* shall follow the *Grid Operator*'s instructions during a *System* restoration process, subject to safety of personnel, the *Grid Operator*'s and the *User*'s *Plant* and *Apparatus*.

TOC 7.6.2 It shall be the responsibility of the *User* to ensure that any of its personnel who may reasonably be expected to be involved in *System* restoration procedures are familiar with, and are adequately trained and experienced in their standing instructions and other obligations so as to be able to implement the procedures notified by the *Grid Operator*.

TOC 7.7 Black Start Procedure

TOC 7.7.1 The procedure for a *Black Start* situation shall be that specified by the *Grid Operator* at the time of the *Black Start* situation. *Users* shall abide by the *Grid Operator* instructions during a *Black Start* provided that the instructions are to operate within the operating parameters of each *Generator*.

TOC 7.7.2 The *Grid Operator* may issue instructions to a *Generator* with *Black Start* capability relating to the commencement of a *Generator* when an external power Supply is made available to it.

TOC 7.7.3 The *Grid Operator* shall also issue instructions relating to the restoration of Demand.

TOC 7.7.4 *Black Start* instructions shall be implemented in accordance with the following procedures:

a. a *Generator* with *Black Start* capability shall start-up as soon as possible and within two hours of an instruction from the *Grid Operator* to initiate start-up. The *Generator* shall confirm to the *Grid Operator* when start-up has been completed;

b. following such confirmation, the *Grid Operator* shall endeavour to stabilise that *Generator* by instructing the restoration of appropriate demand following which the *Grid Operator* may instruct the start-up and synchronisation of the remaining available *Generators* at that *Generating* Facility and their loading with appropriate *Demand* to create a *Power Island*;

c. if during this *Demand* restoration process any *Generator* cannot keep within its safe operating parameters because of Demand conditions, the operator of the *Generator* shall inform the *Grid Operator* and the *Grid Operator* shall, where possible, either instruct *Demand* to be altered or shall re-configure the *Transmission System* or shall instruct a *User* to re-configure its *System* in order to alleviate the problem being experienced by the *Generator;*

d. The *Grid Operator* accepts that the decision to keep a *Generating Unit* operating outside its safe operating parameters is one for the Operator of the *Generator* concerned. The *Grid Operator* shall accept and respond accordingly to a decision of the operator of a *Generator* to change Generation output on a *Generator* if it believes it is necessary to do so for safety reasons; and

TOC 7.7.5 The *Grid Operator* shall have procedures in place for emergency restoration of the *System* following events such as hurricanes, earthquakes and torrential rains.

TOC 7.7.6 These Procedures shall be reviewed and updated by the *Grid Operator* and may be incorporated into other procedures developed in accordance with TOC 7.

TOC 7.7.7 The *Grid Operator* shall inform *Users* of the end of a *Black Start* situation and the time at which the *Transmission System* resumed normal operation.

TOC 7.7.8 All notifications must be made promptly. Notifications by the *Grid Operator* to *Users* and responses may be made by telephone but must be confirmed

within 30 minutes in writing. Where information is requested in writing throughout this Code, facsimile transmission or other electronic means as agreed with the *Grid Operator* in writing may be used.

TOC 7.8 Re-Synchronisation Procedures

TOC 7.8.1 Where there is no *Total System Shutdown* but parts of the *Transmission System* are out of synchronism with each other, the *Grid Operator* shall instruct *Users* to regulate generation output or *Demand* to enable the separate parts to be re-synchronised. The *Grid Operator* shall inform the relevant *Users* when re-synchronisation has taken place.

TOC 7.8.2 The *Grid Operator* shall issue whatever revised dispatch instructions are required to enable re-Synchronisation and to return the *Transmission System* to normal operation.

TOC 7.9 System Incident Procedures

TOC 7.9.1 *System Incident*s are unpredictable both with respect to timing and the resulting implications. The *Grid Operator* shall establish procedures for determining when an *Incident* on the *Transmission System* shall be considered a *System Incident* and also establish outline procedures for handling *System Incident*s.

TOC 7.9.2 In certain circumstances, the *Grid Operator* may require an *Emergency Operation Centre* to be established to coordinate the response to a *System Incident* and to avoid placing further stress on existing *Grid Operator* and *User* operational control arrangements.

TOC 7.9.3 The *Grid Operator* shall inform *Users* promptly that an *Emergency Operation Centre* is to be established and request all relevant *Users* to implement *System Incident Communications Procedures.* The *Grid Operator* shall specify the responsibilities and functions of the *Incident Centre* and the relationship with existing operational and control arrangements.

TOC 7.9.4 The *Emergency Operation Centre* established in accordance with the *Grid Operator*'s instructions shall have any responsibility for the *Operation* of the *Transmission System* and shall be the focal point for communication and the dissemination of information between the *Grid Operator* and senior management representatives of relevant *Users*, the *OUR* and Government.

TOC 7.9.5 During a *System Incident* normal communication channels for operational control communication between the *Grid Operator* and *Users* shall continue to be used.

TOC 7.9.6 The *Grid Operator* shall decide when conditions no longer justify the need to use the *Emergency Operation Centre* and shall inform all relevant *Users* within 30 minutes by facsimile or other agreed electronic means accordingly.

TOC 7.10 System Incident Communications

TOC 7.10.1 The *Grid Operator* and all *Users* shall maintain lists of telephone contact numbers at which, or through which, senior management representatives

nominated for this purpose and who are fully authorised to make binding decisions on behalf of the *Grid Operator* or the relevant *User* can be contacted day or night.

TOC 7.10.2 The lists of telephone contact numbers shall be provided in writing prior to the time that *a User* connects to the *Transmission System* and must be up-dated and circulated to all relevant parties, in writing, whenever the information changes. Notifications and responses shall be made normally by telephone but must be confirmed in writing within 30 minutes.

TOC 7.10.3 All *System Incident* communications between the Senior Management representatives of the relevant parties with regard to the *Grid Operator*'s role in the *System Incident* shall be made via the *Emergency Operation Centre* if such a centre has been established.

TOC 7.11 System Alerts/Warnings

TOC 7.11.1 In the event of *System Incident*s, such as *Total System Shutdown* or a *System* separation, the *Grid Operator* shall issue promptly an alert warning to all *Users*.

TOC 7.11.2 The form of the Alert Warning will be:

"This is an Alert timed at …… hours;
There is a (Major System Incident) at …….. (place);
A System Normalisation Procedure is being implemented;
Standby for further instructions".

TOC 8. INCIDENT INFORMATION SUPPLY

TOC 8.1 Introduction

TOC 8.1.1 This Operations Code requires the *Grid Operator* and *User*s to issue notices of all *Incident*s on their respective *System*s that have or may have implications for the *Transmission System* or a *User*'s *System*.

TOC 8.1.2 The *Grid Operator* may determine that an *Incident* shall be classified as a *Significant Incident* in accordance with TOC 8.7. TOC8 sets out the procedures for reporting and subsequent assessment of *Significant Incident*s.

TOC 8.1.3 TOC8 requires the *Grid Operator* or a *User* to prepare:

a. a preliminary written *Significant Incident* report within 24 hours of the *Grid Operator* determining an *Incident* as a *Significant Incident*; and

b. a full written *Significant Incident* report within 7 business days of the *Grid Operator* determining an *Incident* as a *Significant Incident*, or as agreed by the *OUR*

TOC 8.1.4 In addition, TOC 8 contains requirements governing the content of *Significant Incident* reports, the circulation of *Significant Incident* reports, and their subsequent assessment and review by the *Code Review Panel*.

TOC 8.2 Objective

TOC 8.2.1 The objectives of TOC8 are:

a. to specify the obligations of the *Grid Operator* and *User*s regarding the issue of notices of *Incident*s on their respective *System*s;

b. to ensure notices of *Incident*s provide sufficient detail to allow recipients of such notices to fully assess the likely implications and risks and take the necessary actions required to maintain the security and stability of the *Transmission System* or a *User*'s *System*;

c. to specify the arrangements for reporting *Incident*s that the *Grid Operator* has determined to be a *Significant Incident*; and

d. to provide for the review of all *Significant Incident* reports by the *Code Review Panel* to assess the effectiveness of policies adopted in accordance with this *Transmission Code*.

TOC 8.3 Notification of Incidents

TOC 8.3.1 The *Grid Operator* and *User*s shall issue notifications of *Incident*s on their respective *System*s that have had or may have implications for the *Transmission System* in the case of the *User,* or a *User*'s *System* in the case of both the *Grid Operator* and *User* notifications. Where information is requested in writing throughout this Code, facsimile transmission or other electronic means as agreed with *Grid Operator* in writing may be used.

TOC 8.3.2 Without limiting the requirements of this Code, *Incident* notifications shall be issued for the following, subject to TOC 8.3.1;

a. where *Plant* has been Operated in excess of its rated capability and presented a hazard to Persons;

b. the activation of any alarm or indication of any abnormal operating condition;

c. adverse weather conditions being experienced;

d. breakdown of, faults on or temporary changes in the capabilities of *Plant*;

e. breakdown of or faults on control, communication and Metering equipment; and

f. increased risk of inadvertent operation of protection devices, relays or Equipment

TOC 8.4 Incidents on the Transmission System

In the case of an *Incident* on the *Transmission System*, which has had or may have an *Operational Effect* on a *User System*, the *Grid Operator* shall notify the *User* whose *User System* will be, is, or has been affected.

TOC 8.5 Incidents on a User System

In the case of an *Incident* on a *User System*, which has had or may have an *Operational Effect* on the *Transmission System*, the *User* shall notify the *Grid Operator*. Following notification by the *User*, the *Grid Operator* shall notify any other *User*s whose *System*s will be, or have been affected.

TOC 8.6 Form of notification

Incident notifications must be issued promptly. Notifications and responses to notifications may be made by telephone or the mass media, but shall be confirmed in writing within one (1) hour or as soon as it is practical to do so.

TOC 8.6.1 The appropriate party shall issue a notification (and any response to questions asked) of any *Incident* that has arisen independently of any other *Incident*.

TOC 8.6.2 The notification shall;

a. describe the *Incident* (but is not required to state its cause);

b. be of sufficient detail to enable the recipient of the notification to reasonably consider and assess the implications, and risks arising; and

c. include the name of the individual reporting the *Incident* on behalf of the *Grid Operator* or the *User*.

TOC 8.6.3 The recipient of a notification may ask questions to clarify the notification and the provider of the notification shall, insofar as they are able, answer any questions raised.

TOC 8.6.4 An *Incident* notification shall be given as soon after the *Incident* as possible to allow the recipient to consider and assess the implications and risks arising from the *Incident*.

TOC 8.7 Significant Incident reporting

TOC 8.7.1 The *Grid Operator* may determine that an *Incident* reported by it or a *User* shall be classified as a *Significant Incident*.

TOC 8.7.2 The *Grid Operator* shall promptly notify all potentially affected *User*s by telephone or other media that such a determination has been made and that procedures governing *Significant Incident* reporting are to be followed. The

Grid Operator shall confirm such notice within 30 minutes by facsimile or other electronic means. All affected *User*s shall acknowledge receipt of the notification within 15 minutes of receipt by facsimile or other electronic means.

TOC 8.7.3 Without limiting this general description, *Significant Incident*s shall include, as a minimum all of the following;

a. manual or fault related tripping of *System* circuits, *Plant* or *Apparatus* affecting more than 20% of the *Distribution System* customer base;

b. *System* instability;

c. overloading (i.e. loading in excess of 110% of the rated Capacity) of *System* circuits, and *Plant*; and

d. breaches of *Safety Rules* or procedures that resulted in danger or injury to members of the public or to *Grid Operator* or *User* employees or their representatives.

TOC 8.7.4 Timing of Significant Incident reporting

a. Preliminary report
The *Grid Operator* or *User* must produce a preliminary written *Significant Incident* report within 24 hours of the *Grid Operator* or the *User* receiving notification that the *Grid Operator* has determined an *Incident* to be a *Significant Incident*. The preliminary written *Significant Incident* report shall cover in outline terms the matters specified in Appendix A

b. Full report
The *Grid Operator* or *User* must produce a full written *Significant Incident* report within 7 business days of the *Grid Operator* or the *User* receiving notification that the *Grid Operator* determined an *Incident* to be a *Significant Incident*

TOC 8.8 Written reporting of Significant Incidents by the Grid Operator to Users

TOC 8.8.1 In the case of an *Incident* that has been reported by the *Grid Operator* to a *User*, and subsequently determined by the *Grid Operator* to be a *Significant Incident*, the *Grid Operator* shall provide a full written *Significant Incident* report to the *OUR*.

TOC 8.8.2 The *User* shall not pass the report to other affected *User*s but:

a. Upon the request of the *Grid Operator*, a *User* shall provide a report of the *Incident* (subsequently characterised as a *Significant Incident*) to the *Grid Operator*. The *Grid Operator* may use the information contained from an *Incident* report from a *User* therein in preparing the written report.

b. The *Significant Incident* report may be used in connection with the reporting of *Significant Incident*s under the *Distribution Code*.

TOC 8.9 Written reporting of Significant Incidents by Users to the Grid Operator

TOC 8.9.1 In the case of an *Incident* that has been reported by a *User* to the *Grid Operator*, and subsequently determined by the *Grid Operator* to be a *Significant Incident*, the *User* shall provide a full written *Significant Incident* report to the *Grid Operator*. The *Grid Operator* shall not pass this report to other affected *User*s but may use the information contained therein in preparing a *Significant Incident* report to the *OUR.*

TOC 8.10 Form of Significant Incident report

TOC 8.10.1 A full *Significant Incident* report prepared by the *Grid Operator* shall be sent to the *OUR*. The full *Significant Incident* report shall contain confirmation of the *Significant Incident* notification together with full details relating to the *Significant Incident*. The *Significant Incident* report shall cover in the necessary detail those matters specified in Appendix B.

TOC 9. OPERATIONAL COMMUNICATIONS

TOC 9.1 Introduction

TOC 9.1.1 TOC9 sets out the requirements for the exchange of information in relation to *Operation*s on the *Transmission System* which have had (or may have had) or will have (or may have) an *Operational Effect*:

a. on the *Transmission System* in the case of an *Operation* on a *User System*; and
b. on a *User System* in the case of an *Operation* on the *Transmission System*;

where no requirement for communication is specified in any other section of the *Transmission Code.*

TOC 9.1.2 TOC9 also sets out the procedure for issue of warnings in the event of a risk of serious and widespread disturbance of the whole, or part of, the *Transmission System*.

TOC 9.2 Objective

TOC 9.2.1 The exchange of information is needed in order that the implications of the *Operation* can be considered and the possible risks arising from it can be assessed and appropriate action taken by the relevant party in order to maintain the integrity of the *System*. TOC9 does not seek to deal with any actions arising from the exchange of information, but merely with the exchange of information.

TOC 9.3 Requirement to notify Operations

TOC 9.3.1 The following are examples of situations where notification shall be required if they will have an *Operational Effect*:

a. the implementation of a planned outage of *Plant* and/or *Apparatus*;
b. the planned operation (other than, in the case of a *User*, at the instruction of the *Grid Operator*) of any circuit breaker or isolator or any sequence or combination of the two;
c. voltage control.
d. where an Operational Instruction to be issued may have an effect on another *User's System*, *Plant* or *Apparatus*;
e. where *Plant* is expected to be operated in excess of its rated capability and may present a hazard to Persons;
f. where there is an expectation of abnormal operating conditions;
g. where there is increased risk of inadvertent operation of protection; and
h. in relation to major testing, commissioning and maintenance.

TOC 9.4 Operations on the Transmission System

TOC 9.4.1 In the case of an *Operation* on the *Transmission System* that will have or has had an *Operational Effect* on the *System* of another *User*, the *Grid Operator* shall notify the *User* whose *User System* will be, is, or has been affected.

TOC 9.5 Operations on a User System

TOC 9.5.1 In the case of an *Operation* on the *User System* that will have or has had an *Operational Effect* on the *Transmission System*, the *User* shall notify the *Grid Operator*. Following notification by the *User*, the *Grid Operator* shall notify any other *User*s whose *System*s will be, are, or have been affected.

TOC 9.6 Nature of Notification for an Operation

TOC 9.6.1 In the case of an *Operation* on the *Transmission System* which will have or may have an *Operational Effect* on a *User System* , the *Grid Operator* shall notify the *User* whose *System* will or may be affected. The recipient may ask questions to clarify the notification and the notifying *Party* shall use its reasonable endeavours to provide the necessary information.

TOC 9.6.2 In the case of an operation on a *User System* which will have or may have an *Operational Effect* on the *Transmission System*, the *User* shall notify the *Grid Operator*. The recipient may ask questions to clarify the notification and the notifying party shall use its reasonable endeavours to provide the necessary information to the *Grid Operator* who shall notify any other *User*s on whose *Users System*s the *Operation* will or may have an *Operational Effect*.

TOC 9.7 Form of Notification

TOC 9.7.1 A notification and any response to any questions of an *Operation* which has arisen independently of any other *Operation* or of an *Incident*, shall be of

sufficient detail to describe the *Operation* and to enable the recipient of the notification to reasonably consider and assess the implications and risks arising and shall include the name of the individual reporting the operation on behalf of the *Grid Operator* or the *User*. The recipient may ask questions to clarify the notification and the sender shall, insofar as it is able, answer any questions raised.

TOC 9.7.2 The notification shall, if either party requests, be recorded by the sender and dictated to the recipient, who shall record and repeat each phrase as it is received and on completion of the dictation shall repeat the notification in full to the sender who shall confirm that it has been accurately recorded.

TOC 9.8 Timing

TOC 9.8.1 A notification under TOC 9 must be given as far in advance as practicable and in any event shall be given in sufficient time as shall reasonably allow the recipient to consider and assess the implications and risks arising.

TOC 9.9 Warnings

TOC 9.9.1 A warning shall be issued by the *Grid Operator* (usually by telephone or other electronic means) to *User*s who may be affected when the *Grid Operator* anticipates there is a risk of widespread and serious disturbance to the whole, or part of, the *Transmission System*. Where the warning is given by telephone or other electronic means, the *Grid Operator* shall issue a written confirmation as soon as reasonably practicable thereafter.

TOC 9.9.2 The warning shall contain such information as the *Grid Operator* reasonably considers to be necessary in order to explain the nature and extent of the anticipated disturbance to the *User* provided that sufficient time is available to the *Grid Operator* prior to the issue of the warning and that such information is available to the *Grid Operator*

TOC 9.9.3 For the duration of a warning each *User* in receipt of the warning shall take the necessary steps to warn its operational staff and maintain its *Plant* and/or *Apparatus* in the condition in which it is best able to withstand the anticipated disturbance.

TOC 9.9.4 Scheduling and Dispatch in accordance with the *Generation Code* may be affected during the period covered by a warning. Further provisions on this are contained in the *Generation Code*.

TOC 10. NUMBERING AND NOMENCLATURE OF HV APPARATUS

TOC 10.1 Introduction

TOC 10.1.1 This Code sets out the requirement that:

a. Transmission *Apparatus* on *User*s' Sites ; and
b. *User Apparatus* on Transmission Sites ;

shall have numbering and nomenclature in accordance with the System used from time to time by the *Grid Operator.*

TOC 10.1.2 The numbering and nomenclature of each item of *Apparatus* shall be included in the *Operation Diagram* prepared for each *Connection Site*. Further provisions on *Operation Diagram*s are contained in the Connection Code.

TOC 10.1.3 The term *Apparatus* includes any associated SF6 Gas *Equipment*

TOC 10.2 Objective

TOC 10.2.1 The overall objective is to ensure, so far as possible, the safe and effective operation of the *Total System* and to reduce the risk of human error by requiring, in certain circumstances, that the numbering and nomenclature of *User*'s *Apparatus* shall be in accordance with the system used from time to time by the *Grid Operator*.

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TOC 10.3 Transmission Apparatus on Users' Sites

TOC 10.3.1 Transmission *Apparatus* on *User*s' Sites shall have numbering and nomenclature in accordance with the system used from time to time by the *Grid Operator*.

TOC 10.3.2 When the *Grid Operator* is to install its *Apparatus* on a *User*'s Site , the *Grid Operator* shall notify the relevant *User* of the numbering and nomenclature to be adopted for that *Apparatus* at least eight months prior to proposed installation.

TOC 10.3.3 The notification shall be made in writing to the relevant *User* and shall consist of both a proposed *Operation Diagram* incorporating the proposed Transmission *Apparatus* to be installed, its proposed numbering and nomenclature, and the date of its proposed installation.

TOC 10.3.4 The relevant *User* shall respond in writing to the *Grid Operator* within one month of the receipt of the notification, confirming receipt and confirming either that any other *Apparatus* of the relevant *User* on such *User* Site does not have numbering and/ or nomenclature which could be confused with that proposed by the *Grid Operator*, or, to the extent that it does, that the relevant other numbering and/ or nomenclature shall be changed before installation of the Transmission *Apparatus.*

TOC 10.3.5 The relevant *User* shall not install, or permit the installation of, any *Apparatus* on such *User* Site which has numbering and/ or nomenclature which could be confused with Transmission *Apparatus* which the Grid Operator has advised the User to be installed on that *User* Site or is already on that *User* Site. shall.

TOC 10.4 User Apparatus on Transmission Sites

TOC 10.4.1 *User Apparatus* on *Transmission Sites* shall have numbering and nomenclature in accordance with the system used from time to time by the *Grid Operator.*

TOC 10.4.2 When a *User* is to install its *Apparatus* on a *Transmission Site*, or it wishes to replace existing *Apparatus* on a *Transmission Site* and it wishes to adopt new numbering and nomenclature for such *Apparatus*, the *User* shall notify the *Grid Operator* of the details of the *Apparatus* and the proposed numbering and nomenclature to be adopted for that *Apparatus*, at least eight months prior to proposed installation.

TOC 10.4.3 The notification shall be made in writing to the *Grid Operator* and shall consist of both a proposed *Operation Diagram* incorporating the proposed new *Apparatus* of the *User* to be installed, its proposed numbering and nomenclature, and the date of its proposed installation.

TOC 10.4.4 The *Grid Operator* shall respond in writing to the *User* within one month of the receipt of the notification stating whether or not the *Grid Operator* accepts the *User*'s proposed numbering and nomenclature and, if they are not acceptable, it shall give details of the numbering and nomenclature which the *User* shall adopt for that *Apparatus.*

TOC 10.5 Changes

TOC 10.5.1 Where the *Grid Operator* in its reasonable opinion has decided that it needs to change the existing numbering or nomenclature of Transmission *Apparatus* on a *User* Site or of *User Apparatus* on a *Transmission Site* :

a. The provisions of paragraph TOC 10.4 shall apply to such change of numbering or nomenclature of Transmission *Apparatus* with any necessary amendments to those provisions to reflect that only a change is being made; and

b. in the case of a change in the numbering or nomenclature of *User Apparatus* on a *Transmission Site*, the *Grid Operator* shall notify the *User* of the numbering and/ or nomenclature the *User* shall adopt for that *Apparatus* (the notification to be in a form similar to that envisaged under TOC10.4) at least eight months prior to the change being needed and the *User* shall respond in writing to the *Grid Operator* within one month of the receipt of the notification, confirming receipt.

In either case the notification shall indicate the reason for the proposed change

TOC 10.5.2 *User*s shall be provided upon request with details of the *Grid Operator*'s then current numbering and nomenclature system in order to assist them in planning the numbering and nomenclature for their *Apparatus* on *Transmission Sites*.

TOC 10.5.3 When a *User* installs *Apparatus* in accordance with TOC 10, the *User* shall be responsible for the provision and erection of clear and unambiguous labelling showing the numbering and nomenclature.

Where a *User* is required by TOC 10 to change the numbering and/ or nomenclature of *Apparatus*, the *User* shall be responsible for the provision and erection of clear and unambiguous labelling by the required date.

TOC 10.5.4 When the *Grid Operator* installs *Apparatus* which is the subject of TOC 10, the *Grid Operator* shall be responsible for the provision and erection of a clear and unambiguous labelling showing the numbering and nomenclature. Where the *Grid Operator* changes the numbering and / or nomenclature of *Apparatus* which is the subject of TOC 10, the *Grid Operator* shall be responsible for the provision and erection of clear and unambiguous labelling showing the numbering and nomenclature by the required date.

TOC 11. TESTING, MONITORING AND INVESTIGATION

TOC 11.1 Introduction

TOC 11.1.1 TOC 11 sets out the authorization required and the procedures to be followed by the *Grid Operator*, and *User*s wishing to conduct *Operationa*l Tests or Site Investigations involving *Plant* and *Apparatus* connected to or part of the *Transmission System*.

TOC 11.1.2 The Code stipulates that prior authorisation from the *Grid Operator* is required before conducting Operational Tests or Site Investigations.

TOC 11.2 Objective

TOC 11.2.1 The objectives are to ensure that Operational Tests and Site Investigations;

a. are authorized by the *Grid Operator* and are carried out in accordance with appropriate procedures;

b. are carried out in a coordinated manner to avoid unnecessary risk or damage to *Plant* and to minimise costs to the *Grid Operator* and affected *User*s;

c. do not threaten the safety of personnel or the general public;

d. do not threaten the security or stability of the *Transmission System*; and

e. are properly evaluated on completion and, where appropriate, subject to predefined reporting arrangements.

TOC 11.2.2 A further objective is to allow sufficient tests to be conducted to enable predictive fault finding.

TOC 11.3 Categories of tests

TOC 11.3.1 This Code covers the following categories of test:

a. Operational tests to commission or test the compliance of *Generating Units* with the requirements of a *Power Purchase Agreement* or for other purposes specified in the *Generation Code*.

b. Site Investigation tests in relation to *Plant*, *Apparatus* and operational procedures at *Generator* and *User* sites.

c. Other tests required, in certain circumstances, whether by means of a formal test or verification by inspection, to ascertain whether Operating Parameters and/or the Connection Code are being complied with in respect of the *User*'s *Plant* and *Apparatus*.

TOC 11.4 Authorisation and test procedures

TOC 11.4.1 Prior authorisation from the *Grid Operator* is required before conducting an Operational Test, Site Investigation or other test.

TOC 11.4.2 *User*s seeking to conduct an Operational Test or Site Investigation shall submit a *Test Request* to the *Grid Operator* giving at least 8 weeks minimum notice before the date of the proposed test. A *Test Request* shall include a detailed test proposal including:

a. a brief description of the proposed test;

b. the preferred time or times for the test and the potential duration;

c. the reason for the proposed test indicating whether the test is required for compliance with *Licence* conditions, statutory regulations or Safety Rules. This shall assist in determining the priority to be given to the test;

d. an indication of any potential adverse effects if the Test is cancelled at short notice or delayed; and

e. an indication of any Dispatch Instructions or operational switching required to facilitate the test.

TOC 11.4.3 The *Grid Operator* shall evaluate all Test Requests submitted to it. On receipt of a Test Request the *Grid Operator* shall within 2 weeks either:

a. approve the Test Request;

b. request any additional information from the test proposer required to evaluate the impact of the Test Request; or

c. reject the Test Request application.

TOC 11.4.4 The *Grid Operator* shall consider the following factors when evaluating a Test Request:

a. The impact of the requested test on *Transmission System* stability and security;

b. the impact of the requested test on *Transmission System* economics;

c. the impact of the requested test on other *User*s; and

d. the effect of the requested test on the continuity and quality of electricity Supply.

TOC 11.4.5 If the *Grid Operator* approves a Test Request, it shall inform the test proposer accordingly in writing.

TOC 11.4.6 If the *Grid Operator* requests additional information from the test proposer to evaluate the impact of a Test Request the *Grid Operator* shall stipulate the time within which the information shall be provided. If the information is not provided in the timescale indicated by *Grid Operator* the Test Request shall automatically lapse.

TOC 11.4.7 If the *Grid Operator* does not approve a Test Request, it shall set out its reasons for rejecting the application and consult with the Test proposer on any changes to the Test proposal required to secure approval for the Test. The Test proposer may update a Test proposal in accordance with guidance provided by the *Grid Operator* and submit a revised Test Request.

TOC 11.4.8 The *Grid Operator* shall not withhold approval of a Test Request unless it considers it has reasonable grounds for doing so. If a *User* is not satisfied that a Test Request was rejected on reasonable grounds it can refer the matter to the *OUR* for determination.

TOC 11.4.9 The *Grid Operator* shall not disclose any information received as part of a Test Request application without the consent of the *User* who submitted the Test Request if it reasonably believes the information to be commercially sensitive or otherwise potentially sensitive.

TOC 11.5 Test Panel

TOC 11.5.1 If a *Test Request* is approved, the *Grid Operator* shall decide if a *Test Panel* is required. If the *Grid Operator* decides that a *Test Panel* is required, the test proposer shall convene a *Test Panel, subject to the approval of the Grid Operator.*. The number of *Test Panel* members shall be kept to the minimum number of persons compatible with affected *User* representation.

TOC 11.5.2 The Chairman of a *Test Panel* shall be appointed by the Grid Operator. . The *Grid Operator* and all directly affected *User*s shall be represented on the *Test Panel*.

TOC 11.5.3 The duties and responsibilities of the *Test Panel* are as follows:

a. to prepare a detailed programme for the conduct of the test, including the start and end date of the test, and any Dispatch requirements and operational switching required to facilitate the test;

b. to identify the detailed management requirements of the test;

c. to ensure that all affected parties are properly informed of and have access to all relevant information;

d. to schedule the resources required to conduct the test; and

e. to prepare a *Test Document* that shall include all the elements listed above.

TOC 11.5.4 The *Test Document* shall be copied to all members of the *Test Panel* at least 2 weeks before the start date of the test. Members of the *Test Panel* may provide comments on the *Test Document* to the Chairman of the *Test Panel* no later than 1 week before the scheduled start date of the Test.

TOC 11.5.5 The test shall proceed only on the condition that the *Test Panel* has approved the *Test Document*. If a member of the *Test Panel* is not satisfied with the test proceeding and they have fully discussed the issues within the *Test Panel*, they may make representation to the *OUR*.

TOC 11.5.6 The *Grid Operator* shall not disclose information provided to a *Test Panel* without the consent of the person who submitted the information if it reasonably believes the information to be commercially sensitive or otherwise potentially sensitive.

TOC 11.6 Post test reporting requirements

TOC 11.6.1 At the conclusion of an Operational Test or Site Investigation the test proposer shall prepare a written report on the test that shall be available within 4 weeks of the conclusion of the Operational Test. The report shall be copied to the *Grid Operator* and the *OUR*.

TOC 11.6.2 The Test Report shall not be submitted to any other person who is not a representative of the *Grid Operator* or the test proposer unless the *Grid Operator* and the test proposer having reasonably considered the confidentiality issues arising, and shall have unanimously approved such submission.

TOC 11.6.3 The Test Report shall include a detailed description of the completed Test, the *Plant* or *Apparatus* to which the Test relates, together with the results, conclusions and recommendations as they relate to the Test proposer, *Grid Operator* and all *Users* operationally affected by the Test, where applicable.

TOC 11.6.4 The *Test Panel* shall be disbanded after the final test report has been approved.

TOC 11.7 Operational tests

TOC 11.7.1 The *Grid Operator* shall cooperate with the implementation of all Operational Tests.

TOC 11.7.2 Where the *Grid Operator* considers the impact of an Operational Test to be significantly greater than originally estimated, the *Grid Operator* may at any time contact the Test proposer to discuss a revised Test procedure or schedule.

TOC 11.7.3 The *Grid Operator* shall, where it considers it necessary to do so, cancel, interrupt, or postpone an Operational Test at any time.

TOC 11.7.4 If the Test proposer wishes to cancel an Operational Test before commencement of the Test or during the Test, the Test proposer must notify the *Grid Operator* immediately and the notice must be confirmed in writing within 1 hour by facsimile or other electronic means.

TOC 11.8 Operational tests required by the Grid Operator

TOC 11.8.1 The *Grid Operator* may from time to time need to conduct Operational Tests in order to maintain and develop operational procedures, to train staff, and to acquire information in respect of *Transmission System* behaviour under abnormal *System* conditions.

TOC 11.8.2 The *Grid Operator* shall endeavour to keep the frequency of occurrence, scope, and impact of Operational Tests to the minimum necessary.

TOC 11.8.3 Where the *Grid Operator* intends to carry out an Operational Test and in the *Grid Operator*'s reasonable opinion, such a test will or may have an *Operational Effect* on a *User*'s *System*, the *Grid Operator* shall give [8] weeks notice and provide sufficient information to the affected *User*s to enable the affected *User*s to assess any risks to their *System*s.

TOC 11.8.4 The information provided by *Grid Operator* shall include;

a. a brief description of the Operational Test;

b. the probable effects of the Operational Test; and

c. the scheduled time and duration of the Operational Test.

TOC 11.8.5 Affected *User*s may contact the *Grid Operator* to request additional time or information to consider the impact of the Operational Test on their *System*s and shall respond to the *Grid Operator* within 2 weeks of receipt of the *Grid Operator*'s notice of the test.

TOC 11.9 Operational tests required by Users

TOC 11.9.1 Operation of *User*s' *Plant* and *Apparatus* in accordance with *Prudent Utility Practice* requires testing to maintain and develop operational procedures, develop and measure *Plant* performance, comply with statutory or other industry obligations and contracts, and to train staff.

TOC 11.9.2 Each *User* shall endeavour to limit the frequency of occurrence of Operational Tests and to limit the effects of such Operational Tests on the *Transmission System*.

TOC 11.9.3 *User*s shall submit a *Test Request* to the *Grid Operator* in accordance with the requirements of TOC 11.5

TOC 11.10 Operational tests of Generating Units

TOC 11.10.1 The procedure to be adopted for the Operational testing of *Generating Units* is set out in the *Generation Code* and summarised below:

TOC 11.10.2 The *Generator* shall provide to the *Grid Operator* a timetable and list of all tests to be performed on the *Generating Units*, and such tests shall be subject to approval by the *Grid Operator*. The *Grid Operator* shall be given five (5) days notice of any testing and shall reserve the right to have a representative present during any such tests.

TOC 11.10.3 Testing and monitoring of *Generating Units* is generally performed for the purpose of determining available Capacity and, if relevant, operating characteristics in accordance with the commercial and technical conditions of *Power Purchase Agreement*s.

TOC 11.10.4 Prior to the Synchronization of each new *Generating Unit*, the *Generator* shall carry out a number of tests as set out in the *Generation Code*. These tests cover such aspects as Automatic Voltage Regulator Setting, governor control checks, open and short circuit tests etc.

TOC 11.10.5 After the Pre-Synchronization tests as defined in TOC 11.10.4 and prior to the commissioning date, and under such subsequent conditions as defined by *Power Purchase Agreement*s, *Generator* shall carry out the following tests:

a. Dependable Capacity
b. Reliability Run
c. Automatic Voltage Regulator (AVR) Droop
d. Governor Operation
e. Reactive Capacity
f. Short-term Load Capability
g. Response of Unit to Step Load Changes
h. Full Load Rejection
i. Thermal Performance Tests

TOC 11.10.6 Fully detailed requirements for *Generator* Testing are set out in Section 6 “Testing and Monitoring” of the *Generation Code*.

TOC 11.11 Other operational tests

TOC 11.11.1 Any Operational Test proposal accompanying a *Test Request* shall indicate whether Dispatch Instructions and operational switching instructions are required to facilitate the test.

TOC 11.11.2 The *Grid Operator* shall, subject to any amendments it may require to be made, incorporate the Dispatch Instructions and operational switching instructions required to facilitate the test..

TOC 11.11.3 The *Grid Operator* shall issue Dispatch Instructions for Operational Tests in accordance with the procedures set out in the *Generation Code*.

TOC 11.11.4 In accordance with the *Generation Code* the *Generator* shall provide to the *Grid Operator* a timetable and list of all tests to be performed on the *Generating Units*, and such tests shall be subject to approval by the *Grid Operator*. The *Grid Operator* shall be given five (5) days notice of any testing

and shall reserve the right to have a representative present during any such tests.

TOC 11.11.5 The *Grid Operator* shall inform other *User*s of the scheduled time and nature of the test, if in the opinion of *Grid Operator* those *User*s will or may be affected by the test.

TOC 11.11.6 The Operational Test shall proceed in accordance with normal operational practices but with particularly close communication between the system control engineer and the person responsible for the execution of the Test . Where the Operational Test is complex or time consuming, the *Grid Operator* shall provide additional support at the *System Control Centre*, if necessary.

TOC 11.12 Site Investigation tests

TOC 11.12.1 The *Grid Operator* may, if it reasonably considers that there may be an issue of non-compliance with an agreement by the *User*, carry out a Site Investigation to acquire or verify information relevant to *User*s' *Plant* and/or *Apparatus* design, Operation or Connection requirements under the *Transmission Code*, *Connection Agreements* and other agreements between *User*s and the *Grid Operator*.

TOC 11.12.2 The *Grid Operator* may, having given reasonable notice, send a representative or agent to a *User*'s site in order to investigate any equipment or operational procedure applicable to the *User* site insofar as the condition of that equipment or operational procedure is relevant to compliance with a the *Transmission Code*, a *Connection Agreement*, or other relevant agreements.

TOC 11.13 Other tests

TOC 11.13.1 The *Grid Operator* can, at any time, request a test. Where an Agreement exists (with appropriate test procedures) these shall form the basis of the test.

TOC 11.13.2 Testing, including tests carried out under any relevant agreement may involve attendance by the *Grid Operator* or their representatives at *User* sites in order to carry out or observe such tests.

TOC 11.13.3 Where required, a test shall be carried out in accordance with Dispatch Instructions and operational switching instructions issued by the *Grid Operator* or by such alternative procedures as is required or permitted by the *Transmission Code*.

TOC 11.13.4 Where a test is required at short notice, the *Grid Operator* shall use reasonable endeavours to accommodate the test in the requested timescale provided that in the *Grid Operator*'s reasonable opinion the test would not compromise the security and stability of the *Total System*, or pose a risk to the safe and secure operation of *Plant*, or compromise the safety of related personnel and the general public.

APPENDIX A

FORM OF SIGNIFICANT INCIDENT REPORT

TOC APPENDIX A - FORM OF SIGNIFICANT INCIDENT REPORT

1. Time and date of Significant Incident;
2. Location;
3. Pant or *Apparatus* directly involved (not merely affected by the Incident) including numbers and nomenclature;
4. Description of Significant Incident including probable causes and any damage to *Plant* or *Apparatus*;
5. Demand in MW and/or *Generator* output in MW interrupted and duration of interruption;
6. *Generator* – change in availability;
7. *Generator* – Frequency response (MW correction versus time achieved subsequent to the Significant Incident);
8. *Generator* – Mvar performance (change in output subsequent to the Significant Incident);
9. Estimated or actual time and date of return to service and/or return to pre-Incident availability; and
10. Any other relevant material.

TRANSMISSION METERING CODE

TMC 1. INTRODUCTION

TMC 1.1 Purpose

TMC 1.1.1 This Chapter of the *Transmission Code* sets out the way in which power and energy flows shall be measured at an *Operational Interface*. TMC 1.1.2 The Metering Code is required to establish the requirements for metering the *Active* and *Reactive Energy* and *Demand* from its entry to the *Transmission System* to its exit to the *Distribution System* and *Large Customers.*

TMC 1.1.3 The Code also sets out appropriate procedures for meter reading; and

TMC 1.1.4 Ensures that procedures are in place to manage disputed readings.

TMC 1.2 Scope

TMC 1.2.1 This Chapter applies to:

a. The *Grid Operator*

b. *Large Customers*

c. *Generators*

TMC 1.2.2 The requirements for the metering of *Generators* are set out in the *Generation Code*. An outline of the requirements is set out in TMC 2.

TMC 1.2.3 For *Large Customers* the metering requirements follow those of a *User* connected to the *Distribution System* as set out in the *Distribution Code*. An outline of these requirements is set out in TMC 3.

TMC 2. METERING REQUIREMENTS - GENERATORS

TMC 2.1 Adequate Metering Systems consistent with the technical specifications of this clause shall be installed by the Generator. The Metering System shall comprise a Primary and Backup Metering System and shall be designed, financed and installed by the Generator. The Grid Operator shall own and maintain the Primary Metering System while the Generator shall own and maintain the Backup Metering System

TMC 2.2 Overall Accuracy

TMC 2.2.1 The overall accuracy of *Generator* metering is to be designed to give a tolerance of +/- 0.5% on an ongoing basis.

TMC 2.3 Relevant Metering Policies, Standards and Specifications

TMC 2.3.1 Both Primary and Backup Metering Systems shall be installed to accumulate the outputs and/or inputs at the High Voltage side bushing of the *Generating Unit* step up transformer.

TMC 2.3.2 The *Grid Operator* shall own and maintain the Primary Metering System while the *Generator* shall own and maintain the Backup Metering *System*.

TMC 2.3.3 Each meter shall have its own *Current Transformer* (CT) and *Voltage Transformer* (VT) and necessary independent systems to function effectively.

TMC 2.3.4 Instrument transformers shall conform to ANSI Standard C12.11 and C57.14 Class 03 and shall have sufficient capacity to handle the attached equipment. The ANSI standards refer to the physical characteristics of meters and the procedures and practices related to type and pattern approval. The detailed use of these standards in the testing of meters are set out in the *OUR* document Meter Testing Administrative Protocol which is attached at Appendix B.

TMC 2.3.5 The *Current Transformer*s' secondary winding used for metering purposes shall supply only the metering equipment and associated systems. Notwithstanding the foregoing each *Current Transformer* may have other secondary windings that may be used for purposes other than metering.

TMC 2.3.6 Potential transformers' secondary windings may be used for metering and other purposes provided that the total loading does not exceed one half burden of the rating of the transformer.

TMC 2.4 Parameters for Meter Reading

TMC 2.4.1 The *Generator* shall provide and install meters equal or equivalent to the specification provided by the *Grid Operator* and shall make a continuous recording on appropriate magnetic media or equivalent of the Net Energy Output of the *Generating Unit(s).*

TMC 2.4.2 The parameters to be metered shall be subject to the *Interconnection Agreement* between the *Generator* and the *Grid Operator*, and may consist of but are not limited to any or all of the following parameters:

a. Active Energy (Wh) OUT;

b. Active Energy (Wh) IN;

c. Reactive Energy (VARh) First Quadrant;

d. Reactive Energy (VARh) Fourth Quadrant;

e. *Active Power* Demand (W) OUT;

f. *Active Power* Demand (W) IN;

g. *Reactive Power* Demand (VAR) First Quadrant; and

h. *Reactive Power* Demand (VAR) Fourth Quadrant.

All units shall be expressed at appropriate multiples determined by the maximum expected demand.

TMC 2.5 Frequency of Reading

The Demand Interval shall be fifteen (15) minutes and shall be set to start at the beginning of the hour. Demand shall be calculated by averaging the respective parameters over the stated Demand Interval.

The Grid Operator shall read the appropriate meters To prevent clock drift, the clocks shall be checked and reset as agreed by the parties. If readings are obtained remotely, copies of the data produced by the computer which initiates the reading protocol can be made and provided to the Generator if requested.

TMC 3. METERING REQUIREMENTS – LARGE CUSTOMERS

TMC 3.1 Overall Accuracy

TMS 3.1.1 The overall accuracy of the metering for revenue purposes is to be designed to give a tolerance of +/- 1% when tested in the laboratory and +/- 2 when tested in the field.

TMC 3.2 Relevant Metering Policies, Standards and Specifications

TMC 3.2.1 The meters, and associated installations, used on the *Grid Operator's Transmission System* shall comply with the following documents which are identified as *Transmission Code Technical Specifications* in TGC 10.6 or available from the *OUR*:

a. *JPS* Engineering Instruction 4.7

b. *OUR* Document ELE 2005/07 Electricity Meter Testing in Jamaica - Protocol on Administrative and Testing Procedures and

c. Meter Facilities Policy as set out in *JPS* Engineering Bulletin TSD 007/3

TMC 3.2.2 The meters shall be designed, constructed and operated to comply with the latest revision of the relevant ANSI standards or international equivalents in particular:

a. ANSI C12.1 2008 – The Electric Meters code for Electricity Metering;

b. ANSI C12:10 2004 – Physical aspects of watt-hour meters - safety standard; and

c. ANSI C12:20 2002 – Electricity meters 0.2 and 0.5 accuracy Classes.

TMC 3.3 Requirement for Metering

TMC 3.3.1 All *Connection Points* to the *Transmission System* shall have appropriate metering in accordance with this Transmission Metering Code. The position of

the metering shall be set out in the *Connection Agreement* between the *Grid Operator* and the *Large Customer*.

TMC 3.4 Metering Responsibility

TMC 3.4.1 The *Grid Operator* shall ensure that all *Connection Points* with *Large Customers* are metered in accordance with this Code.

TMC 3.4.2 It is the responsibility of *Large Customers* and *Generators* to cooperate with the *Grid Operator* in the execution of its responsibilities under this Code and, where applicable, under the *Generation Code*.

TMC 3.4.3 The costs for installation and replacement of meters shall be outlined in the *User's Connection Agreement* or the *Generator's Power Purchase Agreement* or *Standard Offer Contract*

TMC 4 Metering Equipment

TMC 4.1 The metering equipment shall consist of :

a. Revenue Meters;

b. *Current* and *Voltage Transformers* where applicable;

c. All interconnecting cables, wires and associated devices, seals and protection; and

d. All equipment associated with *Advanced Metering Infrastructure*.

TMC5 Revenue Meters

TMC 5.1 The revenue meter shall have the appropriate rating for the connection requirements to be supplied and shall conform to the terms of the *Interconnection Agreement* between the *Grid Operator* and the *Large Customer*.

TMC 5.2 Meters shall have an accuracy in accordance with ANSI class 0.5 or international equivalent.

TMC 5.3 At the *Grid Operator's* discretion *Advanced Metering Infrastructure* may be installed at some *Customers' Sites.* This metering infrastructure enables two way communication with the metering systems. These devices shall comply with the specifications in TMC 3.2.2. The accuracy shall be equivalent to ANSI Class 0.5.

TMC 5.4 The relevant metered parameters, as required by the *Grid Operator* for billing purposes, shall be stored cumulatively on the meter and shall be able to be accessed by the *Large Customer*.

TMC 5.5 Where required these parameters may include any or all of the following depending on the connection and the tariff schedule:

a. KW Hours (delivered and received);

b. KVAr Hours (delivered and received);

c. KVA Hours (delivered and received);

d. Ampere Squared Hours;

e. Volt Squared Hours;

f. Maximum Demand (15 minute period);

g. Power Factor;

The above parameters shall be measurable over intervals from 1 minute to 60 minutes.

TMC 6 Voltage and Current Transformers

TMC 6.1 All *Voltage* and *Current Transformers* shall comply with IEC Standards or their equivalents and shall have an accuracy class of 0.5.

TMC 6.2 The burden in each phase of *Voltage* and *Current Transformers* shall not exceed the specified burden of the said *Transformers*.

TMC 7 METERING POINTS

TMC 7.1 Whole Current Metering

TMC 7.1.1 The *Metering Point* should be as close as possible to the *Connection Point*.

TMC 8 CT Metering

TMC 8.1 The *Metering Point* shall be at the position of the *Current Transformers(CT)* used for the metering system. This should be designed to be as close as possible to the *Connection Point*.

TMC 8.2 *Current Transformers* should be installed in a separate chamber and must be before the main switch (on the line side). They shall be housed in suitable metal enclosures, and be able to be secured.

TMC 8.3 Where the *Connection Point* is declared on the outgoing side of a high voltage circuit breaker the metering transformers may be accommodated in that circuit breaker unit.

TMC 8.4 Where appropriate the *Metering Point* should be at the same voltage as the *Connection Point*. Where the *Metering Point* is at a lower voltage than the *Connection Point* then appropriate loss factors should be calculated to ensure any additional loss is appropriately accounted for.

TMC 9 METER READING AND COLLECTION SYSTEMS

TMC 9.1 Meter Reading and Recording Responsibility

TMC 9.1.1 It is the responsibility of the *Grid Operator* to ensure that meters are read in accordance with the requirements of overall Standard EOS7 in the *Grid Operator's Licence.*

TMC 9.1.2 Meter reading and recording shall be undertaken by a suitable authorised representative of the *Grid Operator.*

TMC 9.1.3 It is the responsibility of *Generators* and *Large Customers* to cooperate with the *Grid Operator* in the execution of its responsibilities under this Code.

TMC 9.1.4 The *Customer* shall be provided with access to its billing and consumption records on request.

TMC 10 APPROVAL OF METERS

TMC 10.1 Only meters that have received pattern approval from the Bureau of Standards, Jamaica (*BSJ*) in accordance with the *OUR* Document ELE 2005/07 Electricity Meter Testing in Jamaica - Protocol on Administrative and Testing Procedures, may be used on the *Grid Operator's Transmission System*.

TMC 11 CALIBRATION AND SEALING

TMC 11.1 Calibration

TMC 11.1.1 All meters (new meters and repaired meters) rated above 12kVA shall be calibrated and the tolerance adjusted to ensure that it measures as close to zero tolerance as possible prior to field installation.

TMC 11.1.2 All meters rated above 12kVA shall be recalibrated every10 years unless they have a manufacturers guaranteed calibration period in which case this period shall be used.

TMC 11.1.3 All laboratory calibration shall be undertaken in laboratories accredited by the Bureau of Standards, Jamaica (*BSJ*).

TMC 11.2 Traceability

TMC 11.2.1 The kilowatt hour standard used to calibrate electricity meters shall be traceable to the Systeme Internationale (SI) at the Bureau Internationale des Pois et Measures. This extends to the calibration of *Equipment* used to calibrate meters.

TMC 11.3 Sealing

TMC 11.3.1 All meters shall be constructed to enable the meter unit to be sealed to prevent unauthorised access or interference with the operation of the meter or the input terminals of the meter.

TMC 11.3.2 Seals applied after calibration shall be marked with the date that recalibration is required.

TMC 11.3.3 All seals shall include marks that identify the authorised person that sealed the meter.

TMC 12 METERING DISPUTES

TMC 12.1 If the metering system is found to be inaccurate more than the allowable error, and the *Grid Operator* and the *User* or *Generator* fail to agree upon an estimate for the correct reading within a reasonable time (as specified in the relevant *PPA*) of the Dispute being raised, then the matter may be referred for arbitration by either party in accordance with the relevant *PPA*.

TMC 12.2 Meter Accuracy Check

TMC 12.2.1 The *User* has a right to request a meter accuracy check when they consider that the meter may be reading incorrectly, in accordance with the meter testing protocol.

TMC 12.2.2 Should a *User* request more than one accuracy check in a single calendar year and the accuracy is within +/-2% then the *Grid Operator* may charge for the additional checks.

TMC 13 INSPECTION AND TESTING

TMC 13.1 Maintenance Policy

TMC 13.1.1 The *Grid Operator* shall put in place and implement policy for the inspection and testing and recalibration of all metering *Equipment*. This policy shall be in accordance with the procedures set out in TMC 3.2 above.

TMC 13.2 Maintenance Records

TMC 13.2.1 The *Grid Operator* shall keep all test results, maintenance programme records and sealing records.

TMC 13.3 Generator Metering

TMC 13.3.1 The Generator shall abide by the conditions of the *Generation Code* that details the maintenance procedures to be applied in the case of *Generator* meters. The *Generation Code* includes provisions on the use of Back-up meters when metering inaccuracies are suspected and on the resolution of metering disputes.

TRANSMISSION DATA REGISTRATION CODE

TDRC 1. INTRODUCTION

TDRC 1.1 The Data Registration Code ('DRC') sets out a unified listing of all data required by the *Grid Operator* from *User*s and by *User*s from the *Grid Operator*.

TDRC 1.2 Where there is any inconsistency in the data requirements under any particular section of the *Transmission Code* and the Data Registration Code the provisions of the particular Chapter of the *Transmission Code* shall prevail.

TDRC 1.3 The Code under which any item of data is required specifies the procedures and timing for the supply of data, for routine updating and for recording temporary or permanent changes to data.

TDRC 1.4 The DRC also lists data required to be provided by *Generators* under the *Generation Code*. This data is provided for information only.

TDRC 2. OBJECTIVE

TDRC 2.1 The objective of the DRC is to:

a. List and collate all the data to be provided by each category of *User* to the *Grid Operator* under the *Transmission Code*;

b. List all data to be provided by the *Grid Operator* to each category of *User* under the *Transmission Code*; and

c. List all data to be provided by *Generators* to the *Grid Operator* and by the *Grid Operator* to *Generators* under the terms of the *Generation Code*.

TDRC 3. SCOPE

TDRC 3.1 The *User*s to which the DRC applies are:

a. *Generators* under the terms of the *Generation Code*;

b. *User*s connected directly to the *Transmission System*

TDRC 4. DATA CATEGORIES AND STAGES IN REGISTRATION

TDRC 4.1 Within the DRC each item of data is allocated to three categories.

a. *System* Planning Data as required by the Planning and Connection Codes of the *Transmission Code*;

b. Generation Planning Data as required by the *Generation Code*;

c. Operational Data as required by the Operations Code. TDRC 4 also includes data required from *Generators* in accordance with the Scheduling and Dispatch provisions of the *Generation Code*.

TDRC 5. PROCEDURES AND RESPONSIBILITIES

TDRC 5.1 Responsibility for submission and updating of data

TDRC 5.1.1 In accordance with the provisions of the various Chapters of the *Transmission Code*, each *User* must submit data as summarised, listed and collated in the attached Schedules.

TDRC 5.2 Methods of submitting data

TDRC 5.2.1 The data must be submitted to the *Grid Operator.* The name of the person at the *User* who is submitting each Schedule of data must be included.

TDRC 5.2.2 The data may be submitted via a computer link if such a data link exists between a *User* and the *Grid Operator* or utilising a data transfer media, such as floppy diskette, magnetic tape, CD ROM etc after obtaining the prior written consent from the *Grid Operator*.

TDRC 5.3 Changes to Users' data

TDRC 5.3.1 The *User* must notify the *Grid Operator* of any change to data which is already submitted and registered with the *Grid Operator* in accordance with each Chapter of the *Transmission Code*.

TDRC 5.4 Data not supplied

TDRC 5.4.1 If a *User* fails to supply data when required by any Chapter of the *Transmission Code*, the *Grid Operator* shall estimate such data if and when, in the view of the *Grid Operator*, it is necessary to do so.

TDRC 5.4.2 If the *Grid Operator* fails to supply data when required by any Chapter of the *Transmission Code*, the *User* to whom that data ought to have been supplied, shall estimate such data if and when, in the view of that *User*, it is necessary to do so.

TDRC 5.4.3 Such estimates shall, in each case be based upon data supplied previously for the same *Plant* or *Apparatus* or upon corresponding data for similar *Plant* and/or *Apparatus* or upon such other information as the *Grid Operator* or that *User*, as the case may be, deems appropriate.

TDRC 5.4.4 The *Grid Operator* will advise a *User* in writing of any estimated data it intends to use relating directly to that *User Plant* and/or *Apparatus* in the event of data not being supplied.

TDRC 5.4.5 The *User* will advise the *Grid Operator* in writing of any estimated data it intends to use in the event of data not being supplied.

TDRC 6. DATA TO BE EXCHANGED BETWEEN THE GRID OPERATOR AND USERS

TDRC 6.1 General

TDRC 6.1.1 The following Table provides details of Schedules I to XIII covering the data to be exchanged between the *Grid Operator* and *User*s or *Generators*.

Schedule	Data Type	Description	User	Code Section	JPS Procedure
I	*User* System Data	Electrical parameters relating to *Plant* and *Apparatus* connected to the *Transmission System*	*JPS*	TPC 4.5	EI 3.1 SOPP 4 SOPP 7 SOPP 9
II	Load Characteristics	The estimated parameters of loads in respect of, for example, harmonic content, frequency response.	*JPS*	TPC 1.3 TPC 4.2	
III	Demand profiles and Active Energy	Total demand and Active Energy taken from the *Transmission System*	*JPS*	TPC 1.3 TPC 4.2 TCC 2.1 TOC 2.3 GSDC 3.5.1	
IV	*Connection Point*	Information related to Demand, demand transfer capability and a summary of *Embedded Generators* and Customer generation connected to the *Connection Point*.	*JPS* DCC	TPC 1.3 TPC 4.2	
V	Demand Control	Information related to Demand Control	*JPS* DCC	TOC 2.4 TOC 2.5 TOC 2.6 GSDC 3.5.1	EI 1.6 SOPP 11
VI	Fault Infeed	Information on Short Circuit contribution to the *Transmission System*.	*JPS* DCC GEN	TPC 1.3 TPC 4.2	
VII	User Outages	Information required by the *Grid Operator* for outages on *User*s Systems., including outages affecting the auxiliary supplies of Generating Plants.	*JPS* DCC GEN	TOC 3.4 TOC 3.5 TOC 3.6	EI 1.11 SOPP 14 SOPP 19

Schedule	Data Type	Description	User	Code Section	JPS Procedure
VIII	Generator Planning Parameters	*Generator* fixed Electrical Parameters	GEN	GCC 1.2.4	
IX	Generator Operational Planning	Information required for Operational Planning purposes.	GEN	GSDC 3.2	SOPP 7
X	Scheduling and Dispatch	Operating Parameters required for Scheduling and Dispatch	GEN	GSDC 3.2 GSDC 3.5.1 GMPC 5.1	SOPP 7
XI	Generator Outages	*Generator* Outage Information.	GEN	TOC 3.3 GSDC 3.5.1 GMPC 5.1	EI 1.11 SOPP 19
XII	*Grid Operator* information to Users	All relevant information		TCC 2.1 TOC 2.3 TOC 6.4 TPC 4.5.5 GSDC 3.2.3 GSDC 3.5.5	
XIII	Metering Data	All relevant information		TBA	EI 4.7

Key to *User*s

DCC A Customer connected directly to the *Transmission System*/*Non Embedded Customer*

GEN *Generator*

Abbreviations used in all Schedules:

TPC : Transmission Planning Code

TCC : Transmission Connections Code

TOC : Transmission Operations Code

GCC : Generation Connections Code

GSDC : Generation Scheduling and Dispatch Code

GMPC : Generation Maintenance Planning Code

GLSC : Generation Load Shedding Code

EI : *JPS* Engineering Instructions

SOPP : *JPS* System Operation Policies and Procedures

NOTE: In the Schedules Data Category refers to the Code Sections and/or *JPS* Instructions/Procedures.

(Page 1 of 3)

Schedule I - Users System Data

The data in this Schedule I is required from all *User*s connected directly to the *Transmission System*.

Data Description	Units	Code Section	JPS Instruction/ Procedure
Operation Line Diagram Single Line Diagram showing all existing and proposed equipment and *Apparatus* and Connections together with equipment rating	Drawing	**TCC 2.1**	**SOPP 9**
Site Responsibility Schedules	Schedule	**TCC 5.3**	
Safety Coordinators	Text	**TOC 6.4**	
Reactive Compensation Equipment For all reactive compensation equipment connected to the *User System* at [12kV] and above, other than Power Factor correction equipment associated directly with a Customer Plant, the following details Type of equipment (e.g. fixed or variable) Capacitive rating Inductive rating Operating range Details of any automatic control logic to enable operating characteristics to be determined Point of Connection to the *User System* in terms of electrical location and *System* voltage	 Text MVar Mvar Mvar Text and/or Diagrams Text	**TCC 2.1**	**SOPP 4** **SOPP 7**
Switchgear For all switchgear (i.e. circuit breakers, switch disconnectors and isolators) on all circuits Directly Connected to the *Connection Point* including those at Production Facilities Rated voltage Operating voltage Rated short-circuit breaking current Single phase Three phase	 kV kV kA kA	**TCC 2.1**	**SOPP 7**
Rated load breaking current Single phase Three phase	 kA kA		

Data Description	Units	Code Section	JPS Instruction/ Procedure
Rated peak short-circuit making current Single phase Three phase	 kA kA		
User Connecting System data: Circuit Parameters for all circuits For all *System*s at [12] kV and above Connecting *User System* to the *Transmission System*, the following details are required relating to that *Connection Point* Rated voltage Operating voltage Positive phase sequence Resistance Reactance Susceptance	 kV kV % on 100 % on 100 % on 100	**TCC 2.1**	**SOPP 7**
Zero phase sequence Resistance Reactance Susceptance	 % on 100 % on 100 % on 100		
Interconnecting transformers For transformers between the *Transmission System* and the *User System*, the following data is required: Rated Power Rated Voltage Ratio (i.e. primary/secondary/tertiary) Winding arrangement Vector group Positive sequence resistance @ maximum tap @ minimum tap @ nominal tap Positive sequence reactance @ maximum tap @ minimum tap @ nominal tap Zero phase sequence reactance Tap changer type Tap changer range Tap changer step size Impedance value (if not directly earthed)	 MVA % on MVA % on MVA % on MVA % on MVA % on MVA % on MVA % on MVA On/Off	**TCC 2.1**	**SOPP 7** **EI 3.1**

Data Description	Units	Code Section	JPS Instruction/ Procedure
HV Motor Drives Following details are required for each HV motor drive connected to the *User System* Rated VA Rated *Active Power* Full Load Current Means of starting Starting Current Motor torque/speed characteristics Drive torque/speed characteristics Motor plus drive inertia constant	 MVA MW kA Text kA	**TCC 2.1**	**SOPP 7**
User Protection Data Following details relates only to protection equipment which can trip, inter-trip or close any *Connection Point* circuit breaker or any *Grid Operator* circuit breaker A full description including estimated settings, for all relays and protection systems installed or to be installed on the *User System* A full description of any auto-reclose facilities installed on the *User System*, including type and time delays The most probable fault clearance time for electrical faults on any part of the *User System* Directly Connected to the *Trasmission System*	 Text Text Ms	**TCC 2.1**	**SOPP 7**
Transient Over-Voltage Assessment Data When requested by *JPS*, each *User* is required to submit data with respect to the *Connection Site* as follows (undertaking insulation co-ordination studies) Busbar layout, including dimensions and geometry together with electrical parameters of any associated *Current Transformer*s, voltage transformers, wall bushings, and support insulators Physical and electrical parameters of lines, cables, transformers, reactors and shunt compensator equipment Connected at that busbar or by lines or cables to the busbar (for the purpose of calculating surge impedances) Specification details of connected directly or by lines and cables to the busbar including basic insulation levels Characteristics of over-voltage protection at the busbar and at the termination of lines and cables connected at the busbar	 Diagram Text Text Text	**TCC 2.1** `	**SOPP 7**

(Page 1 of 1)

Schedule II – Load Characteristics Data

The following information is required from each *User* regarding existing and future connections for each *Connection Point*.

Data Description	Units	Data category		Data category
		YR 0	YR 1	
1. Details of individual loads which have fluctuating, pulsing or other characteristics significantly different from the typical range of Domestic, Commercial or Industrial loads supplied				**TPC 1.3** **TPC 4.2**
2. Sensitivity of Demand to variations in voltage and frequency on the *Transmission System* at the peak *Connection Point* Demand (*Active Power*)				
o Voltage sensitivity	MW/kV MVAr/kV			
o Frequency sensitivity	MW/Hz MVAr/Hz			
3. Phase unbalance imposed on the *Transmission System*				
o Maximum	%			
o Average	%			
4. Maximum harmonic content imposed on the *Transmission System*	%			
5. Details of loads which may cause Demand fluctuations greater than [1 MW] at a *Connection Point*				

(Page 1 of 2)

Schedule III – Demand Profiles and Active Energy Data

The following information is required from each *User* who is directly connected to the *Transmission System* with Demand.

Data Description	FY0	FY1			Update Time	Data Category
Forecast daily Demand profiles in respect of each *User System* (summated over all *Connection Point*s for the *Distribution System* Operator and at the *Connection Point* for Non *Embedded Generator*)	1. Day of *User* maximum Demand (MW) at Annual MD Conditions 2. Day of peak *Transmission System* Demand (MW) at Annual MD Conditions 3. Day of minimum *Transmission System* Demand (MW) at Average Conditions *(Delete as appropriate)*				[End January]	**TPC 1.3** **TPC 4.2** **TCC 2.1** **TOC 2.3** **GSDC 3.5.1**
0000 : 0100						
0100 : 0200						
0200 : 0300						
0300 : 0400						
0400 : 0500						
0500 : 0600						
0600 : 0700						
0700 : 0800						
0800 : 0900						
1000 : 1100						
1100 : 1200						
1200 : 1300						
1300 : 1400						
1400 : 1500						
1500 : 1600						
1600 : 1700						
1700 : 1800						
1800 : 1900						
1900 : 2000						
2000 : 2100						
2100 : 2200						
2200 : 2300						
2300 : 2400						

Data Description	YR 0	YR 1	YR 2		Update Time	Data Category
The annual MWh requirements for each *User System* for Non *Embedded Generator* at Average Conditions:					[End Sept]	**TPC 1.3** **TPC 4.2** **TCC 2.1**
1. Domestic 2. Agricultural 3. Commercial 4. Industrial 5. Parish 6. Public Lighting 7. [Any other identifiable categories of *Generator*] 8. *User System* losses						
Applicable only to Non-Embedded Generator					[End Sept]	**TPC 1.3** **TCC 2.1**
1. Total Demand (MW) on its *System* 2. Active Energy (MWh) requirement on its *System* 3. Active Energy from Embedded Generation						

(Page 1 of 1)

Schedule IV – Connection Point Data

The following information is required from each *User* who is directly connected to the *Transmission System* with Demand.

Data Description	Units	YR 0	YR 1		Update Time	Data Category
1. Annual peak hour *User* Demand at Annual MD Conditions	MW pf				[End Sept]	**TPC 1.3** **TPC 4.2**
2. *User* Demand at *Transmission System* peak hour Demand at Annual MD Conditions	MW pf				[End Sept]	**TPC 1.3** **TPC 4.2**
3. *User* Demand at minimum hour *Transmission System* Demand at Average Conditions	MW pf				[End Sept]	**TPC 1.3** **TPC 4.2**
Where a *User* Demand or group of Demands may be fed by alternative *Connection Point*(s) , the following details should be provided: 1. Name of the alternative *Connection Point*(s) 2. Demand transferred 3. Transfer arrangement (e.g. manual or automatic) 4. Time to effect transfer	 MW MVAr hrs				[End Sept]	**TPC 1.3** **TPC 4.2**

(Page 1 of 1)

Schedule V – Demand Control Data

The following information is required from a Non-Embedded Customer.

Data Description	Units	Time Covered	Update Time	Data Category
Programming Phase: applicable to the Non-Embedded Generator				
Demand Control which may result in a Demand change of [1] MW or more on an hourly and *Connection Point* basis 1. Demand profile	MW	Weeks 1 to 8	10:00 Friday	**TOC 2.4** **EI 1.6** **SOPP 11** **GSDC 3.5.1**
2. Duration of proposed Demand Control	hrs	Weeks 1 to 8	10:00 Friday	
Control Phase: applicable to a Non-Embedded Generator				
1. Demand Control which may result in a Demand change of 1 MW or more averaged over any hour on any Connection Supply Point which is planned after 10:00 hours	Mw	Now to 7 Days	Immediate	**TOC 2.5**
2. Any changes to planned Demand Control notified to the *Grid Operator* prior to 10:00 hours	hrs	Now to 7 Days	Immediate	
Post Control Phase				
Demand reduction achieved on previous calendar day of 1 MW or more averaged over any *Connection Point*, on an hourly and *Connection Point* basis 1. *Active Power* profiles	MW	Previous Day	10:00 Daily	**TOC 2.6**
2. Duration	hrs	Previous Day	10:00 Daily	

(Page 1 of 1)

Schedule VI – Fault Infeed Data

The following information is required from each *User* who is connected to the *Transmission System* via a *Connection Point* where the *User System* contains *Embedded Generating Unit*(s) and/or motor loads. The data is required for the three following years

Data Description	Units	Update Time	Data Category
Short Circuit Infeed to Transmission System from User System at a Connection Point			
Name of Connection Point: _____			
1. Symmetrical three-phase short circuit current infeed:		[end Sept]	**TPC 1.3** **TPC 4.2**
○ At instant of fault	kA		
○ After sub-transient fault current contribution has substantially decayed	kA		
2. Zero sequence source impedance values as seen from the *Connection Point* consistent with the maximum infeed above:			
○ Resistance (R)	% on 100		
○ Reactance (X)	% on 100		
3. Positive sequence X/R ratio at instant of fault			

(Page 1 of 1)

Schedule VII – User Outages Data

Data Description	Timescale Covered	Update Time	Data Category
Generators and Non-Embedded Generator provide Details of *Apparatus* owned by them other than *Generating Units* at each *Connection Point*	Year 1	[end Sept]	
Grid Operator informs *User*s of aspects that may affect their *System*s	Year 1		
Users inform *Grid Operator* if not in agreement with aspects as notified	Year 1		
Grid Operator issues final *Transmission System* outage plan with advice on *Operational Effect*s on the Distribution and *User System*s	Year 1	[end Oct]	**TOC 3.5**
Generators, and Non-Embedded Generator to inform *Grid Operator* of changes to outages previously requested	Week 8 ahead to year end	As occurring	**TOC 3.6**

(Page 1 of 4)

Schedule VIII – Generator Planning Parameters Data

Generating Facility Name: _____

The following details are required from each Generating Facility directly connected, or to be directly connected, to the *Transmission System* and/or an existing, or proposed, Embedded Generating Facility. The data shall be supplied for the following 3 years.

Data Description	Units	Update Time	Data Category
Generating Facility Demand			
Demand associated with the Generating Facility supplied through the *Transmission System* or via a *Generator*'s own system in addition to Demand supplied through unit transformer		[end Sept]	
1. Maximum Demand that could occur	MW MVAr		
2. Demand at the time of peak *Transmission System* Demand	MW MVAr		
3. Demand at the time of minimum *Transmission System* Demand	MW MVAr		

The data in the following table shall be supplied for each generating unit.

Data Description	Units	Update Time	Data Category
Individual Generating Unit Demand			
Demand supplied through unit transformer when *Generating Unit* is at Rated MW output	MW MVAr		
Generating Unit Performance and Parameters			
General			
1. Details of point of connection to the *Transmission System* of the *Generating Unit* in terms of geographical and electrical location and system voltage, including a Single Line Diagram	Text	As required	**GCC 1.2.4**
2. Type of *Generating Unit* (e.g. Steam Turbine Unit, Gas Turbine Unit, Cogeneration Unit, wind, etc)	Text		
3. Registered Capacity	MW		

Data Description	Units	Update Time	Data Category
4. *Distribution System* Constrained Capacity (for *Embedded Generating Units* only)	MW		
5. Rated *Active Power*	MW		**GCC 1.2.4**
6. Minimum Generation	MW		
7. Rated Apparent Power	MVA		
8. Rated terminal voltage	kV		
9. *Generator* Performance Chart at stator terminals	Chart		
10. Net Dependable Power Capacity (on a monthly basis)	MW		
11. Short circuit ratio			
12. Turbo-generator inertia constant (alternator plus prime mover)	MW/MVA		
13. Rated field current at Rated MW and MVAr output and at rated terminal voltage	A		
14. Field current open circuit saturation curve as derived from appropriate manufacture's test certificate			
○ 120% rated terminal voltage	A		
○ 110% rated terminal voltage	A		
○ 100% rated terminal voltage	A		
○ 90% rated terminal voltage	A		
○ 80% rated terminal voltage	A		
○ 70% rated terminal voltage	A		
○ 60% rated terminal voltage	A		
○ 50% rated terminal voltage	A		
Impedances			**GCC 1.2.4**
1. Direct axis synchronous reactance	% on MVA		
2. Direct axis transient reactance	% on MVA		
3. Direct axis sub-transient reactance	% on MVA		
4. Quadrature axis synchronous reactance	% on MVA		
5. Quadrature axis sub-transient reactance	% on MVA		
6. Stator leakage reactance	% on MVA		
7. Armature winding direct-current resistance	% on MVA		

Data Description	Units	Update Time	Data Category
Time Constants			**GCC 1.2.4**
1. Direct axis short-circuit transient time constant	secs		
2. Direct axis short-circuit sub-transient time constant	s		
3. Quadrature axis short-circuit sub-transient time constant	s		
4. Stator time constant	s		
Generator Transformer			**GCC 1.2.4**
1. Rated Apparent Power	MVA		
2. Rated voltage ratio			
3. Winding arrangement			
4. Vector group			
5. Positive sequence resistance			
○ @ maximum tap	% on MVA		
○ @ minimum tap	% on MVA		
○ @ nominal tap	% on MVA		
6. Positive sequence reactance			
○ @ maximum tap	% on MVA		
○ @ minimum tap	% on MVA		
○ @ nominal tap	% on MVA		
7. Zero phase sequence reactance	% on MVA		
8. Tap changer range	±%		
9. Tap changer step size	%		
10. Tap changer type (i.e on-load or off-load)	On/Off		
Excitation Control *System* Parameters			**GCC 1.2.4**
1. Exciter category (e.g. rotating or static)	Text		
2. Details of Excitation *System* described in block diagram showing transfer functions of individual elements (including Power System Stabiliser if fitted)	Diagram		
3. Rated field voltage	V		
4. *Generator* no-load field voltage	V		
5. Excitation System on-load positive ceiling voltage	V		

Data Description	Units	Update Time	Data Category
6. Excitation System no-load negative ceiling voltage	V		
7. Power System Stabiliser fitted?	Yes/No		
8. Details of over excitation limiter described in block diagram showing transfer functions of individual elements	Diagram		
9. Details of under excitation limiter described in block diagram showing transfer functions of individual elements	Diagram		
Governor Parameters (All Generating Units) Governor system block diagram showing transfer function of individual elements	Diagram		**GCC 1.2.4**
Prime Mover Parameters Prime mover system block diagram showing transfer function of individual elements and controllers	Diagram		**GCC 1.2.4**
Generator Flexibility Performance Details required with respect to *Generators*			**GCC 1.2.4**
1. Rate of loading following a weekend shut-down (*Generator* and Generating Facility)	MW/Min		
2. Rate of loading following an overnight shut-down (*Generator* and Generating Facility)	MW/Min		
3. Block load following Synchronising	MW		
4. Rate of De-loading from Rated MW	MW/Min		
5. Regulating range	MW		
6. Load rejection capability while still Synchronised and able to supply Load	MW		

(Page 1 of 2)

Schedule IX – Generator Operational Planning Data

Generator Facility Name: _____

The following details are required from each *Generator* in respect of each *Generating Unit*.

Data Description	Units	Data Category	Generating Unit and Generating Facility Data						
			U1	U2	U3	U4	U5	U6	GF
Steam Turbine Generating Units		**GSDC 3.2**							
1. Minimum notice required to synchronise under following conditions:									
○ Hot start	Min								
○ Warm start	Min								
○ Cold start	Min								
2. Minimum time between synchronising different *Generating Units* at a Generating Facility	Min								
3. Minimum block Load requirement on synchronising	MW								
4. Maximum *Generating Unit* loading rates from synchronising under following conditions:									
○ Hot start	Min								
○ Warm start	Min								
○ Cold start	Min								
5. Maximum *Generating Unit* de-loading rate	MW/Min								
6. Minimum interval between de-synchronising and synchronising a *Generating Unit* (off-load time)	Min								
Gas Turbine Generating Units		**GSDC 3.2** **SOPP 7**							
1. Minimum notice required to synchronise	Min								
2. Minimum time between synchronising different *Generating Units* at a Generating Facility	Min								
3. Minimum block Load requirement on synchronising	MW								
4. Maximum *Generating Unit* loading rates from synchronising for									

Data Description	Units	Data Category	Generating Unit and Generating Facility Data						
			U1	U2	U3	U4	U5	U6	GF
○ Fast start	Min								
○ Slow start	Min								
5. Maximum *Generating Unit* de-loading rate	MW/Min								
6. Minimum interval between de-synchronising and synchronising a *Generating Unit*	Min								

(Page 1 of 2)

Schedule X – Scheduling and Dispatch Data

Generating Facility Name: _____

The following details are required from each *Generator* in respect of each *Generating Unit*.

Data Description	Units	Data Category	Generating Unit, and Generating Facility Data						
			U1	U2	U3	U4	U5	U6	GF
Generating Unit Availability Notice		**GSDC 3.2** **GSDC 3.5.1** **GMPC 5.1** **SOPP 7**							
1. *Generating Unit* Availability									
○ Power Capacity	MW								
○ Start time	date/time								
2. *Generating Unit* unavailability									
○ Start time	date/time								
○ End time	date/time								
3. *Generating Unit* initial conditions									
○ Time required for Notice to Synchronise	hrs								
○ Time required for start-up	hrs								
4. Maximum Generation increase in output above declared Availability	MW								
5. Any changes to Primary Response and Secondary Response characteristics									
Scheduling and Dispatch Parameters		**GSDC 3.2** **GSDC 3.5.1** **GMPC 5.1**							
1. *Generating Unit* inflexibility									
○ Description	Text								
○ Start date	date/time								
○ End date	date/time								
○ *Active Power*	MW								

Data Description	Units	Data Category	Generating Unit, and Generating Facility Data						
			U1	U2	U3	U4	U5	U6	GF
2. *Generating Unit* synchronising intervals									
Hot time interval	hrs								
Off-load time interval	hrs								
3. Station *Generating Unit* de-synchronising intervals	hrs								
4. *Generating Unit* basic data									
Minimum Generation	MW								
Minimum shutdown time	hrs								
5. *Generating Unit* two shifting limitation									
6. *Generating Unit* minimum on time	hrs								
7. *Generating Unit* Synchronising Generation	MW								
8. *Generating Unit* Synchronising groups									
9. *Generating Unit* run-up rates with breakpoints	MW/min								
10. *Generating Unit* run-down rates with breakpoints	MW/min								
11. *Generating Unit* loading rates covering the range from Minimum Generation to Maximum Output	MW/min								
12. *Generating Unit* de-loading rates covering the range from Maximum Output to Minimum Generation	MW/min								
Generating Unit Merit Order Data(*)		**GSDC 3.2.2**							
o Fuel data									
o Heat Rate data									

(*)NOTE: Fuel data to be updated at the beginning of each month
Heat Rate data to be updated following twice yearly tests

(Page 1 of 2)

Schedule XI – Generator Outages Data

Generating Facility Name: _____

The following details are required from each *Generator* in respect of each *Generating Unit*.

Data Description	Units	Time Covered	Update Time	Data Category
Provisional Outage Programme				**TOC 3.3**
1. *Generating Unit*s concerned	ID	Year 2 to 3	[End Oct]	**GSDC 3.5.1 GMPC 5.1 EI 1.11**
2. *Active Power* not available as a result of Outage	MW	Year 2 to 3	[End Oct]	**SOPP 19**
3. Remaining *Active Power* of the Facility	MW	Year 2 to 3	[End Oct]	
4. Duration of Outage	Weeks	Year 2 to 3	[End Oct]	
5. Start date and time or a range of start dates and times	Date hrs	Year 2 to 3	[End Oct]	
Grid Operator issues Provisional Outage Programme to *User*s		Year 2 to 3	[End Sept]	
Agreement on Provisional Outage Programme	Text	Year 2 to 3	[End Oct]	
Final Outage Programme				**TOC 3.3**
1. *Generating Units* concerned	ID	Year 1	[End Oct]	**GSDC 3.5.1 GMPC 5.1 SOPP 19**
2. *Active Power* not available as a result of Outage	MW	Year 1	[End Oct]	
3. Remaining *Active Power* of the Plant	MW	Year 1	[End Oct]	
4. Duration of Outage	Weeks	Year 1	[End Oct]	
5. Start date and time or a range of start dates and times	Date hrs	Year 1	[End Oct]	

Data Description	Units	Time Covered	Update Time	Data Category
Grid Operator issues draft Final Outage Programme to *User*s		Year 1	[End Sept]	
Grid Operator issues Final Outage Programme to *User*s	Text	Year 1	[End Oct]	
Short Term Planned Maintenance Outage				**GSDC 3.5.1 GMPC 5.1.3 SOPP 19**
1. *Generating Units* concerned	ID	Year 0	5 Days before	
2. *Active Power* not available as a result of Outage	MW	Year 0	5 Days before	
3. Remaining *Active Power* of the Facility	MW	Year 0	5 Days before	
4. Duration of Outage	Weeks	Year 0	5 Days before	
5. Start date and time or a range of start dates and times	Date hrs	Year 0	5 Days before	

(Page 1 of 2)

Schedule XII – Grid Operator Information to Users

The *Grid Operator* will provide *User*s and prospective *User*s the following data related to the *Transmission System*.

Code	Description
TCC 5.3	**Operation Diagram**
TCC 2.1	**Site Responsibility Schedules**
TOC 2.3	**Demand** The *Grid Operator* will notify each *User* no later than the [end of October] of each calendar year, for the current calendar year and for each of the following 3 calendar years 1. The date and time of annual peak of *Transmission System* demand at Annual Maximum Demand Conditions 2. The date and time of annual minimum *Transmission System* demand at Average Conditions
TPC 4.5.5	**Transmission System Data including** Network Topology and ratings of principal items of equipment Positive, negative and zero sequence data of lines, cables, transformers etc *Generating Unit* electrical and mechanical parameters Relay and protection data
TPC 4.5.5	The following Network Data as an equivalent 138kV and 69 kV source at the *Connection Point* to the *User* System Symmetrical three-phase short circuit current infeed at the instant of fault from the *Transmission System* Symmetrical three-phase short circuit current from the *Transmission System* after the sub-transient fault current contribution has substantially decayed Zero sequence source resistance and reactance values at the *Connection Point*, consistent with the maximum infeed below Pre-fault voltage magnitude at which the maximum fault currents were calculated Positive sequence X/R ratio at the instant of fault Appropriate interconnection transformer data
TOC 6.4	**Names of Safety Co-ordinators**

Code	Description
	Outage Programmes
TOC 3.4	Provisional Outage programme showing the *Generating Units* expected to be withdrawn from service during each week of Years 2 and 3 for Planned Outages
TOC 3.5	Draft Final Outage programme showing the *Generating Units* expected to be withdrawn from service during each week of Year 1 for Planned Outages
	Demand Estimates and Operating Margin
	Synchronising and **Desynchronising** times of **Embedded Generating Units** to **the Distribution System Operator**
	Special Actions that may be required of *User*s
GSDC 3.2.3	Merit Order to be notified to *Generators* at the start of each month
GSDC 3.5.1	*Grid Operator* to provide daily schedule of expected availability and generation dispatch at 15:00hours each day for the following day and at 15:00hours on Friday for the following three (3) days

Schedule XIII – Metering Data

Data Description	Responsible Party	Data Category
Connection and Metering Point reference details for both Delivery Point and Actual Metering Point		**EI 4.7**
Data communication details when communication systems are used		
Data validation and substitution processes agreed between affected parties		