JAMAICA PUBLIC SERVICE COMPANY LIMITED

DISTRIBUTION 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
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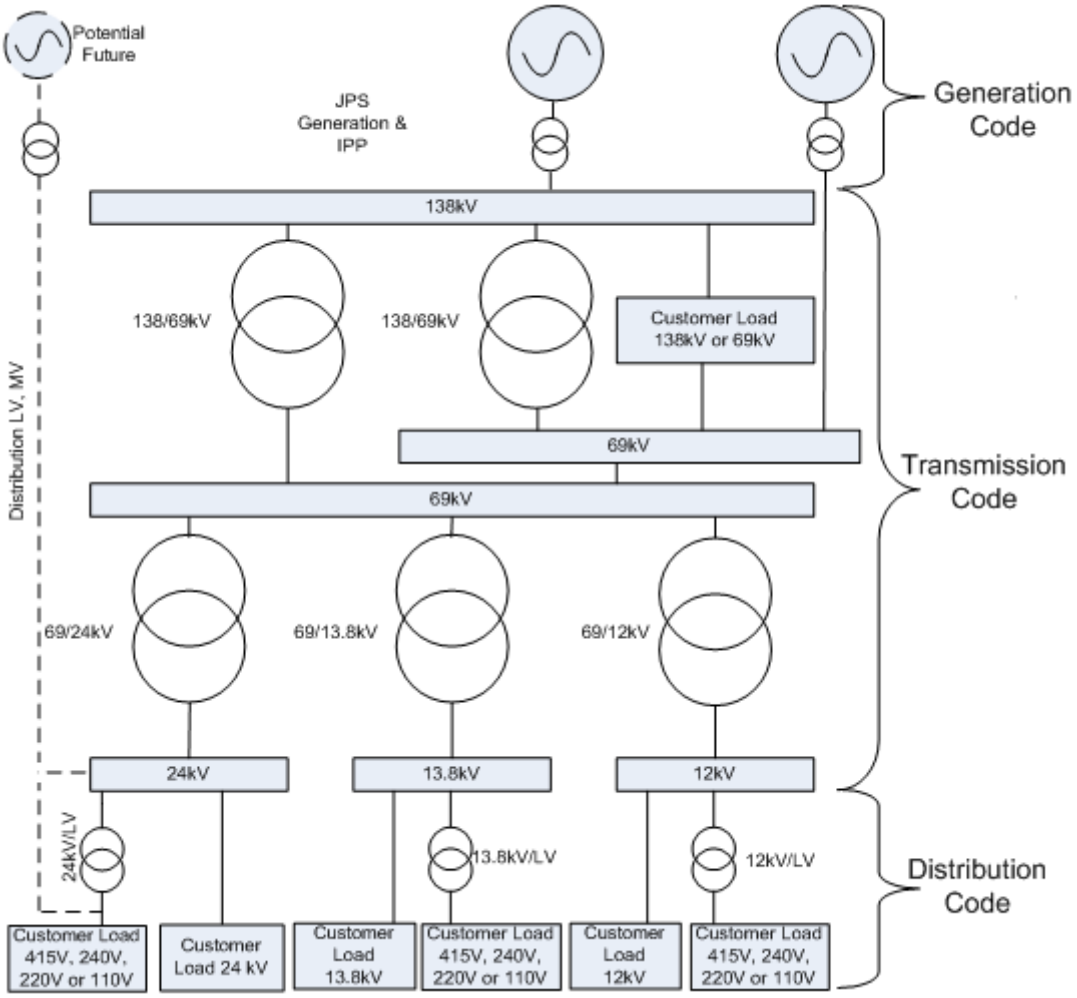
PREFACE

[1] The *Distribution Code* is designed to permit the development, maintenance and *Operation* of an efficient, co-ordinated and economical *Distribution System* in Jamaica, to facilitate the *Distribution 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 *Distribution 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 *Distribution System* are set out in the *Distribution Code*. The *Distribution Code* specifies day-to-day procedures for both planning and operational purposes.

[3] The *Distribution Code* is designed to be used in conjunction with the Generation and Transmission *Code*s which serve a similar purpose for the Generation and *Transmission System*s 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 *Customers 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 Code*s

[5] The *Distribution 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 *Distribution 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 *Distribution System;*
- the technical studies and planning procedures to ensure that the *Distribution 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 *Distribution System*;

iv) The 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.
- *Demand* Control;
- Safety Co-ordination;
- Contingency Planning;
- *Incident* Information Supply;
- Operational Communication;
- Numbering and Nomenclature of HV and MV *Apparatus*;
- *System Test*s; 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) The Metering Code shall include reference to metering *Equipment* requirements and performance which shall include:

- Current and *Voltage Transformer*s;
- *Connection Point*s;
- The *System* for the collection of meter readings whether manual or automatic;
- Standards;
- Accuracy;
- Calibration and Sealing, and
- Inspection and Testing.

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

DISTRIBUTION GLOSSARY AND DEFINITIONS

DGD 1. INTRODUCTION

DGD 1.1 Understanding

DGD 1.1.1 This Glossary and Definitions section applies to all chapters of the *Distribution Code*. Any words not defined here shall have such meanings as ascribed under the relevant statute and regulations or such meaning as normally ascribed and accepted within the power industry; or 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 *Distribution Code.*

DGD 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 *System*s, 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 *System*s 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 or persons 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

Block (Manual) Load Shedding		Manual load shedding (demand curtailment) is applied to maintain a generation-demand balance during periods of known generation shortfall and entails the remote disconnection of groups of distribution *feeders* assigned to pre-designated blocks. The number of feeders to be disconnected simultaneously in single or multiple blocks depends on the scale of generation demand imbalance.
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 Code*s as set out in DGC 10.7.
Code Review Panel		The panel established with the functions and duties set out in DGC 10.2.
Co-Generator		A facility which simultaneously provides electrical and thermal energy from a singular fuel source for it's 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 *Distribution System* at which a *User* or *Generator* is connected to the *Distribution System*.
Connection Related Planning Studies		Power flow simulations, short circuit and stability studies performed as necessary to determine the requirements for the connection of load 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*.
Current Transformer		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.
Customers		Any person or entity supplied with electricity service under a contract with the *Grid Operator*.
Demand		The demand of MW or MVAr of electric power (i.e. both *Active Power* 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 or a *Embedded Generator's* obligations to implement or comply with the requirements of the *Distribution 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 *Embedded Generator* in connection with, or arising out of, any clause in the *Distribution 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 Code Technical Standards		The Technical Specifications applicable/implemented to govern the technical development and *Operation* of the *Distribution System* as listed in section DGC 10.6
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 the *Distribution System* and 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 (e.g. post hurricane restoration).
Entry Point		The point at which *Embedded Generator*s or other *User*s connect to the *Distribution System* where power flows into the *Distribution System*.
Equipment		*Plant* and/or *Apparatus*
Exit Point		The point at which *User*s connect to the *Distribution System* where power flows out of the *Distribution 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(s)		means a *MV* electric line(s) and associated *MV* equipment 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(s)		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 *Generator*s, *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 an *Embedded Generator* or *User* providing for the connection of the *Generator* or *User Plant* to the *Distribution 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 criteria and requirements for the interconnection of *Embedded Generators* as revised from time-to-time.
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		Those parts of the *System* operating at voltages 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

Maximum Plant		The theoretical condition with maximum fault infeed from connected generation.
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.
Minimum Plant		The theoretical condition with minimum fault infeed from connected generation.
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) on 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 and MV *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* or *Distribution System* which will or may cause the *Transmission System*, *Distribution 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 amount of reserve, provided by *Generating Units* by *Demand* Control available over and above required to meet the expected Demand. It is required to limit and then correct Frequency deviations that may occur due 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 (PCC)		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 *Generator*s 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 *System*s, measured in VAR, or multiples thereof. For AC circuits or *System*s, 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(s)		A person(s) 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.
Service Area		A section of the *Distribution System* supplied by one or more substation busbars and/or Feeders of the same MV level.
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 *Distribution 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
Subdivision		An area of real estate composed of subdivided lots.
System		The interconnection facilities and any other transmission or distribution facilities on the *Grid Operators*' 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 Test* 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 System*s together with all *User System*s.
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*'s *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* will plan and operate the *Transmission System* to ensure a reliable and secure supply of electricity to *Customers*.
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 Distribution System,* as more particularly identified in *e*ach section of the *Distribution Code* concerned. In the Preface and General Conditions the term means any person (other than *JPS*) to whom the *Distribution Code* applies.
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.

DISTRIBUTION GENERAL CONDITIONS CODE

DGC 1. INTRODUCTION

DGC 1.1 JPS Licence Obligations

DGC 1.1.1 This *Distribution Code* has been prepared by the Jamaica Public Service Company Limited (*JPS).*

DGC 1.1.2 Under *Licence* 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 *Generator*s, the *Licence* requires the *Generation Code* to be:

"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."

DGC 1.1.3 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 *Distribution Code* seeks to address these aspects of the *Licence* with respect to the *Distribution System*.

DGC 1.1.4 Condition 21 of the *Licence* lays down certain requirements on *JPS* to have in place long term planning procedures and to produce a *Least Cost Expansion Plan.* The *Distribution Code* shall set out the procedures to be used by *JPS* and *Users* in producing the long term plans.

DGC 1.2 Interpretation

DGC 1.2.1 In this code;

a. words and expressions printed in italics are listed in the Distribution Glossary and Definitions and shall bear the respective meaning set out therein;

b. a table of contents, a preface and headings are inserted for convenience and references purposes only and shall not be used in construing the *Distribution Code* or 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 *Distribution Code or relevant Transmission 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 *Distribution 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 *Distribution Code* is intended to or shall derogate from *JPS* statutory or *Licence* obligations; and

j. references to ‘Engineering Standards’, ‘System Operation Policy and Procedures’ and ‘Engineering Instructions’ refer to the Engineering

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.

DGC 1.2.2 *JPS* has responsibilities under this *Distribution Code* in two distinct capacities. These are as follows:

a. *JPS* is responsible for prudent and efficient management of the Jamaican Electricity *System* by virtue of its holding of an 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 *Distribution Code* as it applies to Independent Power Producers and Co-generation facilities. Any reference to "*Generators*" in this *Distribution Code* should be interpreted to include *JPS* in this capacity.

DGC 2. SCOPE

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

DGC 2.1.2 The *Distribution Code* shall be complied with by the *Grid Operator* and existing and potential *Embedded Generator*s and *Users* connected to or seeking to connect to the *System*.

DGC 3. GENERAL REQUIREMENTS

DGC 3.1.1 This *Distribution 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 *Distribution Code* can not 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 *Transmission Code*

g. Compliance with the *Generation Code*

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

DGC 4. COMMUNICATION BETWEEN GRID OPERATORS AND USERS

DGC 4.1.1 Unless otherwise specified in the *Distribution Code*, communication between the *Grid Operator* and the *User*s shall be as agreed from time to time between the *Grid Operator* and the *User*.

DGC 5. DATA ACCURACY

DGC 5.1.1 The accuracy of Data provided by *User*s under this *Distribution 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 *User*s.

DGC 6. CONFIDENTIALITY

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

DGC 7. SYSTEM CONTROL

DGC 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*.

DGC 8. MAINTENANCE STANDARDS

DCC 8.1.1 All *Plant* and *Apparatus* on the *System* shall be operated and maintained in accordance with original equipment manufacturers(OEM) recommendations and *Prudent Utility Practice* and in a manner that shall not pose a threat to the safety of employees or the public.

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

DGC 8.1.34 The *Grid Operator* shall maintain maintenance records relating to its maintenance of *Plant* and *Apparatus* .

DGC 9 COMPETENCY OF STAFF

DGC 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.

DGC 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 shall be undertaking and refresher training at appropriate intervals to maintain the currency of the training.

DGC9.1.3 The *Grid Operator* shall maintain records of training given and issue certificates indicating the areas of competency of the persons trained.

DGC 10. DISTRIBUTION CODE REVIEW

DGC 10.1 Requirement for a Code Review Panel

DGC 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*.

DGC 10.2 Duties of the Code Review Panel

DGC 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 *Distribution Code* 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* was justified and what changes, if any, are necessary to the Distribution and *Transmission Code*s;

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 Code*s that the Panel considers warranted and the reason for such changes.

DGC 10.3 Composition

DGC 10.3.1 The *Grid Operator* shall appoint the Panel and the Panel shall consist of the following persons:

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

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

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

d. One persons 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*.

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

DGC 10.4 Rules and Procedures for Conduct of Business

DGC 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 appointment and retirement of members which the *OUR* shall approve.

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

DGC 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.

DGC 10.5 Technical Standards Subcommittee

DGC 10.5.1 The Technical Standards classified in this code as *Distribution Code Technical Standards* form part of this *Distribution 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* .

DGC 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.

DGC 10.6 Distribution Code Technical Standards

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

a. Engineering Standard 1300 Section 1.2.3 – Voltage Regulation

b. Engineering Standard 1300 Section 2.7 – Grounding Regulations

c. Engineering Standard 1300 Section 2.8 – Transformers

d. System Operation Policy and Procedure No. 2 – Operational Standards of Security of Supply
e. Engineering Instruction Manual, Instruction No. 4.7 – Revenue Metering
f. Engineering Bulletin TSD 007/3 – Metering Facility Policy
g. *JPS* Protective Relaying Philosophy & Practices

DGC 10.7 Revisions of the Code

DGC 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* .

DGC 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.

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

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

DGC 11. FORCE MAJEURE

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

DGC 12. NON-COMPLIANCE

DGC 12.1 Granting of Derogations

DGC 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 an *Embedded Generators* obligations to implement or comply with the *Distribution 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.*

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DGC 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.

DGC 12.2 Request for Derogation

DGC 12.2.1 A request for *Derogation* from any provision in the *Distribution Code* 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 for a delay in achieving compliance or permanent; and

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

DGC 12.3 Derogation for Existing Apparatus not in Compliance

DGC 12.3.1 It may be the case that not all *Apparatus* in use as at the date of adoption of this *Distribution Code* shall 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*.

DGC 13. DISPUTE RESOLUTION

DGC 13.1 Mutual Discussion

DGC 13.1.1 If a *Dispute* or difference of any kind whatsoever(the "*Dispute*") between the *Grid Operator* and a *User* or an *Embedded Generator* in connection with, or arising out of, any clause in this *Distribution 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.

DGC 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*.

DGC 13.2 Determination by the OUR

DGC 13.2.1 Subject to DGC13.1.2 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.

DGC 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.

DGC 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.

DGC 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*.

DGC 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 may be expected on the dispute may be expected.

DGC 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 exercise in accordance with the provisions of the *Licence*.

DGC 14. REQUIREMENT FOR INSPECTION

DGC 14.1.1 All *Plant* and *Apparatus* that shall form part of the *Distribution System* shall only become part of the *Distribution System* following inspection and approval by the Government Electrical Inspectorate.

DISTRIBUTION PLANNING CODE

DPC 1. INTRODUCTION

DPC 1.1 Purpose and Scope

DPC 1.1.1 The purpose of this chapter of the *Distribution Code* is to:

a. Specify the responsibilities of the *Grid Operator*, *Users* and *Generators* with respect to the planning of the *Distribution System*;

b. Specify the technical studies and planning procedures to ensure that the *System* is planned in compliance with statutory requirements;

c. Specify 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.

DPC 1.1.2 The scope of this chapter covers:

a. Grid Operators;

b. Users;

c. *Embedded Generators* and

d. Generators

DPC 1.2 Distribution Planning Responsibilities

DPC 1.2.1 The *Grid Operator* is responsible for *Distribution System* planning including:

a. Analysing the impact of changes to an existing *Users Systems;*

b. Analysing the impact of the connection of new *Users Systems;*

c. Analysing the impact of new generation connections;

d. Analysing the impact of the connection of *Rural Electrification Projects*;

e. Planning the network to meet forecast *Demand* and forecast generation capacities; and

f. Identifying and correcting areas of non-conformance with planning criteria related to Voltage Drop, *System* Capacity, *Fault Level*, *System* Loss and Power Quality.

DPC 1.2.2 To address areas of non-conformance, reinforcement, extension, protection modification and power quality improvement, works may be required at or on:

a. the *Connection Point* between the *Users System* and the *Grid Operators System*,

b. the *Distribution System* remote from *User Connection Points and*

c. the *Transmission System* remote from *User Connection Points*

DPC 1.2.3 The *Users* and *Generators* are responsible for provision of information to support the requirements of the *Grid Operator* and to operate their *System*s in accordance with the *Distribution Code*.

DPC 1.3 Planning Process

DPC 1.3.1 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 *Distribution System*;

b. Formulation of alternative options to meet this need;

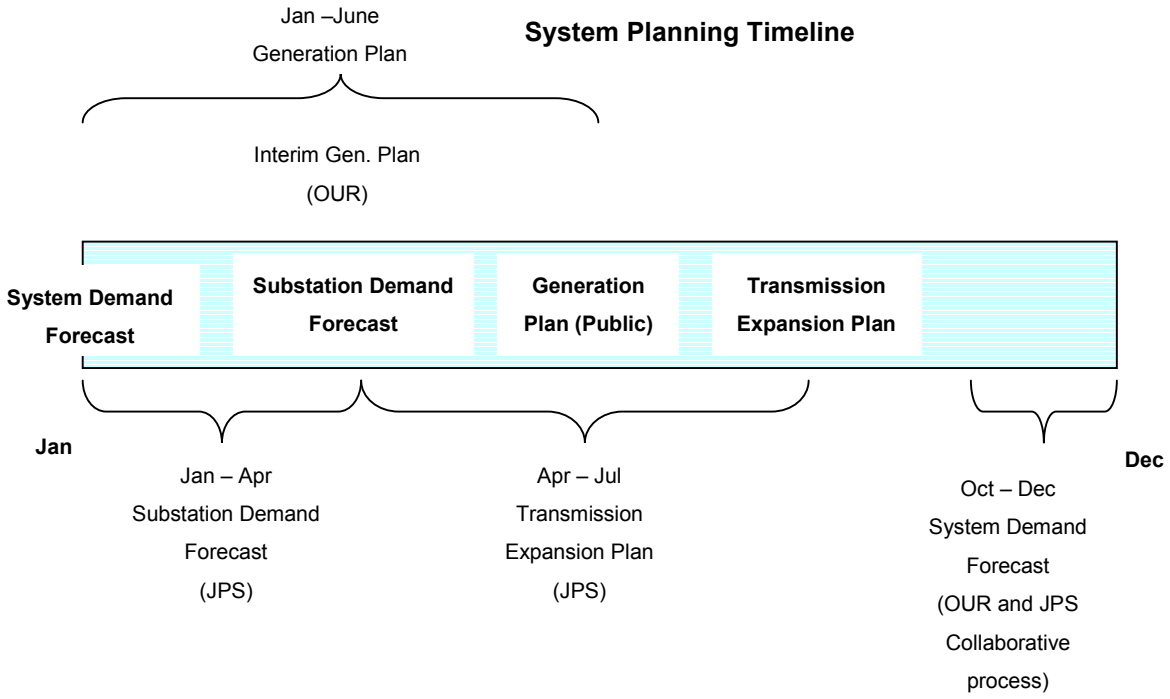
c. Study of these options to ensure compliance with agreed technical limits and justifiable reliability and quality of supply standards;

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.

DPC 1.4 Planning Timescales

DPC 1.4.1 The planning process above should operate on an annual planning 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 Distribution Expansion Plan in Q3 (year n+1).



DPC 1.4.2 *Connection Related Planning Studies* shall be undertaken outside the above process, but new load information shall 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.

DPC 1.4.3 For smaller connections the planning timescales are set and agreed with the *OUR*. These are included in the Distribution Connection Code.

DPC 2. PLANNING PRINCIPLES

DPC 2.1 Planning Criteria

DPC 2.1.1 Planning criteria are based on the requirement to comply with statutory requirements. Where no statutory requirements exist the criteria are based on international practices which would be expected of a reasonable and prudent *Grid Operator.*

DPC 2.1.2 The overriding principle in the planning of the *System* is the compliance with the *Licence* requirement for the *Grid Operator* to “provide an adequate, safe and efficient service based on modern standards”.

DPC 2.1.3 The effective planning of the *Distribution System* requires consideration of a broad range of factors that can affect the network. These factors are identified in Appendix A to this Distribution Planning Code which serves as a representation of the broad scope of any *System* planning activity.

DPC 2.2 Voltage criteria

DPC 2.2.1 The *System* shall be designed to ensure that under normal and planned contingency conditions, voltages at all *Connection Point*s and buses are to be within:

a. ± 5% of nominal voltage under normal conditions

b. ±6% of nominal Voltage under planned contingency conditions

DPC 2.3 Load Power Factor

DPC 2.3.1 The *System* shall be planned for a normal load power factor of 0.95.

DPC 2.4 Security of Supply

DPC 2.4.1 Jamaica does not have a prescriptive reliability standard that covers the *Distribution System* planning in terms of maximum restoration times for different load groups under different contingency considerations. This does not mean that security of supply is disregarded in the planning of the *Distribution System*. The *Service Area* Concept as described in DPC 2.5 shall be used to set a base *N-1* contingency level on a geographic basis and as a general planning guidance. The overall network should be designed to ensure that 98% of *Customers* affected by faults can be restored within 24 hours as assessed on an annual basis.

DPC 2.5 The Service Area Concept

DPC 2.5.1 The *Distribution System* has developed using predominantly radial *feeders* emanating from *Transmission System* substations.

DPC 2.5.2 The design criteria utilises a concept of *Service Areas*, which are networks of substations and feeders defined by any subset of the following parameters:

a. Geography;

b. Feeder Connectivity;

c. Customer Type;

d. Serviceability of Load (Transformer Capacity, Acceptable Voltage);

e. Cost of Service Delivery.

DPC 2.5.3 The *Service Areas* shall be defined by the *Grid Operator.*

DPC 2.5.4 In practical application the definition of *Service Areas* describes a section of (usually interconnected) *Distribution System* supplied from one or more substation busbars or feeders at the same voltage A *Service Area* is not necessarily a load centre, however, situations may arise where this is the case.

DPC 2.5.5 The *Service Area* should be able to sustain itself under normal conditions, and during any single contingency event (i.e. loss of transformer, feeder, recloser etc).

DPC 2.5.6 The objectives of the *Service Area* concept are as follows:

a. Ensure reliable service under normal and N-1 contingency conditions.

b. Localize impact of N-1 contingency.

c. Ensure restoration of supply to *Customers* after contingency in accordance with the *Overall Standards*.

d. Ensure structured approach to expansion of the distribution network.

e. Maximise utilization of distribution *Plant* and assets by feeder load management.

f. Group homogenous *Customers* to facilitate delivery of special service needs.

g. Ensure network safety and security.

DPC 2.5.7 *Service Area* design criteria are as below:

a. Substation MVA capacity should be sufficient to satisfy load *Demand* and to sustain a N-1 contingency situation;

b. Service voltages for all feeders should be the same;

c. Where economically feasible, each *Service Area* should have at least two (2) 3-phase interconnection points to adjacent *Service Areas*;

d. Each feeder in a *Service Area* must have at least one (1) 3-phase connection to a feeder supplied by another transformer;

e. Feeder loadings must be maintained to sustain 100% load transfers within the *Service Area* after any contingency event;

f. *Service Area* must be returned to normalcy after contingency.

DPC 2.5.8 Investment triggers for reinforcement expenditure to support the *Service areas* are as below:

a. Violations of design criteria requirements for *Service Area*;

b. Alternatives for load transfers do not exist;

c. Transformer loading exceed 105% of thermal rating under N-1 contingency conditions;

d. Overhead line exceed 100% of thermal rating under normal or contingency conditions;

e. Violations of service voltage criteria under normal or N-1 conditions.

DPC 3. PLANNING STUDIES

DPC 3.1 General

DPC 3.1.1 The *Grid Operator* shall undertake distribution planning studies as required to:

a. Determine the connection requirements for any *Users System*, submitted in accordance with the connection application process, including any reinforcement, protection or power quality improvement required in order to be compliant with the *System* operating standards of the *Grid Operator*;

b. Determine the connection requirements for any *Generator* Unit (s), submitted in accordance with the connection application process, including any reinforcement, protection or power quality improvement requirements required in order to be compliant with the *System* operating standards of the *Grid Operator*;

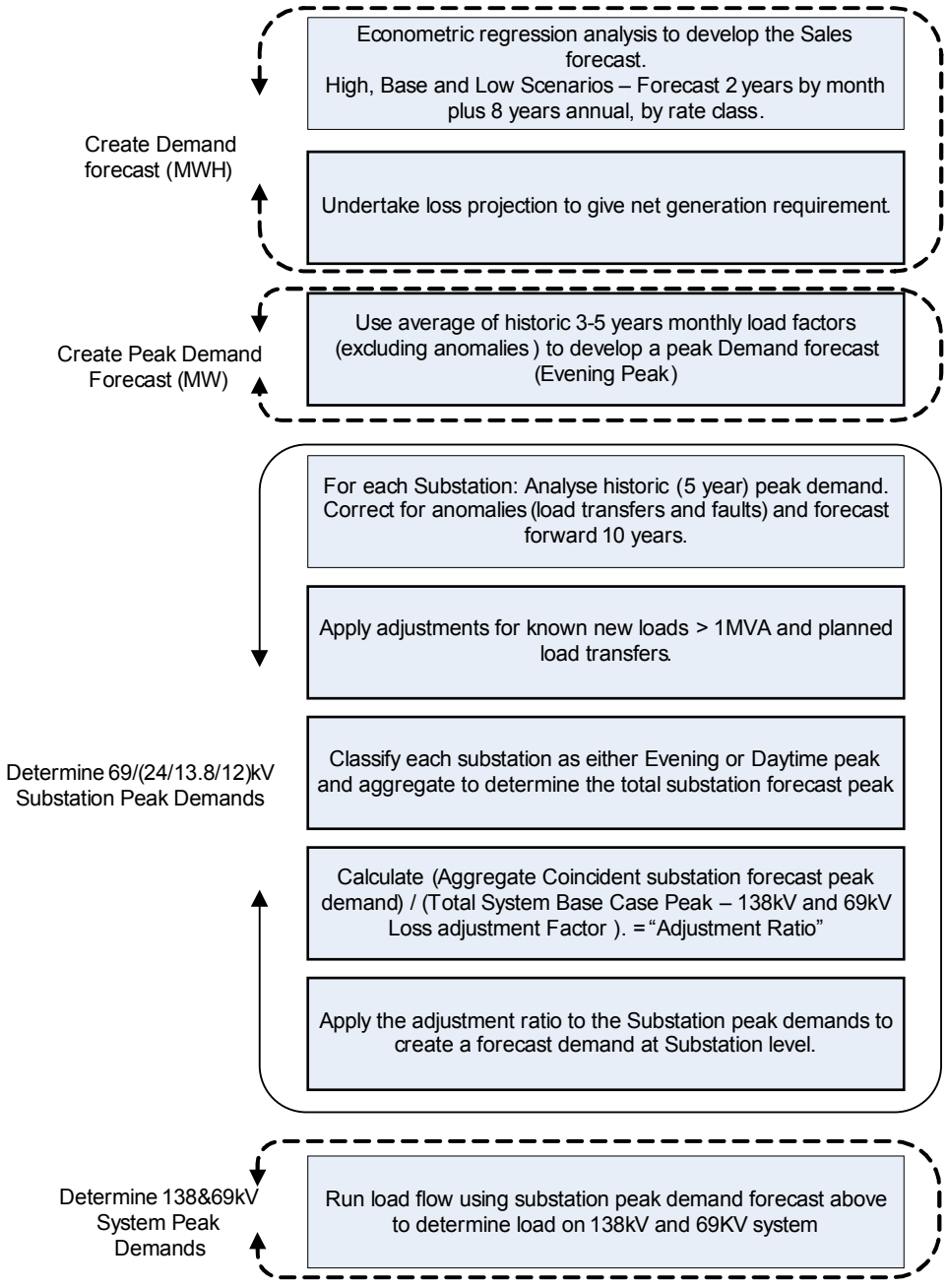
c. Prepare the Distribution Least Cost Expansion Plan which is prepared as required by the *OUR*.

DPC 3.2 Demand Forecasts

DPC 3.2.1 A *Demand* forecast is a critical input to the planning and expansion of the System in a coordinated and economic manner. It may be developed from an energy consumption forecast that applies econometric regression methodology, consistent with industry best practice . This forecast of energy consumption is then used to develop a peak *Demand* forecast for each substation which shall inform the studies outlined further in section DPC 3.2.2.

DPC 3.2.2 The overall process for development of the *Demand* forecast at substation level is as below. This should be undertaken on an annual basis in line with the planning timescales in Section DPC 1.4.1.

System and Substation Demand Forecast Process



DPC 3.3 Load Flow Studies

DPC 3.3.1 The *Grid Operator* shall undertake load flow studies using appropriate modelling tools.

DPC 3.3.2 Load flows shall be modelled at peak feeder loads, based on the feeder metering data or *SCADA* data where metering data is not available, with forecasts at a feeder level based on regression analysis and forecast forward for an appropriate period to ensure that all network components are operating within their design parameters for the forecast period.

DPC 3.3.3 Load flows shall model the contingency scenarios planned for in the network design and shall be undertaken to ensure that all network components are operating within their design parameters for all plausible scenarios of supply network reconfiguration. Short term and emergency ratings of *Plant* may be used if it is considered that the timescale for restoration to normal *Operation* will align with the manufacturer's specification on such ratings, or other parameters as determined by the *Grid Operator*.

DPC 3.4 Voltage Drop Studies

DPC 3.4.1 The *Grid Operator* shall undertake voltage drop studies to determine the voltages at all *Connection Point*s using appropriate modelling tools. Such studies shall be used to determine the impact of any load connection, generation connection, *System* extension or reinforcement.

DPC 3.4.2 The planning of Voltage regulation shall be in accordance with the principles in Engineering Standard ES-1300 section 1.2.3. These principles recommend that voltage regulation planning takes into account a 5 year load growth forecasts and includes the use of:

a. Tap changers to maintain busbars at constant voltage;

b. Line Drop Compensation;

c. In line voltage regulators; or

d. Capacitors (fixed capacitor banks should be sized on present requirements rather than growth forecasts to avoid over voltage).

DPC 3.4.3 The *Distribution System* shall be planned with voltage controlled level bars on the secondary sides of the 69/24kV, 69/13.8kV and 69/12kV sides of the relevant transformers using automatic tap changers.

DPC 3.4.4 Capacitors may be used to provide voltage improvement on the distribution network. Their use shall be in accordance with Engineering Standard ES-1300 section 1.2.3.1. which provides guidance in the following applications:

a. Reducing the lagging component of circuit current;

b. Increasing the voltage level at the load;

c. Improving voltage regulation, if the capacitors are properly switched;

d. Reducing I^2R power loss and I^2X kVAr loss in the *System* because of reduction in current;

e. Increasing power factor of *Generators*;

f. Decreasing kVA loading on *Generator*s and circuits to relieve overloads and reduce *Demand*.

DPC 3.4.5 Suitable control *System*s shall be employed where required to ensure that excess voltages are not experienced at *Connection Points* during periods of light load or abnormal running conditions.

DPC 3.4.6 Voltage regulators may be used to provide level bars or fixed voltage increases at intermediate points on the *Distribution System*. Their use shall be in accordance with Engineering Standard ES-1300 section 1.2.3.2. which covers the rating, determination of optimum location, requirements for bypassing, control settings and economic evaluation of regulators and recommends the determination of size and location after fixed capacitor bank sizes and locations have been determined.

DPC 3.4.7 Voltage drops shall be modelled at peak feeder loads based on the feeder metering data, or *SCADA* data where metering data is not available, to ensure that the design voltage at the customer *Connection Point*s meet the voltage requirements of this code.

DPC 3.4.8 Voltage drops shall be modelled for the contingency scenarios planned for in the network design and shall be undertaken to ensure that the design voltage at customer *Connection Point*s meets the voltage requirements of this code for all plausible scenarios of supply network reconfiguration.

DPC 3.4.9 Any extension or connection to the *Grid Operators Distribution System* shall be designed in such away that it does not adversely affect the voltage control employed on the *Distribution System.* Information on the voltage regulation and control arrangements shall be made available by the *Grid Operator* if requested by the *User*.

DPC 3.5 Short Circuit Studies

DPC 3.5.1 The *Grid Operator* shall undertake *Fault Level* studies at all switching points on the network where fault interrupting devices are located. The studies shall determine the 3 phase and single phase to ground short circuit levels. Studies shall be carried out for the *Maximum Plant and Minimum Plant* conditions.

DPC 3.5.2 The *System* should normally be designed to ensure that the short-circuit fault current does not exceed 80% of the declared manufacturers ratings of all switches, fuses, circuit breakers and other protective devices in terms of both *Breaking Capacity* and *Making Capacity*.

DPC 3.5.3 Where it is identified that the design *Breaking Capacity* or *Making Capacity* is likely to be exceeded, the non-compliance should be documented and the *Plant* subject to appropriate operational restrictions until compliance is achieved.

DPC 3.5.4 The *Grid Operator* and *User* shall exchange information on fault infeed levels at *Connection Points.* This shall include:

a. The maximum and minimum three-phase and line to ground fault in feeds; and

b. The X/R ratio under short circuit conditions.

DPC 3.5.5 Unless the *Grid Operator* agrees otherwise it is not acceptable for a *User* or *Embedded Generator* to limit fault current infeed to the *Grid Operators Distribution System* through the use of protection and associated *Equipment* if the failure of that protection and associated *Equipment* could cause the *Grid Operators Distribution System* to operate outside its short circuit rating.

DPC 3.6 System Loss Studies

DPC 3.6.1 *System* loss studies shall be performed to quantify the technical losses in the *Distribution System* and determine optimum *System* open points to provide an acceptable balance between reduced technical losses and *System* reliability.

DPC 3.6.2 Where investment in the *System* is required, lower loss solutions, in terms of *Plant* and *System* configuration should be evaluated as part of the alternative solutions and appropriate allowances made in the economic appraisal for any benefit arising from the adoption of such solutions.

DPC 3.7 Reliability

DPC 3.7.1 *System* reliability studies shall be carried out to determine the theoretical levels of SAIDI and SAIFI for the *System*. These studies shall be used to determine optimum *System* configurations when undertaking any connection, extension to or reinforcement of the *Distribution System*.

DPC 3.7.2 SAIDI and SAIFI have the definitions as described in IEEE Standard 1366-2003 as outlined below.

SAIDI – The *System* Average Interruption Duration Index is the average outage duration for each customer served. It is measured in units of time, minutes or hours, and is calculated as:

$$SAIDI = \frac{\text{sum of all customer interruption durations}}{\text{total number of customers served}}$$

SAIFI - The *System* Average Interruption Frequency Index is the average number of interruptions that a customer would experience. It is measured in units of interruptions per customer, usually over the course of a year, and is calculated as:

$$SAIFI = \frac{\text{sum of all customer interruptions}}{\text{total number of customers served}}$$

DPC 3.8 Economic Criteria

DPC 3.8.1 The planning studies described in this section may require solutions to be developed to address any non-conformances found. It is usual that several alternative solutions shall be determined. The *Grid Operator* shall use industry recognised methods of financial investment appraisal to ensure that the option chosen represents the most efficient investment over the life of the assets.

DPC 3.8.2 Unless other methods are agreed with *OUR*, the *Grid Operator* shall utilise a *Discounted Cash Flow* method to decide between alternative projects. The appraisal shall normally cover a 40 year investment period unless the nature of the assets to be installed requires an alternative period.

DPC 3.8.3 The relevant and applicable *Discount Rate* shall be as approved by the *OUR* for the electricity sector from time to time.

DPC 3.8.4 For each comparable viable solution the investment appraisals shall require financial benefits to be determined for:

a. Reduction in Losses;

b. Improvements in Safety;

c. Improvements in Quality of Supply; and

d. Costs of maintenance.

DPC 3.8.5 The methodology for determining a-d above shall be documented by the *Grid Operator* and applied in a consistent manner.

DPC 3.9 System Grounding

DPC 3.9.1 *System* grounding shall be in accordance with the *System*s Grounding Regulations in Engineering Standard ES-1300 section 2.7

DPC 3.9.2 *System* Grounding shall be designed to the following key principles:

a. To protect life from danger or electric shock, and property from damage.

b. To limit the voltage upon a circuit when exposed to higher voltages than that for which the circuit is designed.

c. In general to limit AC circuit voltages to Ground to 150V or less on circuits supplying interior wiring *System*s; and

d. To limit the voltage on a circuit which might otherwise occur through exposure to lightning.

DPC 4. STANDARD PLANNING DATA

DPC 4.1 Energy And Demand Forecast

DPC 4.1.1 Where the *Grid Operator* considers it necessary, the *User* shall provide the *Grid Operator* with its Energy and *Demand* forecasts at each *Connection Point* for the five succeeding years.

DPC 4.1.2 This forecast data, for the first year shall include monthly Energy and *Demand* forecasts, while the remaining four years shall include only annual forecasts.

DPC 4.1.3 The *Users* shall provide the net and gross values of Energy and *Demand* forecast. The net values shall be less any deductions to reflect the output of Customer Generating *Plant*.

DPC 4.1.4 The following factors shall be taken into account by the *Grid Operator* and *Users* when forecasting *Demand*:

a. Historical *Demand* Data;

b. *Demand* Trends;

c. Customer Self Generating *Plant* Schedules; and

d. *Demand* Transfers.

DPC 4.2 Distribution System Data

DPC 4.2.1 The *Grid Operator* shall have available all the data relevant to the *Distribution System* itself. This network data includes the following:

DPC 4.2.2 Transformers (Including Voltage Regulators) - 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.

DPC 4.2.3 Distribution Lines -The primary input data required among other things are line voltage, conductor type, type of construction, thermal ratings, emergency rating, and sequence impedances.

DPC 4.2.4 *Embedded Generator*s - Generators are modelled by their *Real* and *Reactive Power* capabilities for steady state analysis. Generators with dynamic performance response capabilities require more detailed mathematical models for dynamic analysis , primarily for 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.

DPC 4.2.5 Other Parameters - In order to develop a reliability data bank, outage rates and durations for all major *Equipment* are also necessary.

DPC 4.3 User System Data

DPC 4.3.1 For *Users* connected at 110/220V or 220/415V the following data shall be required by the *Grid Operator*

a. Maximum power requirement (kVA or kW)

b. Type and number of significant load items (Cookers, Showers, Motors, Welders etc)

DPC 4.3.2 For *Users* Connected at MV the following data shall be provided to the *Grid Operator*.

a. Connected Load including type and control arrangements including automatic disconnections or load transfers

b. Maximum *Demand*

For Fluctuating and Cyclical Loads:

c. The rate of change of *Demand*

d. The switching Interval

e. The magnitude of the largest step change

DPC 5. EMBEDDED GENERATORS

DPC 5.1 General

DPC 5.1.1 *Embedded Generators* can have a significant effect on the *Distribution System*. To enable the *Grid Operator* to assess the impact that an *Embedded Generator* will have on the *System* they shall be required to provide the information outlined in DPC 5.2.

DPC 5.1.2 *Embedded Generators* shall comply with the *JPS Guide to the Interconnection of Distributed Generation.*

DPC 5.2 Provision of Information

DPC 5.2.1 The *Grid Operator* shall use information provided to in the planning of the *Distribution System* and the assessment of connection requirements in terms of the voltage level to which the connection should be made and any other requirements to enable the connection of the *Generator*.

DPC 5.2.2 All *Generators* shall provide the following information below:

Data Description	Units
Terminal Volts	kV
Rated kVA (Apparent Power)	kVA
Rated kVAr (Reactive Power)	kVAr
Rated kW (Active Power)	kW
Reactive Power required	kVAr
Type of Generator	Text
Type of Prime Mover	Text
Annual Operating Regime	Text
Fault Level contribution	MVA
Method of Voltage Control	Text
Generator Step-up Transformer Details	Text
Rated Capacity	MVA
Voltage Ratio	Text
Impedance	% on specified base

DPC 5.2.3 For all *Embedded Generator*s at a single site equal to or greater than 3MW in aggregate:

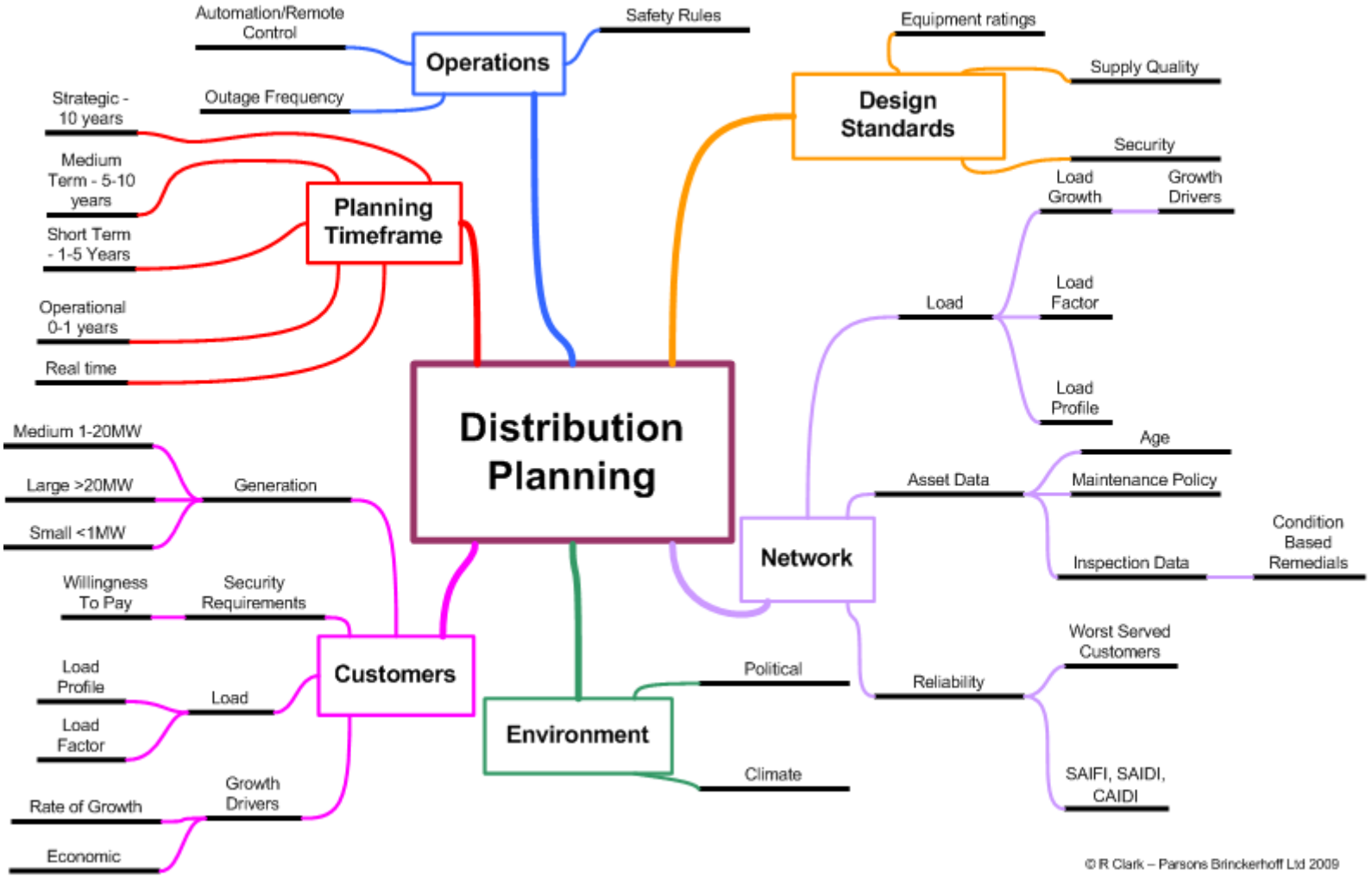
Data Description	Units
Rated MW at *Registered Capacity* for individual units and the *Power Station*	MW
Rated MW at Minimum Generation for individual units in the *Power Station*	MW
Auxiliary *Active Power Demand* for individual units and the Power Station at *Registered Capacity*	MW
Auxiliary *Reactive Power Demand* for individual units and the Power Station at *Registered Capacity*	MVAr
Auxiliary *Active Power Demand* for individual units and the Power Station under Minimum Generation	MW
Auxiliary *Reactive Power Demand* for individual units and the Power Station under Minimum Generation	MVAr
Individual Generator Information	
Rating	MVA
Generator MW/MVAr Capability Chart	Text
Inertia Constant	MWsec/MVA
Stator Resistance	% on specified base
Direct axis synchronous, transient and sub-transient reactance	% on specified base
Quadrature axis synchronous, transient and sub-transient reactance	% on specified base
Direct axis synchronous, transient and sub-transient time constants	secs
Quadrature axis synchronous, transient and sub-transient time constants	secs

DPC 5.2.4 Under certain circumstances more or less detailed information than that specified above may be required. Additional data requirements are outlined in the Distribution Connections Code and Distribution Data Registration Code of this *Distribution Code*.

APPENDIX A

DISTRIBUTION PLANNING CONSIDERATIONS

DPC APPENDIX A - DISTRIBUTION PLANNING CONSIDERATIONS



DISTRIBUTION CONNECTION CODE

DCC 1. INTRODUCTION

DCC 1.1 General

DCC 1.1.1 The Distribution Connection Code specify the normal method of connection to the *Distribution System* and the minimum technical, design and operational criteria which must be complied with by any *User* or prospective *User*.

DCC 1.1.2 For the purpose of the Distribution Connection Code *User* refers to both *Embedded Generators* and *Customers* connected to the *Distribution System*.

DCC 1.1.3 In addition, details specific to each *User's* connection may be set out in a separate *Connection/Interconnection Agreement* or in some cases a *Power Purchase Agreement*. The connection conditions set out in this Code are complementary to these Agreements.

DCC 1.1.4 All interconnection costs and responsibility shall normally be borne by the *User* connected to the *Distribution System* unless specified otherwise by an *Interconnection Agreement* or policy or as dictated by the *OUR*.

DCC 1.1.5 The *JPS* Line Extension Policy provides for the process and commercial aspects of managing *User* connections to the *System*. This Distribution Connection Code does not serve to cover the commercial arrangements for the payments, deposits or refunds for connections.

DCC 1.2 Objective

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

DCC 1.2.2 This Distribution Connection Code applies to the following:

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

b. *Customers* directly connected to the *Distribution System*, and

c. *Generators* connected to the *Distribution System* (*Embedded Generator*s).

DCC 2. METHOD OF CONNECTION

DCC 2.1 General

DCC 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 *Distribution System*;

b. Maximum *Demand* to be supplied;

c. Generating Facility MW capacity;

d. Supply voltage;

e. Reliability considerations;

f. Standby or auxiliary power requirements;

g. Substation configuration; and

h. Costs.

DCC 2.1.2 The studies to be undertaken to determine the works required to facilitate a connection are those outlined in the Distribution Planning Code and serve to ensure that for any new connection the proposed customer(s) and all existing *Customers* receive a supply within the statutory parameters.

DCC 2.1.3 Multiple *Connections Points* shall not be provided to *Connection Sites*.

DCC 2.1.4 No interconnection of the *System*s from two different *Connection Point*s shall be allowed unless specifically detailed in the *Connection Agreement*s and appropriate safeguards put in place.

DCC 2.1.5 It should be noted that it shall not be technically or economically practicable to achieve uniformity of the method of connection. In all cases, *Prudent Utility Practice* shall influence the method adopted.

DCC 2.1.6 The provisions relating to connection to the *Distribution System* are contained in the *Connection Agreement* with a *User* and include provisions relating to both the submission of information and reports relating to compliance with the relevant Connection Conditions for that *User*, *Safety Rules*, commissioning and periodic testing programmes, *Operation Diagram*s, approval to connect, any *Power Purchase Agreement* and the Terms and Conditions of Service.

DCC 2.2 Connections at Low Voltage

DCC 2.2.1 For low voltage connections, supply shall be provided at:

a. Single phase 110V;

b. Single Phase110/220V; or,

c. Three phase 220V Delta

d. Three Phase 415/240V Star

dependant on *User* requirements and availability in the location required.

DCC 2.2.2 The information required for low voltage connections shall be a minimum of:

a. Customer name, address and contact details

b. Location of proposed connection.

c. Type of connection (Residential, Commercial, Industrial)

d. Capacity required (if not known then type of use – appliances etc)

e. Identification of any large motors or welders.

DCC 2.2.3 Normal connections shall be provided by up to three single phase pole mounted transformers appropriately connected. Transformer ratings and connections shall be in accordance with Engineering Standard ES-1300-2.8.

DCC 2.2.4 Connections may be provided by ground mounted three phase pad mount transformers where specific *User* requests are made.

DCC 2.2.5 The normal method of low voltage supply will utilise overhead lines. The connection will be a single connection of the appropriate number of phases. No alternative is normally provided. Underground cables may be used in the central business area or due to specific *User* request. The charging policy outlined in the JPS Standard Terms and Conditions of Service approved by the OUR shall apply to requests for non-standard connection.

DCC 2.2.6 The connection will be made to an appropriate point on the customer premises approved by the Government Electrical Inspector. The customer may be required to provide for the connection from this *Connection Point* to the *Metering Point.*

DCC 2.2.7 The *Metering Points* shall be accommodated in metering facilities provided by the *Customer*. These metering facilities shall comply fully with the requirements of Engineering Bulletin No. TSD 007/3 – Metering Facility Policy and the Standard Terms and Conditions of Service.

DCC 2.2.8 The distance between the *Connection Point* and the *Metering Point* should be minimised. It is also desirable that any such connection between the *Connection Point* and the *Metering Point* is secured to prevent unauthorised access.

DCC 2.3 Connection at Medium Voltage (MV)

DCC 2.3.1 For connections given at MV level, then prior to the *Completion Date* under the *Connection Agreement*, the following, (as applicable) may be requested to be supplied by the *User to the Grid Operator*:

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 Protection and Control single line diagrams;

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

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 MV *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*.

DCC 2.3.2 Such connections shall normally be overhead and provided from a radial feeder. The connection shall not normally be designed to provide a switched alternative supply for faults on the *Distribution System* that supplies the *Customer*. The *Service Area* concept is used as outlined in the Planning Code to determine appropriate network configuration and any reinforcement required to enable the connection to be accommodated onto the *System*. The connection shall be designed to comply with the Guaranteed and *Overall Standards* of restoration.

DCC 2.3.3 Alternative supply arrangements may be requested based on either switched alternative, (Manual or Automatic) or parallel circuit supply. These may be provided at the discretion of the *Grid Operator* based on technical considerations. The appropriate charging policy in force at the time shall apply to requests for non standard connection.

DCC 2.3.4 In some cases (for example *Subdivisions*) a single connection to a premise shall be made and multiple *Metering Point*s shall be installed to meter individual *Customers*. In these cases meters shall only be installed to provide supplies to electrically isolated *User Systems*.

DCC 2.4 Connection of Generators

DCC 2.4.1 *Generator* connections shall comply with the requirements of the *Generation Code*.

DCC 2.4.2 In accordance with the *Generation Code*, *Generator*s with a rated capacity of 10MW or below may be connected to the *Distribution System* where technical conditions allow. The design of connections between any *Embedded Generating Unit* and the *Distribution System* shall be as set out in the *Generation Code*. The design of connections between the *Distribution System* and *Customers* shall be consistent with the *Licence*.

DCC 2.4.3 The voltage of connection shall be at the discretion of the *Grid Operator* and based on the relevant studies as described in the Planning Code.

DCC 2.4.4 The connection of generators to the *Distribution System* shall be consistent with the *OUR* Document Ele 2005/08.1 "Guidelines for the addition of Generating Capacity to the Public Electricity Supply *System* (2006)" and the "*JPS Guide to the Interconnection of Distributed Generation" documents as amended from time to time*.

DCC 2.4.5 *Embedded Generation Units* shall be required, as a minimum, to meet following performance standards:

a. Sustained Operation at any Load within the loading limits and within the *System* frequency range 49.5 Hz to 50.5 Hz,;

b. Emergency Operation at any Load within the loading limits within the *System* frequency range 48.0 Hz to 52.5 Hz during exceptional conditions;

c. Maintain normal rated output at the voltages specified in DPC 2.2.1.

d. Sustained *Operation* at the rated Power Factor set out in the *Interconnection Agreement*.

DCC 2.4.6 *Embedded Generation Units* shall not normally be required to have *Black Start* facilities

DCC 2.4.7 *Embedded Generation units* shall not normally be permitted or required to generate when the part of the *Distribution System* to which they are connected is disconnected from the *Transmission System*. Any such permission or requirement shall be detailed in the *Interconnection Agreement* along with detailed requirements for the voltage and frequency control.

DCC 3. POWER QUALITY STANDARDS

DCC 3.1 Power Quality

DCC 3.1.1 For the purpose of this Article, Power Quality shall be defined as the quality of the voltage, including its frequency and the resulting current that is measured in the *Distribution System* during normal conditions. The standards applicable to Power Quality are set out in the *Grid Operator's Power Quality Policy* and System Operation Policy No 2 'Operational Standards of Security of Supply' which shall be approved by the OUR and amended from time-to-time. DCC 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 from the nominal value of 50 ± 0.2Hz;

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 *Distribution System*.

DCC 3.2 Frequency Variations

DCC 3.2.1 The frequency of the *Distribution System* shall be consistent with *JPS* System Operation Policy No.2 and have a normal frequency of 50Hz ± 0.2Hz and shall be controlled within the limits of 49.5 and 50.5 Hz.

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

DCC 3.3 Power Factor

DCC 3.3.1 The *User* shall maintain power factor at the *Connection Point* to the *Distribution System* consistent with *JPS* Standard Terms and Conditions of Service as amended from time to time.

DCC 3.3.2 The *Grid Operator* shall correct *Reactive Power Demand* on feeders and substations to a level that will economically reduce technical losses and maintain a minimum power factor of 0.95 lagging on the *Distribution System*.

DCC 3.4 Voltage Variations

DCC 3.4.1 The voltage on the 24 kV, 13.8kV and 12 kV parts of the *Distribution System* at each *Connection Site* with a *User* shall normally remain within ±5% of the nominal value.

DCC 3.4.2 The voltage on the lower voltage side of transformers at *Connection Site*s with *User*s shall be consistent with the JPS Standard Terms and Conditions of Service as amended from time to time.

DCC 3.5 Voltage Waveform Quality

DCC 3.5.1 All *Plant* and *Apparatus* connected to the *Distribution System*, and that part of the *Distribution System* at each *Connection Site*, should be capable of withstanding distortions of the voltage waveform in respect of harmonic content and phase unbalance as outlined in the *Grid Operator's Power Quality Policy*.

DCC 3.6 Exceptional Conditions

DCC 3.6.1 Some events such as system faults which involve the *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 section DCC 3 and its subsections. During these events, the *Grid Operator* shall be relieved of its obligation to comply with the *System* conditions referenced in the aforementioned sections.

DCC 4. PLANT AND APPARATUS RELATING TO CONNECTION SITES

DCC 4.1 General Requirements

DCC 4.1.1 All *Plant* and *Apparatus* relating to the *Users*/*Grid Operator* at the *Connection Point*, shall be compliant with the following requirements in DCC 4.0 and its subsections. .

DCC 4.2 Substation Plant and Apparatus

DCC 4.2.1 All circuit breakers, switch disconnectors, Earthing Devices, power transformers, *Voltage Transformer*s, reactors, *Current Transformer*s, 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 Electrotechnical 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 Natural Environmental 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

DCC 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.

DCC 4.3 Generator Connection Points

DCC 4.3.1 The requirements for the design of *Connection Point*s between *Generator*s and the *Grid Operator* are set out in the *Generation Code.* For information the following sections are extracted from the *Generation Code*, minor wording modification have been made to refer to *Distribution* connections.

DCC 4.3.2 The *Generation Code* states that 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.

DCC 4.3.3 All Substations shall have the capability to disconnect or separate, from the *Distribution System*, any line and/or *Generating Unit* which is interconnected to the Substation.

DCC 4.3.4 The *Generation Code* states that the method of connection of *Generating Unit(s)* shall be determined on the basis of several technical and economic factors which include:

a. Proximity to *System* Grid;

b. *Generating Unit* MW rating or Generating Facility MW capacity;

c. Supply voltage;

d. Reliability considerations;

e. Auxiliary power supply;

f. Substation configuration; and

g. Costs.

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* shall influence the method adopted.

DCC 4.4 Connection Points to Transmission System

DCC 4.4.1 The *Distribution System* connection to the *Transmission System* shall comply with section TCC 4.4 of the Transmission Connection code.

DCC 4.5 Protection Requirements

DCC 4.5.1 The protective *System*s 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 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;

DCC 4.5.2 All protection *System*s and settings shall be in accordance with the *Grid Operators* protection policy as contained in the document '*JPS* Protective Relaying Philosophy & Practices'.

DCC 4.5.3 Protection of the *Distribution System* and *Customers* directly supplied from the *Distribution System* shall be designed, coordinated and tested to achieve the desired level of speed, sensitivity and discrimination to isolate the affected parts of the *System* while ensuring that the section isolated does not include parts of the *System* not directly affected by the fault, as far as possible in accordance with *Prudent Utility Practice*, and maintaining supplies to the remainder of the *System* within design parameters.

DCC 4.5.4 The *Grid Operator* shall be solely responsible for the protection of the *Distribution System*. *Users* and *Embedded Generators* shall be solely

responsible for the protection of the *User Systems* on their side of the *Connection Point*.

DCC 4.5.5 *Users* shall design their protection *System* to ensure that no other *User* shall be affected for faults on their *System.*

DCC 4.5.6 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 Practice*.

DCC 4.5.7 The *Grid Operator* may require specific *User*s to provide other protection schemes, designed and developed to minimize the risk and/or impact of disturbances on the Grid.

DCC 4.5.8 Where as part of the *Connection Agreement*, a *User* is required to provide *Demand* disconnection as part of the *Grid Operators* under frequency management process that includes the automatic disconnection of substations and feeders then the relays shall comply with the requirements of Appendix B.

DCC 5. SITE RELATED CONDITIONS

DCC 5.1 General

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

DCC 5.2 Responsibilities For Safety

DCC 5.2.1 Before connection to the *Distribution System* at the *MV* level 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*

DCC 5.3 Site Responsibility Schedules

DCC 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* at the *MV* level, a Site Responsibility Schedule shall be produced for *Grid Operator* and *User*s with whom they interface.

DCC 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. These documents should be incorporated into the *Connection (Interconnection) Agreements*.

DCC 5.4 Operation Diagrams

DCC 5.4.1 An *Operation Diagram* shall be prepared for each *Connection Site* at which a *Connection Point* is at the *MV* level in accordance with Appendix C. *Users* shall provide *Operation Diagrams* of their *Apparatus* to the *Grid Operator* in a suitable form as specified by the *Grid Operator.*

DCC 5.4.2 The *Operation Diagram* shall include all *MV 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 *MV 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 to that used on the relevant *Connection Site* and circuit.

DCC 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 *MV Apparatus* and related *Plant*.

DCC 5.5 SF6 Gas Zone Diagrams

DCC 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 *MV Apparatus* is utilised. This is to ensure that responsibility for the SF6 gas is documented and is particularly important as the chamber containing the insulating medium can extend beyond the *Connection Point*. They shall use, where appropriate the graphical symbols shown in Appendix C. The nomenclature used shall conform with that used in the relevant *Connection Site* and circuit.

DCC 5.6 Preparation of Operation and SF6 Gas Zone Diagrams

DCC 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.

DCC 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 *MV Apparatus* or it wishes to change the existing numbering or nomenclature of its *MV 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 *MV Apparatus* to be installed and its numbering and nomenclature or the changes, as the case may be.

DCC 5.8 Validity

DCC 5.8.1 The composite *Operation Diagram* prepared by *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 the *Grid Operator* and the *User*, to endeavour to resolve the matters in *Dispute*.

DCC 5.9 Site Common Drawings

DCC 5.9.1 *Site Common Drawings* shall be prepared for each *Connection Site* which is connected at the *MV* level and shall include *Connection Site* layout drawings, electrical layout drawings, common Protection/control drawings and common services drawings.

DCC 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*.

DCC 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*.

DCC 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*.

DCC 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*.

DCC 5.10 Changes to Site Common Drawings

DCC 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 DCC 5.9.

DCC 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.

DCC 5.11 Validity of Site Common Drawings

DCC 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*.

DCC 5.12 Access

DCC 5.10.1 The provisions relating to access to *Grid Operator* Sites by *User*s, and to *User* Sites by the *Grid Operator* are set out in each *Connection Agreement* with the *Grid Operator* and each *User* and/or Standards Terms and Conditions of Service.

DCC 5.10.2 In addition to those provisions, where a *Grid Operator* Site contains exposed MV conductors, unaccompanied access shall only be granted to individuals holding an *Authority for Access* issued by the *Grid Operator*.

DCC 5.13 Maintenance Standards

DCC 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*.

DCC 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*.

DCC 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*.

DCC 5.13.4 Either Party shall have the right to inspect the test results and maintenance records relating to the other Party's *Plant* and *Apparatus* at any time.

DCC 6. COMMUNICATIONS AND CONTROL

DCC 6.1.1 In order to ensure control of the *Distribution System*, telecommunications between *User(s)* and the *Grid Operator* must be established **if required by the *Grid Operator***.

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

DCC 6.1.3 At any *Connection Point* where the *Users* 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*.

DCC 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 D.

APPENDIX A

SITE RESPONSIBILITY SCHEDULES

DCC 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 MV *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 DOC 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 MV *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

TECHNICAL REQUIREMENTS FOR UNDER FREQUENCY RELAYS

DCC APPENDIX B - TECHNICAL REQUIREMENTS FOR UNDER FREQUENCY RELAYS

[1] The *Connection Agreement* shall specify the manner in which *Demand* at the *User Site*, subject to Automatic Load Disconnection (separate from the *Grid Operators* underfrequency load shedding scheme), shall be actuated by under-frequency relays.

[2] *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.

[3] 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.

[4] The voltage supply to the *Under Frequency Relay*s 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 Transformer*s 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*.

[5] 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..

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.

APPENDIX C

PROCEDURES RELATING TO OPERATION DIAGRAMS

DCC APPENDIX C - PROCEDURES RELATING TO OPERATION DIAGRAMS

Basic Principles

a. Where practicable, all the MV *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* Step Up 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 MV *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 *Operation Diagrams* shall be approved by the *Grid Operator*.

APPENDIX D

SCADA INTERFACING

DCC APPENDIX D - 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 *System*s - Operating Conditions - Power Supply and Electromagnetic Compatibility" and IEC870-3: "Telecontrol *Equipment* and *System*s - 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.

DISTRIBUTION OPERATIONS CODE

DOC 1. INTRODUCTION

DOC 1.1 General

DOC 1.1.1 This Operations Code is concerned with defining the operational responsibilities of the *Grid Operator* and *User*s in respect of the *Distribution System*. The Code covers the following areas:

a. *Demand* forecasts;

b. Operational Planning;

c. Testing and Monitoring;

d. *Demand* Control;

e. Operational Communication

f. Safety Co-ordination;

g. Contingency Planning;

h. *Significant Incident* Reporting and Information Supply;

i. Numbering and Nomenclature of *Apparatus*; and

j. Special *System Test*s.

DOC 1.2 Scope

DOC 1.2.1 This Operations Code applies to *JPS* in its capacity as *Grid Operator* and to the following:

a. *Users* directly connected to the *Distribution System with a Connection Point* at 12kV or above and who have *Apparatus* other than transformers on the *User's* side of the *Connection Point* operating at that voltage.

b. *Generators* connected to the *Distribution System* (*Embedded Generators*) with a capacity of 1MVA or more.

DOC 2. DEMAND

DOC 2.1 Introduction

DOC 2.1.1 In order for the *Grid Operator* to operate the *Distribution System* efficiently and to ensure maximum *System* Security and *System* Stability, there is a need for those *Users* and *Generators* specified in DOC 1.2.1 to provide *Demand* and generation output information to the *Grid Operator*.

DOC 2.1.2 The *Transmission* and *Generation Codes* specify the *Grid Operator's* requirements for *Demand* forecasting for *Generating Unit*s subject to Central Dispatch. This Chapter specifies the information to be provided by all other *Users* of the *Distribution System* to the *Grid Operator* so these requirements can be met.

DOC 2.1.3 The information to be provided under this Chapter is required to enable the *Grid Operator* to maintain the integrity of the *Distribution System*.

DOC 2.1.4 Where *Demand* data is required from the *User*, this means the Active (MW) *Demand* for electricity at the *Distribution System Connection Point* with the *User*. The *Grid Operator* may, in certain cases, specify that the *Demand* data shall include the Reactive (MVAr) *Demand*.

DOC 2.1.5 The information to be provided to the *Grid Operator* shall be in writing.

DOC 2.1.6 References to data to be supplied on an hourly basis refers to it being supplied for each period of 60 minutes ending on the hour in each day.

DOC 2.2 Objective

DOC 2.2.1 The objectives of this Operations Code are to:

a. set out the *Demand* forecast and Generating *Plant* Output information required to be provided by *Users* to enable the *Grid Operator* to operate its *Distribution System*; and

b. specify the information required to be provided by *Users* to the *Grid Operator* to enable it to comply with its obligations and requirements under the *Transmission* and *Distribution Codes*.

DOC 2.3 Demand forecast information

DOC 2.3.1 The *Grid Operator* shall co-ordinate all *Demand* forecast information for each *Connection Point* to meet the requirements of the *Transmission* and *Distribution Codes*.

DOC 2.4 Embedded Generator information

DOC 2.4.1 Information relating to Generating *Plant* Embedded in the *Distribution System* and not subject to Central Dispatch shall be provided, where specified, to the *Grid Operator*. *User*s with their own generation may be required to furnish such information should the *Grid Operator* reasonably consider that it would affect its *Demand* forecasts.

DOC 2.5 Demand and Generation forecast periods

DOC 2.5.1 *Demand*

Phase	Applicable Parties	Forecast Data	Time period for which forecast data is required
Operational Planning 2 Years ahead (End of January each Year)	All *Distribution System User*s with *Demand*s in excess of 5MVA	Hourly forecast of Active and Reactive *Demand*	For Day of *User*s Max *Demand*, Day of *System* Peak and Day of *System* Minimum
	Users whose actions, in the opinion of *Grid Operator*, can have an effect on the stability of the *System*	Active and Reactive *Demand*	At specified times each week in the forecast period as identified by the *Grid Operator* in advance. The times shall be identified in 1hour periods for each week.
PROGRAMMING PHASE 1 - 8 Weeks (By 10:00am each Friday)	All *Users* who forecast *Demand* changes in excess of 5MVA in any 1 hour period	Active and Reactive *Demand*s	Any hour where the *User* forecasts a *Demand* change in excess of 5MVA for the period.
Control Phase 0 – 24hrs Commencing 00:00	all identified *Users* with *Demand* changes in excess of 5MVA in any 1 hour period	Active and Reactive *Demand*s	Any hour where the *Users* forecasts a *Demand* change in excess of 5MVA for the period.

DOC 2.5.2 Generation

Phase	Applicable Parties	Forecast Data	Time period for which forecast data is required
Operational Planning 2 Years ahead (End of January each Year)	All Embedded with capacity in excess of 1MVA	Hourly forecast of Active and Reactive Generation	For Day of *User*s Max Output, Day of *System* Peak and Day of *System* Minimum
PROGRAMMING PHASE 1 - 8 Weeks (By 10:00am each Friday)	*Embedded Generator*s who forecast output changes in excess of 5MVA in any 1 hour period	Active and Reactive Generation	Any hour where the *Embedded Generator* forecasts a Generation change in excess of 5MVA for the period.

Phase	Applicable Parties	Forecast Data	Time period for which forecast data is required
Control Phase 0 – 24hrs Commencing 00:00	*Embedded Generators* with output changes in excess of 5MVA in any ½ hour period	Active and Reactive Generation	Any ½ hour where the *Embedded Generator* forecasts a output change in excess of 5MVA for the period.

DOC 2.6 Grid Operator and User forecasts

DOC 2.6.1 The following factors shall be taken into account by the *Grid Operator* and the *Users* when conducting *Demand* forecasting in the Operational Planning Phase:

a. Historic *Demand* Data

b. Weather forecasts (NB Responsibility for weather correction of *User*'s loads rests with the *User*);

c. Historic *Demand* trends;

d. Incidence of major events or activities;

e. *Generating Unit* active power generation forecasts or schedules;

f. *Demand* transfers;

g. Interconnection with adjacent *Connection Points*;

h. Planned *Demand* reduction (e.g. block load shedding); and

i. Any other factor reasonably considered necessary that may impact the *Demand* forecast.

DOC 3. OPERATIONAL PLANNING

DOC 3.1 Introduction

DOC 3.1.1 Distribution Operations Code Chapter 3 ("DOC 3") is concerned with the co-ordination through various timescales, of Planned Outages of *Plant* and *Apparatus* for construction, repair and maintenance, which affect the *Operation* of the *Distribution System*.

DOC 3.1.2 DOC 3 establishes procedures to enable the collection of such data from *Users* as is required by the *Grid Operator* to comply with the requirements of *the Distribution and Transmission Codes* .

DOC 3.1.3 The means of providing the information to the *Grid Operator* and its confirmation includes any non-transitory written form which enables the recipient to retain the information.

DOC 3.2 Objectives

DOC 3.2.1 One objective of DOC 3 is to set out the Operational Planning Procedure and typical timetable for the co-ordination of outage requirements for *Plant* and *Apparatus* to be provided by *Users* to enable the *Grid Operator* to operate the *Distribution System.*

DOC 3.2.2 Another objective is to specify the information to be provided by *Users* to the *Grid Operator* to allow it to comply with the *Transmission* and *Distribution Codes*.

DOC 3.3 Information flow and coordination

DOC 3.3.1 *Embedded Generating Plant*

Information relating to *Embedded Generating Plant* not subject to Central Dispatch whose Registered Capacity is greater than 5 MVA shall be provided where specified directly to the *Grid Operator*. This may include *Users* with own Generation where the *Grid Operator* considers it appropriate.

DOC 3.3.2 Other *Plant* and *Apparatus*

Information relating to all *Plant* and *Apparatus* connected to the *Distribution System*, or that which may affect its *Operation*, shall be provided to the *Grid Operator* on request.

DOC 3.4 Timescales and data

DOC 3.4.1 The following information is required to be provided by *User*s and *Generator*s to the *Grid Operator* in the timescales indicated.

DOC 3.4.2 The Operational Planning Phase covers the Year 1 period. For all *Generator*s and *User*s with *Connection Point*s on the *Distribution System* where the *Grid Operator* has identified that such *Customers* must comply with the outage planning requirements of this code due to the impact that their outages may have on the *System*, such *Generator*s and *User*s are to inform the *Grid Operator* of proposed planned outages required at the *Connection Point*s for the following year commencing January 1st (Year 1).

DOC 3.4.3 The information gathered through this *Distribution Code* shall be used by the *Grid Operator* in the formation of the *Transmission and Distribution System* Outage Plan which shall be issued at the end of October.

DOC 3.4.4 As time passes the Year 1 plan becomes the Year 0 or current year plan. The Outage plan shall be kept up to date during year 0 by the *Grid Operator*, taking account of *System* conditions, planned Outage schedule deviations of *Embedded Generators* and *User's Equipment* connected to the *Distribution System*.

DOC 3.4.5 This *Operations* Code does not provide requirements for the notification and forward planning of outages on the *Distribution System* other than for those identified in DOC 3.4.2

DOC 3.4.6 The Programming Phase covers the period from one(1) week. The phase commences at 13:00 each Friday and at this time the *Grid Operator* shall issue the week ahead outage plan covering all outages on the *Distribution System*.

DOC 3.4.7 In DOC 3 “Year 0” means the current calendar year at any time, “Year 1” means the next calendar year, “Year 2” means the calendar year after Year 1 and so on.

DOC 3.5 Generation scheduling information

DOC 3.5.1 The *Grid Operator* shall obtain Scheduling information from *Generators* for *Embedded Generating Plant* not subject to Central Dispatch where it considers it appropriate and relevant.

DOC 3.5.2 The Scheduling information shall specify the following on an individual *Generating Unit* basis:

a. the period the unit is required;

b. the planned half-hourly output; and

c. any other information the *Grid Operator* reasonably considers necessary.

DOC 4. TESTING AND MONITORING

DOC 4.1 Introduction

DOC 4.1.1 To ensure that the *Distribution System* is operated efficiently and within *Licence* Conditions and to meet statutory actions the *Grid Operator* shall organise and carry out testing and/or monitoring of the effect of *Users* electrical *Apparatus* on the *Distribution System*.

DOC 4.1.2 The Testing and/or Monitoring Procedures shall be specifically related to the technical criteria detailed in the Distribution Planning Code (DPC) and Connection Code (DCC). They shall also relate to the parameters submitted by *Users* in the Distribution Data Registration Code (DDRC).

DOC 4.1.3 The testing carried out under this Distribution Operations Chapter 4 (DOC 4) should not be confused with the more extensive Special *System Test*s outlined in DOC 11.

DOC 4.2 Objective

DOC 4.2.1 The objective of DOC 4 is to specify the requirement to test and/or monitor the *Distribution System* to ensure that *Users* are not operating outside the technical parameters required by the Distribution Planning and Connection Codes and/or the Distribution Operations Codes.

DOC 4.3 Procedure related to quality of supply

DOC 4.3.1 The *Grid Operator* shall from time to time determine the need to test and/or monitor the quality of supply at various points on its *Distribution System*.

DOC 4.3.2 The requirement for specific testing and/or monitoring may be initiated by the receipt of complaints as to the quality of supply on its *Distribution System*.

DOC 4.3.3 In certain situations the *Grid Operator* may require the testing and/or monitoring to take place at the *Connection Point* of a *User* with the *Distribution System*.

DOC 4.3.4 Where testing and/or monitoring is required at the *Connection Point*, the *Grid Operator* shall advise the *User* involved and shall make available the results of such tests to the *User*. These tests shall be performed by the *Grid Operator* at the *Grid Operator's* cost

DOC 4.3.5 Where the results of such tests show that the *User* is operating outside the technical parameters specified in the Distribution Planning and Connections Codes, the *User* shall be informed accordingly.

DOC 4.3.6 Where the *User* requests the *Grid Operator* to perform a retest, the retest shall be carried out at the *User's* cost and witnessed by a *User* representative.

DOC 4.3.7 A *User* shown to be operating outside the limits specified in the Distribution Planning and Connections Code shall rectify the situation or disconnect the *Apparatus* causing the problem from its electrical *System* connected to the *Distribution System* immediately or within such time as is agreed with the *Grid Operator*.

DOC 4.3.8 Continued failure to rectify the situation may result in the *User* being disconnected in accordance with the *Connection Agreement* from the *Distribution System* either as a breach of the *Distribution Code* or other statutory requirement where appropriate.

DOC 4.3.9 The *User* may conduct test(s) on the *User's* side of the *Connection Point* at the *User's* cost, however the *Grid Operator* shall be notified prior to such test(s).

DOC 4.4 Procedure related to Interconnection Point Parameters

DOC 4.4.1 The *Grid Operator* from time to time shall monitor the effect of the *User* on the *Distribution System*. The monitoring will normally be related to amount of *Active Power* and *Reactive Power* transferred across the *Connection Point*.

DOC 4.4.2 Where the *User* is exporting to or importing from the *Distribution System Active Power* and *Reactive Power* in excess of the parameters in the *Connection Agreement* the *Grid Operator* shall inform the *User* and where appropriate demonstrate the results of such monitoring.

DOC 4.4.3 The *User* may request technical information on the method of monitoring and, if necessary, request another method reasonably acceptable to the *Grid Operator*.

DOC 4.4.4 Where the *User* is operating outside of the specified parameters, the *User* shall immediately restrict the *Active Power* and *Reactive Power* transfers to within the specified parameters.

DOC 4.4.5 Where the *User* requires increased *Active Power* and *Reactive Power* in excess of the physical capacity of the *Connection Point,* the *User* shall restrict power transfers to those specified in the *Connection Agreement* until a modified *Connection Agreement* has been applied from the *Grid Operator* and physically established. All costs to increase the physical capacity of the *Connection Point* shall be the responsibility of the *User*.

DOC 5. DEMAND CONTROL

DOC 5.1 Introduction

DOC 5.1.1 Distribution Operations Code Chapter 5 ("DOC 5") is concerned with the provisions to be made by the *Grid Operator* or a *User* with *System*s connected to the *Distribution System*, in certain circumstances, to permit reductions in total *Demand* in the event of insufficient Generating *Plant* being available to meet total *Demand* or to avoid disconnection of *Customers* or in the event of breakdown and/or overloading on any part of the *Transmission* and/or *Distribution System*s.

DOC 5.1.2 DOC 5 deals with the following method of reducing *Demand* or *Demand* Control:

a. *Block (Manual) Load Shedding* initiated by the *Grid Operator*;

b. *User* disconnection;

c. Automatic underfrequency load shedding ; and

d. Emergency manual distribution *feeder* disconnection.

The term "*Demand* Control" is used to describe any or all of these methods of achieving a *Demand* reduction.

DOC 5.2 Objective

DOC 5.2.1 To establish procedures to enable the *Grid Operator* to achieve a reduction in *Demand* in order to avoid a Breakdown or Overloading of any part of the *Total System* in a manner that does not unduly discriminate against or unduly prefer any one or group of *Customers*.

DOC 5.3 Procedure

DOC 5.3.1 The *Grid Operator* shall arrange within the *Distribution System* a scheme to reduce load in a controlled manner by any of the following methods:

a. Disconnecting *Customers* (either manually or by a disconnection scheme);

b. Automatic underfrequency disconnection;

c. By instruction; or

d. By reduction of *System* voltage.

DOC 5.3.2 Issue of warnings for Operational *System* load reduction

A *System* of warnings shall be contained within the load reduction arrangements to give notice, wherever practical, of possible implementation.

DOC 5.3.3 Automatic disconnection of *Demand* by Underfrequency Relays

The Grid Operator shall arrange to have available at selected locations protection relays to detect progressively low frequency conditions on the *System* and shall provide for a percentage of *System Demand* to be disconnected automatically in progressive stages.

The areas of *Demand* affected by the underfrequency disconnection scheme should be such as to allow the *Demand* relief to be uniformly applied throughout the *Distribution System*, but may take into account any operational requirements and essential load.

DOC 5.3.4 Emergency manual disconnection of *Demand*

The *Grid Operator* shall arrange to have available a rotating block load shedding scheme based on *Connection Points* with the *Distribution System*. The scheme shall be designed to be called into *Operation* in the event of a generation shortfall or depressed voltage, and shall be implemented in predetermined timescales to disconnect *Demand* in stages.

DOC 5.3.5 Co-ordination of actions

Where *Demand* Control is exercised by *the Grid Operator* in order to safeguard the *Distribution System,* the *Grid Operator* shall liaise with and inform *Users* accordingly so far as is practical.

DOC 6. OPERATIONAL COMMUNICATION

DOC 6.1 Introduction

DOC 6.1.1 Distribution Operations Code Chapter 6 ("DOC 6") sets out the requirements for the exchange of information in relation to *Operation*s and/or *Incident*s on the *Distribution System* or any *User System* connected to the *Distribution System* which have had, may have had, will have or may have an *Operational Effect* on the *Distribution System* or any other *User System*.

DOC 6.1.2 The requirement to notify in DOC 6 does not relate to providing reasons for *Incidents* and/or *Operations* but relates generally to communicating what may

occur or what has occurred as a result of an *Incident* and/or *Operation* causing an *Operational Effect*.

DOC 6 provides that when an *Incident* has occurred on the *Distribution System*, [which itself may have been caused or exacerbated by an *Operation* or *Incident* on a *User System*] , the *Grid Operator* in reporting the *Incident* on the *Distribution System* to a *User* can pass on what it has been told by the *User* in relation to the *Operation* or *Incident* on that *User System*.

DOC 6.2 Objective

DOC 6.2.1 To provide for the exchange of information so that the implications of an *Operation* and/or *Incident* 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* and the *User System*.

DOC 6.2.2 DOC 6 does not seek to deal with any actions arising from the exchange of information, but merely with the exchange of information.

DOC 6.3 Communication Procedure

DOC 6.3.1 The *Grid Operator* and each *User* connected to its *Distribution System* shall nominate officers and agree communication channels to make effective the exchange of information required by DOC 6.

DOC 6.3.2 Communication should, as far as possible, be direct between the *User* and the *Grid Operator*. However, this does not preclude communication with the *User*'s nominated representative.

DOC 6.3.3 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 and if it is practical to do so.

A notification under DOC 6 shall be given as far in advance as possible and in the event of an *Incident* shall be given in sufficient time as shall reasonably allow the recipient to reasonably consider and assess the arising implications and risks.

DOC 6.3.4 Where given orally a notification shall be dictated to the recipient who shall record it and on completion shall repeat the notification in full to the sender and check that it has been accurately recorded.

DOC 6.3.5 Where information is requested in writing throughout this Code, facsimile transmission or other electronic means as agreed with the *Grid Operator* in writing maybe used.

DOC 6.4 Notification of Operations

DOC 6.4.1 In the case of an *Operation* on a *User System* connected to the *Distribution System*, which will have or may have an *Operational Effect* on the *Distribution System*, the *User* shall notify the *Grid Operator* in accordance with DOC 6.

DOC 6.4.2 In the case of an *Operation* on the *Distribution System* or an *Operation* on the *Transmission System*, which in the opinion of the *Grid Operator*, will have or may have an *Operational Effect* on a *User System* connected to the *Distribution System*, the *Grid Operator* shall notify the *User*. This does not preclude any *User* of an affected *User System* asking the *Grid Operator* for information regarding the *Operation* which has affected the *User's System*

DOC 6.4.3 Whilst in no way limiting the general requirement to notify in advance, the following are examples of situations where notification shall be required, in as much as they may have or have had an *Operational Effect* on the the *Distribution System* or another *User System*:

a. the implementation of a Scheduled Outage of *Plant* and/or *Apparatus* which has been arranged pursuant to DOC 3;

b. the operation of any *Circuit Breaker* or isolator or any sequence or combination of the two including any temporary *Equipment* overloads, *System* parallels, or *Generating Unit* synchronising; and

DOC 6.5 Notification of Incidents

DOC 6.5.1 In the case of an *Incident* on a *User System* connected to the *Distribution System*, which has had or may have had an *Operational Effect* on the *Distribution System* or on the *Transmission System*, the *User* shall notify the *Grid Operator* in accordance with this DOC 6.

DOC 6.5.2 In the case of an *Incident* on the *Distribution System* or on receipt of notification of an *Incident* on the *Transmission System*, which in the opinion of the *Grid Operator*, will have or may have an *Operational Effect* on a *User System* connected to the *Distribution System*, the *Grid Operator* shall notify the *User* in accordance with this DOC 6. This does not preclude any *User* of an affected *User System* asking the *Grid Operator* for information regarding the *Incident* which has affected the *User's System*.

DOC 6.5.3 An *Incident* on the *Distribution System* may be caused or exacerbated by a prior *Incident* or *Operation* on another *User's System* and in that situation the information to be notified is different from that where the *Incident* arose independently of any other *Incident* or *Operation*.

DOC 6.5.4 The following are examples of situations where notification shall be required if they have or may have an *Operational Effect*:

a. the actuation of any alarm or indication of any abnormal operating condition;

b. adverse weather conditions being experienced;

c. breakdown, faults, or temporary changes in the capabilities of, *Plant* and/or *Apparatus* including protection; and

d. increased risk of inadvertent operation of protection devices and equipment.

DOC 6.6 Form of Notification

DOC 6.6.1 A notification by the *Grid Operator* of an *Operation* on the *Distribution System* [including *Operations* that may have been caused by another *Operation* (the "First *Operation*") or by an *Incident* on a *User's System*], shall describe the *Operation* and shall where relevant contain the information which the *Grid Operator* has been given in relation to the First *Operation* or that *Incident* by the *User*.

DOC 6.6.2 The notification shall be of sufficient detail to enable the recipient of the notification to reasonably consider and assess the implications and consequences arising from the *Operation* on the *Distribution System* and shall include the name of the individual reporting the *Operation* on behalf of the *Grid Operator*. The recipient may ask questions to clarify the notification.

DOC 6.6.3 A notification by the *Grid Operator* of an *Operation* under DOC 6 which has been caused by an *Operation* or an *Incident* on the *Transmission System*, shall describe the *Operation* on the *Distribution System* and may contain the information which the *Grid Operator* has been given in relation to the *Operation* or an *Incident* on the *Transmission System*.

DOC 6.6.4 The notification shall be of sufficient detail to enable the recipient of the notification to reasonably consider and assess the implications and consequences arising from the *Operation* on the *Distribution System* and shall include the name of the individual reporting the *Operation* on behalf of the *Grid Operator*. The recipient may ask questions to clarify the notification.

DOC 6.6.5 A notification by the *Grid Operator* of an *Incident* on the *Distribution System*[including *Incidents* that may have been caused or exacerbated by another *Incident* (the "first *Incident*") or by an *Operation* on a *User's System*] shall describe the *Incident* and shall where relevant contain the information which the *Grid Operator* has been given in relation to the first *Incident* or that *Operation* by the *User*. The notification shall be of sufficient detail to enable the recipient of the notification to reasonably consider and assess the implications and risks arising from the *Incident* on the *Distribution System* and shall include the name of the individual reporting the *Incident* on behalf of the *Grid Operator*. The recipient may ask questions to clarify the notification.

DOC 6.6.6 The notification shall be dictated, except in an emergency situation, to the recipient who shall record it and on completion shall repeat the notification in full to the sender and check that it has been accurately recorded. A

DOC 6.6.7 Where a *User* is reporting an *Operation* or an *Incident* on the *User's System* [including those *Operations* that may have been caused by an *Incident* or scheduled/planned action affecting the *User's System*], the notification to the *Grid Operator* shall describe the *Operation* or *Incident* and shall contain where relevant the information which the *User* has in relation to that *Incident* or scheduled/planned action affecting the *User's System*. The *Grid Operator* may pass on the information contained in the notification to other affected *Users* with affected *User Systems*.

DOC 6.6.8 The *User* shall not pass on to other *Users* with *User Systems* connected to the *System* any information contained in a notification received from the *Grid Operator* or a notification issued to another *User* from the *Grid Operator,* but shall only say that there has been an *Incident* on the *System* and, where applicable and indicated by the *Grid Operator*, an estimated time of return to service.

DOC 6.7 Significant Incidents

DOC 6.7.1 The *Grid Operator* may determine than an *Incident* shall be classified as a *Significant Incident* in accordance with DOC 6.7.3.

DOC 6.7.2 Where an *Incident* on the *Distribution System* or a *User System* has had or may have had a significant *Operational Effect* on the *System* and any other *User Systems*, the *Incident* shall be reported in writing by the *Grid Operator* in accordance with the provisions of DOC 9.

DOC 6.7.3 Without limiting this general description, a *Significant Incident* 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. Overloading (i.e. loading in excess of 110% of the rated capacity) of *System* circuits and *Plant*, or

c. *System* Instability

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

DOC 7. SAFETY CO-ORDINATION

DOC 7.1 Introduction

DOC 7.1.1. Distribution Operations Code Chapter 7 ('DOC 7') requires that an approved *Safety Management System* is applied by the *Grid Operator* to meet statutory and other requirements.

DOC 7.1.12 Similar criteria and standards contained within the *Grid Operator's Safety Management Systems* are required to be provided by other *Users* of the *Distribution System* to the *Grid Operator* when carrying out work or tests at the operational interface with the *Distribution System*.

DOC 7.2 Objective

DOC 7.2.1 To lay down requirements with a view to ensuring safety of persons working on the *Distribution System* at or across operational and ownership boundaries.

DOC 7.3 Procedure

DOC 7.3.1 Approved *Safety Management System*s

The *Grid Operator* in conjunction with the connecting *User* as specified in DOC 7 shall establish a *Safety Management System* specifying the principles and procedures, and where appropriate, the documentation to be applied so as to ensure the health and safety of all who are liable to be working or performing tests on the *Distribution System*, or on *Plant* and *Apparatus* connected to it.

DOC 7.3.2 Operational boundaries and principles

A *Safety Management System* is to be adopted and shall be jointly agreed at sites or locations where an *Operational Interface* exists.. This shall include provision for persons approved by the *Grid Operator* and *User* to operate the *Safety Management System*s in use by field personnel where appropriate.

A system of documentation shall be maintained by the *Grid Operator* and the *User* which records the safety precautions taken when:

a. work or tests are to be carried out on *Plant* and/or *Apparatus* across the *Operational Interface*; and

b. isolation and/or earthing of the other's *System* is needed.

Where relevant, copies of the *Safety Management System*s and related documentation shall be exchanged between the *Grid Operator* and *Users* for each *Operational Interface*.

DOC 7.3.3 Authorised personnel

Safety Management System shall include the provision for written authorisation of personnel concerned with the control, operation, work or testing of *Plant* and *Apparatus* forming part of, or connected to, the *Distribution System*.

Each individual Authorisation shall indicate the class of operation and/or work permitted and the section of the *System* to which the authorisation applies.

The authorisation of personnel concerned with the control, operation, work or testing of *Plant* and *Apparatus* which is under the safety management of the *Grid Operators System Control* shall only be undertaken by the approved officers of the *Grid Operator*.

DOC 7.3.4 Site specific safety

Arrangements shall be made by all parties to ensure site safety and security as required by statutory requirements. Arrangements shall also be made by all parties to ensure that personnel are warned, by an appropriate means, of hazards specific to any site before entering any area of the site. This shall include hazards that may be temporary or permanent. Where these risks include contamination or similar, suitable decontamination facilities and procedures shall be provided.

Arrangements shall be made to facilitate inspections by the *Grid Operator* management and safety representatives to sites accommodating the *Grid Operator* owned *Plant* and *Apparatus*.

DOC 7.4 System Control

DOC 7.4.1 Control responsibilities

The *Grid Operator* and *Users* shall jointly agree and outline in writing schedules specifying the responsibilities for control of *Equipment*. These shall ensure that only one party is responsible for any item of *Plant* or *Apparatus* at any one time.

The *Grid Operator* and each *User* shall at all times have nominated a *Control Person* or persons responsible for the co-ordination of safety from the *System* pursuant to this DOC 7.

DOC 7.4.2 Control documentation

The *Grid Operator* and *Users* shall maintain a suitable system of documentation which records all relevant operational events that have taken place on the *Distribution System* or any other *User System* connected to it and the co-ordination of relevant safety precautions for work.

All documentation relevant to the operation of the *Distribution System*, and safety precautions taken for work or tests, shall be held by the *Grid Operator* and the appropriate *User* for a period of not less than five years.

DOC 7.4.3 *System* diagrams

Diagrams illustrating sufficient information for *Control Persons* to carry out their duties shall be exchanged by the *Grid Operator* and the appropriate *User*.

DOC 7.4.4 Communications

Where the *Grid Operator* reasonably specifies the need, suitable communication systems shall be established between the *Grid Operator* and other *Users* to ensure the control function is carried out in a safe and secure manner.

Where the *Grid Operator* reasonably decides a back up/alternative routing of communication is necessary to provide for the safe and secure *operation* of the *Distribution System* the means shall be agreed with the appropriate *User*s.

Schedules of telephone numbers/call signs shall be exchanged by the *Grid Operator* and the appropriate *User* to enable control activities to be efficiently co-ordinated.

The *Grid Operator* and appropriate *Users* shall establish 24 hour availability of personnel with suitable authorisation where the joint operational requirements *Demand* it.

DOC 7.5 Schedules of responsibility

DOC 7.5.1 Ownership, *Operation* and Maintenance Schedules

Schedules specifying the ownership and the responsibilities for *Operation* and Maintenance shall be jointly agreed by the *Grid Operator* and the appropriate *User* for each location where either an *Operational Interface* or joint responsibilities exist.

For those *Users* connected at MV and having firm supply connections provided by more than one circuit, and where the *User* so requests the *Grid Operator*, these schedules shall identify those specified *Grid Operator* circuits for Planned Outages and the *User* shall be notified at least two(2) weeks in advance of the planned outage.

These specified circuits shall usually operate at the voltage level at which the supply is provided and shall have a significant effect on the security level of the *User's* supply. These specified circuits shall be those where the *Grid Operator* and the *User* have agreed that during the outages of the specified circuits the *User* can introduce measures to manage critical processes or safety aspects.

Those *User*s connected at MV and not having firm supply connections provided by more than one circuit may seek to obtain outage planning information through established arrangements with the *Grid Operator*.

DOC 7.6 Maintenance of schedules and diagrams

DOC 7.6.1 All schedules and diagrams shall be maintained by the *Grid Operator* and appropriate *Users* and exchanged as necessary to ensure they reflect the current agreements and network configuration.

DOC 8. CONTINGENCY PLANNING

DOC 8.1 Introduction

DOC 8.1.1 *Distribution* Operations Code Chapter 8 ('DOC 8') covers the *System* recovery procedures following a *Total System Shutdown* as recognised by the *Grid Operator* and that the *Grid Operator* intends to implement *Black Start* procedures.

DOC 8.2 Objectives

DOC 8.2.1 DOC 8 outlines requirements with a view to assisting the restart of the *Total System* or to operating the *Total System* in abnormal situations which require

co-ordination between all *Users* with a common approach to give uniformity of priorities.

DOC 8.3 System recovery

DOC 8.3.1 The *Grid Operator* is responsible for the control of the *Transmission System* and the *Distribution System*.

DOC 8.3.2 Following a *System Shutdown* or *Significant Incident*, the restoration of the *System* shall be managed through the implementation of a *System Restoration Strategy* developed by the *Grid Operator* under the requirements of section TOC 7 of the *Transmission Code*.

DOC 8.3.3 All *Users of the Distribution System* shall comply with instructions issued by the *Grid Operator* pursuant to the implementation of the *System Restoration Strategy*.

DOC 8.3.4 It should be recognised by *Distribution System Users* that the restoration of the *System* needs to be flexible and *User*s shall comply with instruction issued by the *Grid Operator* during an event even if they conflict with the *System Restoration Strategy*.

DOC 8.4 System Incident procedures

DOC 8.4.1 The *Grid Operator* and *User*s shall ensure that there are suitable communication channels available and established protocols, including the responsibilities of senior members of staff, to facilitate the co-ordination of activities after a *Significant Incident or Total System Shutdown.*

DOC 9. SIGNIFICANT INCIDENT REPORTING AND INFORMATION SUPPLY

DOC 9.1 Introduction

DOC 9.1.1 The Distribution Operations Code Chapter 9 ('DOC 9') sets out the requirements for reporting in writing those *Incident*s termed *Significant Incident*s.

DOC 9.1.2 DOC 9 also provides for the investigation of *Significant Incident*s by the *Grid Operator*.

DOC 9.2 Objectives

DOC 9.2.1 The objective of DOC9 is to facilitate the provision of more detailed information in writing and the investigation of those *Significant Incident*s reported by the *Grid Operator* under DOC 6.

DOC 9.3 Procedure

DOC 9.3.1 Communications

The Grid Operator and each *User* specified in DOC 9 shall nominate officers and establish communication channels to ensure the effectiveness of this

DOC 9. Such officers and communication channels may be the same as those established under DOC 6.3.

Communication should, as far as possible, be direct between the *User* and *the Grid Operator*. However, this does not preclude communication with the *User's* nominated representative.

DOC 9.3.2 Written reports of *Significant Incident*s by the *Grid Operator*

In the case of an *Incident* which has been determined by *the Grid Operator* to be a *Significant Incident* under DOC 6, a written report shall be prepared by the *Grid Operator* . Upon a request by the *Grid Operator*, a *User* shall provide to the *Grid Operator* a report on the Incident, subsequently termed a *Significant Incident*, that the *Grid Operator* may used in the written *Significant Incident* report.

DOC 9.3.3 Form

A report shall be in writing with more details relating to the *Significant Incident*, although it need not state the cause of the *Incident*. The report should, as a minimum, contain the following:

a. Date and time of *Significant Incident*;

b. Location;

c. *Apparatus* involved;

d. Brief description of *Significant Incident*; and

e. Details of any *Demand* Control undertaken.

f. Effect on other *System User*s including where appropriate:-

- duration of *Incident*; and
- estimated date and time of return to normal service.

g. Effect on generation including, where appropriate:-

- generation interrupted;
- frequency response achieved;
- MVAr performance achieved; and
- estimated date and time of return to normal service

The above list is not intended to be exhaustive to this DOC 9.

DOC 9.3.5 Timing

A written report shall be given as soon as reasonably practicable under DOC 9 and in any event a preliminary report shall normally be given within 24 hours of the *Grid Operator* determining an Incident as a *Significant Incident*. A final written report shall be submitted to the *OUR* by the *Grid Operator* within 7 business days of the *Grid Operator* determining an *Incident* as a *Significant Incident*, or as agreed timelines with the *OUR*.

DOC 9.3.6 Duty to report *Incident*s

Nothing in this DOC 9 shall be construed as relieving *Users* from their duty to report *Incident*s as required by statutory regulations.

DOC 9.3.7 Investigation into *Significant Incident*s

Where a *Significant Incident* has been declared *the Grid Operator* may request an investigation be carried out.

The composition of such an investigation panel shall be appropriate to the *Incident* to be investigated.

Where there has been a series of *Significant Incident*s (that is to say, where a *Significant Incident* has caused or exacerbated another *Significant Incident*) the Grid Operator may determine that the investigation should include some or all of those *Significant Incident*s.

Any investigation under DOC 9 is separate from any inquiry which may be carried out under legal or statutory requirements.

DOC 10. NUMBERING AND NOMENCLATURE

DOC 10.1 Introduction

DOC 10.1.1 Distribution Operations Code Chapter 10 ("DOC 10") sets out the responsibilities and procedures for notifying the relevant owners of the numbering and nomenclature of *Apparatus* at *Connection Points*.

DOC 10.1.2 The numbering and nomenclature of *Apparatus* shall be included in the *Operation Diagram* prepared for each site having an Ownership Boundary.

DOC 10.2 Objectives

DOC 10.2.1 The prime objective embodied in DOC 10 is to ensure that at any site where there is an Ownership Boundary every item of *Apparatus* has numbering and/or nomenclature that has been mutually agreed and notified between the owners concerned to ensure, so far as is reasonably practicable the safe and effective *Operation* of the *System*s involved and to reduce the risk of error.

DOC 10.3 Procedure

DOC 10.3.1 New *Apparatus*

When the *Grid Operator* or a *User* intends to install *Apparatus* on a site having an Ownership Boundary the proposed numbering and/or nomenclature to be adopted for the *Apparatus* must be notified to the other owners.

The notification shall be made in writing to the relevant owners and shall consist of an *Operation Diagram* incorporating the proposed *Apparatus* to be installed and its proposed numbering and/or nomenclature. The notification shall be made to the relevant owners at least three months prior to the proposed installation of the *Apparatus*.

The relevant owners shall respond in writing within one month of the receipt of the notification confirming both receipt and whether the proposed numbering and/or nomenclature is acceptable or, if not, what would be acceptable.

In the event that agreement cannot be reached between *the Grid Operator*, and the other owners, *the Grid Operator*, acting reasonably, shall have the right to determine the numbering and nomenclature to be applied at that site.

DOC 10.3.2 Existing *Apparatus*

The *Grid Operator* and/or every *User* shall supply the other Party on request with details of the numbering and nomenclature of *Apparatus* on sites having an Ownership Boundary.

The *Grid Operator* and every *User* shall be responsible for the provision and erection of clear and unambiguous labelling showing the numbering and nomenclature of its *Apparatus* on sites having an Ownership Boundary.

DOC 10.3.3 Changes to existing *Apparatus*

Where the *Grid Operator* or a *User* needs or wishes to change the existing numbering and/or nomenclature of any of its *Apparatus* on any site having an Ownership Boundary, the provisions of DOC 10 shall apply with any amendments necessary to reflect that only a change is being made.

Where any *Party* changes the numbering and/or nomenclature of its *Apparatus*, which is the subject of DOC 10, that party shall be responsible for the provision and erection of clear and unambiguous labelling.

DOC 11. SPECIAL SYSTEM TESTS

DOC 11.1 Introduction

DOC 11.1.1 Distribution Operations Code Chapter 11 (“DOC 11”) sets out the responsibilities and procedures for arranging and carrying out Special *System Test*s which have or may have an effect on the *Grid Operators Distribution System* or *Users Systems*. Special *System Test*s are those tests which involve either simulated or the controlled application of irregular, unusual or extreme conditions on the *System* or any part of the *System*, but which do not include commissioning or re-commissioning test or any other tests of a minor nature.

DOC 11.2 Objective

DOC 11.2.1 The objectives of DOC 11 are to:

a. ensure that the procedures for arranging and carrying out Special *System Test*s are such that, so far as practicable, Special *System* Tests do not threaten the safety of personnel or the general public and cause minimum threat to the security of supplies, the integrity of *Plant* or *Apparatus* and are not detrimental to the *Grid Operator* and *Users*; and

b. set out procedures to be followed for establishing and reporting Special *System Test*s.

DOC 11.3 Procedure

DOC 11.3.1 General

If the *System Test* proposed by the *Grid Operator* or the *User* connected to the *Distribution System* will or may have an effect on the *Transmission System* then the provisions of DOC 11 and the *Transmission Code* shall apply.

Special *System Test*s which have a minimal effect on the *Distribution System* or *System*s of other *Users* shall not be subject to this procedure; minimal effect will be taken to mean variations in voltage, frequency and waveform distortion of a value not greater than those figures which are defined in the Distribution Planning and Connection Codes.

DOC 11.3.2 Proposal Notice

When the *Grid Operator* or a *User* intends to undertake a *System Test* which will have or may have an effect on the *System* or other *User's Systems* normally notice shall be provided twelve (12) months in advance of the proposed *System Test,* or as otherwise agreed by the *Grid Operator,* by the person proposing the *System Test* (the "Test Proposer") to the *Grid Operator* and to those *Users* who may be affected by such a *System Test*, ,.

The proposal shall be in writing and shall contain details of the nature and purpose of the proposed *System Test* and shall indicate the extent and situation of the *Plant* or *Apparatus* involved.

If the information set out in the proposal notice is considered insufficient by the recipient they shall contact the Test Proposer with a written request for further information which shall be supplied as soon as reasonably practicable. the *Grid Operator* shall not be required to do anything under DOC 11 until it is satisfied with the details supplied in the proposal or pursuant to a request for further information.

If the *Grid Operator* wishes to undertake a *System Test* the *Grid Operator* shall be deemed to have received a proposal of that *System Test*.

DOC 11.3.3 Preliminary notice and establishment of *Test Panel*

the *Grid Operator* shall have overall co-ordination of the *System Test*, using the information supplied to it under DOC11 and shall identify in its reasonable estimation, which *Users* other than the Test Proposer, may be affected by the proposed *System Test*.

DOC 11.3.4 *Test Panel*

A Test Co-ordinator, who shall be a suitably qualified person, shall be recommended by the Test Proposer and approved by the *Grid Operator* with the agreement of the *Users* which the *Grid Operator* has identified may be affected and shall act as Chairman of the *Test Panel* (the "*Test Panel*").

All *Users* identified under DOC 11 shall be given in writing, by the Test Co-ordinator, a preliminary notice of the proposed *System Test*. The preliminary notice shall contain:

a. the Test Co-ordinator's name and nominating company;

b. the details of the nature and purpose of the proposed *System Test*, the extent and situation of the *Plant* or *Apparatus* involved and the *Users* identified by the *Grid Operator*;

c. an invitation to each identified *User* to nominate a suitably qualified person to be a member of the *Test Panel* for the proposed *System Test*.

The preliminary notices shall be sent within one month of the receipt of the proposal notice or the receipt of any further information requested.

As soon as possible after the expiry of this one month period all relevant *User*s and the Test Proposer shall be notified by the Test Co-ordinator of the composition of the *Test Panel*.

A meeting of the *Test Panel* shall take place as soon as possible after the relevant *User*s and the Test Proposer have been notified of the composition of the *Test Panel*.

The *Test Panel* shall consider:

a. the details of the nature and purpose of the proposed *System Test* and other matters set out in the proposal notice;

b. the economic, operational and risk implications of the proposed *System Test*;

c. the possibility of combining the proposed *System Test* with any other tests and with *Plant* and/or *Apparatus* outages which arise pursuant to the operational planning requirements of the *Grid Operator* and *User*s; and

d. implications of the proposed *System Test* on the Scheduling and Dispatch of Generating *Plant*, insofar as it is able to do so.

Users identified under DOC 11 and the *Grid Operator*, whether or not they are represented on the *Test Panel*, shall be obliged to supply that *Test Panel* upon written request with such details as the *Test Panel* reasonably requires in order to consider the proposed *System Test*.

The *Test Panel* shall be convened by the Test Co-ordinator when it is necessary to conduct its business, subject to the oversight of the *Grid Operator*.

DOC 11.3.5 Proposal report

Within two months of the first meeting the *Test Panel* shall submit a report, which in this DOC 11 shall be called a proposal report, which shall contain:

a. proposals for carrying out the *System Test* (including the manner in which the *System Test* is to be monitored);

b. an allocation of costs (including un-anticipated costs) between the affected Parties, (the general principle being that the Test Proposer shall bear the costs); and

c. such other matters as the *Test Panel* consider appropriate.

The proposals report may include requirements for indemnities to be given in respect of claims and losses arising from the *System Test*. All *System Test* procedures must comply with all applicable legislation.

If the *Test Panel* is unable to agree unanimously on any decision in preparing its proposal report the proposed *System Test* shall not take place and the *Test Panel* shall be dissolved.

The proposal report shall be submitted to all those who received a Preliminary notice.

Within fourteen days of receipt of the proposal report, each recipient shall respond to the Test Co-ordinator with its approval of the proposal report or its reason for non-approval.

In the event of non-approval by one or more recipients, the *Test Panel* shall as soon as practicable meet in order to determine whether the proposed *System Test* can be modified to meet the objection or objections.

If the proposed *System Test* cannot be so modified then the *System Test* shall not take place and the *Test Panel* shall be dissolved.

If the proposed *System Test* can be so modified the *Test Panel* shall as soon as practicable, and in any event within one month of meeting to discuss the responses to the proposal report, submit a revised proposal report.

In the event of non-approval of the revised proposal report by one or more recipients, the *System Test* shall not take place and the *Test Panel* shall be dissolved.

DOC 11.3.6 Final test programme

If the proposal report (or, as the case may be, the revised proposal report) is approved by all recipients, the proposed *System Test* can proceed and at least one month prior to the date of the proposed *System Test*, the Test Panel shall submit to *the Grid Operator* and all recipients of the proposal notice a programme which in this DOC 11 shall be called a final test programme stating any switching sequence and proposed timings, a list of those staff involved in the carrying out of the *System Test* (including those

responsible for site safety) and such other matters as the *Test Panel* deem appropriate.

The final test programme shall bind all recipients to act in accordance with the provisions contained in the programme in relation to the proposed *System Test*.

Any problems with the proposed *System Test* which arise or are anticipated after the issue of the final test programme and prior to the day of the proposed *System Test* must be notified to the Test Co-ordinator as soon as possible in writing If the Test Co-ordinator decides that these anticipated problems merit an amendment to or postponement of the *System Test* he shall notify any party involved in the *System Test* accordingly.

If on the day of the proposed *System Test* operating conditions on the *System* are such that any party involved in the proposed *System Test* wishes to delay or cancel the start or continuance of the *System Test*, they shall immediately inform the Test Co-ordinator of this decision and the reasons for it. The Test Co-ordinator shall then postpone or cancel, as the case may be, the *System Test* and shall if possible, agree with all parties involved in the proposed *System Test* another suitable time and date or if he cannot reach such agreement, shall reconvene the *Test Panel* as soon as practicable which shall endeavour to arrange another suitable time and date and the relevant provisions of DOC 11 shall apply.

DOC 11.3.7 Final report

At the conclusion of the *System Test*, the Test Proposer shall be responsible for preparing a written report (the “final report”) of the *System Test* for submission to other members of the *Test Panel*.

The final report shall include a description of the *Plant* and/or *Apparatus*, tested and of the *System Test* carried out, together with the results, conclusions and recommendations.

The final report shall not be distributed to any party which is not represented on the *Test Panel* unless the *Test Panel* having considered the confidentiality issues, shall have unanimously approved such distribution.

When the final report has been submitted under the *Test Panel* shall be dissolved.

DISTRIBUTION METERING CODE

DMC 1. INTRODUCTION

DMC 1.1 Purpose

DMC 1.1.1 To establish the requirements for metering the *Active* and *Reactive Energy* and *Demand* input to and/or output from the *Distribution System*.

DMC 1.1.2 To ensure appropriate procedures for metering reading; and

DMC 1.1.3 To ensure that procedures are in place to manage disputed readings.

DMC 1.2 Scope

DMC 1.2.1 This Chapter applies to:

a. The *Grid Operator*

b. *Users*

c. *Embedded Generators*

DMC 2. METERING REQUIREMENTS – EMBEDDED GENERATORS

DMC 2.1 Overall Accuracy

DMC 2.1.1 The overall accuracy of *Generator* metering is to be designed to give a tolerance of +/- 0.5% on an ongoing basis.

DMC 2.2 Relevant Metering Policies, Standards and Specifications

DMC 2.2.1 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.

DMC 2.2.2 The *Grid Operator* shall own and maintain the Primary Metering *System* while the *Generator* shall own and maintain the Backup Metering *System*.

DMC 2.2.3 Each meter shall have its own *Current Transformer* (CT) and *Voltage Transformer* (VT) and necessary independent *System*s to function effectively.

DMC 2.2.4 Instrument transformers shall conform to ANSI Standards 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.

DMC 2.2.5 The *Current Transformers'* secondary winding used for metering purposes shall supply only the metering *Equipment* and associated *System*s.

Notwithstanding the foregoing each *Current Transformer* may have other secondary windings that may be used for purposes other than metering.

DMC 2.2.6 *Voltage 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.

DMC 2.3 Parameters for Meter Reading

DMC 2.3.1 The *Generator* shall provide and install appropriate *Equipment* and shall make a continuous recording on appropriate magnetic media or equivalent of the Net Energy Output of the *Generating Unit(s).*

DMC 2.3.2 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*.

DMC 2.4 Frequency of Meter Reading

DMC 2.4.1 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.

DMC 2.5 Generators <100kW

DMC 2.5.1 For small *Generator*s with a rated capacity below 100kW the full generator metering requirements above may be reduced. These generators shall be permitted to be metered using separate import and export meters. DMC 2.5.2 The metering requirements for such connection shall have the specification and accuracy as defined in DMC 3.0.

DMC 2.6 Metering Responsibility (Embedded Generators)

DMC 2.6.1 It is the responsibility of *Embedded Generators* to cooperate with the *Grid Operator* in the execution of all its responsibilities under this code.

DMC 2.6.2 The costs for installation and replacement of meters shall be outlined in the *Generator's Power Purchase Agreement* or *Standard Offer Contract*.

DMC 3. METERING REQUIREMENTS - USERS

DMC 3.1 Overall Accuracy

DMC 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.

DMC 3.2 Relevant Metering Policies, Standards and Specifications

DMC 3.2.1 The meters, and associated installations, used on the *Grid Operator's Distribution System* shall comply with the following documents which are identified as *Distribution Code Technical Specifications* in DGC10.6 or issued by 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

DMC 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.

DMC 3.3 Requirement for Metering

DMC 3.3.1 All *Exit Point*s and *Entry Point*s to the *Distribution System* shall have appropriate metering in accordance with this Distribution Metering Code.

DMC 3.4 Metering Responsibility (Users)

DMC 3.4.1 It is the responsibility of the *Grid Operator* to ensure that all *Exit Point*s and *Entry Point*s are metered in accordance with this code.

DMC 3.4.2 It is the responsibility of *Users* to cooperate with the *Grid Operator* in the execution of all its responsibilities under this code.

DMC 3.4.3 The costs for installation and replacement of meters shall be outlined in the *User's Connection Agreement and/or the* Standard Terms and Conditions of Service.

DMC 4. METERING EQUIPMENT

DMC 4.1.1 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.

DMC 4.2 Revenue Meters

DMC 4.2.1 The revenue meter shall have the appropriate rating for the connection requirements to be supplied and shall conform to the terms of the *Connection Agreement* between the *Grid Operator* and *User*/*Generator*.

DMC 4.2.2 Meters shall have an accuracy in accordance with ANSI class 0.5 or international equivalent.

DMC 4.2.3 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 *System*s. These devices shall comply with the specifications in DMC 3.2.2. The accuracy shall be equivalent to ANSI Class 0.5.

DMC 4.2.4 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 *UserGenerator*.

DMC 4.2.5 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.

DMC 4.3 Voltage Transformers

DMC 4.3.1 All *Voltage Transformers* shall comply with IEC Standards or their equivalents and shall have and accuracy class of 0.5.

DMC 4.3.2 The burden in each phase of the *Voltage Transformer* shall not exceed the specified burden of the said *Voltage Transformer*.

DMC 4.4 Current Transformers

DMC 4.4.1 All *Current Transformers* shall comply with IEC Standards or their equivalents and shall have and accuracy class of 0.5.

DMC 4.4.2 The burden in each phase of the *Current Transformer* shall not exceed the specified burden specification of the said *Current Transformer*.

DMC 5. METERING POINTS

DMC 5.1 Whole Current Metering

DMC 5.1.1 The *Metering Point* should be as close as possible to the *Connection Point*.

DMC 5.2 CT Metering

DMC 5.2.1 The *Metering Point* shall be at the position of the *Current Transformer*s used for the metering system. This should be designed to be as close as possible to the *Connection Point*.

DMC 5.2.2 *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.

DMC 5.2.3 Where the *Connection Point* is declared on the outgoing side of a High voltage circuit breaker the metering *Current Transformers* may be accommodated in that circuit breaker unit.

DMC 5.2.4 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.

DMC 6. METER READING AND COLLECTION SYSTEMS

DMC 6.1 Meter Reading and Recording Responsibility

DMC 6.1.1 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 Operators Licence.*

DMC 6.1.2 Meter reading and recording shall be undertaken by a suitable authorised representative of the *Grid Operator.*

DMC 6.1.3 It is the responsibility of *Users* and *Embedded Generators* to cooperate with the *Grid Operator* in the execution of its responsibilities under this code.

DMC 6.1.4 The *User* shall be provided with access to its billing and consumption records on request.

DMC 7. APPROVAL OF METERS

DMC 7.1.1 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 Operators Distribution System*.

DMC 8. CALIBRATION AND SEALING

DMC 8.1 Calibration

DMC 8.1.1 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.

DMC 8.1.2 All meters rated above 12kVA shall be recalibrated every 10 years where unless they have a manufacturers guaranteed calibration period in which case this period shall be used.

DMC 8.1.3 All meters rated at 12kVA and below shall comply with the requirements of acceptance testing in *OUR* Document ELE 2005/07 Electricity Meter Testing in Jamaica - Protocol on Administrative and Testing Procedures, prior to field installation.

DMC 8.1.4 All laboratory calibration shall be undertaken in laboratories accredited by the Bureau of Standards, Jamaica (*BSJ*).

DMC 8.2 Traceability

DMC 8.2.1 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.

DMC 8.3 Sealing

DMC 8.3.1 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.

DMC 8.3.2 All meters shall be sealed to prevent unauthorised access or interference with the *Operation* of the meter or the input terminals of the meter.

DMC 8.3.3 Seals applied after calibration shall be marked with the date that recalibration is required.

DMC 8.3.4 All seals shall include marks that identify the authorised person that sealed the meter.

DMC 9. METERING DISPUTES

DMC 9.1 Meter Accuracy Check

DMC 9.1.1 A *User/Embedded Generator* 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.

DMC 9.1.2 Should a *User/Embedded Generator* request more than one accuracy check in a single calendar year then the *Grid Operator* may charge for these additional check should the accuracy be within +/-2%.

DMC 9.2 Resolution of Disputes

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

DMC 10. INSPECTION AND TESTING

DMC 10.1 Maintenance Policy

DMC 10.1.1 The *Grid Operator* shall put in place and implement a policy for the inspection and testing and recalibration of all metering *Equipment*. This policy shall be in accordance with the procedures set out in DMC 3.2 above.

DMC 10.2 Maintenance Records

DMC 10.2.1 The *Grid Operator* shall keep all test results, maintenance programme records and sealing records for a period of at least 5 years.

DMC 10.3 Generator Metering

DMC 10.3.1 The *Grid Operator* and *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 *Dispute*s.

DISTRIBUTION DATA REGISTRATION CODE

DDRC 1. INTRODUCTION

DDRC 1.1 General

DDRC 1.1.1 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*.

DDRC 1.1.2 Where there is any inconsistency in the data requirements under any particular section of the *Distribution Code* and the Data Registration Code the provisions of the particular Chapter of the *Distribution Code* shall prevail.

DDRC 1.1.3 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.

DDRC 1.1.4 The DRC also lists data required to be provided by *Generator*s under the *Generation Code*. This data is provided for information only.

DDRC 1.2 Objective

DDRC 1.2.1 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 *Distribution Code*;

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

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

DDRC 1.3 Scope

DDRC 1.3.1 The *User*s to which the DRC applies are:

a. *Generator*s under the terms of the *Generation Code*;

b. *JPS* in its role as *Grid Operator*; and

c. *User*s connected directly to the *Distribution System.*

DDRC 2. DATA CATEGORIES AND STAGES IN REGISTRATION

DDRC 2.1 General

DDRC 2.1.1 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 *Distribution Code*;

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

c. Operational Data as required by the *Operation*s Code. This section also includes data required from *Generator*s in accordance with the Scheduling and Dispatch provisions of the *Generation Code.*

DDRC 3. PROCEDURES AND RESPONSIBILITIES

DDRC 3.1 Responsibility for Submission and Updating of Data

DDRC 3.1.1 In accordance with the provisions of the various Chapters of the *Distribution Code*, each *User* must submit data as summarised, listed and collated in the attached Schedules.

DDRC 3.2 Methods of Submitting Data

DDRC 3.2.1 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.

DDRC 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*.

DDRC 3.3 Changes to Users' Data

DDRC 3.3.1 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 *Distribution Code*.

DDRC 3.4 Data not supplied

DDRC 3.4.1 If a *User* fails to supply data when required by any Chapter of the *Distribution Code*, the *Grid Operator* shall estimate such data if and when, in the view of the *Grid Operator*, it is necessary to do so.

DDRC 3.4.2 If the *Grid Operator* fails to supply data when required by any Chapter of the *Distribution 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.

DDRC 3.4.3 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.

DDRC 3.4.4 The *Grid Operator* shall 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.

DDRC 3.4.5 The *User* shall advise the *Grid Operator* in writing of any estimated data it intends to use in the event of data not being supplied.

DDRC 4. DATA TO BE EXCHANGED

DDRC 4.1 General

DDRC 4.1.1 The following Table provides details of Schedules I to XIII covering the data to be exchanged between the *Grid Operator* and *User*s or *Generator*s.

Schedule	Data Type	Description	*User*	Code Section	*JPS* Procedure
I	*User System* Data	Electrical parameters relating to *Plant* and *Apparatus* connected to the *Distribution System*	*JPS*	DCC 2.1 DCC 2.2 DCC 2.3	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*	DPC 1.2 DPC 3	
III	Demand profiles and Active Energy	Total *Demand* and Active Energy taken from the *Distribution System*	*JPS*	DPC 1.2 DPC 3 DCC 2.1 DOC 2.3 GSDC 3.5.1	
IV	*Connection Point*	Information related to *Demand*, and a summary of *Embedded Generator*s and Customer generation connected to the *Connection Point*.	*JPS* *User*	DPC 1.2 DPC 3 DPC 4.1 DPC 4.2 DPC 4.3 DPC 5	
V	*Demand* Control	Information related to *Demand* Control	*JPS* *User*	DOC 5 GSDC 3.5.1	EI 1.6 SOPP 11
VI	Fault Infeed	Information on Short Circuit contribution to the *Distribution System*.	*JPS* *User* GEN	DPC 1.2 DPC 3.5	

Key to *User*s

JPS *JPS* in its capacity as Operator of the *Distribution System*

GO *JPS* in its capacity as *Grid Operator*

GEN *Generator*

Abbreviations used in all Schedules:

DPC : Distribution Planning Code

DCC : Distribution Connections Code

DOC : Distribution *Operation*s Code

TOC Transmission *Operation*s 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.

Schedule I – Users System Data

The data in this Schedule I is required from all *User*s with appropriate *Demand* at the discretion of the *Grid Operator*.

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	**DCC 2.3**	**SOPP 9**
Site Responsibility Schedules	Schedule	**DCC 5.3**	
Safety Coordinators	Text	**DOC 7.3**	
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	**DCC 2.3**	**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	**DCC 2.3**	**SOPP 7**
Rated load breaking current Single phase Three phase	 kA kA		
Rated peak short-circuit making current Single phase Three phase	 kA kA		
***User* Connecting *System* data: Circuit Parameters for all circuits**		**DCC 2.3**	**SOPP 7**

Data Description	Units	Code Section	*JPS* Instruction/ Procedure
For all *System*s at [12] kV and above Connecting *User System* to the *Distribution System*, the following details are required relating to that *Connection Point*			
Rated voltage	kV		
Operating voltage	kV		
Positive phase sequence			
Resistance	% on 100		
Reactance	% on 100		
Susceptance	% on 100		
Zero phase sequence			
Resistance	% on 100		
Reactance	% on 100		
Susceptance	% on 100		
Interconnecting transformers For transformers between the *Distribution System* and the *User System*, the following data is required: Rated Power Rated Voltage Ratio (i.e. primary/secondary/tertiary) Winding arrangement Vector group	MVA	**DCC 2.3**	**SOPP 7** **EI 3.1**
Positive sequence resistance			
@ maximum tap	% on MVA		
@ minimum tap	% on MVA		
@ nominal tap	% on MVA		
Positive sequence reactance			
@ maximum tap	% on MVA		
@ minimum tap	% on MVA		
@ nominal tap	% on MVA		
Zero phase sequence reactance Tap changer type Tap changer range Tap changer step size Impedance value (if not directly earthed)	**% on MVA** On/Off		
MV Motor Drives Following details are required for each MV motor drive connected to the *User System* Rated VA Rated *Active Power* Full Load Current Means of starting Starting Current	 MVA MW kA Text kA	**DCC 2.3**	**SOPP 7**

Data Description	Units	Code Section	*JPS* Instruction/ Procedure
Motor torque/speed characteristics Drive torque/speed characteristics Motor plus drive inertia constant			
***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 *System*s 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 *Distribution System*	 Text Text ms	**DCC 2.3**	**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 Transformer*s, 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	**DCC 2.3** `	**SOPP 7**

Schedule II – Load Characteristics Data

The following information is required from each *User* with appropriate *Demand* ,at the discretion of the *Grid Operator,* regarding existing and future connections for each *Connection Point*.

Data Description	Units	Data for Future Years				Data category
		YR 0	YR 1	YR 2	YR 3	
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						**DPC 4.3**
2. Sensitivity of *Demand* to variations in voltage and frequency on the *Distribution System* at the peak *Connection Point Demand* (*Active Power*)						
○ Voltage sensitivity	MW/kV MVAr/kV					
○ Frequency sensitivity	MW/Hz MVAr/Hz					
3. Phase unbalance imposed on the *Distribution System*						
○ Maximum	%					
○ Average	%					
4. Maximum harmonic content imposed on the *Distribution System*	%					
5. Details of loads which may cause *Demand* fluctuations greater than [1 MW] at a *Connection Point*						

Schedule III – Demand Profiles and Active Energy Data

The following information is required from each *User*s with appropriate *Demand*, at the discretion of the *Grid Operator*.

Data Description	FY0	FY1	FY2		Update Time	Data Category
Forecast daily *Demand* profiles in respect of each *User System* (summated over all *Connection Point*s)	1. Day of *User* maximum *Demand* (MW) at Annual MD Conditions 2. Day of peak *Distribution System Demand* (MW) at Annual MD Conditions 3. Day of minimum *Distribution System Demand* (MW) at *Average Conditions* *(Delete as appropriate)*				[End January]	**DPC 4.1** **DCC 2.3** **DOC 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	FY0	FY1	FY2		Update Time	Data Category
Data Description	YR 0	YR 1	YR 2		Update Time	Data Category
The annual MWh requirements for each *User System* (summated over all *Connection Point*s for the *Distribution System*) at *Average Conditions*:					[End Sept]	**DPC 4.1 DCC 2.3**
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 *User*s with *Embedded Generator* s					[End Sept]	**DPC 4.1.3 DPC 5 DCC 2.4**
1. Total *Demand* (MW) on its *System* 2. Active Energy (MWh) requirement on its *System* 3. Active Energy from Embedded Generation						

Schedule IV – Connection Point Data

The following information is required from each *User* with appropriate *Demand*, at the discretion of the *Grid Operator*.

Data Description	Units	YR 0	YR 1	YR 2		Update Time	Data Category
Forecast *Demand* and Power Factor related to each *Connection Point*							
1. Annual peak hour *User Demand* at Annual MD Conditions	MW pf					[End Sept]	**DPC 4.1** **DPC 4.3**
2. *User Demand* at *Distribution System* peak hour *Demand* at Annual MD Conditions	MW pf					[End Sept]	**DPC 4.1** **DPC 4.3**
3. *User Demand* at minimum hour *Distribution System Demand* at *Average Conditions*	MW pf					[End Sept]	**DPC 4.1** **DPC 4.3**
***Demand* Transfer Capability**							
Where a *User Demand* or group of *Demand*s may be fed by alternative *Connection Point*(s) , the following details should be provided:						[End Sept]	**DPC 4.1** **DPC 4.3**
1. Name of the alternative *Connection Point*(s)							
2. *Demand* transferred	MW MVAr						
3. Transfer arrangement (e.g. manual or automatic)							
4. Time to effect transfer	hrs						

Schedule V – Demand Control Data

The following information is required from the *Grid Operator* or Embedded Customer.

Data Description	Units	Time Covered	Update Time	Data Category
Programming Phase: applicable to the *Grid Operator* and *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	**DOC 5.3** **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 *Distribution System* Operator and 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	**DOC 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	**DOC 5**
2. Duration	hrs	Previous Day	10:00 Daily	

Schedule VI – Fault Infeed Data

The following information is required from each *User* who is connected to the *Distribution 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 *Distribution System* from *User System* at a *Connection Point*			
Name of *Connection Point*: _____			
1. Symmetrical three-phase short circuit current infeed:		[end Sept]	**DPC 3.5**
○ 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			

Schedule VII – User Outages Data

Data Description	Timescale Covered	Update Time	Data Category
*Generator*s and Non-*Embedded Generator* provide Details of *Apparatus* owned by them other than *Generating Unit*s 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 *User System*s	Year 1	[end Oct]	**DOC 3.3**
Embedded Generator and *User*s to inform *Grid Operator* of changes to outages previously requested	Week 8 ahead to year end	As occurring	**DOC 3.3**

***Transmission Code* is referenced as the final outage plan rests with Transmission.**

Schedule VIII – Generator Planning Parameters Data

Generating Facility Name: _____

The following details are required from each Generating Facility with a rated capacity greater than [100kW] directly connected, or to be directly connected, to the *Distribution System* 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 *Distribution 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 *Distribution System Demand*	MW MVAr		
3. *Demand* at the time of minimum *Distribution 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 *Distribution 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		
4. *Distribution System* Constrained Capacity (for *Embedded Generating Unit*s only)	MW		
5. Rated *Active Power*	MW		GCC 1.2.4
6. Minimum Generation	MW		
7. Rated Apparent Power	MVA		

Data Description	Units	Update Time	Data Category
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		
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		

Data Description	Units	Update Time	Data Category
***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		
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		

Data Description	Units	Update Time	Data Category
Governor Parameters (All *Generating Unit*s) 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 *Generator*s			**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		

Schedule IX – Generator Operational Planning Data

***Generator* Facility Name**: _____

The following details are required from each *Generator* in respect of each *Generating Unit with a rated capacity greater than [100kW]*.

Data Description	Units	Data Category	*Generating Unit* and Generating Facility Data						
			U1	U2	U3	U4	U5	U6	GF
Steam Turbine *Generating Unit*s		**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 Unit*s 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 Unit*s		**GSDC 3.2** **SOPP 7**							
1. Minimum notice required to synchronise	Min								
2. Minimum time between synchronising different *Generating Unit*s at a Generating Facility	Min								
3. Minimum block Load requirement on synchronising	MW								

Data Description	Units	Data Category	*Generating Unit* and Generating Facility Data						
			U1	U2	U3	U4	U5	U6	GF
4. Maximum *Generating Unit* loading rates from synchronising for									
○ 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								

Schedule X – Scheduling and Dispatch Data

Generating Facility Name: _____

The following details are required from each *Generator* in respect of each *Generating Unit* with a rated capacity greater *than [100kW]*.

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

Schedule XI – Generator Outages Data

Generating Facility Name: _____

The following details are required from each *Generator* in respect of each *Generating Unit* with a rated capacity greater *than 1MW*

Data Description	Units	Time Covered	Update Time	Data Category
Provisional Outage Programme				**DOC 3.3** **TOC3.3**
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** **DOC 3.3**
1. *Generating Unit*s concerned	ID	Year 1	[End Oct]	**GSDC 3.5.1**
2. *Active Power* not available as a result of Outage	MW	Year 1	[End Oct]	**GMPC 5.1** **SOPP 19**
3. Remaining *Active Power* of the *Plant*	MW	Year 1	[End Oct]	
4. Duration of Outage	Weeks	Year 1	[End Oct]	

Data Description	Units	Time Covered	Update Time	Data Category
5. Start date and time or a range of start dates and times	Date hrs	Year 1	[End Oct]	
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 Unit*s 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	

Schedule XII – Grid Operator Information to Users

The *Grid Operator* shall provide, where appropriate for the *Demand*, *User*s and prospective *User*s, with appropriate connection capacities, the following data related to the *Distribution System.*

Code	Description
DCC 5.4	***Operation Diagram***
DCC 5.3	**Site Responsibility Schedules**
DOC 2.3	***Demand*** The *Grid Operator* shall 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 *Distribution System Demand* at Annual Maximum *Demand* Conditions 2. The date and time of annual minimum *Distribution System Demand* at *Average Conditions*
DPC 4.2	***Distribution 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
DPC 4.2	The following Network Data as an equivalent voltage source at the voltage of the *Connection Point* to the *User System* Symmetrical three-phase short circuit current infeed at the instant of fault from the *Distribution System* Symmetrical three-phase short circuit current from the *Distribution 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
DOC 7.3	**Names of Safety Co-ordinators**

Code	Description
	Outage Programmes
DOC 3.4	Provisional Outage programme showing the *Generating Unit*s expected to be withdrawn from service during each week of Years 2 and 3 for Planned Outages
DOC 3.5	Draft Final Outage programme showing the *Generating Unit*s 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 Unit*s** to **the *Distribution System* Operator**
	Special Actions that may be required of *User*s
GSDC 3.2.3	Merit Order to be notified to *Generator*s 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 *System*s are used		
Data validation and substitution processes agreed between affected parties		