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FINAL

FORMULATION OF NATIONAL ELECTRICITY GRID CODE FOR SEYCHELLES

Grid Code

Public Utilities Corporation (PUC)

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Seychelles Energy Commission

MINISTRY OF ENVIRONMENT, ENERGY AND CLIMATE CHANGE
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Reference to part of this report which may lead to misinterpretation is not permissible.

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1 GLOSSARY

1.1 Acronyms

Acronym	Description
AC	Alternating current
AFR	Automatic Frequency Restoration
AGC	Automatic Generator Control
ALVDD	Automatic Low Voltage Demand Disconnection
AVR/AVC	Automatic Voltage Regulation / Automatic Voltage Control
BSP	Bulk Supply Point
CB	Circuit Breaker
CCGT	Combined Cycle Gas Turbine
CDGU	Centrally Dispatched Generation Unit
CO2	Carbon Dioxide
COP	Committed Outage Programme
DC	Direct Current
DCC	Distribution Control Centre
DI	Dispatch Instruction
DMOL	Design Minimum Operating Level
DSO	Distribution System Operator
DREPS	Dispatchable Renewable Power Station
DWFPS	Dispatchable Wind Farm Power Station
DPVPS	Dispatchable Photovoltaic Power Station
ECC	Emergency Control Centre
GAO	Grid Asset Owner
GC	General Conditions
GO	Grid Operator
GRM	Grid Reliability Margin
GS	Generation Schedule

GT	Gas Turbine
HV	High Voltage
HVDC	High Voltage Direct Current
IEC	International Electrotechnical Committee
IOP	Indicative Outage Programme
ITU	International Telecommunications Union
JSGCRP	Joint Seychelles Grid Code Review Panel
LDC	Load Despatch Centre
LV	Low Voltage
MEC	Maximum Export Capacity
MO	Market Operator
MV	Medium Voltage
MVDC	Medium Voltage Direct Current
NCC	National Control Centre
NCDGU	Non-Centrally Dispatched Generating Unit
OC	Operating Code
OLTC	On load Tap Changer
PUC	Public Utilities Corporation
POP	Provisional Outage Programme
POR	Primary Operating Reserve
PSP	Pumped Storage Plant
PVPS	Photovoltaic Power Station
PVSP	Photovoltaic Solar Panel
REPS	Renewable Power Station
RMS	Root Mean Square
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SDC	Scheduling and Dispatch Code
SEC	Seychelles Energy Commission (current Energy Regulator)
SEM	Seychelles Electricity Market

SGCRP	Seyschelles Grid Code Review Panel
SLR	Special Load Reading
SOS	System operator Seychelles
SOR	Secondary Operating Reserve
SVC	Static Var Compensator
TAO	Transmission Asset Owner
TOR	Tertiary Operating Reserve
TTC	Total Transfer Capacity
UFR	Under Frequency Relay
Un	Nominal Voltage
VO	Voluntary Outage
WFPS	Wind Farm Power Station
WTG	Wind Turbine Generator

1.2 Units

Unit	Description
A	Ampere
°C	Degree Celsius
GW	Giga Watt
GWh	Giga Watt hour
hPa	hecto Pascal
Hz	Hertz
kA	kilo Ampere
kW	kilo Watt
kWh	kilo Watt hour
kV	Kilo Volt
MWh	Mega Watt hour
MW	Mega Watt

TWh	Tera Watt hour
MVA	Mega Volt Ampere
Mvar	Mega Volt Ampere reactive/ Megavar
Mvarh	Megavar hour
var	Volt Ampere reactive

1.3 Definitions

Definition	Description
Act	The ENERGY ACT 2012.
Active Energy	The electrical energy produced, flowing or supplied by an electric circuit during a time interval, being the integral with respect to time of the instantaneous Active Power, measured in units of Watt-hours or standard multiples thereof, i.e.: 1000 Watt-hours = 1 Kilo Watt-hour (kWh) 1000 Kilo Watt-hours = 1 Mega Watt-hour (MWh) 1000 Mega Watt-hours = 1 Giga Watt-hour (GWh) 1000 Giga Watt-hours = 1 Tera Watt-hour (TWh)
Active Power	The product of the components of alternating current and voltage that equate to true power which is measured in units of Watts and standard multiples thereof, for example: 1000 Watts = 1 kW 1000 kW = 1 MW 1000 MW = 1 GW
Active Power Control	The automatic change in Active Power output from a Controllable REPS in a response to an Active Power Control Set-point received from PUC.
Active Power Control Mode	A mode of operation of a Controllable REPS where the Controllable REPS has been instructed by the PUC to maintain its Active Power output at the Active Power Control Set-Point.
Active Power Control Set-point	The maximum amount of Active Power in MW, set by the PUC, that the Controllable REPS is permitted to export.
Active Power Control Set-Point Ramp Rate	The rate of increase or decrease of Active Power output of a Controllable REPS in response to an Active Power Control Set-point instruction.
Actual Active Power	Active Power available from a REPS based on the actual weather conditions

Active User	Generation Units, Dispatchable Renewable Power Station, Aggregated Generating Units and Demand Side Aggregators
Additional Grid Code Availability Notice	A notice submitted by a User to the PUC pursuant to Scheduling and Dispatching Code (SDC) relating to additional data on Availability (Scheduling and Dispatching procedures).
Additional Grid Code Characteristics Notice	A notice to be submitted to PUC; pursuant to SDC related to additional technical data.
AGC Control Range	The range of loads over which AGC may be applied.
AGC Maximum Load	The upper limit of the AGC Control Range.
AGC Minimum Load	The lower limit of the AGC Control Range.
Aggregated Demand Site Response	A group of Individual Demand Sites represented by a Demand Side Aggregator, which together are capable of a Demand Side MW Capacity equal to or above 500 kW (and which shall therefore subject to Central Dispatch from the PUC). Each Individual Demand Site shall have a Demand Side MW Capacity of no greater than 500 kW. Unless otherwise specified, information submitted in respect of an Aggregated Demand Site shall always be at an aggregated level.
Aggregated Generating Unit	A group of Generating Units represented by a Generator Aggregator, each of which must not have a Registered Capacity greater than 100 kW. An Aggregated Generating Unit with a total Registered Capacity of 1000 kW or more shall be subject to Central Dispatch, but one with a total Registered Capacity of less than 1000 kW may be subject to Central Dispatch subject to agreement with the PUC. Unless otherwise specified by the PUC or otherwise in the Grid Code, information submitted in respect of an Aggregated Generating Unit shall always be at an aggregated level.
Aggregated Maximum Export Capacity	In the case of a Generator Aggregator, the aggregated value (in MW, MVA, kW and/or kVA) provided in each Connection Agreement for the Generating Units for which the Generator Aggregator is responsible.
Aggregator	Either a Generator Aggregator or a Demand Side Aggregator in respect of an Aggregated Demand Site.
Alert	A Red Alert, an Amber Alert or a Blue Alert or other Alert warning as agreed pursuant to Operating procedures (Emergency Control and Power System Restoration)
Amber Alert	An alert issued by the PUC to the Users when a single Event would give rise to a reasonable possibility of failure to meet the Power System Demand, or of Frequency or Voltage departing significantly from normal or if multiple Events are probable due to, N-1 violation, maintenance and prevailing weather conditions.
Ancillary Service	A service, other than the production of electricity, which is used to operate a stable and reliable Power System including Reactive Power, Operating Reserve,

	Frequency Control, Voltage Control and Blackstart Capability.
Ancillary Service Agreement	The bilateral agreement between the PUC and the User, which contains the detail specific to the User's provision of Ancillary Services.
Annual SLR Conditions	The hour, day and month in a year when the peak demand is expected
Apparatus	An item of equipment in which electrical conductors are used, supported or of which they may form part and includes meters, lines, cables and appliances used or intended to be used for carrying electricity for the purpose of supplying or using electricity.
Apparent Power	The product of voltage and of alternating current measured in units of volt-amperes and standard multiples thereof.
Automatic Frequency Restoration	A system for reconnecting Demand Customers automatically following a low frequency Event on the T & D System, once the frequency has recovered.
Automatic Generator Control	A control system installed between the NCC and a Power Station whereby MW set points can be adjusted remotely by the PUC to reflect the Dispatch Instruction
Automatic Low Voltage Demand Disconnection	The automatic disconnection of Demand Customers when the Voltage or the rate of change of voltage has violated acceptable limits as determined by the PUC.
Automatic Mains Failure Mode	The operation of Generation Unit(s) at an Individual Demand Site of a Demand Side Aggregator where in the event of Disconnection, the Generation Unit(s) is(are) enabled and supplies(y) the Demand Customer's not Synchronized to the T&D System. Upon sustained restoration of the connection to the T&D System for a settable period of time, the Generation Unit(s) Synchronize to the T&D System for a short period of time not exceeding 180 seconds to facilitate the smooth transfer of power prior to Shutdown of the Generation Unit(s).
Automatic Voltage Regulation	Automatic maintenance of a Generation Unit's and Ancillary Service Provider's terminal voltage at a desired set point.
Automatic Voltage Regulator	A continuously acting automatic closed loop control system acting on the excitation system so as to maintain a Generation Unit's and Ancillary Service Provider's terminal voltage at a desired set point.
Autonomous Generating Units	A Generating Unit that is not subject to Central Dispatch or subject to Active Power control by the PUC in case of islanding opreation.
Autoproducer	Persons to whom electrical Energy is provided and by whom the electrical Energy is generated essentially for their own use, by means of a direct connection to the T&D system.
Auxiliaries	Any item of Plant and/or Apparatus not directly a part of the boiler plant or Generating Unit, but required for the boiler plant's or Generating Unit's functional operation.

Auxiliary Diesel Engine	A diesel engine driving a Generating Unit which can supply a Unit Board or Station Board, which can start without an electrical power supply from outside the Power Station within which it is situated.
Auxiliary Fuel	A fuel other than a Primary Fuel which may be used for start up purposes or for support of combustion or Maximization when the Generation Unit is producing Energy
Auxiliary Load	The electrical Demand of the Generation Unit's Auxiliary Plant required for the operation of the Generation Unit.
Auxiliary Plant	Any item of Plant and/or Apparatus not directly a part of the Generation Unit, but required for Generation Unit's functional operation.
Availability	At any given time the measure of Active Power a Generation Unit(s) is capable of delivering to the Connection Point and the term "Availabilities" shall be construed accordingly. This can be calculated as a gross figure. In terms of a Demand Side Aggregator the measure at any given time of the Active Power the Demand Side Aggregator is capable of delivering to the System.
Availability Notice	A notice to be submitted to the PUC pursuant to SDC.
Availability Factor	The ratio of the Energy that could have been produced during a specified period of time by a Generation Unit operating in accordance with its Availability, and the Energy that could have been produced during the same period by that Generation Unit operating at its Registered Capacity. Availability Factor can alternatively be reported in gross terms.
Available Active Power	The amount of Active Power that the Controllable REPS could produce based on current weather conditions. The Available Active Power shall only differ from the actual Active Power if the Controllable REPS has been curtailed, constrained or is operating in a restrictive Frequency Response or Voltage mode.
Battery Energy Storage System	A technology storing energy with chemical process.
Black Start	The procedure necessary for a recovery from a Total Shutdown or Partial Shutdown.
Black Start Capability	Ability in respect of a Black Start Station, for at least one of its Centrally Dispatched Generation Units to start-up from Shutdown and to energise a part of the T&D System and be Synchronised to the T&D System upon instruction from the PUC/NCC.
Black Start Shutdown	In the event of a Partial Shutdown or Total Shutdown of the T&D System, the Controllable REPS shall be sent a Black Start Shutdown signal by the PUC and upon receipt of the signal, the Controllable REPS shall trip the circuit breaker(s) at the Connection Point and shutdown the Controllable REPS in a controlled manner.

Black Start Station	A Power Station which is registered pursuant to Grid Code as having a Black Start Capability
Block Load	The level of output that a Generating Unit immediately produces following Synchronisation. For avoidance of doubt, Block Load can equal 0 MW.
Block Load Cold	Block Load during a Cold Start.
Block Load Hot	Block Load during a Hot Start.
Block Load Warm	Block Load during a Warm Start.
Blue Alert	An alert issued by the PUC signifying that either a Partial Shutdown or a Total Shutdown of the Power System has taken place.
Business Day	Monday through Friday excluding public holidays and holidays observed by PUC.
Cancelled Start	A response by a Generator to an instruction from the PUC cancelling a previous instruction to Synchronise to the T&D System.
Capacity	The rated continuous load-carrying ability, expressed in megawatts (MW) or megavolt-amperes (MVA) of generation, transmission, or other electrical equipment.
Capacity Adequacy	When there is sufficient Generation Capacity to meet the Demand and Reserve requirements.
Capacity Adequacy Indicator	An indication issued by the PUC for each weekly peak of the year based on Availability and Demand forecasts whether or not there is sufficient Generation Capacity to meet Demand.
Capacity Shortfall Warning	A warning issued by the PUC that based on Availability and Demand forecasts there is insufficient Generation Capacity to meet the peak Demand.
CCGT/Diesel Installation Matrix	The matrix which must be submitted by a Generator under the Planning Code and which is used by the PUCs for Scheduling and Dispatch purposes under the SDCs as a "look up" table determining which CCGT/Diesel Units will be operating at any given MW Dispatch level subject to any updated Availability information submitted by a Generator to a PUC under SDC; such as matrix must be pre-defined and approved by PUC.
CCGT Installation	A collection of Generation Units comprising one or more Combustion Turbine Units and one or more Steam Units where, in normal operation, the waste heat from the Combustion Turbine Units is passed to the water/steam system of the associated Steam Unit or Steam Units and where the component Generation Units within the CCGT Installation are directly connected by steam or hot gas lines which enable those Units to contribute to the efficiency of the combined cycle operation of the CCGT Installation.
CCGT Unit	A Generation Unit within a CCGT Installation
Central Dispatch	The process of Scheduling and issuing Dispatch Instructions directly to a

	Control Facility by the PUC pursuant to the Grid Code. All Dispatchable REPSs, Pumped Storage Plant Demand, Demand Side Aggregators, and Aggregated Generating Units are subject to Central Dispatch. In relation to all other Generation Units, thresholds apply as follows: • all other Generation Units with a Registered Capacity of 200 kW or more are subject to Central Dispatch; • all other Generation Units with a Registered Capacity of 50 kW or more and less than 200 kW are not subject to Central Dispatch unless required by the PUC; however, such Generation Units can elect to be subject to Central Dispatch; • all other Generation Units with a Registered Capacity of less than 50 kW are not subject to Central Dispatch unless required by the PUC; • any Power Station, which has an aggregate Registered Capacity of 200 kW or more, consisting of more than one Generation Unit that is not otherwise subject to Central Dispatch, is subject to Central Dispatch as an Aggregated Generating Unit; • all Generation Units with a Registered Capacity of less than 200 kW can elect whether to comply with SDC relating to the submission of Commercial Offer Data.
Centrally Dispatched Generating Unit	A Generating Unit within a Power Station subject to Central Dispatch, which comprises, unless specified otherwise in relation to a particular use of the term, a Thermal Plant including a CCGT/Diesel Installation, a Dispatchable REPS, Hydro Unit and Pumped Storage Plant in respect of its Pumped Storage Generation.
Cold Start	Any Synchronization of a Generating Unit that has previously not been Synchronized for a period of time longer than its submitted Warm Cooling Boundary.
Collector Network	The network of underground cables and overhead lines within a Controllable REPS used to convey electricity from individual WTGs and/or PVPs, or other types of REPS as defined in the intro of the technology report, to the Connection Point.
Combustion Turbine Unit	A Generation Unit which compresses the inlet air and feeds fuel to the combustion chamber. The fuel and air burn to form hot gases which in turn forces these hot gases into the turbine, causing it to spin. The turbine can be fuelled by natural gas, by distillate or by other such fuels as technology may allow.
Commercial Energy Metering	Metering which is utilized to measure Energy for Tariff charging purposes.
Commercial Offer Data	Data submitted by a User or an Intermediary to PUC pursuant to the energy regulation in relation to prices and, where applicable, Nominated Profile for certain Users.

Commissioning	Activities involved in undertaking the Commissioning Test or implementing the Commissioning Instructions pursuant to the terms of the Connection Agreement or as the context requires the testing of any item of Users and PUC's equipment required pursuant to this Grid Code prior to connection or re-connection in order to determine that it meets all requirements and standards for connection to the T&D System. It also includes activities that determine the new values of parameters that apply to it following a material alteration or modification and in addition those activities involved in undertaking the Commissioning Tests or implementing the Commissioning Instructions as the context requires.
Commissioning Instructions	A step-by-step test procedure for a Commissioning Test.
Commissioning Test	Testing of a CDGU, Controllable REPS, Pumped Storage Plant Demand, Demand Side Aggregators, Aggregated Generating Units, or an item of a User's and PUC's Equipment required pursuant to the Connection Conditions prior to connection or re-connection; this is to determine whether or not it is suitable for connection to the System and also to determine the new values of parameters to apply to it following a material alteration or modification of a CDGU, Controllable REPS, Pumped Storage Plant Demand, Demand Side Aggregators, Aggregated Generating Units, or of an item of a User's Equipment and the term "Commissioning Testing" shall be construed accordingly.
Committed Outage Programme	A programme of Outages of the Generator's Generation Units prepared by the PUC for at least 1 year in advance, covering assets of PCU and IPPs.
Committed Project Planning Data	Data relating to a User Development once the offer for a Connection, Use of System Agreement and/or supplemental agreements are accepted.
Communications and Control Room	The communications and control room established by the User in accordance with the Connection Agreement
Connection Agreement	The bilateral agreement between the PUC and the User, which contains the detail specific to the User's connection to the T&D System.
Connection Conditions	The section of this Grid Code which is identified as the Connection Conditions to establish certain principles and standards relating to connection, method of connection, Plant and Apparatus designation and nomenclature, technical standards, performance standards, data requirements.
Connection Date	The date on which the Commissioning Instructions have to the PUC's satisfaction been properly implemented in respect of every part of the User's Equipment, following which the PUC shall, as soon as reasonably practicable notify the User to that effect, specifying the date of completion of such implementation
Connection Offer	A quotation letter together with the unsigned Connection Agreement which forms the PUC's offer for connection of the Facility to the T&D System as the result of an application for connection of the Facility.

Connection Point	The physical point where the User's Plant Apparatus or System is joined to the T&D System .
Connection Site	The site at which the Plant and Apparatus of the User at the User's side of the Connection Point is to be installed including the land, spaces, roads and any surfaces.
Constrained Group	A group of Generating Units located within a constrained part of the System as determined by the PUC.
Contingency	The unexpected failure or Outage of a system component, such as a Generation Unit, transmission line, circuit breaker, switch, or other electrical element. A Contingency also may include multiple components, which are related by situations leading to simultaneous component outages.
Contingency Reserve	The margin of available Generation Capacity over forecast System Demand which is required in the period of 24 hours ahead down to real time, to cover against uncertainties in availability of Generation Capacity and against Demand forecast errors or variations
Continuous Parallel Mode	Unrestricted periods of Synchronised operation of Generation Unit(s) to the T&D System at an Individual Demand Site of a Demand Side Aggregator, subject to Connection Agreement or DSO Connection Agreement conditions.
Control Action	An action, such as switching, whereby the T&D System is operated.
Control Centre	A location used for the purpose of monitoring, control and operation of the T&D System or a User System other than a Generator's System; such as national or regional control center.
Control Facility	A location used for the purpose of Monitoring, control and operation of the User 's Plant and Apparatus (greater or equal to 200kW) and for accepting Dispatch Instructions via Electronic Interface.
Control Phase	The Control Phase (as described in the OC1 & OC3) follows on from the Programming Phase and starts with the issue of the Generation Schedule for the next day and covers the period down to the real time.
Control Synchronizing	The coupling (by manual or automatic closing of the circuit breaker) of two asynchronous Systems by means of synchroscope.
Controllable REPS	A site containing at least one WTG or one PVP can automatically act upon a remote signal from the PUC to change its Active Power output.
Controllable REPS Availability	The amount of power the Controllable REPS can produce given favorable weather conditions.
Controllable REPS Operator	The operator of the Controllable REPS.
Controlled Active Power	The amount of Active Power that a Controllable REPS is permitted to export based on the Active Power Control Set-point signal sent by the PUC.

Critical Fault Clearance Time	The longest fault duration not leading to out-of-step conditions such as pole-slipping in a Generating Unit following a Fault Disturbance. Critical Fault Clearance Time will vary according to the active and reactive power output of the Generating Unit. The minimum Critical Fault Clearance Time for a particular Fault Disturbance is likely to occur when the Generating Unit is at maximum Active Power output and maximum leading Reactive Power output.
Current Source Technology	Current source technology include all static devices generating an AC current from a rectified DC current source. The intermediate DC current is kept constant with a controlled rectifier and high inductance reactors, while the AC output is of variable Frequency and Voltage.
Customer	A person to whom electrical power is provided (whether or not this is the same person who provides the electrical power).
Customer Demand Management	Reducing the supply of electricity to a Customer or disconnecting a Customer in a manner agreed for commercial and operational purposes between a Supplier and its Customer.
Cycle Operating Mode	The Open Cycle Mode or combine cycle Operating Mode of a CCGT Installation which may need to be specified pursuant to a Dispatch Instruction under SDC
Declaration	A notice prepared by the User in respect of a User's Plant submitted to the PUC in accordance with the requirements of SDC1 and setting out the values (and times applicable to those values) of Availability, Ancillary Services capabilities, Operating Characteristics. "Declared" shall be construed accordingly.
Declared Operating Characteristics	The Operating Characteristics which the Generator or Demand Side Aggregator Operator shall have informed the PUC under the provisions of SDC1 and which shall reasonably reflect the true Operating Characteristics of the Generation Unit or Demand Side Aggregator.
De-energise	Disconnect from the T&D System utilizing for example circuit switches to isolate the Plant and/or Apparatus. "De-energised" and "De-energising" shall be construed accordingly.
De-Load	The condition in which a Generating Unit has reduced or is not delivering MW to the System to which it is Synchronised.
De-Load Break Point	The point at which due to technical reasons a Generating Unit may need to pause during its MW Output reduction process.
De-Loading Rate	The rate at which a Generation Unit reduces MW Output from Minimum Generation to zero when it is instructed to cease output. There are up to two possible de-loading rates, which shall be named accordingly: De-Loading Rate 1 and De-Loading Rate 2.
Demand	The amount of electrical power consumed by the Power System comprising of both Active and Reactive Power, unless otherwise stated.
Demand Control	All or any of the methods of achieving a Demand reduction or an increase in Demand.

Demand Control Alert	A warning issued by PUC when it anticipates that it will or may instruct the LDC to implement Demand reduction.
Demand Customer	A person to whom electrical Energy is provided by means of a direct connection to the T&D System. Autoproducers are to be considered both Generators and Demand Customers.
Demand Disconnection	Disconnection of Demand Customers
Demand Side Aggregator	An Individual Demand Site or Aggregated Demand Site with a Demand Side Aggregator power capacity of at least 50 kW. The Demand Side Aggregator shall be subject to Central Dispatch.
Demand Side Aggregator Energy Profile	The estimated total Energy requirement for an Individual Demand Site or aggregated consumption for each Individual Demand Site which form part of an Aggregated Demand Site and which must be submitted to the PUC in the Availability Notice under SDC.
Demand Side Aggregator MW Availability	The forecasted change in Active Power which can be achieved in one currency zone by a Demand Side Aggregator and which must be submitted by the User to the PUC in an Availability Notice under SDC.
Demand Side Aggregator MW Capacity	The maximum change in Active Power that can be achieved by a Demand Side Aggregator on a sustained basis for the duration of the Demand Side Aggregator's Maximum Down Time by totalling the potential increase in on-site Active Power Generation and the potential decrease in on-site Active Power Demand at each Individual Demand Site..
Demand Side Aggregator MW Response	The proportion (in MW) of the Demand Side Aggregator MW Capacity that is delivered at a given time following a Dispatch Instruction from the PUC. This value will be zero unless dispatched by the PUC.
Demand Side Aggregator MW Response Time	The time as specified by the Demand Side Aggregator Operator in the Technical Parameters and is the time it takes for the Demand Side Aggregator Operator to be able to implement the Demand Side Aggregator MW Response from receipt of the Dispatch Instruction from the PUC.
Demand Side Aggregator Notice Time	The time as specified by the Demand Side Aggregator Operator in the Technical Parameters and is the time it takes for the Demand Side Aggregator to begin ramping to the Demand Side Aggregator MW Response from receipt of the Dispatch Instruction from the PUC.
Demand Side Aggregator Operator	A person who operates a Demand Side Aggregator, with an aggregated Demand Side Aggregator MW Capacity not less than 500 kW.
Demand Side Aggregator Ramp Time	The time it takes for a Demand Side Aggregator to ramp to the Demand Side Aggregator MW Response. It is equal to the Demand Side Aggregator MW Response Time less the Demand Side Aggregator Notice Time.
De-maximisation Instruction	An instruction issued by the PUC to Generators to cease Maximisation.
Design Minimum	The minimum Active Power output of Controllable REPS where all WTGs or PVP

Operating Level (DMOL)	are generating electricity and capable of ramping upwards (only for wind) at any of the specified ramp rates (given available wind), and shall not be greater than 12% of Registered Capacity.
Designated Operator	The operators approved in writing by the relevant User as competent to carry out the procedures in the agreed Operation Instructions for parties connecting to the T&D system
De-Synchronise	The act of taking a Generation Unit which is Synchronised to the T&D System off the T&D System to which it has been Synchronised. The term "De-Synchronised", and other like terms, shall be construed accordingly.
De-Synchronising	The act of taking a Generating Unit off the Network, to which it has been Synchronised. Like terms shall be construed accordingly.
Diesel Unit	A Generation Unit within a Diesel Installation.
Diesel Installation	A collection of Generation Units comprising one or more Diesel Generation Units
Disconnection	The physical separation of Users (or Customers) from the T&D System or a User System as the case may be.
Dispatch	The issue by the PUC of instructions to a Generator, Pumped Storage Generator, Demand Side Aggregator Operator or Generator Aggregator in respect of its CDGU, Pumped Storage Plant Demand, Demand Side Aggregator, Aggregated Generating Units, pursuant to SDC. The term "Dispatched" shall be construed accordingly.
Dispatch Instruction	An instruction given by the PUC to a CDGU, Demand Side Aggregator, Pumped Storage Plant Demand to that User's approved Control Facility to change the output, fuel or manner of operation of the CDGU, Demand Side Aggregator, Pumped Storage Plant Demand. "Instruct" and "Instructed" shall be construed accordingly.
Dispatchable REPS	A Controllable REPS which must have an Active Control Facility in order to be dispatched via an Electronic Interface by the PUC.
Disputes Resolution Procedure	The procedures described in the Connection Agreement, Use of System Agreement and Ancillary Services Agreement relating to disputes resolution.
Distribution System	The system consisting (wholly or mainly) of electric circuits, transformers and switchgear which are operated by and used for the distribution of electricity from Grid Supply Points or Generating Units or other entry points to the point of delivery to Customers or other Users and any Plant and Apparatus and meters used in connection with the distribution of electricity, but not including any part of the Transmission System.
Distribution System Operator (DSO)	An entity, PUC, which is responsible for, amongst other things, the planning, development, operation and maintenance of the Distribution System.
Disturbance	An unplanned event that produces an abnormal System condition.

Disturbing Loads	A load on the System that adversely affects Power Quality.
DSO Connection Agreement	The bilateral agreement between the DSO and the DSO Demand Customer, which contains the detail specific to the DSO Demand Customer's connection to the Distribution System.
DSO Demand Customer	A person to whom electrical Energy is provided by means of a direct connection to the Distribution System.
Dwell Time Down	The duration for which the Generating Unit must remain at the Dwell Time Down Trigger Point during a change in its MW Output while ramping down between instructed MW Output and Minimum Generation.
Dwell Time Down Trigger Point	A constant MW level at which a Generating Unit must remain while ramping down between instructed MW Output and Minimum Generation. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Dwell Time Up	The duration for which the Generating Unit must remain at the Dwell Time Up Trigger Point during a change in its MW Output while ramping up between Minimum Generation and instructed MW Output.
Dwell Time Up Trigger Point	A constant MW level at which a Generating Unit must remain while ramping up between Minimum Generation and instructed MW Output. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Earthing	A way of providing a connection between conductors and earth by an Earthing Device.
Earthing Device	A means of providing a connection between a conductor and earth being of adequate strength and capability for the intended purpose.
Effect of Parallel Flows	The effect of the flow of electricity on an electric system's T&D facilities resulting from scheduled electric power transfers from Generation to Loads, along more than 1 path.
Electronic Alert System	The primary means by which an Alert is transmitted by the PUC to Users (or to certain Users only) in accordance with OC.
Electronic Interface	A system, in accordance with the requirements of the PUC's data system, at the Control Facility, providing an electronic interface between the PUC and a User, for issuing and receiving instructions, including Dispatch Instructions as provided for in the Grid Code and established pursuant to an agreement between the PUC and the User.
Embedded Generation	Generation Units within a Power Station which are directly connected to a T&D System or the system of any other User, such connection being either a direct connection or a connection via a busbar of another User but with no other Connection to the T&D System.
Embedded Generator	Protection designed to disconnect Generation Units from the T&D System during abnormal system conditions by tripping a dedicated circuit breaker or

Interface Protection	recloser located as close as practically possible to the interface between the Demand Customer equipment and the T&D System.
Emergency	Any abnormal system condition that requires automatic or immediate manual action to prevent or limit loss of transmission facilities or generation supply that could adversely affect the reliability of the T&D System.
Emergency Instruction	A Dispatch instruction issued by the PUC, pursuant to SDC to a CDGU which may require an action or response which is outside the limits implied by the then current Declarations.
End of Restricted Range	The end point in MW of a Forbidden Zone.
End Point of Start-up Period	The time after which the rate of change of the Generating Unit Output is not dependent upon the initial Warmth of the Generating Unit.
Energise	The movement of any isolator, breaker or switch so as to enable Active Power and Reactive Power to be transferred to and from the Facility through the Generator's Plant and Apparatus. "Energised" and "Energising" shall be construed accordingly.
Energy	The electrical energy produced, flowing or supplied by an electrical circuit during a time interval and being the integral with respect to time of the instantaneous Active Power, measured in units of Watt-hours or standard multiples thereof.
Energy Limit	The target amount of Energy to be generated by an Energy Limited Generating & Storage Unit within the Trading Day.
Energy Limit Factor	A factor between zero and one, which is applied to the Energy Limit for use in calculating the scheduled Energy of Energy Limited Generating & Storage Units in the period between the end of the Trading Day and the end of the Optimisation Time Horizon period.
Energy Limit Start	06:00 hours on the Trading Day.
Energy Limit Stop	06.00 hours on the day following the Trading Day.
Energy Limited Generating Unit	A RES Unit with a limit on the Energy it can deliver in a specified time period.
Energy Limited Storage Unit	Any Storage Unit with a limit on the Energy it can deliver in a specified time period.
PUC Networks Electrical Safety Rules	The current version of the document prepared by PUC.
PUC Power Generation Electrical Safety Rules	The current version of the document prepared by PUC.
Estimated Registered	Those items of Planning Data which either upon connection will become

Data	Registered Data, or which for the purposes of the Plant and/or Apparatus concerned as at the date of submission are Registered Data, but in each case which for the seven succeeding the PUC financial years will be an estimate of what is expected.
Event	An unscheduled or unplanned occurrence on, or relating to either the T&D System or a User's System, including faults, incidents and breakdowns.
Extraordinary AVR Response	Any response to a Voltage Dip that requires an extraordinary response from normal behavior of the Automatic Voltage Regulator of a Generation Unit. For the avoidance of doubt any action of an Automatic Voltage Regulator, which results in anything other than an adjustment of the excitation field current is deemed to be an Extraordinary AVR Response. Where such schemes, including fast valving, are being considered by a Generator they need to be formally agreed with the PUC before implementation.
Extraordinary Governor Response	Any response to a Voltage Dip that requires an extraordinary response from normal behavior of the Governor Control System of a Generation Unit. For the avoidance of doubt any action other than Governor Control System with respect to Frequency dips is deemed to be an Extraordinary Governor Response. Where such schemes, including fast valving, are being considered by a Generator they need to be formally agreed with the PUC before implementation.
Facility	The User's facility located at the Connection Site including the User's Plant and Apparatus plus the Plant and Apparatus to be installed at the User's side of the Connection Point necessary to effect the connection
Failure to Follow Notice to Synchronise Instruction	An instruction given by the PUC to a Generator in respect of its CDGU confirming that it has failed to Synchronise more than 5 minutes after the time specified in the Notice to Synchronise.
Failure to Reach Minimum Generation Instruction	An instruction given by the PUC to a Generator in respect of its CDGU confirming that it has De-Synchronised where it has tripped before reaching Minimum Generation.
Fault Disturbance	Any type of fault including, but not limited to, single line to ground, line to line and three-phase short-circuits, in any single item of Plant anywhere in the T&D System where the operation of the PUC protection will not disconnect the Generator Plant from the existing or planned T&D System under normal or Scheduled Outages conditions. For the avoidance of doubt this Fault Disturbance can include bus zone protection.
Fault Inception	The point in time at which the T&D System Voltage at the Connection Point goes outside the range as defined in Connection Condition, on any or all phases. At nominal voltages less than 33 kV, this shall be the point in time at which the Voltage under construction is less than 0.9pu of the nominal Voltage.
Fault Ride-Through	The ability of a Generating Unit to stay connected to the T&D System during and following a Fault Disturbance.

Fault Ride-Through Time	The required fault duration that a Generating Unit shall ride through for a particular Fault Disturbance, and is equivalent to the Critical Fault Clearance Time.
Flexible Outage	An Outage scheduled in the Committed Outage Programme as a Flexible Outage which is not within four Business Days of the scheduled start date and time
Flywheel Generator	A technology storing energy under permanent rotating mass.
Forbidden Zone	A MW range within which a Generator cannot operate in a stable manner due to an inherent technical limitation of the machine.
Forced Outage Probability	The probability, in percentage terms, of a Generation Unit not being available to provide Energy or Ancillary Services.
Forecast Minimum Generation Profile	The User's forecast of the average level of Minimum Generation, in MW, for the User's Plant for each Trading Period in the Optimisation Time Horizon.
Forecast Minimum Output Profile	The User's forecast of the average level of minimum MW Output, in MW, for a Storage Plant for each Trading Period in the Optimization Time Horizon.
Forecast Statement	A forecast statement shall include forecasts in respect of capacity, forecast flows and loading on each part of the transmission system of the Board and fault levels for each electricity transmission node together with: • a statement identifying those parts of the transmission system of the Board most suited to new connections and to the transport of further quantities of electricity; • the generating capacity which is likely to be connected to the transmission system; • the demand for electricity in the period to which the statement relates; and • a statement on the demand for electricity generated from renewable, sustainable or alternative sources generally and a statement on arrangements for the supply of electricity to customers who have opted to purchase such electricity.
Frequency	The number of alternating current cycles per second (expressed in Hertz) at which an Electric System is running.
Frequency Control	The control of the Frequency on the Power System.
Frequency Deadband	A Frequency range within which the Governor Control System is not expected to respond to changes in T&D System Frequency. The purpose of the Frequency Deadband is to filter out noise and not to restrict the normal Frequency response of the Governor Control System.
Frequency Demand Disconnection	Disconnection of Demand Customers when Frequency falls below a particular threshold.

Frequency Event	An event where the T&D System Frequency deviates from a frequency range.
Frequency Regulation	The automatic adjustment of Active Power output by a Generation Unit, initiated by free governor action in response to continuous minor fluctuations of Frequency on the Power System.
Frequency Response	The automatic adjustment of Active Power output from a Generation Unit(s) in response to Frequency changes
Frequency Response Ramp Rate	The minimum rate of increase or decrease of Active Power output of a Controllable REPS, Storage, Aggregator Unit when acting to control T&D System Frequency.
Frequency Response System	A facility providing the means to automatically adjust the Active Power output from a Generation Unit(s) in response to changes in Frequency.
Frequency Sensitive Mode	The operation of a Generating Unit whereby its generation level is varied automatically to compensate for variations in the Frequency of the System.
Full-Day Test	An Operational Test with a total duration of equal to or greater than 6 hours, or where the Active Energy produced during the total duration of the test is equal to or greater than: (i) 3 times the Active Energy which would be produced by the Test Proposer's Plant during 1 hour of operation at the Plant's Registered Capacity; or (ii) 500 kWh
Gas Turbine Unit	A Generation Unit driven by gas.
General Conditions	The part of Grid Code which is defined as the General Conditions
Generating Plant	A Power Station subject to Central Dispatch.
Generating Unit	Has the same meaning as Generation Unit. Generating unit shall be construed accordingly.
Generation	The process of producing electrical energy from other forms of energy; also, the amount of electric energy produced, usually expressed in megawatthours (MWh).
Generation Outage Programme	Any or all of the Indicative Outage Programme, the Provisional Outage Programme and the Committed Outage Programme.
Generation Unit	Any apparatus which produces electricity and, for the purpose of SDC1 and SDC2, shall include a CCGT/Diesel Installation or a CCGT/Diesel Unit, where running arrangements and/or System conditions apply.
Generation Unit	The Active Power and Reactive Power produced by a Generation Unit net of

Output	Generation Unit Auxiliary Load
Generator	A person or Power Station as the case may be who generates electricity and is subject to the Grid Code pursuant to any agreement with the PUC or otherwise. Autoproducers are to be considered both Generators and Demand Customers.
Generator Aggregator	A person who represents several Generating Units, each of which does not have a Registered Capacity greater than 100 kW and the combined Registered Capacity of which is equal to or greater than 1000 kW, in relation to those Generating Units and receiving Dispatch Instructions in relation to those Generating Units under SDC. For the avoidance of doubt, a Generator Aggregator cannot aggregate a Generating Unit with an output equal to or above 1000 kW.
Generator Declared Inflexibilities	The inflexibilities declared by a Generator to the PUC under SDC and which the PUC must take into account under SDC when compiling the Indicative Operations Schedule.
Generator Site	The site owned (or occupied pursuant to a lease, licence or other agreement) by the Generator which contains the Connection Point.
Generator Transformer	A transformer whose principal function is to provide the interconnection between the Generation Unit and the Network and to transform the Generation Unit voltage to the Network voltage.
Generator Terminal	The stator terminals of a Generating Unit.
Governor Control System	A system which will results in Active Power output of a Generation Unit changing, in response to a change in System Frequency, in a direction which assists in the recovery to Target Frequency
Governor Droop	The percentage drop in the Frequency that would cause the Generation Unit under free governor action to change its output from zero to its full Capacity. In the case of a Controllable REPS, it is the percentage drop in the Frequency that would cause the Controllable REPS to increase its output from zero to its full Registered Capacity.
Grid Code	The code prepared by the PUC pursuant to page 84 of the Energy Act, and approved by the SEC, as from time to time revised, amended, supplemented or replaced with the approval of or at the instruction of the SEC. Grid Code means the technical specifications defining parameters for electricity generation, autoproduction or that a co-generation plant needs to meet to ensure proper functioning of the electricity networks.
Grid Code Review Panel	The Grid Code Review Panel shall be governed by a constitution, which defines its scope, membership, duties, and rules of conduct and operation as approved by the SEC.

Grid Code Test	A test that is to be mutually agreed, with agreement not to be unreasonably withheld, and conducted in accordance with Grid Code.
Grid Connected	Connected to the T&D System
Grid Connected Transformer	Any transformer directly connected to the T&D System.
Grid Connection Point	The point at which a Generating Unit, a CCGT/Diesel Installation or a CCGT/Diesel Unit or a Customer or an External System, is directly connected to the T&D System.
Grid Supply Point or GSP	A point of connection between the T&D System and the Distribution System or a Demand Customer and Distribution System or other network operator.
Hot Cooling Boundary	The period of time, following De-Synchronisation of a Generating Unit after which the Warmth State transfers from being hot to being warm.
Hot Start	Any Synchronisation of a Generating Unit that has previously not been Synchronised for a period of time shorter than or equal to its submitted Hot Cooling Boundary.
Hydro Unit	A Unit which generates electricity from the movement of water excluding Pumped Storage.
In Writing	This includes typewriting, printing, lithography, electronic mail, facsimile and other modes of reproducing words in a legible and non-transitory form;
Incremental Price	The marginal price at a particular MW Output, for increasing Energy output (or reducing demand) by 1 MWh, once that unit has started to generate Energy (or reduce Demand, as the case may be).
Indicative Operations Schedule	The schedule prepared by the PUC pursuant to SDC.
Indicative Outage Programme	A programme of Outages of the Generator's Generation Units prepared by the PUC pursuant to OP and covering 4-7 years ahead.
Individual Demand Site	A single premises of a Demand Customer connected to the T&D System or a DSO Demand Customer connected to the Distribution System with a Demand Side Aggregator MW Capacity.
Installed Plant	The size, nature and name plate rating of each fundamental constituent part of the Generation Unit. For a conventional Generation Unit this should include, at a minimum, information on each constituent part of the alternator, excitation system and turbine. For a windfarm this should, at a minimum, include the individual Wind Turbine Generator size, make and model and the number of Wind Turbine Generator(s) installed.

	For Solar Plants this should at minimum include PVP size, make and model, number of inverter, Relevant, additional information should also be included, such as Power System Stabilisers. Where a User is not clear on the requirements, clarification must be sought from the PUC.
Initial Symmetrical Short-Circuit Current	RMS value of the AC symmetrical component of a prospective (available) short-circuit current applicable at the instant of short circuit if the impedance remains at the zero time value.
Investigation	Investigation carried out by the PUC under Monitoring, Testing and Investigation. "Investigate" shall be construed accordingly.
Licence	An electricity generation licence or an electricity supply licence, as the context requires, granted pursuant to the Energy Act, Clause 29.
Licence Standards	The standards set out or referred to in the PUC Licence.
Load	The Active Power or Reactive Power, as the context requires, generated, transmitted or distributed and all like terms shall be construed accordingly.
Load Factor	The ratio of the actual electrical Energy produced by a Generation Unit to the possible maximum electrical Energy that could be produced by that Generation Unit in any defined period
Load Up Break Point Cold	The break point which defines the shared MW boundary between the two Loading Rates Cold. The first Loading Rate Cold applies from Block Load to the first Load Up Break Point Cold, the second Loading Rate Cold applies from the first Load Up Break Point Cold to the second Load Up Break Point Cold, the third Loading Rate Cold applies from the second Load Up Break Point Cold to the end point of the Start Up period, which should be set equal to the Minimum Generation.
Load Up Break Point Hot	The break point which defines the shared MW boundary between the Loading Rates Hot. The first Loading Rate Hot applies from Block Load to the first Load Up Break Point Hot, the second Loading Rate Hot applies from the first Load Up Break Point Hot to the second Load Up Break Point Hot, the third Loading Rate Hot applies from the second Load Up Break Point Hot to the end point of the Start Up period, which should be set equal to the Minimum Generation.
Load Up Break Point Warm	The break point which defines the shared MW boundary between the Loading Rates Warm. The first Loading rate applies from Block Load to the first Load Up Break Point Warm, the second Loading Rate Hot applies from the first Load Up Break Point Warm to the second Load Up Break Point Warm, the third Loading Rate Warm applies from the second Load Up Break Point Warm to the end point of the Start Up period, which should be set equal to the Minimum Generation.
Loading Rate	The Loading Rate Cold, Loading Rate Hot or Loading Rate Warm as the case

	may be.
Loading Rate Cold	The rate at which a Generating Unit increases Output from Block Load to Minimum Generation when it is instructed to Cold Start. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Loading Rate Hot	The rate at which a Generating Unit increases Output from Block Load to Minimum Generation when it is instructed to Hot Start. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Loading Rate Warm	The rate at which a Generating Unit increases Output from Block Load to Minimum Generation when it is instructed to Warm Start. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Lopping Mode (Islanding mode)	The operation of Generation Unit(s) at an Individual Demand Site of a Demand Side Aggregator where the Generation Unit(s) supplies the Demand Customer's or DSO Demand Customer's Load while not Synchronised to the T&D System. The Generation Unit(s) is(are) Synchronised to the T&D System for short periods of time not exceeding 180 seconds at Start-Up and Shutdown of the Generation Unit(s) to facilitate a smooth transfer of power.
Low Frequency Relay	An electrical measuring relay intended to operate when its characteristic quantity (Frequency) reaches the relay settings by decrease in Frequency.
Margin	The difference between maximum Active Power (net of Auxiliary Loads) from Available Generation Units and net System Demand expressed in MW.
Maximisation	An increase in MW Output above the Registered Capacity up to the level of the Short Term Maximisation Capability, and the terms "Maximise" and "Maximised" shall be construed accordingly.
Maximisation Instruction	An instruction issued by the PUC to the Generator to Maximise the MW Output of a Generation Unit.
Maximum Continuous Rating	The maximum capacity (MW) (or effective rating), modified for ambient limitations, that a Generation Unit can sustain indefinitely without loss of equipment life, less the capacity used to supply the Auxiliary Load.
Maximum Down Time	In the case of a Demand Side Aggregator, the maximum period of time during which Demand Side Aggregator MW Response can be greater than zero.
Maximum Export Capacity	The value (in MW, MVA, kW and/or kVA) provided in accordance with the User's Connection Agreement
Maximum Import Capacity	The values (kW and/ or kVA) provided in accordance with the User's Connection Agreement
Maximum On Time	The maximum time that a Generating Unit can run following Start Up.
Maximum Ramp Down	The maximum Ramp Down Rate of a Demand Side Aggregator. In the case of

Rate	a Demand Side Aggregator which consists of an Aggregated Demand Site this shall be the aggregated maximum Ramp Down Rate of the Individual Demand Sites.
Maximum Ramp Up Rate	The maximum Ramp Up Rate of a Demand Side Aggregator. In the case of a Demand Side Aggregator which consists of an Aggregated Demand Site this shall be the aggregated maximum Ramp Up Rate of the Individual Demand Sites.
Maximum Storage Capacity	The maximum amount of Energy that can be Stored in the Storage technology, Pumped Storage Generator, BESS, Flywheel, Ultracapacitor.
Measurement Point	The Measurement Point shall be the Connection Point to the T&D System or such other point or points as may be agreed between the PUC and the User.
Merit Order	An order, compiled by the PUC pursuant to SDC1, of CDGUs, Controllable REPSs, Demand Side Aggregators, Storage Plant Demand and Aggregated Generating Units Price Sets
Meteorological Mast	A device erected at the Controllable REPS which has the capability to measure representative wind speed, wind direction, air temperature and air pressure, irradiation, soiling to a degree of accuracy corresponding to the appropriate prevailing European Standard at that time.
Meter	A device for measuring and recording units of electrical energy.
Metering Code	The code that specifies the minimum technical design and operational criteria to be complied with for metering and data collection equipment and associated procedures as required under the Market Regulation.
Metering Equipment	Meters, time switches, measurement transformers, metering protection and isolation equipment, circuitry and their associated data storage and data communications equipment and wiring which are part of the Active Energy and Reactive Energy measuring equipment at or related to a Site.
Minimum Demand Regulation (MDR)	That minimum margin of Active Power to provide a sufficient regulating margin for adequate Frequency Control.
Minimum Down Time	The minimum time that must elapse from the time a Generation Unit De-Synchronises until the next Start-Up. In the case of Demand Side Aggregators, the minimum period of time during which Demand Side Aggregator MW Response at a Demand Side Aggregator can be greater than zero.
Minimum Generation	The minimum MW Output which a Generating Unit can generate continuously, registered with the PUC under SDC as a Technical Parameter.
Minimum Load	Minimum MW Output a Generator can maintain on a continuous basis, whilst providing System Services.
Minimum off time	The minimum time that must elapse from the time of a Generation Unit Shutdown before it can be instructed to Start-up. In the case of Demand Side Aggregators, the minimum time that must elapse

	while the Demand Side Aggregator MW Response is at zero until the next delivery of Demand Side Aggregator MW Response.
Minimum on time	The minimum time that must elapse from the time of a Generation Unit Start-up before it can be instructed to Shutdown.
Minimum Storage Capacity	The minimum amount of Energy that can be Stored in the Storage technology, Pumped Storage Generator, BESS, Flywheel, Ultracapacitor.
Minimum Up Time	The minimum time that must elapse from the time of a Generation Unit Start-up before it can be instructed to Shutdown.
Modification	Any actual or proposed replacement, renovation, modification, alteration or construction by or on behalf of a User or the PUC to User's Plant or Apparatus or the PUC's Plant or Apparatus, as the case may be, or the manner of its operation which has or may have a material effect on a User or the PUC, as the case may be, at a particular Connection Site.
Monitoring	Monitoring carried out by the PUC under Monitoring, Testing and Investigation. "Monitor" shall be construed accordingly.
Mvar Output	The Reactive Power produced or absorbed by a Generation Unit net of Generation Unit Auxiliary Load
MW Dispatch Instruction	An instruction given by the PUC from its National Control Centre to the Generator's approved contact person or location regarding the MW Output of the Generation Unit.
MW Output	The actual Active Power output in MW of a Generation Unit at the Connection Point.
National Control Centre	The PUC's National Control Centre, as notified by the PUC to the Generator from time to time.
Network	The T&D System.
Network Control	Network switching and Control Actions that the PUC needs to carry out in implementing the T&D Outage Programme, in routine operation of the T&D System and in responding to emergency and fault situations on the T&D System, which may from time to time affect the operations of Users or security of supply to Users.
No Load Cost	A price which forms part of Commercial Offer Data expressed in SCR/hour and which is invariant in the level of MW Output and which applies at all times when the level of MW Output is greater than zero.
Non- Centrally Dispatched Generation Unit (NCDGU)	A Generating Unit not subject to Central Dispatch.
Normal Dispatch Condition	The condition of the Generation Unit at the End of the Start-up Period.
Notice to Synchronise	A Dispatch instruction given by the PUC from its National Control Centre to

	the Generator's approved contact person or location to synchronise the Generation Unit.
Off-Site Storage Location	The site in close vicinity to the Generator Site where (pursuant to a lease, licence or other agreement) the User stores stocks of Primary Fuel and/or Secondary Fuel. A dedicated pipeline with a dedicated pump must be in place on this site between the dedicated fuel tank off-site and the Generating Plant. As a maximum, this Off-Site Storage Location should be no more than 6 km from the Generating Plant.
Open Cycle Gas Turbine Unit	A Generation Unit driven by a gas turbine other than a CCGT Installation or CCGT Unit.
Open Cycle Mode	The mode of operation of a CCGT Installation where only the Gas Turbine Unit is operational (i.e. without operation of any associated Steam Turbine Units).
Operating Characteristics	The technical capabilities, flexibilities and limitations for the operation of a Generation Unit or Demand Side Aggregator as registered or declared in accordance with the provisions of the Grid Code.
Operating Code (SOC)	The part of Seychelles Grid Code which is identified as the Seychelles Operating Code
Operating Margin	Contingency Reserve and Operational Reserve.
Operating Mode	An Operating Mode of a Generating Unit is a pre-defined method of operating that Generating Unit, as agreed between the PUC and the User.
Operating Reserve	The additional MW Output required from Generation Units or Demand reduction which must be realisable in real time operation to contain and correct any potential Power System Frequency deviation to an acceptable level. It will include Primary Operating Reserve, Secondary Operating Reserve and Tertiary Operating Reserve
Operation	A scheduled or planned action relating to the operation of a System (including an Embedded Independent Generating Plant).
Operation Instructions	Management instructions and procedures, both in support of the Safety Rules and for the local and remote operation of Plant and Apparatus, issued in connection with the actual operation of Plant and/or Apparatus at or from a Connection Site.
Operational Control Phase	The period from real time to one week ahead of real time.
Operational Data	Data required under the Operating Codes and/or Scheduling and Dispatch Codes.
Operational Date	When the PUC is satisfied that all of the Grid Code Tests have been carried out correctly and satisfactorily completed the PUC will as soon as is practicable notify the User, specifying the time and date of such completion.
Operational Effect	Any effect on the operation of the relevant other system that causes the T&D System or the User's System to operate (or be at a materially increased risk

	of operating) differently to the way in which they would or may have normally operated in the absence of that effect. Operationally Effected shall be construed accordingly.
Operational Planning Phase	The period from 1 week to the end of the 7th year ahead of real time. Refer OC2 for more detail on Operational Planning.
Operational Tests	Tests carried out by the PUC in order to maintain and develop operational procedures, to train staff and to acquire information in respect of T&D System behaviour under abnormal System conditions, and also tests carried out by other Users for similar purposes in respect of their Plant.
OPTEL	The operational telephony system owned by PUC and used by the PUC for voice communication with Users.
Optimisation Time Horizon	The time period from and including 06:00 hours on the relevant Trading Day up to but not including 12:00 hours on the subsequent Trading Day.
Other Relevant Data	The data referred to in SDC.
Outage	In relation to a Generation Unit, a total or partial reduction in Availability such that the Generation Unit is unavailable to achieve its full Registered Capacity in accordance with its Registered Operating Characteristics. In relation to a Demand Side Aggregator, a total or partial change in Availability such that the Demand Side Aggregator is unavailable to achieve its full Demand Side Aggregator MW Capacity in accordance with its submitted Technical Parameters.
Partial Shutdown	The situation existing when all generation has ceased in part of the Power System and there is no electricity supply from any other part of the System.
Phase Voltage	Voltage measured between the line and System neutral.
Planned Rota Load Shedding	Planned De-Energisation of Customers on a rota basis where there is a significant shortfall of Generation required to meet the Total Demand for a protracted period.
Planning Code	That part of Grid Code which is identified as the Planning Code
Plant	Fixed and movable items used in the generation and/or consumption of and/or supply and/or transmission of electricity other than Apparatus.
Post Control Phase	The days following the Control Phase
Post Event Notice	A notice issued by the PUC in accordance with OC.
Power Factor	The ratio of Active Power to Apparent Power.
Power Quality	Target conditions for power quality and the variation in power quality that can be expected at Grid Connection Points.
Power Station	An installation consisting of Generation Unit(s).
Power System	The T&D System and all User System's within the Republic of Seychelles.
Power System Restoration	The restoration of the Power System or part of the Power System to a state of normal operation from a state of Total Shutdown or Partial Shutdown as the context requires.

Power System Restoration Plan	A plan, prepared and maintained by the PUC pursuant to OC setting out guidelines assisting those involved in Power System Restoration to achieve Power System Restoration as safely and as quickly as possible.
Power System Stabiliser	Device that injects a supplementary signal into the AVR (Automatic Voltage Regulator) in order to improve Power System damping.
Pre-Incident Frequency	The value is the average T&D System Frequency between 60 and 30 seconds prior to the occurrence of a significant Frequency disturbance.
Preliminary Project Planning Data	Data relating to a proposed User Development at the time the User applies for a Connection and Use of System Agreement and/or a supplemental Agreement but before an offer is made and accepted.
Price Quantity Pairs	Incremental Prices and their respective quantity ranges for Generating Units, Demand Side Aggregators, and Aggregated Generating Units as part of Commercial Offer Data.
Price Sets	The Price Quantity Pairs, Start-up Costs, Shutdown Costs and No Load Costs submitted by a User to PUC under SDC.
Primary Frequency Control	Primary Frequency Control takes place in the period of up to 30 seconds after a change in Frequency and is achieved by automatic corrective responses to Frequency deviations occurring on the T&D System. This automatic correction arises from: (a) natural frequency demand relief of motor load; (b) automatic MW output adjustment of Generation Units initiated by Governor Droop or other responses including peaking of Combustion Turbine Units, condensate stop or frequency triggered response of pumped storage units; and (c) automatic load shedding.
Primary Fuel	The fuel or fuels registered in accordance with the Grid Code as the principal fuel(s) authorized for Energy production by the Generation Unit
Primary to Secondary Fuel Switchover Output	The MW output, not lower than Minimum Load at which a Generation Unit can achieve a switch over from Primary Fuel to Secondary Fuel.
Primary Operating Reserve (POR)	The additional increase in MW Output (and/or reduction in Demand) required at the Frequency nadir (minimum), compared to the pre-incident output (or Demand) where the nadir occurs between 5 and 15 seconds after an event.
Priority Customers	Customers which are either: • exempt from load shedding under the rota load shedding scheme or • exempt from load shedding under the technical under-frequency load shedding scheme or • prioritised for supply under the technical under-frequency load shedding scheme.
Priority Dispatch	The Dispatch given priority as afforded under governing legislation.

Programming Phase	The period between Operational Planning Phase and the Control Phase. It starts at the 1 week ahead stage and finishes with the issue of the Generation Schedule for the day ahead
Provisional Outage Programme	An Outage programme of the Generator's Generation Units as prepared by the PUC pursuant to OC2 and covering years 2-3 ahead.
Provisional Running Orders	A statement prepared and issued by the PUC to the Generator pursuant to SDC1, which indicates for each Generation Unit owned or controlled by the Generator, the expected load pattern, the required fuel or fuels and Synchronising and De-Synchronising times for the following day.
Prudent Utility Practice	Those standards, practices, methods and procedures conforming to safety and legal requirements which are attained by exercising that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from skilled and experienced operatives engaged in the same type of undertaking under the same or similar circumstances.
Pumped Storage Generation	A Pumped Storage Plant in its operation of producing Energy by releasing water from an upper reservoir.
Pumped Storage Generator	A Generator which owns and/or operates any Pumped Storage Plant.
Pumped Storage Mode	A mode of operation of a Pumped Storage Unit including
Pumped Storage Plant	A Generation Plant that produces Active Energy using water from an upper reservoir and takes energy by pumping water up to the same reservoir.
Pumped Storage Plant Demand	A Pumped Storage Plant in its operation of consuming Energy by pumping water to an upper reservoir.
Pumped Storage Unit	A Generation Unit within a Pumped Storage Plant.
Ramp Down Break Point	The MW level at which the Ramp Down Rate changes. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Ramp-down Capability	The rate of decrease in a Generation Unit's Output after the End Of Start-up Period. Ramp-down Capabilities apply over the output range from its Registered Capacity to Minimum Generation. The rate of change is not dependent upon the initial warmth of the plant but may depend on the MW Output.
Ramp Down Rate	The maximum rate of decrease in a Generating Unit's Output after the End Of Start-up Period. The Ramp Down Rate applies over the output range from its Registered Capacity to Minimum Generation. The rate of change is not dependent upon the initial Warmth of the plant but may depend on the MW Output. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Ramp Up Break Point	The MW level at which the Ramp Up Rate changes. There may be circumstances where more than one parameter applies and this is indicated

	by adding a number at the end of the parameter.
Ramp-up Capability	The rate of increase in a Generation Unit' Output after the End Of Start-up Period. This rate of increase continues until the Generation Unit reaches the level of output instructed by the control room operator or its Registered Capacity. Following the End Of Start-up Period, the rate of increase is not dependent upon the initial warmth of the plant but may depend on the MW Output.
Ramp Up Rate	The maximum rate of increase in a Generating Unit's Output after the End Of Start-up Period. This rate of increase continues until the Generating Unit reaches the level of output instructed by the control room operator of its Registered Capacity. The rate of increase is not dependent upon the initial Warmth of the plant but may depend on the MW Output. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Reactive Power	Means the product of voltage and current and the sine of the phase angle between them measured in units of volt-amperes reactive and standard multiples thereof.
Red Alert	A Red Alert may be issued when the Frequency or Voltage has deviated significantly from normal, or User's Demand has been disconnected, or, in the period immediately ahead there is a high probability of failing to meet the Power System Demand or to maintain normal Voltage.
Re-declaration	Notification to the PUC by the User of any revisions to data, pursuant to SDC.
Registered Capacity	The maximum Capacity, expressed in whole kW, that a Generation Unit can deliver on a sustained basis, without accelerated loss of equipment life, at the Connection Point which is under the dispatch (or control of a Controllable REPS) of the PUC. This shall be the value at 27°C, 80% relative humidity and 1012 hPa (Mean Seychelles Value).
Registered Data	Those items of Standard Planning Data and Detailed Planning Data that upon connection become fixed (subject to any subsequent changes).
Registered Fuel	The fuel(s) registered under the Planning Code of the Grid Code
Registered Operating Characteristics	The values of a Generation Unit's Operating Characteristics for operation of the Generation Unit pursuant to the Grid Code registered under the Connection Conditions.
Regulating Margin	The margin of generating Capacity that is Synchronised over Demand which is required in order to maintain Frequency Control.
Regulatory Authority	The authority (Seychelles Energy Commission) appointed under legislation to regulate the electricity industry in the respective jurisdiction.
Regulatory Authorities	Each Regulatory Authority taken together.
Remote Terminal Unit (RTU)	A device that collects, codes and transmits data. An RTU collects information from a master device and implements processes that are directed by that

	master. RTUs are equipped with input channels for sensing or metering, output channels for control, indication or alarms and a communications port.
Renewable Power Station	An installation consisting of Renewable Generation Unit(s) as defined in the Energy Act 2012 pg. 85-86.
Remote Transmission Assets	Any Plant and Apparatus or meters owned by the TAO which: a) are Embedded in a User System and which are not directly connected by Plant and/or Apparatus owned by the TAO to a sub-station owned by the TAO; and b) are by agreement between the TAO and such User operated under the direction and control of such User.
Replacement Reserve	Replacement Reserve is the additional MW Output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully available and sustainable over the period from 20 minutes to 4 hours following an Event.
REPS Extension	An increase to the Registered Capacity of any Controllable REPS.
Reserve Characteristics	The MW level of reserve available at any given MW Output of a CDGU as set out in the available Ancillary Service Agreement.
Responsible Manager	A manager who has been duly authorised by a User or the PUC to deal with issues including matters related to the Grid Code on behalf of that User or the PUC, as the case may be.
Responsible Operator	A person nominated by a User to be responsible for control and operation of the Plant and Apparatus related to the User's System
Rise Time	In relation to reactive current response from Controllable REPS, it is the length of time from Fault Inception for reactive current to reach 90% of its steady-state value.
Rota Load Shedding Plan	A plan that provides for disconnection and reconnection of defined blocks of demand on instruction from the PUC
Safety Rules	PUC Networks Electrical Safety Rules, PUC Power Generation Electrical Safety Rules or the rules of a User, compliance with which ensures that persons working on Plant and/or Apparatus to which the rules apply are safeguarded from hazards arising from the System.
Settling Time	In relation to reactive current response from Controllable REPS, it is the length of time from Fault Inception for reactive current to settle within +/- 10% of its steady-state value.
Scheduled Operational Date	Has the meaning set out in the Connection Agreement.
Scheduled Outage	Any Fixed Outage, Flexible Outage or Short Term Scheduled Outage.
Scheduling and Dispatch Code (SDC)	The parts of the Grid Code which specify the Scheduling and Dispatch process.

Secondary Frequency Control	Secondary Frequency Control takes place in the time scale from 5 seconds up to 10 minutes after the change in Frequency. It is provided by a combination of automatic and manual actions. These include: (a) a contribution from automatic governor action and other control systems on Generation Units; (b) manual action by Generation Unit operators altering the MW Output of Generation Units in response to Dispatch Instructions issued by the PUC in accordance with SDC2.
Secondary Fuel	The fuel or fuels registered in accordance with the Grid Code as the secondary or back-up fuel(s) authorised for Energy production by the Generation Unit.
Secondary to Primary Fuel Switchover Output	The MW output, not lower than Minimum Load at which a Generation Unit can achieve a switch over from Secondary Fuel to Primary Fuel.
Secondary Operating Reserve (SOR)	The additional MW Output (and/or reduction in Demand) required compared to the pre-incident Output (or Demand), which is fully available by 15 seconds from the time of the start of the Frequency fall and sustainable up to 90 seconds following an Event.
Shaving Mode (Demand Response service using captive generation/Storage technology, etc..)	The Synchronised operation of Generation Unit(s) to the Distribution System at an Individual Demand Site of a Demand Side Aggregator where the Generation Unit(s) supplies part of, or, the DSO Demand Customer's entire Load. Normally the Generation Unit(s) would operate for 2 hours per day as agreed with the DSO.
Short-Term Maximisation Capability	The capability of a Generating Unit to deliver, for a limited duration of time, MW Output greater than its Registered Capacity.
Shutdown	The condition of a Generation Unit where the generator rotor is at rest or on barring.
Shutdown Costs	The costs associated with shutting down a Demand .
Significant System Incident (SSI)	Events which have had or might have had or might have an operational effect on the T&D System or a User's System.
Simultaneous Tap Change	A tap change implemented on the generator step-up transformers of CDGUs, effected by Generators in response to a Dispatch Instruction from the PUC issued simultaneously to the relevant Power Stations. The Dispatch Instruction, which is normally preceded by advance warning, must be effected within 1 minute of receipt from the PUC of the Dispatch Instruction.
Seychelles Electricity Market (SEM)	The wholesale Seychelles island electricity market established and governed pursuant to the relevant legislation and the MARKET REGULATION.
Site	A PUC Site, or User Site, as the case may be.
Small Scale	Generators with Registered Capacity of 50kW or less (on a single Site) and

Generators	greater than 10kW (on a site basis) where PUC considers that the Generator is in a location that does not make its operation particularly critical to the operation of the T&D System.
Soak Time Cold	The duration of time for which the Generating Unit must remain at the Soak Time Trigger Point Cold during a Cold Start. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Soak Time Hot	The duration of time for which the Generating Unit must remain at the Soak Time Trigger Point Hot during a Hot Start. . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Soak Time Trigger Point Cold	A constant MW level at which a Generating Unit must remain while loading up between Block Load and Minimum Generation after a Cold Start. . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Soak Time Trigger Point Hot	A constant MW level at which a Generating Unit must remain while loading up between Block Load and Minimum Generation after a Hot Start. . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Soak Time Trigger Point Warm	A constant MW level at which a Generating Unit must remain while loading up between Block Load and Minimum Generation after a Warm Start. . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Soak Time Warm	The duration of time for which the Generating Unit must remain at that Soak Time Trigger Point Warm during a Warm Start. . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Solar Generator(s) (PVP)	A Generation Unit(s) generating electricity from sun.
Special Action	Special Actions will generally involve a Load change, a Load reduction change or a change in required Notice to Synchronise in a specific timescale on individual or groups of CDGUs. They may also include selection of Special Protection Scheme for stability or thermal reasons.
Special Protection Scheme	A control or protection scheme to facilitate System operation by the intertripping of circuit breakers or other Control Actions.
Spin Generation	A mode of operation of a Pumped Storage Unit where it is spinning in air in the same direction as it would if it was generating Active Power
Spin Pump	A mode of operation of a Pumped Storage Unit which is intermediate between the Unit being at standstill and pumping.
Stable/Stability	A Generation Unit is adjudged to be stable if the various machine states and

	variables, including but not limited to rotor angle, active power output, and reactive power output, do not exhibit persistent or poorly damped oscillatory behaviour, when the Generation Unit is subjected to a Fault Disturbance or other transient event on the T&D System.
Standard Planning Data	The general data required by the PUC under the PC. It is generally also the data that the PUC requires from a new User in applications for Connection and Use of System Agreements.
Standby Mode	The operation of Generation Unit(s) at an Individual Demand Site of a Demand Side Aggregator where the Generation Unit(s) supplies the Demand Customer's or DSO Demand Customer's Load while not Synchronised to the T&D System.
Start of Restricted Range	The start point in MW of a Forbidden Zone. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Start-Up	The action of bringing a Generation Unit from Shutdown to Synchronous Speed.
Start-Up Cost	The costs associated with Start-Ups.
Station Board	A switchboard through which electrical power is supplied to the Auxiliaries of a Power Station, and which is supplied by a Station Transformer. It may be interconnected with a Unit Board.
Station Transformer	A transformer supplying electrical power to the Auxiliaries of a Power Station, which is not directly connected to the Generating Unit terminals.
Steam Unit	A Generation Unit whose prime mover converts the heat-energy in steam to mechanical energy.
Step Change	A step change is defined as a single, rapid change of the RMS voltage. T&D System step changes can occur due to switching in and out of capacitors, lines, cables, transformers and other plant.
Substitute Reserve	The additional MW output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully available and sustainable over the period from 4 hours to 24 hours following an Event.
Supercapacitor	A technology storing energy in a dielectric insulating material.
Supplier	The holder of a Supply Licence.
Supply	The process of delivering electrical energy by a Supplier; also, the amount of electric energy delivered, usually expressed in megawatthours (MWh).
Synchronise	The condition where an incoming Generation Unit or system is connected to another System so that the frequencies and phase relationships of that Generation Unit or System, as the case may be, and the System to which it is connected are identical and the terms "Synchronise", "Synchronising". The "Synchronisation" shall be construed accordingly.
Synchronous	The operation of rotating synchronous Apparatus for the specific purpose of

Compensation	either the Generation or absorption of Reactive Power.
Synchronous Start-Up Time Cold	The time taken to bring a Generating Unit to a Synchronised state from a Cold (De-Synchronised) state.
Synchronous Start-Up Time Hot	The time taken to bring a Generating Unit to a Synchronised state from a Hot (De-Synchronised) state.
Synchronous Start-Up Time Warm	The time taken to bring a Generating Unit to a Synchronised state from a Warm (De-Synchronised) state.
System	Any User System and/or the T&D System as the case may be.
System Capacity Shortfall Warning	A warning issued by the PUC if, the Availability forecast and Demand forecast indicate that there will be a deficit in any week,
System Emergency Condition	A Partial Shutdown or Total Shutdown or any other physical or operational condition and/or occurrence on the Power System which, in the PUC's reasonable opinion, is (i) imminently likely to endanger or is endangering life or property; or (ii) is imminently likely to impair or is impairing: - the PUC's ability to discharge any statutory, regulatory or other legal obligation and/or - the safety and/or reliability of the Power System.
System Planning	The process by which the performance of the System is evaluated and future changes and additions to the System are determined.
System Planning Data	Data that must be submitted at regular periods by all Users, or other such data or information as requested by the PUC under Planning Code.
System Services	Services which are required for System reasons and which include those which must be provided by Users in accordance with the Connection Conditions and those which must be provided by a User if the User has agreed to provide them under supplemental agreements
System Support Agreement	A bilateral agreement between the PUC and a User for services which are required for System reasons and which exclude those which must be provided by Users in accordance with the Connection Conditions.
System Support Services	Those services defined as System Support Services in the PUC Licence.
System Test	Tests which involve simulating conditions, 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 recommissioning tests or any other tests of a minor nature.
Target Frequency	That Frequency determined by the PUC, in its reasonable opinion, as the desired operating Frequency of the Power System.
Target Reservoir Levels	Part of the Commercial Offer Data for a Pumped Storage Generating Unit and means the target level of the reservoir for the end of the Trading Day.
Technical Parameters	The technical capabilities, flexibilities and limitations for the operation of a

	User's Plant as registered or declared in accordance with the provisions of the Grid Code including those parameters listed in Renewables and Power Technology Report, Appendix A in SDC.
Technical Parameters Notice	A notification as submitted under SDC.
Tertiary Operating Reserve	Tertiary Operating Reserve band 1 and Tertiary Operating Reserve band 2
Tertiary Operating Reserve band 1	The additional MW Output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully available and sustainable over the period from 90 seconds to 5 minutes following an event.
Tertiary Operating Reserve band 2	The additional MW Output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully available and sustainable over the period from 5 minutes to 20 minutes following an event.
Test Proposer	The User submitting proposal for a test.
Testing	Testing carried out by the PUC pursuant to OC and/or CC. The term "Test" shall be construed accordingly.
Thermal Overload	A Thermal Overload occurs when the designed thermal rating of a transmission line or cable is exceeded. The thermal rating of a transmission line is dictated by its physical construction and varies with the ambient weather conditions, while the thermal rating of a transmission cable is dependent solely on its physical construction.
Thermal Plant	A Generating Unit that uses any source of thermal Energy.
Total Shutdown	The situation existing when all generation has ceased and there is no electricity supply
Transmission Asset Owner (TAO)	The PUC, acting in its capacity as the T&D System Owner.
Transmission Planning Criteria	System Planning practices and considerations that the PUC follows. The application of Transmission Planning Criteria may vary to match local conditions and local System requirements.
Transmission Reliability Margin	A transmission transfer capacity margin which accounts for the security margin for regulation, reserve sharing, and may also take into account uncertainties of system conditions and other assumptions made to produce Total Transfer Capacity ex-ante.
Transmission Station	A node in the electricity T&D System with transmission circuit/s, transformer/s, circuit breakers and their associated protection and communications systems. For avoidance of doubt these are substation with 33 kV voltage level and above
T&D System	The System consisting (wholly or mainly) of high Voltage electric lines and underground cables operated by the PUC for the purposes of transmission of electricity from one Power Station to a sub-station or to another Power

	Station or between sub-stations or to or from any External Interconnection including any Plant and Apparatus and meters owned or operated by the PUC or TAO in connection with the transmission of electricity.
T&D System Operator (PUC)	The holder of the licence granted pursuant to Energy Act 11, 2012 to operate a T&D System.
T&D System Owner	The holder of the licence granted pursuant to Energy Act 11, 2012 to own the T&D System.
PUC Licence	A Licence authorising a PUC to carry out electricity transmission activities, pursuant to Energy Act of the Republic of Seychelles.
PUC Telecommunication Interface Cabinet	The physical interface point between the PUC's telecommunications equipment and the Controllable REPS's control equipment.
Under Test Flag	The flag indicating the under test status accorded to certain Generating Units by PUC in accordance with the relevant Grid Code.
Unit Board	A switchboard through which electrical power is supplied to the Auxiliaries of a Generating Unit and which is supplied by a Unit Transformer. It may be interconnected with a Station Board.
Unit Transformer	A transformer directly connected to a Generating Unit's terminals, and which supplies power to the Auxiliaries of a Generating Unit.
Use of System Agreement	An agreement between the PUC and a User setting out the terms relating to the use of the T&D System.
Use of System Tariffs	Tariffs set by the PUC subject to approval by the SEC for use of the T&D System.
User	A term utilised in various sections of the Grid Code to refer to the persons using the T&D System, as more particularly identified in each section of the Grid Code concerned. The term means any person (other than the PUC) to whom the Grid Code applies.
User Development	In the Planning Code means either User's Plant and/or Apparatus to be connected to the T&D System, or a Modification relating to a User's Plant and/or Apparatus already connected to the T&D System, or a proposed new connection or Modification to the connection within the User System.
User Site	A site owned (or occupied pursuant to a lease, licence or other agreement) by a User on which there is a Connection Point.
User System	Any system owned or operated by a User comprising:- (i) Generating Units; and/or (ii) systems consisting (wholly or mainly) of electric circuits used for the distribution of electricity from Grid Supply Points or Generating Units or other entry points to the point of delivery to Customers, or other Users;

	and Plant and/or Apparatus connecting: a) the system as described above; or b) Demand Customers' equipment; to the T&D System or to the relevant other User System, as the case may be. The User System includes any Remote T&D Assets operated by such User or other person and any Plant and/or Apparatus and meters owned or operated by the User or other person in connection with the distribution of electricity but does not include any part of the T&D System.
User System Entry Point	A point at which a Generation Unit, a CCGT/Diesel Installation or a CCGT/Diesel Unit, as the case may be, which is Embedded connects to the User System.
Var	A single unit of Reactive Power.
Voltage	Voltage of relevant section of T&D System- nominally 11kV, 0.4kV.
Voltage Control	The retention of the Voltage on the System within acceptable limits.
Voltage Dip	A short-duration reduction in Voltage on any or all phases due to a Fault Disturbance or other Significant System Incident, resulting in T&D System Voltages outside the ranges and more generally, bus Voltages or terminal Voltages of less than 90% of nominal voltage on any or all phases. Percentage Voltage Dip shall be calculated with respect to nominal voltage.
Voltage Regulation	The automatic adjustment of Reactive Power output from a Generation Unit(s) in response to Voltage changes.
Voltage Regulation Set-point	The Voltage in kV that the Voltage Regulation System will act to regulate by continuous modulation of the REPS 's Reactive Power.
Voltage Regulation System	A facility providing the means to automatically adjust the Reactive Power output from a Generation Unit(s) in response to changes in Voltage.
Voltage Regulation System Slope Setting	The percentage change in T&D System Voltage that would cause the Reactive Power output of a Controllable REPS to vary from maximum Mvar production capability of Q/Pmax of 0.33 to maximum Mvar absorption capability of Q/Pmax of -0.33 or vice-versa.
Warm Cooling Boundary	The period of time, which must be greater than that defined by the Hot Cooling Boundary, post De-Synchronisation of a Generating Unit after which the Generating Unit's Warmth State transfers from being warm to cold.
Warm Start	Any Synchronisation of a Generating Unit that has previously not been Synchronised for a period of time longer than its submitted Hot Cooling Boundary and shorter than or equal to its submitted Warm Cooling Boundary.
Warmth	The temperature related condition of a CDGU which changes according to the length of time since the CDGU was last De-Synchronised, expressed as various levels of warmth (dependent upon the design of the CDGU).

Warmth State	Either cold, warm or hot, as defined under the timeframes since last De-Synchronisations for Cold Start, Warm Start or Hot Start respectively.
Warning	A warning as provided for in OC.
Wind Farm Control System	The control system at the Controllable WFPS which provides for Active Power Control, Frequency Response, ramp rate control and other WTG control features.
Solar PV Control System	The control system at the Controllable PVPS which provides for Active Power Control, Frequency Response, ramp rate control and other PVP control features.
Wind Following Mode	A mode of operation of a Controllable WFPS where the system frequency is within normal range and the Controllable WFPS is not under Active Power Control by the PUC, allowing the Controllable WFPS to produce up to 100% of its Available Active Power, depending on the Power-Frequency Curve in operation. When operating on Power-Frequency Curve 2, the Controllable WFPS is required to maintain its Active Power output at a fixed percentage of its Available Active Power when T&D System Frequency is within the deadband range.
Wind Following Ramp Rate	The maximum rate of increase of Active Power output of a Controllable WFPS in response to an increase in wind speed.
Wind Turbine Generator(s) (WTG)	A Generation Unit(s) generating electricity from wind.
Within-Day Test	An Operational Test with a total duration of less than 6 hours in any Trading Day and if the scheduling of the test results in a deviation from the Indicative Operations Schedule of less than: (i) 3 times the Active Energy which would be produced by the Test Proposer's Plant during 1 hour of operation at the Plant's Registered Capacity; and (ii) 500 kWh.

2 GENERAL CONDITIONS (GC)

GC.1 Introduction

GC.1.1 The General Conditions (GC) contain provisions of more general application, which need to be included in the Grid Code.

GC1.2 Where the Glossary refers to any word or term which is more particularly defined in a part of the Grid Code, the definition in that part of the Grid Code will prevail over the definition in the Glossary in the event of any inconsistency.

GC.2 Objectives

GC.2.1 The objectives of the General Conditions are as follows:

a) to ensure, insofar as it is possible, that the various sections of the Grid Code work together, and work in practice, for the benefit of the operation of the Power System and for the benefit of the GO and Users;

b) to provide a set of principles governing the status and development of the Grid Code and related issues, as approved by the SEC;

c) to provide an outline of how the GO, and the Regulatory Authorities will cooperate with regard to Grid Code revisions and derogations to both Sections Under Common Governance and other Grid Code sections which may be considered to be relevant to the operation of the grid.

GC.3 Scope

GC.3.1 The General Conditions apply to the GO, SEC and to all Users as they are defined in the Glossary.

GC.4 Purpose

GC.4.1 This Grid Code is designed to cover all material technical aspects relating to the operation and use of the T & D System, and all material technical aspects relating to the use of Plant and or Apparatus connected to the T & D System.

GC.5 Grid Code Review Panel

GC.5.1 The GO shall establish and maintain the Grid Code Review Panel which shall be a standing body constituted to:

(a) generally review and discuss the Grid Code and its workings;

(b) review and discuss suggestions for amendments to the Grid Code which the GO, the SEC, or any User may wish to submit to the GO for consideration by the Grid Code Review Panel from time to time;

(c) discuss what changes are necessary to the Grid Code arising out of any unforeseen circumstances referred to it by the GO; and

(d) publish recommendations and ensure that User consultation upon such recommendations has occurred through Grid Code Review Panel members.

GC.5.2 The Grid Code Review Panel shall be governed by a constitution, which defines its scope, membership, duties, and rules of conduct and operation as approved by the SEC.

The Grid Code Review Panel members shall be chosen from the following entities:

- the Chairman and 2 people appointed by GO;
- a person appointed by SEC;
- 2 people representing all power producers that each have production facility with a total registered capacity in excess of 100MW;
- 2 people representing all power producers that each have centrally dispatched production facility with a total registered capacity of 100MW or less.

GC.6 Grid Code Revision

GC.6.1 All revisions to the Grid Code must be reviewed by the Grid Code Review Panel prior to application to the SEC by the GO. All proposed revisions from Users, the SEC, or the GO will be brought before the Grid Code Review Panel by the GO for consideration. In the event that any member of the Grid Code Review Panel decides that the revision is worthwhile, it shall be reviewed. The GO shall then inform the proposer of the decision, with an accompanying explanation if required. If the proposing User is not satisfied with the response from the GO, they can bring it to the attention of SEC to determine what revision should be made.

The GO will advise the Grid Code Review Panel, all Users, and the SEC of all proposed revisions to the Grid Code with notice of no less than 10 Business days in advance of the next scheduled meeting of the Grid Code Review Panel.

GC.6.2 Following review of a proposed revision by the Grid Code Review Panel, the GO will apply to the SEC for revision of the Grid Code based on the GO recommendation and shall make representation of all other views or considerations including those of the Grid Code Review Panel. The GO, in applying to the SEC, shall also notify each User of the proposed revision and other views expressed by the Grid Code Review Panel and Users so that each User may consider making representations directly to the SEC regarding the proposed revision.

GC.6.3 The SEC shall consider the proposed revision, other views, and any further representations and shall determine whether the proposed revision should be made and, if so, whether in the form proposed or in an amended form. Where amendments to the revision are

contemplated by the SEC, the SEC shall consult the Grid Code Review Panel, the GO, and Users as appropriate.

GC.6.4 Having been so directed by the SEC that the applied for revision or amended revision shall be made, the GO shall notify each User of the revision at least 10 Business Days prior to the revision taking effect, and the revision shall take effect (and this Grid Code shall be deemed to be amended accordingly) from (and including) the date specified in such notification or other such date as directed by the SEC.

GC.7 Grid Code Interpretation

GC.7.1 In the event that any User requires additional interpretation of the intention and application of any provision of the Grid Code, it may apply to the GO for such interpretation. Provided that the request is reasonable, the GO shall provide the User with an interpretation of the relevant provision. All communication shall be in writing.

GC.7.2 In the event that the User, acting reasonably, considers that an interpretation provided by the GO pursuant to GC.7.1 is incomplete, the User may request additional clarification from the GO.

GC.7.3 In the event that the User, acting reasonably, considers that an interpretation provided by the GO pursuant to GC.7.1 is unreasonable or incorrect, the User may require the GO to refer the matter for consideration, at the next scheduled meeting of the Grid Code Review Panel.

GC.8 Derogations

GC.8.1 If a User finds that it is, or will be, unable to comply with any provision of the Grid Code, then it shall without delay report such non-compliance to the GO and shall, subject to the provisions of GC.9.2 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable. Where the GO is aware or should reasonably be aware that a non-compliance may have an impact on the operation, the GO shall provide details of the non-compliance.

GC.8.2 Where the non-compliance is:

(a) with reference to Plant and/or Apparatus connected to the T & D System and is caused solely or mainly as a result of a revision to the Grid Code; or

(b) with reference to Plant and/or Apparatus which is connected, approved to connect, or for which approval to connect to the T & D System is being sought,

and the User believes either that it would be unreasonable (including cost and technical considerations) to require it to remedy such non-compliance or that it should be granted an extended period to remedy such non-compliance, it shall promptly submit to the GO a request for a derogation from such provision in accordance with the requirements of GC.8.3

and shall provide the SEC with a copy of such a request. In consideration of a derogation request by a User, the GO may contact the relevant User to obtain clarification of the derogation request, or to obtain further information regarding the request, or to discuss changes to the request. Once the derogation request has been validated by the GO, the reference number is assigned.

The GO will assess the derogation request and provide to the SEC an assessment and a recommendation.

On receipt of a derogation assessment from the GO, the SEC will consider the derogation request, the GO's assessment and the GO's recommendation.

In its consideration of a derogation request by a User, the SEC may contact the relevant User and/or the GO to obtain clarification of the request, or to obtain further information regarding the request, or to discuss changes to the request.

Provided that the SEC considers that the grounds for the derogation are reasonable, then the SEC shall grant such derogation unless the derogation would, or it is likely that it would, have a materially adverse impact on the security and stability of the T & D System or the other T & D System or impose unreasonable costs on the operation of the T & D System or on other Users

GC.8.3 A request for derogation from any provision of the Grid Code shall contain:

(a) the version number of the Grid Code;

(b) identification of the Plant and/or Apparatus in respect of which a derogation is sought;

(c) identification of the provision with which the User is, or will be, unable to comply;

(d) the extent of the non-compliance;

(e) the reason for the non-compliance; and

(f) the date by which compliance will be achieved (if remedy of the non-compliance is possible) subject to GC.8.2.

GC.8.4 If the GO finds that it is, or will be, unable to comply with any provision of the Grid Code, then it shall, subject to the remaining provisions of GC.8 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.

GC.8.5 In the case where the GO requests a derogation, the GO shall submit the information set out in GC.8.3 to the SEC.

GC.8.6 To the extent of any derogation granted in accordance with this GC.8, the GO and/or the User (as the case may be) shall be relieved from its obligation to comply with the applicable provision of the Grid Code and shall not be liable for failure to so comply but shall comply with any alternate provisions as set forth in the derogation.

GC.8.7 The SEC shall:

(a) keep a register of all derogations which have been granted, identifying the company and Plant in respect of whom the derogation has been granted, the relevant provision of the Grid Code and the Grid Code version number, the period of the derogation and the extent of compliance to the provision;

(b) on request from any User, provide a copy of such register of derogations to such User; and

(c) publish this register online.

GC.8.8 Where a material change in circumstance has occurred a review of any existing derogations, and any derogations under consideration, may be initiated by the SEC at the request of the SEC, the GO, or Users.

GC.9 Plant Failures

GC.9.1.1 When partial breakage or partial failure of a Plant and/or Apparatus occurs which causes a non-compliance but does not necessarily prevent the Plant and/or Apparatus being operated safely or securely then the User shall promptly notify the GO of the non-compliance and the User's proposed programme for remedying the non-compliance.

GC.9.1.2 Where time permits and if the GO reasonably considers that a non-compliance of a User as described in GC.9.1 may have a materially adverse impact on another User or Users, the GO will consult the affected User or Users as to the impact of the intended non-compliance on the User or Users.

GC.9.1.3 If the GO, acting reasonably, and taking into account the operation of the T & D System and the consultation with any affected Users in GC.9.2, is satisfied as to the User's programme for remedying the non-compliance, and the breakage or failure is not causing or is not likely to cause the Plant and/or Apparatus to materially affect the security and stability of the T & D System or other Users and is not likely to impose unreasonable and unforeseen costs on the operation of the T & D System or other Users, then the GO may, for so long as the GO is so satisfied, treat the User as being in compliance with the relevant provision of the Grid Code, and the User will be deemed to be so compliant.

GC.9.1.4 If the GO, at its discretion, taking into account the operation of the T & D System and the consultation with any affected Users in GC.9.2, is not satisfied as to the User's programme for remedying the non compliance, the User shall apply for a derogation under the terms of GC.8.

GC.9.2 When breakage or failure of a Plant and/or Apparatus occurs which causes a non-compliance which prevents the Plant and/or Apparatus being operated safely or securely then the User shall promptly notify the GO of the non-compliance and reflect such non-compliance in Availability Notices and Technical Parameters Notices and other data submitted under SDC1 until such time as the non-compliance has been remedied.

GC.9.3 Failing agreement between the User and the GO, the User shall immediately apply for derogation in accordance with GC 8.2.

GC.10 Assistance in Implementation

GC.10.1 The GO has a duty to implement, and comply with, the Grid Code as approved by the SEC.

GC.10.2 In order to fulfil its duty to implement the Grid Code the GO may, in certain cases, need access across boundaries, or may need services and/or facilities from Users. This could, for example, include De-Energising and/or disconnecting Plant and/or Apparatus. These cases would be exceptional and it is not, therefore, possible to envisage precisely or comprehensively what the GO might reasonably require in order to put it in a position to be able to carry out its duty to implement the Grid Code in these circumstances.

GC.10.3 Accordingly, all Users are required to abide by the letter and spirit of the Grid Code, which shall include providing the GO with such rights of access, services and facilities as provided for in appropriate agreements, and complying with such instructions as the GO may reasonably require in implementing the Grid Code.

GC.11 Unforeseen Circumstances

GC.11.1 If circumstances arise which the provisions of the Grid Code have not foreseen, the GO shall to the extent reasonably practicable in the circumstances, consult promptly and in good faith with all affected Users in an effort to reach agreement as to what should be done.

GC.11.2 If agreement between the GO and those Users as to what should be done cannot be reached in the time available, the GO shall determine what should be done. Whenever the GO makes such a determination it shall have regard wherever practicable in accordance with this GC.11 to the views expressed by Users and, in any event, the GO will act reasonably and in accordance with Prudent Utility Practice in all circumstances. In addition the GO will, following such a determination and upon request, make available to any affected User its reasons for the determination.

GC.11.3 Each User shall comply with all instructions given to it by the GO following such a determination provided the instructions are consistent with the then current technical parameters of the User System as notified under the Grid Code. The GO shall promptly refer

all such unforeseen circumstances, and any such determination, to the Grid Code Review Panel for consideration. In cases of unforeseen circumstances, the panel will hold a meeting outside of the schedule (not less than 4 times each year).

GC.12 Hierarchy

In the event of any conflict between the provisions of the Grid Code and any contract, agreement, or arrangement between the GO and a User, the provisions of the Grid Code shall prevail unless the Grid Code expressly provides otherwise.

GC.13 Ownership of Plant and/or Apparatus

References in the Grid Code to Plant and/or Apparatus of a User include Plant and/or Apparatus used by a User under any agreement with a third party.

GC.14 System Control

Where a User System is, by agreement, under the GO control, then for the purposes of communication and the co-ordination of operational time scales the GO can (for these purposes only) treat that User System (or part thereof) as part of the T & D System, but as between the GO and other Users it will continue to be treated as the User System.

GC.15 Illegality and Partial Invalidity

GC.15.1 If any provision of the Grid Code should be found to be illegal or partially invalid for any reason, the legality and validity of all remaining provisions of the Grid Code shall not be affected.

GC.15.2 If part of a provision of the Grid Code is found to be unlawful or invalid but the rest of such provision would remain valid if part of the wording were deleted, the provision shall apply with such modification as may be necessary to make it valid and effective, but without affecting the meaning or validity of any other provision of the Grid Code.

3 PLANNING CODE (PC)

PC.1 Introduction

Development of the T & D System will arise for a number of reasons including, but not limited to:

(a) development on a User System already connected to the T & D System;

(b) the introduction of a new Connection Site or the Modification of an existing Connection Site between a User System and the T & D System;

(c) changing requirements for electricity T & D facilities due to changes in factors such as Demand, Generation, technology reliability requirements, and/or environmental requirements; and

(d) the cumulative effect of a number of such developments referred to in above by one or more Users.

Accordingly, the development of the T & D System may involve work:

(a) at a new or existing Connection Site where User's Plant and/or Apparatus is connected to the T & D System;

(b) on new or existing T & D circuits or other facilities which join that Connection Site to the remainder of the T & D System; and

(c) on new or existing T & D circuits or other facilities at or between points remote from that Connection Site.

The time required for the planning and subsequent development of the T & D System will depend on the type and extent of the necessary work, the time required for obtaining planning permission and wayleaves, including any associated hearings, and the degree of complexity in undertaking the new work while maintaining satisfactory security and quality of supply on the existing T & D System.

PC.2 Objectives

The objectives of the Planning Code are to provide for:

(a) GO/User interaction in respect of any proposed development on the User System that may impact on the performance of the T & D System or the direct connection with the T & D System;

(b) the supply of information required by the GO from Users in order for the GO to undertake the planning and development of the T & D System in accordance with the T & D Planning Criteria and relevant standards;

(c) the supply of information required by the GO for the purposes of the Forecast Statement.

PC.3 Scope

The Planning Code applies to the GO and to the following Users:

(a) Generators and Generator Aggregators with Registered Capacity greater than 50 kW;

(b) all Generators connected to the 33 kV System;

(c) T & D Asset Owner;

(d) Demand Customers; and

(e) Demand Side Aggregators.

The above categories of User will become bound by the Planning Code prior to generating, distributing or consuming electricity, as the case may be, and references to the various categories (or to the general category) of User should, therefore, be taken as referring to a prospective User in that role as well as to Users actually connected.

PC.4 Planning Procedures for Connection

PC.4.1 Information

PC.4.1.1 Users and prospective Users of the T & D System are able to assess opportunities for connecting to, and using, the T & D System, through:

(a) the statement, prepared by the GO, enabling prospective Users to assess for each of the seven succeeding years, the opportunities available for connecting to and using the T & D System and to assess those parts of the T & D System most suited to new connections and transport of further quantities of electricity;

(b) a Connection Offer by the GO to enter into or amend a Connection Agreement; and

(c) published Use of System Tariffs.

PC.4.2 Application for Connection

PC.4.2.1 Users proposing a new Connection Site or Modification of an existing Connection Site shall send an application form to the GO.

PC.4.2.2 The application form to be submitted by a User when making an application for a Connection Offer shall include:

(a) a description of the Plant and/or Apparatus to be connected to the T & D System or, as the case may be, of the Modification relating to the User's Plant and/or Apparatus already connected to the T & D System, each of which shall be termed a "User Development" in the Planning Code;

(b) the relevant data as listed in the Planning Code Appendix; and

(c) the desired Connection Date and Operational Date of the proposed User Development.

PC.4.2.3 The application form for a Connection Offer shall be sent to the GO as more particularly provided in the connection offer process documentation.

PC.4.2.4 Data supplied in the application form or data submitted along with the application form which is directly relevant to the application and has been submitted in support of it will be treated as Preliminary Project Planning Data until such time as the Connection Offer has been made and accepted.

PC.4.3 Connection Offer

PC.4.3.1 A Connection Offer shall include, but shall not be limited to, the following:

(a) details of how the connection is to be made, including details of the Plant and Apparatus that will be required to implement the connection;

(b) a description of any Modification that the applicant User is required to pay for;

(c) an indication of the Connection Date and the Operational Date; and

(d) an estimate of the charges for connection.

PC.4.3.2 Any Connection Offer will provide that it must be accepted by the applicant User within the period stated in the Connection Offer, after which the Connection Offer will automatically lapse. Acceptance of the Connection Offer shall be effected by execution of the Connection Agreement by both parties which renders the connection works relating to that User Development committed and binds both parties in accordance with its terms. Within 30 Business Days (or such longer period as the GO may agree in any particular case) of acceptance of the Connection Offer the User shall supply the data pertaining to the User Development as listed in the Appendix to this Planning Code.

PC.4.3.3 Once a Connection Offer has been accepted then all data supplied in the application form and any data submitted along with the application form will be treated as Committed Project Planning Data.

PC.4.4 Complex Connection

PC.4.4.1 The magnitude and complexity of any T & D System development will vary according to the nature, location and timing of the proposed User Development which is the subject of the application and it may, in certain circumstances, be necessary for the GO to carry out additional or more extensive system studies to evaluate more fully the impact of the proposed User Development on the T & D System. Where the GO judges that such additional or more extensive studies are necessary the GO shall advise the User the areas that require more detailed analysis and before such additional studies are carried out, the User shall indicate whether it wishes the GO to undertake the work necessary to proceed to make a Connection Offer within the period allowed or such extended time as the GO, acting reasonably considers is necessary.

PC.4.4.2 To enable the above detailed system studies to be carried out, the GO may require the User to supply some or all of the data items listed in the Appendix to this Planning Code as Committed Project Planning Data in advance of the normal time-scale, provided that the GO considers that it is relevant and necessary. In the event that such data items are supplied they will be treated as Preliminary Project Planning Data submitted in support of the application as outlined in PC.4.2.4.

PC.4.5 Notice Required

PC.4.5.1 Any User proposing to de-rate, close, retire, withdraw from service or otherwise cease to maintain and keep available for Dispatch in accordance with Good Industry Practice any Generation Unit or Generation Units or Controllable REPSs with Registered Capacity greater than 100 kW in aggregate shall give the GO at least 18 calendar months notice of such action and any Generation Unit or Generation Units or Controllable REPSs with Registered Capacity less than or equal to 50 kW in aggregate shall give the GO at least 12 calendar months notice of such action.

PC.5 System Planning

PC.5.1 In order for the GO to undertake the planning and development of the T & D System, in accordance with the relevant standards, and, where appropriate, to participate in the coordinated planning and development of both the T & D System, the GO will require Users to provide data and information on a regular basis. Information received for this purpose will be treated as System Planning Data.

PC.5.2 The GO may also require additional data or information from a User. Where the GO considers that this information is required then the User where reasonable shall submit the information to the GO without delay. Such information may be required so that the GO can:

(a) plan and develop the T & D System in accordance with the relevant standards;

(b) monitor Power System adequacy and Power System performance and project future Power System adequacy and Power System performance; and

(c) fulfil its statutory and regulatory obligations.

PC.5.3 In the planning and development of the T & D System, the GO may require an individual User, or group of Users, to modify or install new Plant or Apparatus, where the GO can reasonably show that it is prudent or necessary to do so. A User may object on grounds that to modify or install new Plant or Apparatus as required, in accordance with Good Industry Practice, would be technically infeasible. This may include, but shall not be limited to, for example, the installation of Power System Stabilizers.

PC.6 Planning Data

PC.6.1 As far as the Planning Code is concerned, there are three relevant types of data; Preliminary Project Planning Data, Committed Project Planning Data and System Planning Data.

PC.6.1.1 These three types of data, which relate to differing levels of confidentiality, commitment and validation, are described below.

PC.6.1.2 Preliminary Project Planning Data and Committed Project Planning Data relate to the data required from a User at various stages during the process for introduction of a new Connection Site or Modification of an existing Connection Site as outlined in PC.4, and more specifically in the application form for a Connection or Modification. System Planning Data relates to the data that must be submitted at regular periods by all Users, or other such data or information as requested by the GO under PC.6.

PC.6.2 An existing User proposing a new Connection Site will need to supply data both in an application for a Connection Offer and under the Planning Code in relation to that proposed new Connection Site and such information will be treated as Preliminary Project Planning Data or Committed Project Planning Data (as the case may be), but the data an existing User supplies under the Planning Code relating to its existing Connection Sites will be treated as System Planning Data

PC.6.3 Preliminary Project Planning Data

PC.6.3.1 At the time the User applies for a Connection Offer but before such an offer is made by the GO, the data relating to the proposed User Development will be considered as Preliminary Project Planning Data. This data will be treated as confidential within the scope of the provisions relating to confidentiality in the GO policy on confidentiality.

The following information shall be published on the GO website:

(i) User's name (legal and project name);

(ii) User's contact details;

(iii) User's date of completed application;

(iv) Status of application, for example in progress or issued;

(v) Specific location, including grid co-ordinates;

(vi) The Registered Capacity applied for; and

(vii) Interacting group where applicable.

PC.6.3.2 Preliminary Project Planning Data contains such data as may be reasonably required by the GO to evaluate the connection application/ as outlined in PC.4.2 and, if applicable, any other data directly relevant to, and submitted in support of, the application.

PC.6.4 Committed Project Planning Data

PC.6.4.1 Once the Connection Offer has been formally accepted by the prospective User, the data relating to the User Development, already submitted as Preliminary Project Planning Data, and any subsequent data required by the GO under this Planning Code, will become Committed Project Planning Data. This data, together with other data held by the GO relating to the T & D System will form the basis from which new applications by any User will be considered and from which planning of the T & D System and power system analysis will be undertaken. Accordingly, Committed Project Planning Data will not be treated as confidential to the extent that the GO is obliged:

(a) to use it in the preparation of the Forecast Statement and in any further information given pursuant to the Forecast Statement;

(b) to use it when considering and/or advising on applications (or possible applications) of other Users (including making use of it by giving data from it, both orally and in writing, to other Users making an application (or considering or discussing a possible application) which is, in the GO's view, relevant to that other application or possible application);

(c) to use it for the GO planning purposes and to use it when participating in coordinated planning and development of both the T & D System;

PC.6.5 To reflect different types of data, Preliminary Project Planning Data and Committed Project Planning Data are themselves divided into those items of Data which:

(a) will always be forecast, known as Forecast Data;

(b) upon connection become fixed (subject to any subsequent changes), known as Registered Data; and

(c) relate to Plant and/or Apparatus which upon connection will become Registered Data, but which prior to connection will be an estimate of what is expected, known as Estimated Registered Data.

PC.6.6 System Planning Data

PC.6.6.1 The Planning Code requires that, as soon as is practical, and not later than a date which is the earlier of 18 months prior to the scheduled Operational Date or 6 months after the signing of the Connection Agreement, unless otherwise directed by the SEC, all data requirements as stated in the Appendix to the Planning Code, not previously requested by the GO and supplied by the User, will be submitted by the User to the GO. This will include confirming any estimated values assumed for planning purposes or, where practical, replacing them by validated actual values and by updated estimates for the future and by updating forecasts for Forecast Data items such as Demand. As more accurate data becomes available, due to completion of detailed design, test measurements/results or any other sources, this information will be submitted by the User to the GO as soon as practicable and not later than the Operational Date.

PC.6.6.2 The Planning Code requires that Users submit to the GO, each year, the System Planning Data as listed in the Appendix to the Planning Code. This data should be submitted by

calendar week 8 of each year and should cover each of the ten succeeding years (and in certain instances the current year). Where from the date of one submission to the/a subsequent date submission there is no change in the data to be submitted for any given year, instead of resubmitting the data, a User may submit a written statement that there has been no change from the data submitted the previous time, pertaining to the particular year specified.

PC.6.7 System Planning Data, together with other data held by the GO relating to the T & D System, will form the basis from which new applications by any User will be considered and from which planning of the T & D System will be undertaken. Accordingly, System Planning Data will not be treated as confidential to the extent that the GO is obliged:

(a) to use it in the preparation of the Forecast Statement and in any further information given pursuant to the Forecast Statement;

(b) to use it when considering and/or advising on applications (or possible applications) of other Users (including making use of it by giving data from it, both orally and in writing, to other Users making an application (or considering or discussing a possible application) which is, in the GO's view, relevant to that other application or possible application);

(c) to use it for the GO planning purposes;

To reflect the different types of data referred to above System Planning Data is itself divided into those terms of data:

1) which will always be forecast, known as Forecast Data;

2) which upon connection become fixed (subject to any subsequent changes), known as Registered Data; and

3) which relate to Plant and/or Apparatus which for the purposes of the Plant and/or Apparatus concerned as at the date of submission are Registered Data but which for the ten succeeding years will be an estimate of what is expected, known as Estimated Registered Data.

PC.7 Planning Standards

PC.7.1 The GO shall apply the T & D Planning Criteria and relevant standards in the planning and development of the T & D System and where appropriate when participating in the coordinated planning and development of the T & D System.

PC.7.2 In assessing the technical requirements of a User's connection, the GO shall not unfairly discriminate between Users of a similar category, location or size although it will not be technically or economically practicable to achieve uniformity of method of connection at all times.

PC.7.3 The T & D System Voltage level at which a User's System will be connected and the busbar configuration which a User's System uses will depend upon but shall not be limited to the following:

(a) the size of the Generation Units and the number of Generation Units comprising the User's System;

(b) proximity to the existing T & D System; and

(c) the cost of the proposed connection.

PC.7.4 The T & D System Voltage level at which a Demand Customer will be connected to the T & D System will depend upon but shall not be limited to the following:

a) the size of the MW Demand at the Connection Point;

b) consistency with future development of the T & D System or the Other T & D System;

c) proximity to the existing T & D System; and

d) the cost of the proposed connection.

PC.7.5 The method of connection used may exceed the relevant standards where this is required by the User and is acceptable to the GO.

PC.8 Validation and Verification of Data

PC.8.1 Where a User submits data, which in the opinion of the GO is incorrect then the GO may request that User supply such additional information as the GO deems necessary to verify the accuracy of the data.

PC.8.2 Where, following consideration of such information submitted under PC.8.1, the GO maintains, acting reasonably, that the additional information is insufficient to verify the accuracy of the original data then the GO may request that the User carry out specific Tests to verify the data. Where such a Test or Tests are requested, they will be subject to the provisions of the relevant operational codes.

PC.8.3 In the event that the data as submitted by the User is verified by the Test or Tests to be correct then all costs reasonably incurred as a result of such Test or Tests as agreed will be borne in full by the GO.

P.C.8.4 In the event that any of the data items submitted are shown to be incorrect or inaccurate then the User will bear the cost of the Test in full and the data values as ascertained by the Tests will be the values used in the data. If, as a result of the changes to the data arising from the Test or Tests, the GO have to redo or perform additional system studies then the User will also bear the cost reasonably incurred as a result of this additional work.

4 PLANNING CODE APPENDIX (PCA)

This appendix specifies data to be submitted to the GO by Users or prospective Users of the T & D System. The requirement to provide data is governed by the Planning Code (PC4.2, PC4.3, PC4.4, PC5 and PC6).

The specific data requirements depend on whether the User is a Customer or a Generator or a Demand Aggregator Operator or more than one combined. PC.A1 and PC.A2 apply to all Users. PC.A3 applies to demand Users. PC.A4 applies to Generators and PC.A6 applies to Demand Side Aggregator Operators.

Any material changes to the data specified in PC.A3, PC.A4 or PC.A6 must be notified to the GO as soon as practicable.

PC.A1 General Information

Applicant Information	**Information**
Full name of the User	
Address of the User	
Contact Person	
Customer Number	
Telephone Number	
Fax Number	
Email Address	

Installer Details	**Information**
Installer	
Postal address	
Electrical Contractor's Name	
Telephone Number	
Fax Number	
Email Address	

PC.A2 New Connections

PC.A2.1 General Details

PC.A2.1.1 Projected or target Operational Date.

PC.A2.1.2 Target Connection Date.

PC.A2.1.3 Reliability of connection requested (number of connecting circuits e.g. one, two?); subject to technical and system security and reliability standards.

PC.A2.2 Map and Diagrams

PC.A2.2.1 Provide a 1:25,000 "Discovery Series" Ordnance Survey map, with the location of the facility clearly marked with an "X". In addition, please specify the Ordnance Survey Grid Co-ordinates of the electrical connection point which is assumed to be at the HV bushings of the Grid Connected Transformer.

PC.A2.2.2 Provide a plan of the site (1:200 or 1:500) of the proposed facility, indicating the proposed location for a T & D station compound, location of the connection point, generators, transformers, stations, site buildings etc. The plan is to be submitted in hard copy format. A digitized format may be required and should also be provided if available.

PC.A2.2.3 Provide an electrical single line-diagram of the proposed facility detailing all significant items of plant. The plan is to be submitted in hard copy format. A digitized format may be required and should also be provided if available.

PC.A2.3 Licensing and Authorization

PC.A2.3.1 Details of any Generation or Supply Licence held by the applicant, or of any application for a Generation or Supply Licence.

PC.A2.3.2 Details of any authorisation or application for authorisation to construct or reconstruct the Generation station, other applications requested by the GO for which the connection is being sought.

PC.A3 Demand Data Requirements

PC.A3.1 Treatment on Demand Data

At the time the User applies for a connection offer but before an offer is made by the GO and accepted by the applicant User the above data will be considered as Preliminary Project Planning Data as described in PC 6.3.

Once the Connection Offer has been formally accepted by the prospective User all data shall be provided by the User and treated as Committed Project Planning Data as discussed in PC 6.4.

Following the Operational Date or Modification Date as appropriate, all data requirements as listed in this appendix shall be submitted by the User to the GO and shall be treated as System Planning Data as discussed in PC 6.6. This will include confirming any estimated values assumed for planning purposes and replacing them by validated actual values and by updated estimates for future Forecast Data.

PC.A3.2 Registered Connection Capacity

The registered connection capacity is required in MW and Mvar, corresponding to the maximum MVA. It should be stated whether the User is producing or absorbing Mvar.

PC.A3.3 Measurement and Forecast Data (>100 kVA)

This section details the measurements of demand and 10-year demand forecasts that are required from each User of the T & D System who is a Demand Customer in respect of each infeed from the T & D System to the Customer's network(s).

The GO shall notify each User who is a Demand Customer in advance of each load reading day. These load reading days are during peak, minimum, and other days as per the PUC current practices. PUC reserves the right to ask for additional two more measurements during reading days.

The measurements of demand and 10-year demand forecasts should be submitted by the end of calendar week 8 of each year.

PC.A3.3.1 Measurement Point

Demand measurements and forecasts for each infeed from the T & D System shall relate to the appropriate Measurement Point.

PC.A3.3.2 Peak Load - Load Readings and Forecast

PUC to comment about methodology to measure peak load (period of the year, day of the week, hours of the day etc.)

A forecast of the expected MW and Mvar winter peak demand at the Measurement Point in the same hours for the next ten xx years is required.

The load forecast shall take account of sections PC.A3.3.6 through PC.A3.3.9 dealing with embedded generation, description of forecast methodology, transformer reinforcements and permanent load transfer.

PC.A3.3.3 Average - Load Readings and Forecast

PUC to comment about Average Load or other scenarios.

A corresponding 10-year forecast of the MW and Mvar demand at the Measurement Point in month Xxx at 12.30 hours for the next ten (10) years is also required. For example, the forecasts to be received by calendar week 9 of 2017 should cover years 2017 through 2026.

The load forecast shall take account of sections PC.A3.3.6 through PC.A3.3.9 dealing with embedded generation, description of forecast method, transformer reinforcements and permanent load transfer.

PC.A3.3.4 Minimum Load - Load Readings and Forecast

A coincident set of measurements of MW and Mvar values at PUC practice for minimum load readings and forecast is required. The load readings shall take account of embedded generation as detailed in section PC.A3.3.6.

A corresponding 10-year forecast of the MW and Mvar minimum demand at the Measurement Point for the next ten (10) years is also required. The load forecast shall take account of sections PC.A3.3.6 through PC.A3.3.9 dealing with embedded generation, description of forecast method, transformer reinforcements and permanent load transfer.

PC.A3.3.5 non Coincidental Peak Demand - Load Readings and Forecast

Each User of the T & D System who is a Demand Customer, is required to specify by calendar week 8 of each year, the MW and Mvar values corresponding to the maximum MVA demand which occurred at the Measurement Point during the previous year. The date and time of the occurrence of this maximum demand should be stated by the User.

PC.A3.3.6 Embedded Generation

All load readings shall specify, separately, the MW and Mvar contribution from significant embedded generation. The User should indicate whether the generator is producing or absorbing Mvar from the system. The type or types of significant embedded generation should be specified – hydro, wind, biomass, diesel, solar PV or other.

All load forecasts shall specify, separately, the installed capacity of existing and projected significant embedded generation. Both MW and Mvar capability should be given, indicating the Mvar limits both for production and absorption. The type or types of embedded generation should be specified – hydro, wind, biomass, diesel, solar PV or other.

PC.A3.3.7 Load Forecast - Methodology

The User shall provide, with the forecast data, a brief description of the basis for the forecast.

PC.A3.3.8 Load Forecast – Transformer Reinforcement

The User shall provide, with the forecast data, details of planned changes in transformer capacity between the Measurement Point and the Connection Point.

PC.A3.3.9 Data Templates

For uniformity of data capture, and to facilitate Users of the T & D System who are Demand Customers, the GO will provide to each such User prepared templates with data validation to facilitate entry of the required data.

Users shall provide data to the GO using these data templates or in such other form as may be agreed by the GO.

PC.A3.4 User Network Data

Single-line diagram of user network to a level of detail to be agreed with the GO.

Electrical characteristics of all electric circuits and equipment (R, X, B, R0, X0, B0,) continuous and overload ratings if deem necessary by PUC.

Contribution from User network to a three-phase short circuit at connection point.

Connection details of connected transformers, shunt capacitors, shunt reactors etc. (star, delta, zigzag, etc.)

PC.A3.5 Standby Supply Data

For each User who is a Demand Customer, that can take supply from more than one supply point, the following information is required:

- Source of the standby supply (alternative supply point(s))
- standby capacity required (MW and Mvar)

PC.A3.6 Fluctuating Loads

For each demand that can fluctuate by more than 100 kVA at the point of connection to the T & D System, the following information is required:

- Rate of change of Active Power and Reactive Power, both increasing and decreasing (kW/s. kvar/s)
- The shortest repetitive time interval between fluctuations in Active Power and Reactive Power Demand (Seconds)
- The magnitude of the largest step changes in Active Power and Reactive Power Demand (kW, Kvar)

PC.A3.7 Disturbing Loads

Description of any Disturbing Load to be connected to the T & D System.

PC.A3.8 Grid Connected Transformer

Description	Symbol	Units
Number of windings		
Vector Group		
Rated current of each winding		A
Transformer Rating		MVA_{Trans}
Transformer nominal LV voltage		kV
Transformer nominal HV voltage		kV
Tapped winding		
Transformer Ratio at all transformer taps		
Transformer Impedance (resistance R and reactance X) at all taps	R+jX	% on rating MVA_{Trans}
For 3 winding transformers, where there are external connections to all 3 windings, the impedance (resistance R and reactance X) between each pair of windings is required, measured with the third set of terminals open-circuit.	$Z_{HV:LV1}$	% on rating MVA_{Trans}
	$Z_{HV:LV2}$	% on rating MVA_{Trans}
	$Z_{LV1:LV2}$	% on rating MVA_{Trans}
Transformer zero sequence impedances at nominal tap		
Zero Phase Sequence impedance measured between the HV terminals (shorted) and the neutral terminal, with the LV terminals open-circuit.	$Z_{HT\,0}$	Ohm
Zero Phase Sequence impedance measured between the HV terminals (shorted) and the neutral terminal, with the LV terminals short-circuited to the neutral.	$Z_{HL\,0}$	Ohm
Zero Phase Sequence impedance measured between the LV terminals (shorted) and the neutral terminal, with the HV terminals open-circuit.	$Z_{LT\,0}$	Ohm
Zero Phase Sequence impedance measured between the LV terminals (shorted) and the neutral terminal, with the HV terminals short-circuited to the neutral.	$Z_{LH\,0}$	Ohm
Zero Phase Sequence leakage impedance measured between the HV terminals (shorted) and the LV terminals (shorted), with the Delta winding closed.	$Z_{L\,0}$	Ohm
Earthing Arrangement including LV neutral earthing resistance & reactance		
Core construction (number of limbs, shell or core type)		
Open circuit characteristic		Graph

PC.A3.9 Shunt Capacitor/ Reactor Data

For each shunt capacitor or reactor with a rating in excess of 1 Mvar connected to or capable of being connected to a user network, the following information shall be provided:

- Rating (Mvar)
- Resistance / Reactance / Susceptance of all components of the capacitor or reactor bank

- Fixed or switched.
- If switched, control details (manual, time, load, voltage, etc.)
- If automatic control, details of settings.

PC.A4 Generator Data Requirements

PC.A4.1 General Details

Each Generator shall submit to the GO detailed information as required to plan, design, construct and operate the T & D System:

Station Name _____

Number of Generating units _____

Primary Fuel Type / Prime Mover (e.g. gas, hydro etc.) _____

Secondary Fuel Type (e.g. oil) _____

Generation Export Connection Capacity Required (MW) _____

PC.A4.2 Treatment of Generator Data

Data item which must be provided by the applicant and which shall be treated as Preliminary Project Data as discussed in PC 6.3.

Data item which, if not provided by the applicant as Preliminary Project Data, will be estimated by the GO at the applicant's sole risk. The GO puts the applicant on notice that this data estimate shall be treated as Preliminary Project Data as discussed in PC 6.3.

Once the Connection Offer has been formally accepted by the prospective User all data shall be provided by the User and treated as Committed Project Planning Data as discussed in PC 6.4.

Following the Operational Date or Modification Date as appropriate, all data requirements as listed in this appendix shall be submitted by the User to the GO and shall be treated as System Planning Data as discussed in PC 6.6. This will include confirming any estimated values assumed for planning purposes and replacing them by validated actual values and by updated estimates for future Forecast Data.

PC.A4.3 Generator Operating Characteristics and Registered Data

Minimum requirements for generator operating conditions are specified in the Connection Conditions.

For thermal plant, a functional block diagram of the main plant components, showing boilers, alternators, any heat or steam supplies to other processes etc. to be provided. Single shaft or separate shaft is to be indicated.

For each individual unit, on Primary Fuel and on Secondary Fuel where applicable, the following to be filled in:

Unit Number _____

Registered Capacity (MW) _____

Fuel _____

Description	Symbol	Units
Normal Maximum Continuous Generation Capacity:		MW
Normal Maximum Continuous Export Capacity		MW
Primary Fuel Switchover Output		MW
Secondary Fuel Switchover Output		MW
Power Station auxiliary load		MW
Power Station auxiliary load		Mvar
Maximum (Peaking) Generating Capacity		MW
Maximum (Peaking) Export Capacity		MW
Normal Minimum Continuous Generating Capacity		MW
Normal Minimum Continuous Export Capacity		MW
Generator Rating:	Mbase	MVA
Normal Maximum Lagging Power Factor		Mvar
Normal Maximum Leading Power Factor		Mvar
Governor Droop	R	
Forbidden zones		MW
Terminal Voltage adjustment range		kV
Short Circuit Ratio		
Rated Stator Current		Amps
Number of available hours of running at Registered		
Capacity from on-site fuel storage stocked to its full capacity		

Description	
Capability Chart showing full range of operating capability of the generator including thermal and excitation limits.	Diagram
Open Circuit Magnetisation Curves	Graph
Short Circuit characteristic	Graph
Zero power factor curve	Graph
V curves	Diagram

Description	Symbol	Units
Time to synchronise from warm		Hour
Time to synchronise from cold		Hour
Minimum up-time		Hour
Minimum down-time		Hour

Normal loading rate	MW / min
Normal deloading rate	MW / min
Can the generator start on each fuel	
Ability to change fuels on-load	
Available modes (lean burn, etc.)	
Time to change modes on-load	
Control range for **AGC** operation	MW
Other relevant operating characteristics not otherwise provided....	

Reserve Capability:

- Primary Spinning Reserve
- Secondary Spinning Reserve
- Tertiary Reserve

Provide details of reserve capability of the generator in different operating modes:

- Unit co-ordinating,
- turbine follow,
- recirculation,
- base load, etc.

PC.A4.3.1 Generator Transformer

Description	Symbol	Units
Number of windings		
Vector Group		
Rated current of each winding		Amps
Transformer Rating		MVA_{Trans}
Transformer nominal LV voltage		kV
Transformer nominal HV voltage		kV
Tapped winding		
Transformer Ratio at all transformer taps		
Transformer Impedance at all taps[1]		% on rating MVA_{Trans}
Transformer zero sequence impedance at nominal tap	Z_0	Ohm
Earthing Arrangement including neutral earthing resistance & reactance		
Core construction (number of limbs, shell or core type)		
Open circuit characteristic		Graph

[1] For Three Winding Transformers the HV/LV1, HV/LV2 and LV1/LV2 impedances together with associated bases shall be provided.

PC.A4.4 Generator Parameters

Description	Symbol	Units
direct axis Synchronous reactance	X_d	% on rating
direct axis Transient reactance saturated	$X'_{d\ sat}$	% on rating
direct axis Transient reactance unsaturated	$X'_{d\ unsat}$	% on rating
Sub-transient reactance unsaturated	$X''_d = X''_q$	% on rating
quad axis Synchronous reactance	X_q	% on rating
quad axis Transient reactance unsaturated	$X'_{q\ unsat}$	% on rating
Negative Phase Sequence Synchronous reactance	X_2	% on rating
Zero phase sequence reactance	X_0	% on rating
Turbine generator Inertia constant for entire rotating mass	H	MW s/MVA
Stator resistance	Ra	% on rating
Stator Leakage reactance	X_L	% on rating
Poiter reactance	X_P	% on rating

Generator Time Constants

Description	Symbol	Units
Direct axis open Circuit Transient	Tdo’	sec
Direct axis open Circuit sub-Transient	Tdo’’	sec
Quad axis open Circuit Transient	Tqo’	sec
Quad axis open Circuit sub-Transient	Tqo’’	sec
Direct axis short Circuit Transient	Td’	sec
Direct axis short Circuit sub-Transient	Td’’	sec
Quad axis short Circuit Transient	Tq’	sec
Quad axis short Circuit sub-Transient	Tq’’	sec

PC.A4.5 Excitation System

Fill in the following parameters or supply a Laplace-domain control block diagram in accordance with IEEE standard excitation models (or as otherwise agreed with the GO) completely specifying all time constants and gains to fully explain the transfer function from the compensator or generator terminal voltage and field current to generator field voltage.

Description	Symbol	Units
Excitation system type (AC or DC)		Text
Excitation feeding arrangement (solid or shunt)		Text

Excitation system Filter time constant	Tr	sec
Excitation system Lead time constant	Tc	sec
Excitation system Lag time constant	Tb	sec
Excitation system Controller gain	Ka	
Excitation system controller lag time constant	Ta	sec
Excitation system Maximum controller output	Vmax	p.u.
Excitation system minimum controller output	Vmin	p.u.
Excitation system regulation factor	Kc	
Excitation system rate feedback gain	Kf	
Excitation system rate feedback time constant	Tf	sec

PC.A4.6 Speed Governor System

Supply a Laplace-domain control block diagram in accordance with IEEE standard prime mover models for thermal and hydro units (or as otherwise agreed with the GO) completely specifying all time constants and gains to fully explain the transfer function for the governor in relation to frequency deviations and set point operation.

PC.A4.7 Control Devices (including Power System Stabilizers) and Protection Relay

Please supply any additional Laplace domain control diagrams for any outstanding control devices or special protection relays in the generating unit, which automatically impinge on its operating characteristics within 30 seconds following a system disturbance and which have a minimum time constant of at least 0.02 seconds.

PC.A4.8 Environmental Impact

Description	Units
CO_2	tonne CO_2 / tonne fuel
	Unit CO_2 removal efficiency
SO_2	tonne SO_2 / tonne fuel
	Unit SO_2 removal efficiency
NO_X	tonne NO_X / exported MWh curve

PC.A4.9 Pumped Storage

Description	Units
Reservoir Capacity	MWh pumping
Max Pumping Capacity	MW
Min Pumping Capacity	MW
Efficiency (generating / pumping ratio)	%

PC.A4.10 Wind Turbine Generators and Mains Excited Asynchronous Generators

State whether turbines are Fixed Speed or Variable Speed:

- provide manufacturer details on electrical characteristics and operating performance with particular reference to Flicker and Harmonic performance.
- provide details of the anticipated operating regime of generation, i.e. continuous, seasonal etc. List the anticipated maximum export level in MW for each calendar month, and indicate how generation would vary over a typical 24 hour period during the month of maximum export.
- provide details of expected rapid or frequent variations in output, including magnitude, max rate of change expected, frequency and duration.

For Mains Excited Asynchronous Generators, please state:

Description	Units
How the generator is run up to synchronous speed	
Magnitude of inrush / starting current	Amps
Duration of inrush / starting current	ms
Starting / paralleling frequency	Hz
Power factor on starting	
Reactive power demand at zero output ('no load')	kvar
Give details of reactive power compensation to be installed	

PC.A4.11 Modelling Requirements for Wind Turbine Generators

PC.A4.11.1 Introduction

The GO requires suitable and accurate dynamic models for all Generators connected to, or applying for a connection to, the T & D system in order to assess reliably the impact of the Generator's proposed installation on the dynamic performance and security and stability of the Power System.

Modelling requirements for Generators are processed on the identification by the applicant of the relevant library model according to the software in use by PUC, i.e. PSS/E, Digsilent Power Factory, etc.. and the provision of the applicable data parameters in the current, appropriate application form. Where there are no suitable library models available, specially written models are supplied. These are usually known as "user-written models/user defined models".

The GO may requires Controllable WFPSs greater than 200 kW to provide specially written models and associated data parameters specific to the Wind Turbine Generators and any associated controls and reactive compensation equipment to be used in the applicant's Controllable WFPS scheme. The requirements of these models are as outlined in this section of the Planning Code Appendix.

PC.A4.11.2 Wind Turbine Generator Dynamic Models

PC.A4.11.2.1 Requirement to provide a dynamic model

Each Controllable WFPS shall provide a dynamic model, or shall provide an unambiguous reference to a dynamic model previously provided to the GO, appropriate for the Controllable WFPS. If all the Wind Turbine Generators in the Controllable WFPS are not identical, the model shall incorporate separate modules to represent each type of Wind Turbine Generator. Appropriate data and parameter values must be provided for each model. The model shall be provided in the format in line with the software tool in use by PUC, or in such other format as may be agreed between the Controllable WFPS and the GO.

The models for Wind Turbine Generators and the Controllable WFPS (computer software based on a mathematical representation of the behaviour of the machine) must be able to calculate how quantities such as Active Power output, Reactive Power output, turbine speed etc. vary as factors such as the Voltage at the Connection Point change. They must take account of the inherent characteristics of the machines and the actions of the WTG control systems and any relevant Controllable WFPS control systems.

The models provided shall be treated as Preliminary Project Planning Data, Committed Project Planning Data or System Planning Data as appropriate, as set out in PC.6 of the Planning Code.

PC.A4.11.2.2 Computer environment

These models must run on the digital software in use for the Seychelles network system studies. They must not require a simulation time step of less than 5ms. Details of the current digital software type and version, computer platform, compiler version etc, will be provided by the GO upon request. The GO may from time to time request that the models be updated to be compatible with changes in the GO's computing environment. Each Controllable WFPS shall ensure that such updated models are provided without undue delay.

PC.A4.11.2.3 Features to be represented in the dynamic model

The dynamic model must represent the features and phenomena likely to be relevant to angular and Voltage stability. These features include but may not be limited to:

a) the electrical characteristics of the Generator;

b) the separate mechanical characteristics of the turbine and the Generator and the drive train between them;

c) variation of power co-efficient with pitch angle and tip speed ratio;

d) blade pitch control;

e) converter controls;

f) reactive compensation;

g) protection relays.

PC.A4.11.2.4 Model aggregation

For computational reasons, it is essential that the models of individual WTGs can be aggregated into a smaller number of models, each representing a number of WTGs at the

same site. A representation of the collector network may be included in the aggregate model of the Controllable WFPS.

PC.A4.11.2.5 Model documentation

The model should be fully documented. The documentation should describe in detail the model structure, inputs, outputs and how to set up and use the model and should be based on the documentation of standard library models of the power system software in use by PUC.

The GO may, when necessary to ensure the proper running of its complete system representation or to facilitate its understanding of the results of a dynamic simulation, request additional information concerning the model, including the source code of one or more routines in the model. The Controllable WFPS shall comply with any such request without delay. Where the Controllable WFPS or any other party (acting reasonably) designates such information as confidential on the basis that it incorporates trade secrets, the GO shall not disclose the information so designated to any third party.

PC.A4.11.2.6 Time to comply

Where a User requires reasonable time to develop the necessary model or models so as to comply fully with all the provisions in this section, the User may apply to the GO to be deemed compliant with the provisions of PCA 4.11.2 on the basis of the General Conditions of the Grid Code. The GO shall consider any such application in accordance with GC.9.1.3, and if the GO is satisfied as to the User's programme for developing and testing the necessary dynamic model, the GO may, for so long as the GO is so satisfied, treat the User as being in compliance with the provisions of this section. If the GO decides, acting reasonably, that it is not satisfied as to the User's programme for developing and testing the necessary dynamic model and that the User cannot be deemed to be in compliance with PCA 4.11.2, the provisions of GC.9.1.4 shall apply and the User shall apply for a derogation under the terms of GC.8.

PC.A4.11.3 Validation of Model

All models provided to the GO for use in dynamic simulations must be validated. The GO must be satisfied that the behaviour shown by the model under simulated conditions is representative of the behaviour of the real equipment under equivalent conditions.

For validation purposes the Controllable WFPS shall ensure that appropriate tests are performed and measurements taken to assess the validity of the dynamic model. Where the validity of the model has not been confirmed prior to the commissioning of the Controllable WFPS, appropriate tests shall be carried out and measurements taken at the Controllable WFPS to assess the validity of the dynamic model. The tests and measurements required shall be agreed with the GO.

The Controllable WFPS shall provide the GO with all available information showing how the predicted behaviour of the dynamic model to be verified compares with the actual observed behaviour of a prototype or production WTG under laboratory conditions and/or actual

observed behaviour of the real WTG as installed and connected to a T & D or distribution network.

If the on-site measurements or other information provided indicate that the dynamic model is not valid in one or more respects, the Controllable WFPS shall provide a revised model whose behaviour corresponds to the observed on-site behaviour as soon as reasonably practicable.

The conditions validated should as far as possible be similar to those of interest, e.g. low short circuit level at Connection Point, close up, severe faults, nearby moderate faults, remote faults, Voltage excursions, Frequency excursions, large wind speed variations.

PC.A4.11.4 Wind Farm Data

In order to construct a valid dynamic model of each Controllable WFPS, the following Controllable WFPS data is required.

Wind Turbine Generator (WTG) transformer (connects the WTG with the internal Controllable WFPS network)

- Rating of WTG transformer (MVA or kVA)
- WTG transformer voltage ratio (kV)
- WTG transformer impedance (%)

Internal Controllable WFPS network and corresponding data

To be described how the Controllable WFPS's internal network structure (collector network) will be laid out (by means of a single-line diagram or other description of connections). The description should include a breakdown of how the individual WTGs are connected together as well as how they are connected back to the Controllable WFPS substation. Specify different cable or overhead line types and the individual length of each section of circuit.

Description	Type1	Type2	Type3
Total length (m)			
Conductor cross section area per core (mm)			
Conductor type (Al, Cu, etc)			
Type of insulation			
Charging capacitance (µF/km)			
Charging current (Ampere/km)			
Positive sequence resistance (R1 Ohm/km)			
Positive sequence reactance (X1 Ohm/km)			

Grid connected transformer

This is the transformer that is connecting the Controllable WFPS site with the T & D System (equivalent to the Generator Transformer of a conventional power station). Data is required for this transformer as follows:

- Rating of grid transformer (MVA or kVA)
- Transformer Voltage ratio (kV)
- Transformer impedance (%)

Reactive compensation installed at site

Number of inductive devices

Indicate for each device the inductive Mvar capability. If the device has more than one stage please indicate the number of stages and the Mvar capability switched in each stage i.e. 0.5 Mvar in 5 steps etc.

Number of capacitive devices

Indicate for each device the Capacitive Mvar capability. If the device has more than one stage please indicate the number of stages and the Mvar capability switched in each stage i.e. 0.5 Mvar in 5 steps etc.

Method of voltage/reactive power control applied to each controllable reactive compensation device. This information should be provided in sufficient detail (e.g. transfer function block diagram, control system gain/droop, deadband and hysteresis characteristics, tap steps, etc.) to allow an appropriate power system model to be developed within the digital software in use by PUC.

PC.A4.12 Modelling Requirements for Solar PV Generators

PC.A4.12.1 Introduction

The GO may requires Controllable PVPSs greater than 0.1 MW to provide specially written models and associated data parameters specific to the Solar PV Generators and any associated controls and reactive compensation equipment to be used in the applicant's Controllable PVPS scheme. The requirements of these models are as outlined in this section of the Planning Code Appendix.

PC.A4.12.2 Solar PV Dynamic Model

PC.A4.12.2.1 Requirement to provide a dynamic model

It is anticipated that for PVPs there are no moving part therefore any 'dynamic behavior' is related to an appropriate control system which allow the PVP to provide some system flexibility.

Each Controllable PVPS shall provide a 'dynamic model' as full inverter control model scheme to regulate the output active and reactive power according to the PVPS required capability curve.

Appropriate data and parameter values must be provided for each model. The model shall be provided in format in line with the software tool in use by PUC, or in such other format as may be agreed between the Controllable WFPS and the GO.

The models for Controllable PVPS (computer software based on a mathematical representation of the behaviour of the machine) must be able to calculate how quantities such as Active Power output, Reactive Power output, vary as factors such as the Voltage at the Connection Point change. They must take account of the inherent characteristics of technology and the actions of the PVPS control systems and any relevant Controllable PVPS control systems.

The models provided shall be treated as Preliminary Project Planning Data, Committed Project Planning Data or System Planning Data as appropriate, as set out in PC.6 of the Planning Code.

PC.A4.12.2.2 Computer environment

These models must run on the digital software in use for the Seychelles network system studies. They must not require a simulation time step of less than 5ms. Details of the current digital software type and version, computer platform, compiler version etc, will be provided by the GO upon request. The GO may from time to time request that the models be updated to be compatible with changes in the GO's computing environment. Each Controllable PVPS shall ensure that such updated models are provided without undue delay.

PC.A4.12.2.3 Features to be represented in the dynamic model

The dynamic model must represent the features and phenomena likely to be relevant to angular and Voltage stability. These features include but may not be limited to:

h) the electrical characteristics of the PVPS inverter;

i) variation of power co-efficient with incoming shade in the worst direction;

j) converter controls;

k) reactive compensation;

l) protection relays.

m) Active Power output

PC.A4.12.2.4 Model aggregation

For computational reasons, each PVPS will be modelled with an equivalent single generator/inverter.

PC.A4.12.2.5 Model documentation

The model should be fully documented. The documentation should describe in detail the model structure, inputs, outputs and how to set up and use the model and should be based on the documentation of standard library models of the power system software in use by PUC.

The GO may, when necessary to ensure the proper running of its complete system representation or to facilitate its understanding of the results of a dynamic simulation, request additional information concerning the model, including the source code of one or more routines in the model. The Controllable PVPS shall comply with any such request without delay. Where the Controllable PVPS or any other party (acting reasonably) designates such information as confidential on the basis that it incorporates trade secrets, the GO shall not disclose the information so designated to any third party.

PC.A4.12.2.6 Time to comply

Where a User requires reasonable time to develop the necessary model or models so as to comply fully with all the provisions in this section PC.A 4.12.2, the User may apply to the GO to be deemed compliant with the provisions of PC.A 4.12.2 on the basis of GC.9.1.3 of the General Conditions of the Grid Code. The GO shall consider any such application in accordance with GC.9.1.3, and if the GO is satisfied as to the User's programme for developing and testing the necessary dynamic model, the GO may, for so long as the GO is so satisfied, treat the User as being in compliance with the provisions of this section. If the GO decides, acting reasonably, that it is not satisfied as to the User's programme for developing and testing the necessary dynamic model and that the User cannot be deemed to be in compliance with PC.A 4.12.2, the provisions of GC.9.1.4 shall apply and the User shall apply for a derogation under the terms of GC.8.

PC.A4.12.2.7 Validation of the model

All models provided to the GO for use in dynamic simulations must be validated. The GO must be satisfied that the behaviour shown by the model under simulated conditions is representative of the behaviour of the real equipment under equivalent conditions.

For validation purposes the Controllable PVPS shall ensure that appropriate tests are performed and measurements taken to assess the validity of the dynamic model. Where the validity of the model has not been confirmed prior to the commissioning of the Controllable PVPS, appropriate tests shall be carried out and measurements taken at the Controllable PVPS to assess the validity of the dynamic model. The tests and measurements required shall be agreed with the GO.

The Controllable PVPS shall provide the GO with all available information showing how the predicted behaviour of the dynamic model to be verified compares with the actual observed behaviour of a prototype or production PVP under laboratory conditions and/or actual observed behaviour of the real PVP as installed and connected to a T & D.

If the on-site measurements or other information provided indicate that the dynamic model is not valid in one or more respects, the Controllable PVPS shall provide a revised model

whose behaviour corresponds to the observed on-site behaviour as soon as reasonably practicable.

The conditions validated should as far as possible be similar to those of interest, e.g. low short circuit level at Connection Point, close up, severe faults, nearby moderate faults, remote faults, Voltage excursions, Frequency excursions, fast clouds shading the area, etc.

PC.A4.13 Generator Forecast Data

PC.A4.13.1 Expected Maintenance Requirements

Expected Maintenance Requirements weeks / year

PC.A4.13.2 Forecast Availability of Registered Capacity

Apart from the expected scheduled maintenance requirements:

Availability of Registered Capacity	Reason	Available Exported MW	Time %
Registered Capacity			
Restricted Rating			
Forced outage probability			
	Total		100%

Reasons for restricted rating might include poor fuel, loss of mill, loss of burners, hydro flow restrictions, etc.

PC.A4.13.3 Energy limitation

Description	Unit
Daily	GWh
Weekly	GWh
Monthly	GWh
Annual	GWh

PC.A4.13.4 Expected monthly GWh

Description	Unit
January	GWh
February	GWh
March	GWh
April	GWh

May	GWh
June	GWh
July	GWh
August	GWh
September	GWh
October	GWh
November	GWh
December	GWh

PC.A4.14 Generator Aggregators

For each Generator Aggregator, the following information shall be provided:

- Name of Generator Aggregator group;
- Total Generation Capacity at their Connection Points of all Generation Units being aggregated (MW) (Aggregated Maximum Export Capacity).

For each Generator Site within the Generator Aggregator group, the following information shall be provided:

- Location;
- Registered Capacity; and
- Name of the T & D Station to which the Generation Site is normally connected.

PC.A5 Distributed Storage Devices

PC.A5.1 Introduction

It is anticipated that to achieve high penetration of renewable, additional technologies will be applied in large scale to the Seychelles T&D. These have been recognized in particular in Battery Energy Storage (BESS), Flywheel Generators (FG) and Ultra Capacitors (UC) which performance can address multiple timeframe of services in T&D.

FG is an active device which rotating mass can provide energy services for a short time, depending on the system requirement. BESS & UC are passive device which need Energy Stored as chemical to provide services.All technology have an inverter interface with T&D which appropriate control enable to provide frequency and/or voltage regulation or both.

PC.A5.2 Requirement to provide a dynamic model (for BESS & UC)

For BESS and UC, no moving part are present therefore any 'dynamic behavior' is related to an appropriate control system which allow the PVP to provide some system flexibility.

Each Controllable Storage shall be provided of a 'dynamic model' as full inverter control model scheme to regulate the output active and/or reactive power according to the Storage minimum technical requirements in the connection agreement.

Appropriate data and parameter values must be provided for inverter for each model. The model shall be provided in format in line with the software tool in use by PUC, or in such other format as may be agreed between the Controllable Storage and the GO.

The models for Controllable Storage (computer software based on a mathematical representation of the behavior of the machine) must be able to calculate how quantities such as Active Power output, Reactive Power output, vary as factors such as the Voltage at the Connection Point change. They must take account of the inherent characteristics of technology, the actions of the Storage control systems and any relevant Controllable Storage control systems.

The models provided shall be treated as Preliminary Project Planning Data, Committed Project Planning Data or System Planning Data as appropriate, as set out in PC.6 of the Planning Code.

PC.A5.3 Requirement to provide a dynamic model (for FG)

For FG the whole generator shall be model including the rotating mass which speed decreases when active power is provided to the grid for frequency control. Being the interface, inverter based, the appropriate control system which allow the FG to provide some system services shall be also modelled.

The model shall be provided in format in line with the software tool in use by PUC, or in such other format as may be agreed between the Controllable Storage and the GO.

The models for Controllable Storage (computer software based on a mathematical representation of the behavior of the machine) must be able to calculate how quantities such as Active Power output, Reactive Power output, vary as factors such as the Voltage at the Connection Point change. They must take account of the inherent characteristics of technology, the actions of the Storage control systems and any relevant Controllable Storage control systems.

The models provided shall be treated as Preliminary Project Planning Data, Committed Project Planning Data or System Planning Data as appropriate, as set out in PC.6 of the Planning Code.

PC.A5.4 Computer environment

These models must run on the digital software in use for the Seychelles network system studies. They must not require a simulation time step of less than 5ms. Details of the current digital software type and version, computer platform, compiler version etc, will be provided by the GO upon request. The GO may from time to time request that the models be updated to be compatible with changes in the GO's computing environment. Each Controllable Storage shall ensure that such updated models are provided without undue delay.

PC.A5.5 Features to be represented in the dynamic model

The 'dynamic model' must represent the features and phenomena likely to be relevant to angular and Voltage stability. These features include but may not be limited to:

- the electrical characteristics of the Storage inverter;
- converter controls;
- reactive compensation;
- protection relays;
- active Power output;
- rotating mechanical speed (FG).

PC.A5.6 Model aggregation

Each Controllable Storage will be modelled with an equivalent single storage device.

PC.A5.7 Model documentation

The model should be fully documented. The documentation should describe in detail the model structure, inputs, outputs and how to set up and use the model and should be based on the documentation of standard library models of the power system software in use by PUC.

The GO may, when necessary to ensure the proper running of its complete system representation or to facilitate its understanding of the results of a dynamic simulation, request additional information concerning the model, including the source code of one or more routines in the model. The Controllable Storage shall comply with any such request without delay. Where the Controllable Storage or any other party (acting reasonably) designates such information as confidential on the basis that it incorporates trade secrets, the GO shall not disclose the information so designated to any third party.

PC.A5.8 Time to comply

Where a User requires reasonable time to develop the necessary model or models so as to comply fully with all the provisions in this section, the User may apply to the GO to be deemed compliant with the provisions of this section on the basis of GC.9.1.3 of the General Conditions of the Grid Code. The GO shall consider any such application in accordance with GC.9.1.3, and if the GO is satisfied as to the User's programme for developing and testing the necessary dynamic model, the GO may, for so long as the GO is so satisfied, treat the User as being in compliance with the provisions of this section. If the GO decides, acting reasonably, that it is not satisfied as to the User's programme for developing and testing the necessary dynamic model and that the User cannot be deemed to be in compliance with this section, the provisions of GC.9.1.4 shall apply and the User shall apply for a derogation under the terms of GC.8.

PC.A5.9 Validation of model

All models provided to the GO for use in dynamic simulations must be validated. The GO must be satisfied that the behaviour shown by the model under simulated conditions is representative of the behaviour of the real equipment under equivalent conditions.

For validation purposes the Controllable Storage shall ensure that appropriate tests are performed and measurements taken to assess the validity of the dynamic model. Where the validity of the model has not been confirmed prior to the commissioning of the Controllable Storage, appropriate tests shall be carried out and measurements taken at the Controllable Storage to assess the validity of the dynamic model. The tests and measurements required shall be agreed with the GO.

The Controllable Storage shall provide the GO with all available information showing how the predicted behaviour of the dynamic model to be verified compares with the actual observed behaviour of a prototype or production Storage under laboratory conditions and/or actual observed behaviour of the real Storage as installed and connected to a T & D.

If the on-site measurements or other information provided indicate that the dynamic model is not valid in one or more respects, the Controllable Storage shall provide a revised model whose behaviour corresponds to the observed on-site behaviour as soon as reasonably practicable.

The conditions validated should as far as possible be similar to those of interest, e.g. low short circuit level at Connection Point, close up, severe faults, nearby moderate faults, remote faults, Voltage excursions, Frequency excursions, fast clouds shading the area, etc.

PC.A6 Demand Side Aggregator Operator

For each Demand Side Aggregator Operator, the following information shall be provided:

General Details

- name of Demand Side Aggregator;
- address of the Demand Side Aggregator Control Facility;
- address of each Individual Demand Site(s) comprising the Demand Side Aggregator;
- Seychelles Grid Co-ordinates of the Connection Point of each Individual Demand Site comprising the Demand Side Aggregator;
- Meter Point Reference Number for each Individual Demand Site comprising the Demand Side Aggregator;
- classification of operation of each Individual Demand Site comprising the Demand Side Aggregator as one of:
  a. avoided Demand consumption only,
  b. combination of avoided Demand consumption and Shaving Mode operation of Generation Units,
  c. combination of avoided Demand consumption and Continuous Parallel Mode operation of Generation Units,
  d. combination of avoided Demand consumption and Lopping Mode operation of Generation Units,
  e. combination of avoided Demand consumption and Standby Mode operation of Generation Units,

f. combination of avoided Demand consumption and Automatic Mains Failure Mode operation of Generation Units,

g. Shaving Mode operation of Generation Units only,

h. Continuous Parallel Mode operation of Generation Units only,

i. Lopping Mode operation of Generation Units only,

j. Standby Mode operation of Generation Units only,

k. Automatic Mains Failure Mode operation of Generation Units only;

- current classification of operation of each Individual Demand Site comprising the Demand Side Aggregator if different to above;
- details of all Generation Units used as part of the Demand Side Aggregator operated in Continuous Parallel Mode, Shaving Mode or Lopping Mode, including the make, model, Capacity, MVA rating, fuel type, and protection settings;
- whether a change is required to the current Maximum Export Capacity or Maximum Import Capacity of Individual Demand Sites comprising the Demand Side Aggregator;
- whether the operation of Embedded Generator Interface Protection trips a DSO-operated interface circuit breaker, DSO Demand Customer main incomer, Generation Unit LV circuit breaker, Generation Unit HV transformer circuit breaker or other on a Distribution System-connected Individual Demand Site including Demand Side Aggregator containing Generation;
- the current operation Embedded Generator Interface Protection if different to above;
- details of all Demand loads with Demand reduction capability of 5 MW or greater, including size in MW and demand reduction capability from load;
- whether the Distribution System Operator has been informed about the intention of the Demand Side Aggregator Operator to operate a Demand Side Aggregator;
- whether each Individual Demand Site comprising the Demand Side Aggregator is currently participating as or part of any Aggregated Generator Unit or other Demand Side Aggregator;
- proposed effective date in Single Electricity Market for first-time applicants; and
- proposed date for Grid Code Testing.

Technical Details

- total Demand Side Aggregator MW Capacity (MW) of the Demand Side Aggregator;
- Demand Side Aggregator MW Capacity (MW) of each Individual Demand Site comprising the Demand Side Aggregator;
- total Demand Side Aggregator MW Capacity of the Demand Side Aggregator available from on-site Generation (MW) operated in Shaving Mode or Continuous Parallel Mode;

- Demand Side Aggregator MW Capacity of each Individual Demand Site comprising the Demand Side Aggregator available from on-site Generation (MW) operated in Shaving Mode or Continuous Parallel Mode;
- total Demand Side Aggregator MW Capacity of the Demand Side Aggregator available from avoided Demand consumption (MW) and on-site Generation (MW) operated in Lopping Mode and on-site Generation (MW) operated in Standby Mode;
- Demand Side Aggregator MW Capacity of each Individual Demand Site comprising the Demand Side Aggregator available from avoided Demand consumption (MW) or on-site Generation (MW) operated in Lopping Mode or on-site Generation (MW) operated in Standby Mode;
- Demand Side Aggregator MW Response Time of the Demand Side Aggregator;
- Demand Side Aggregator Notice Time of the Demand Side Aggregator;
- Minimum Down Time of the Demand Side Aggregator;
- Maximum Down Time of the Demand Side Aggregator;
- Minimum off time of the Demand Side Aggregator;
- Maximum Ramp Up Rate of the Demand Side Aggregator;
- Maximum Ramp Down Rate of the Demand Side Aggregator.

5 CONNECTION CONDITIONS (CC)

CC.1 Introduction

CC.1.1 For the protection of the T & D System and Users' Plant and Apparatus directly connected to the T & D System, and in order to maintain, insofar as is possible by Good Industry Practice, a stable and secure operation of the T & D System for the benefit of all Users, it is necessary to require certain minimum technical, design and operational criteria to be met by Users' Plant and Apparatus.

CC.1.2 These Connection Conditions establish certain principles and standards relating to connection, method of connection, Plant and Apparatus designation and nomenclature, technical and performance standards, data requirements.

CC.1.3 These Connection Conditions supply information as to the performance characteristics of the T & D System at the Connection Point, in order to enable Users and prospective Users to design their Plant and Apparatus and to provide appropriate control systems and Plant protection schemes.

CC.1.4 In addition to the Connection Conditions, there are Connection Agreements, which are bilateral agreements between the GO and each User and which contain the details specific to each User's connection to the T & D System. The Connection Agreement requires the User and the GO to comply with the terms of the Grid Code, except to the extent that a derogation has been granted under the General Conditions.

CC.2 Objective

a) The Connection Conditions define the minimum standards for the method of connection to the T & D System.

b) The Connection Conditions define the technical, design and operational standards which must be complied with by any User connecting to the T & D System.

c) The Connection Conditions define the normal T & D System performance standards at the Connection Point.

d) The Connection Conditions outline the types of signals and indications that will be required to be made available to the GO by each User.

e) The Connection Conditions detail requirements for the designation and nomenclature of all User Plant and Apparatus connected to the T & D System.

CC.3 Scope

The Connection Conditions apply to the GO and to the following Users:

(a) Generators with Registered Capacity greater than 100 kW;

(b) Demand Customers; and

(c) Demand Side Aggregator Operators.

CC.4 T & D Station Compound

CC.4.1 The User shall provide a T & D Station compound, as provided for in the Connection Agreement. It shall be immediately adjacent to the User's facility and be suitable for the erection of a T & D Station and for installing other equipment required for connecting the User's System to the T & D System.

CC.4.2 Connection to the T & D System must meet the standards defined in the Planning Code and the Connection Conditions. The method of connection used may exceed the standards where this is required by the User and is acceptable to the GO.

CC.5 Plant Designation

CC.5.1 The name of the User Site shall be designated by the User and subsequently approved by the GO. Such agreement shall not to be unreasonably withheld.

CC.5.2 The designation and proposed nomenclature of User Plant and Apparatus connected to the T & D System shall be in accordance with the GO standard practice which, in particular, is designed to ensure that the designation and nomenclature avoids confusion. The User shall notify the designation and proposed nomenclature of Users' Plant and/or Apparatus to the GO who may, if it determines that such proposed designation may lead to confusion or does not conform with the GO standard practice, request a change in the proposed designation and nomenclature.

CC.5.3 The GO's standard practice currently requires that, unless otherwise agreed with the GO, the following standard designations apply:

Voltage level designation: for each voltage level a number is associated: i.e.

i. 33 kV: 3

ii. 11 kV: 1

iii. 0.4 kV: 04

Generation Units:

For Hydro :

For Wind:

For Solar :

For thermal:

Generator transformers and Interconnector Transformers:

at 33 kV;

at 11 kV;

at 0.4 kV;.

Power Station transformers (i.e. dedicated transformers supplying both the Generation Unit and the Power Station auxiliaries from the HV busbar):

at 33 kV;

at 11 kV;

at 0.4 kV;

Unit transformers (i.e. transformers supplying auxiliaries of a Generation Unit):

AXT1, AXT2 etc.

Load transformers:

for 33/11 kV;

for 33/0.4 kV;

for 11/0.4kV;

Bus sections, conventional busbars:

single bus;

double bus;

Bus sections, ring busbars:

Bus Couplers:

Lines and cables : i.e. each line or cable at a station identified by name of station or stations at the remote end or ends of the line or cable in alphabetical order.

Circuit Breakers: i.e. CB.

Main Earth Disconnects :

Line Disconnect:

Busbar Disconnects:

Coupler Disconnects:

CC.5.4 Every User shall be responsible for the provision, erection and maintenance of clear and unambiguous labelling showing the designation and nomenclature of its Plant and Apparatus at the User Site.

CC.6 Relevant Technical Standards Applying to User Plant and Apparatus

CC.6.1 All User Plant and Apparatus associated with the connection to the T & D System shall comply with the:

(a) Seychelles Law and

(b) Standard

(i) the British Standards; or

(ii) if there is no relevant in Seychelles standards, such other relevant standard which is in common use as International best practice;

In each case, as current at the date of the User's applicable Connection Agreement, where the GO, acting reasonably, determines that in order to ensure the safe and co-ordinated operation of a User's Plant and/or Apparatus with the T & D System, there is a requirement for supplemental specifications and/or standards to apply to the design of a User's Plant and/or Apparatus, the GO shall notify the User and the User shall comply with the additional requirements. On request from the User, the GO shall provide reasonable evidence as necessary to demonstrate the need for the supplemental specifications and/or standards.

CC.6.2 In the event that any standard or specification with which a User's Plant and/or Apparatus is required to comply under CC.6.1 is amended, the GO will, having consulted with the affected Users and with the Grid Code Review Panel, make a recommendation to the SEC as to what action should be taken.

CC.7 Specific Design and Performance Standards

CC.7.1 In order to facilitate secure and stable operation of the T & D System for the benefit of all Users, it is necessary that Users' Plant and Apparatus is designed to be capable of sustained operation within a range of T & D System conditions.

CC.7.2 All Users

CC.7.2.1 Earthing

CC.7.2.1.1 The earthing of all Users' Plant and Apparatus and provision of an earthing system shall, as a minimum requirement, be in accordance with the recommendations contained in the "Guide for Safety in Alternating Current Substations", ANSI/IEEE No. 80.

CC.7.2.1.2 The GO shall consult with each User regarding the specification for the earthing grid to be provided.

CC.7.2.1.3 Each User's earth disconnects must be earthed directly to the main station earth grid.

CC.7.2.1.4 The User will be obliged to certify (by a competent body) that remote earths have been isolated from the User's site and any other affected third parties sites and that adequate precautions shall be taken by the User to ensure that dangerous grid potential rises are not transferred outside the earthing zone. The T & D Station cannot be energised until this certification has been received by the GO.

CC.7.2.1.5 Each User's earthing system shall be bonded to the T & D Station earth grid so that both earthing systems are effectively integrated.

CC.7.2.1.6 Each User shall ensure that all staff working on the User's earthing system shall be adequately trained to perform such work in a safe manner.

CC.7.2.2 Design

CC.7.2.2.1 User Plant and Apparatus shall be designed with the following minimum capabilities (at the applicable Voltage levels).

This standard defines minimum clearances to protect personnel, vehicles and equipment against inadvertent contact, or hazardous proximity, to exposed conductors, and defines the minimum basic clearances required in a.c. switchyards.

Parameter (Minimum)	**33 kV (36 kV class)**	**11 kV (12 kV class)**	**0.4kV**
Insulation Level (kV); - Lightning Impulse (1.2/50 µsec.) - Switching Impulse (0.25/2.5 ms) - Power Frequency (50 Hz, for 1 min)	170 - 70	75-95 - 28	
Clearance outdoor in air of live metal parts (mm) phase to earth	500 (320)	500 (160)	25 between conductors 20 conductor to earth
Height of live parts above pedestrian passageways (mm)	3000	3000	3000
Height of bottom of unscreened live bushings above ground (mm)	4000	4000	4000
Height of live conductors above roadways (mm)	10000	10000	

User Plant and Apparatus at the Connection Point shall be designed taking account of the short circuit current levels specified in CC.8.5 User circuit breakers shall be capable of safely making and interrupting currents due to faults, taking account of the current levels specified in CC.8.6. Circuit breakers with a higher rating than the current levels specified in CC.8.6 may be necessary for a number of reasons, including, but not limited to the need to provide an adequate safety margin or to cater for a high DC component in the fault current. It shall be the responsibility of the User to determine what safety margin, if any, to apply when selecting the User's Plant and Apparatus.

CC.7.2.3 LV Cables and Wiring

CC.7.2.3.1 All multi-core control and protection cables shall be provided with a suitable metallic screen. Facilities for earthing these screens at the base of cabinets shall be provided.

CC.7.2.3.2 LV supply cable and auxiliary wiring shall be routed from the T & D Station to each User's control building through a mutually agreed cable corridor. The cables will be laid in concrete troughs with reinforced concrete covers, or as mutually agreed, in the User's marshalling rack, which will be situated near the T & D Station.

CC.7.2.4 Locking

CC.7.2.4.1 The facility to lock in the open/closed position and interlocking facilities shall be provided by each User on appropriate disconnects and/or circuit breakers (with withdraw facilities) in order to ensure that the incoming feeder(s) to the facility can be safely isolated when required by the GO. The specific details of this requirement shall be outlined at the design phase.

CC.7.2.4.2 Existing Power Stations operating under PUC Power Generation Electrical Safety Rules, in accordance with 10.4, will be deemed to comply with CC.7.2.4.1 subject to review by the GO

CC.7.2.5 Grid Connected Transformer

CC.7.2.5.1 Generators shall provide on-load tap-changing (OLTC) facilities for all Generator Transformers.

CC.7.2.5.2 Generator Transformer windings shall be connected in star (with the star point or neutral brought out) on the higher Voltage side and in delta on the lower Voltage side.

Other Grid Connected Transformers may be connected either in delta on the lower voltage side and in star (with the star point or neutral brought out) on the higher Voltage side;

CC.7.2.5.3 Provision should be made for the earthing of the neutral of each Transformer connected to the 11 kV System by bringing out the neutral and ensuring that the insulation is such that the transformer can be operated unearthed.

CC.7.2.5.4 The HV neutrals of all Transformers connected to the 33 kV System should be solidly earthed. The capability of being operated unearthed is unnecessary.

CC.7.2.5.5 The GO will provide the facility for the tripping of Grid Connected Transformer HV circuit breakers from the User's transformer protection.

CC.7.3 Generators

CC.7.3.1 The conditions specified in this section of the code apply to all Generation Units connected or connecting to the T & D System. Unless explicitly stated all conditions specified apply over the full operating capabilities of the Generation Unit at the Connection Point.

For all Generation Units where Secondary Fuel Registered Capacity is different than Primary Fuel Registered Capacity all appropriate Connection Conditions must be met. In case some CCs are not met, CC.1.4 applies.

CC.7.3.1.1 Each Generation Unit, shall, as a minimum, have the following capabilities:

(a) operate continuously at normal rated output at T & D System Frequencies in the range 49.5Hz to 50.5Hz;

(b) remain synchronised to the T & D System at T & D System Frequencies within the range 47.5Hz to 52.0Hz for a duration of 60 minutes;

(c) remain synchronised to the T & D System at T & D System Frequencies within the range 47.0Hz to 47.5Hz for a duration of 20 seconds required each time the Frequency is below 47.5Hz;

(d) remain synchronised to the T & D System during rate of change of T & D System Frequency of values up to and including 0.7 Hz per second;

(e) sustained operation at the specified Minimum Generation within the range 49.8 to 51.0 Hz;

(f) remain synchronised to the T & D System at normal rated output at T & D System Voltages within the ranges specified for step changes in T & D System Voltage of up to 10%;

(g) sustained operation in accordance with the Reactive Power capability as required by CC.7.3.6 at T & D System Voltages within the ranges specified in CC.8.3.2, unless otherwise specified;

(h) remain synchronised during and following any Fault Disturbance anywhere on the Power System which could result in Voltage dips at the HV terminals of the Generator Transformer of no greater than 95% of nominal Voltage (5% retained) for fault durations up to and including the Fault Ride-Through Times as defined in the table below and Voltage dips of no greater than 50% of nominal Voltage (i.e. 50% retained) for fault durations up to and including the Fault Ride-Through Times as defined in the table below (see also Fault Ride-Through Envelopes below). Following the fault clearance, the Generation Unit should return to prefault conditions subject to its normal Governor Control System and Automatic Voltage Regulator response.

VOLTAGE DIP MAGNITUDE	**Fault Ride-Through Times**		
	33 kV System	11 kV System	0.4 kV System
95% (5% retained)	150 ms	150 ms	na
50% (50% retained)	450 ms	450 ms	na

(i) remain synchronised to the T & D System during a negative phase sequence load unbalance in accordance with IEC 60034-1;

(j) The short circuit ratio of each Generation Unit shall be in accordance with IEC 60034-1;

(k) Minimum Load — greater than 50% of Registered Capacity for CCGT/ Diesel Installations. For CCGT Installations whilst operating in Open Cycle Mode as a result of combined cycle plant capability being unavailable, the Minimum Load of each Combustion Turbine Unit must be not greater than 35% of the Registered Capacity divided by the number of Combustion Turbine Units.

(l) Ramp up capability — not less than 10% of Registered Capacity per minute when the Unit is in the Normal Dispatch Condition.

(m) Ramp down capability — not less than 10% of Registered Capacity per minute when the Unit is in the Normal Dispatch Condition.

(n) Minimum up-time — not greater than 1 hour for Thermal Units

(o) Minimum down-time — not greater than 2 hours for Thermal Units

(p) Block Loading — not greater than 10% of Registered Capacity

(q) Operating Reserve

(i) POR for RES penetration:

a) If RES is Less than 45% of the Total generation, POR shall not be less than 15% Registered Capacity.

This shall be provided, at a minimum, at MW Outputs in the range from 50% to 85% of Registered Capacity; provision in the range of 85% to 100% Registered Capacity shall be not less than that indicated by a straight line with unit decay from 15% of Registered Capacity at 85% output to 0 at 100% output.

b) If RES greater equal 55%, POR shall be not less than 35% registered capacity to be provided, at a minimum, at MW Outputs in the range from 50% to 65 % Registered Capacity; provision in the range of 65% to 100%

Registered Capacity shall be not less than that indicated by a straight line with unit decay from 35% of Registered Capacity at 65% output to 0 at 100% output.

c) Between 45% and 55%, not less than y% given by the formula:

y%=15+(35-15)/100*(RES-45)

where RES is the actual renewable penetration

(ii) SOR for RES penetration:

a) If RES is Less than 45%, SOR shall not be less than 15% Registered Capacity.

This shall be provided, at a minimum, at MW Outputs in the range from 50% to 85% Registered Capacity; provision in the range of 85% to 100% Registered Capacity shall be not less than that indicated by a straight line with unity decay from 15% of Registered Capacity at 85% output to 0 at 100% output.

b) If RES is greater equal 55%, SOR shall be not less than 35% registered capacity. This shall be provided, at a minimum, at MW Outputs in the range from 50% to 65% Registered Capacity; provision in the range of 65% to 100% Registered Capacity shall be not less than that indicated by a straight line with unit decay from 35% of Registered Capacity at 65% output to 0 at 100% output.

c) Between 45% and 55%, not less than y% given by the formula:

y%=15+(35-15)/100*(RES-15),

where RES is the actual renewable penetration

(iii) TOR1 not less than 15% Registered Capacity

It shall be provided, at a minimum, at MW Outputs in the range from 50% to 85% Registered Capacity; provision in the range of 85% to 100% Registered Capacity shall be not less than that indicated by a straight line with unity decay from 15% of Registered Capacity at 85% output to 0 at 100% output.

(r) The GO may request Generation Units of Registered Capacity greater than or equal to 500 kW to have the capacity to operate under AGC at all loads between AGC Minimum Load and AGC Maximum Load.

CC.7.3.1.2 Users shall install Generation Unit governors that comply with OC4.3.4. Users shall not change frequency or load related control settings of Unit governors without agreement with the GO.

CC.7.3.1.3 Notwithstanding CC.7.3.1.1 combustion turbine, hydro, or other technology based Generation Units shall as appropriate, register and perform according to Operating Characteristics giving maximum flexibility of operation, consistent with their type and model of generation plant, in accordance with Good Industry Practice. Where appropriate, Operating Characteristics and in particular start times, should be registered separately for normal (planned) starts, and for starts required under conditions of system stress, such as following the loss of a Generation Unit. The Generator shall maintain operational procedures and practices, which ensure that there are no unnecessary delays in responding to Dispatch instructions in accordance with the technical capabilities of the Generation Plant.

CC.7.3.1.4 When the GO approaches a Generator, the Generator shall co-operate with the GO in the development of procedures and facilities to improve the response of each Generation Unit during conditions of system stress, including, for example, automatic start-up of fast-start Generation Units following a loss of Generation Unit(s) or in advance of an anticipated loss of Generation Unit(s). This shall be subject to the agreement of the Generator that the procedures are consistent with secure operation of the Generator's Plant. Such agreement shall not to be unreasonably withheld.

CC.7.3.2 Control Synchronising shall be provided by Generators at circuit breakers identified by the GO, which, depending on the Plant configuration may include:

a) the Generation Unit circuit breaker;
b) the Generator Transformer LV and HV circuit breakers;

The GO will provide to the Generator signals from the GO operated Plant and Apparatus as are required to facilitate synchronising on the Generator Transformer HV circuit breaker, in accordance with the relevant provisions of the Connection Agreement.

CC.7.3.3 The Synchronising facilities in CC.7.3.2 shall facilitate Synchronising under the following conditions:

a) T & D System Frequency within the limits 48.0 to 52.0 Hz;
b) T & D System Voltage within the limits as specified in CC.8.3.2, notwithstanding CC.7.3.6;

CC.7.3.5 Each Generation Unit shall be designed, where practicable, to mitigate the risk of common mode failure with other Generation Units. In particular each Generation Unit shall be designed so that it can operate with its essential auxiliaries supplied through a unit transformer which shall be connected between the Generation Unit circuit breaker and the Generator Transformer LV terminals, or from another secure source as agreed with the GO. Auxiliary supplies may, provided that they are in accordance with Good Industry Practice, be taken from an alternative source during commissioning, testing, start-up or emergencies.

In the case of a CCGT/DIESEL Installation this applies to the Combustion Turbine Units only.

CC.7.3.5 Reactive Power Capability

CC.7.3.5.1 Each Generation Unit shall have the following Reactive Power capability as measured at their alternator terminals:

Voltage Range	Connected at:	At Registered Capacity between:	At 50% of Registered Capacity between:
0.4kV ≤ V ≤ 33kV	33kV	0.85 power factor leading to 0.85 power factor lagging	0.7 power factor leading to 0.4 power factor lagging

CC.7.3.5.2 At between Registered Capacity and 50% Registered Capacity, Mvar capability to be not less than indicated by a straight line drawn between the two points derived from the above, on a plot of Mvar capability against MW output.

CC.7.3.5.3 At below 50% Registered Capacity, Mvar capability to be not less than that at 50% Registered Capacity.

CC.7.3.5.4 The Generator Transformer shall be designed such that the Reactive Power capability is possible over the full range of T & D System Voltages (specified in CC.7.3.6.1)

CC.7.3.5.5 The GO and the Generator will liaise on matters related to CC.7.3.6 at the design stage.

CC.7.3.6 Each Generation Unit must be fitted with a fast acting proportional turbine speed governor and unit load controller or equivalent control device to provide Frequency response under normal operating conditions in accordance with OC4. The governor must be designed and operated to the appropriate

a) Seychelles Standards; or

b) In the absence of a relevant Seychelles Standards, such other standard which is in common use within the Seychelles

as at the time when the installation of which it forms a part was designed. Normal governor regulation shall be between 3% and 5%.

CC.7.3.7 All Generation Units shall be capable of contributing to control of T & D System Voltage by continuous modulation of Generator Voltage by means of a suitable continuously acting Automatic Voltage Regulation (AVR) which shall comply with BS4999 part 140, or equivalent International Standards and the characteristics of which have been accepted by the GO prior to the Connection Date. Such acceptance shall not to be unreasonably withheld.

CC.7.3.8 Each Generator Transformer shall have on-load tap changing facilities (OLTC). The tap step shall not alter the Voltage ratio at the HV terminals by more than:

a) 2.5% on the 11kV system

b) 1.6% on the 33kV and 400V systems

or as agreed with the GO.

CC.7.4 Each Demand Side Aggregator shall, as a minimum, have the following capabilities:

(a) Able to provide Demand Side Aggregator MW Response between 0 MW and the Demand Side Aggregator MW Capacity;

(b) Maximum Ramp Up Rate not less than 5% per minute of Demand Side Aggregator MW Response as specified in the Dispatch Instruction;

(c) Maximum Ramp Down Rate not less than 5% per minute of Demand Side Aggregator MW Response as specified in the Dispatch Instruction;

(d) Minimum Down Time not less than 30 minutes;

(e) Maximum Down Time not less than 2 hours;

(f) Minimum off time not greater than 2 hours; and

(g) Demand Side Aggregator MW Response Time of not greater than 20 minutes hour.

On-site Generation that forms part of a Demand Side Aggregator shall, as a minimum, have the following capabilities:

(h) operate continuously at normal rated output at T & D System Frequencies in the range 49.25 Hz to 50.75 Hz;

(i) remain synchronised to the T & D System at T & D System Frequencies within the range 47.5Hz to 52.0Hz for a duration of 20 minutes;

(j) remain synchronised to the T & D System at T & D System Frequencies within the range 47.0Hz to 47.5Hz for a duration of 20 seconds required each time the Frequency is below 47.5Hz; and

(k) remain synchronised to the T & D System during a rate of change of T & D System Frequency of values up to and including 0.7 Hz per second.

CC.8 T&D System Performance

CC.8.1 The GO shall in accordance with Prudent Utility Practice plan, design and operate the T & D System so as to endeavor to maintain the performance targets at the Connection Point as set out in this CC.8.

CC.8.2 T & D System Frequency

CC.8.2.1 The T & D System Frequency is nominally 50 Hz:

(a) Normal operating range: 49.8 to 50.2 Hz.

(b) During T & D System disturbances: 48.0 to 52.0 Hz.

(c) During exceptional T & D System disturbances: 47.0 to 52.0 Hz.

CC.8.3 T & D System Voltages.

CC.8.3.1 The T & D System Voltages are nominally 33kV, 11kV and 0.4kV. Normal operating ranges are:

(a) 33kV system: 31kV to 35kV;

(b) 11kV system: 10.3kV to 11.7kV;

(c) 0.4kV system: 0.376kV to 0.424kV.

CC.8.3.2 During T & D System disturbances or following T & D faults:

(a) 33kV system: 30kV to 36.3kV;

(b) 11kV system: 10.0kV to 12.1kV;

(c) 0.4kV system: 0.36kV to 0.440kV.

Some T & D System disturbances (e.g. earth faults, lightning strikes) will result in short-term Voltage deviations outside the above ranges.

CC.8.3.3 Insulation Level: equipment shall withstand the following insulation levels under power frequency and impulse test (1.2/50 us):

System Voltage	Withstand Voltage level	Impulse Level
400V	3kV	/
11kV	28kV	75kV
33kV	70kV	170kV

CC.8.4 The negative phase-sequence component of the phase Voltage of the T & D System Voltages will generally not exceed 1% under normal operating conditions.

CC.8.5 The T & D System is designed and operated to maintain the Initial Symmetrical Short-Circuit Current below the following table:

System Voltage [MVA]	(RMS Symmetrical) [kA]
400V Domestic	10
400V Industrial/ Commercial	45
11kV	18.4
33kV	25

The GO shall notify any User with a connection to the T & D System at a location to which item (d) above applies that the location is so designated.

CC.8.6 Neutral treatment shall be solidly earthed or via resistance in order to comply with followings:

System Voltage (MVA)	(RMS Symmetrical) [kA]
11kV	Directly earthed or R=5 ohm if I>1200 A
33kV	Directly earthed or via Z if I>2500 A

CC.9 Metering

CC.9.1 Metering Equipment shall be installed at User Sites in accordance with the provisions of the Connection Agreement and to the standards defined in the Metering Code.

CC.9.2 The point or points at which supply is given or taken between the distribution system and the user's installation shall be the terminals of the user's incoming/outgoing switchgear. The metering point where incoming or outgoing active and/or reactive energy is metered shall also be the incoming/outgoing terminals of the user's switchgear which are connected to the distribution system, except that in the case of transformer(s) supplying only 1 customer at low voltage, the meter shall be installed by the Customer.

CC.9.3 Metering equipment will be supplied, owned and installed by PUC as close as technically and practically possible to the user's incoming/outgoing switchgear terminals, except for the case of dedicated substations as explained in CC9.2.

CC.10 User Protection and Power Quality

This shall apply to the DSO, Generators, and Demand Customers.

CC.10.1 Every User shall, acting in accordance with Good Industry Practice, be responsible, insofar as is reasonably practicable, for ensuring that faults on Plant and Apparatus cause minimal disturbance to the Power System. Faults on Plant and/or Apparatus connected to the T & D System should be cleared as soon as possible with no deliberate time delay introduced .

The maximum clearance times (from fault current inception to arc extinction) shall be within the limits established in accordance with the protection and equipment short circuit rating policy adopted for the distribution system. Such clearance times are supplied after application and in any event should be cleared within a maximum time of 300 ms.

These clearance times are from primary protection systems only. Without limiting this obligation, a User shall as a minimum prior to connection of the User's System to the T & D System install and maintain, in accordance with Good Industry Practice, the protection equipment specified in CC.10.8 and CC.10.9.

CC.10.2 For the avoidance of doubt, the adequacy of protection equipment installed by the User for protecting the User's Plant and Apparatus against T & D System disturbances is for the User to determine. It should also be noted that the GO's requirements are primarily intended to

protect the T & D System facilities. Although they afford a level of protection to Users they are not primarily designed to protect Users' facilities.

CC.10.3 For the purpose of CC.10.1 the minimum protection requirements for a User facility connecting to the T & D System will vary according to type, size, earthing and method of connection. User protection required by the GO should always be in service when the associated plant is in service.

CC.10.4 It should be noted that high speed automatic reclosing (HSAR) is a feature of T & D System operation. This feature is characterised by the sudden re-energisation of the power supply after a dead time of approximately 600 ms.

CC.10.5 It is recommended that Users take precautions against disturbances on the T & D System including without limitation protection against:

(a) load unbalance (negative sequence) protection;

(b) over/under-voltage;

(c) over/under-frequency;

(d) a combination of (b) and (c) that may result in overfluxing; and

(e) high speed automatic reclosing (HSAR), where applicable.

Users may consult with the GO with respect to protection adequacy.

CC.10.6 In order to ensure secure operation of the T & D System and correct co-ordination and discrimination between faults on the T & D System and the Distribution System and User Systems, settings for User's protection systems that may have an Operational Effect, shall be notified to the GO and it will be necessary for the GO to prohibit the settings of some User protection systems within certain ranges. Protection systems where such limitations will apply include, but are not limited to:

(a) Generation Unit under-frequency, over-current, or distance protection

(b) transformer over-fluxing, over-current, or distance protection;

(c) loss-of-mains protection.

A mechanism for the notification, and where applicable approval and determination, of such settings will be set out in the User's Connection Agreement or other agreements.

CC.10.7 The GO shall provide to the User the information and signals necessary for the interface co-ordination and operation of the User's protection, in accordance with the relevant provisions of the Connection Agreement, other agreements and CC.7.2.5.4.

CC.10.8 Where it is feasible to do so, the GO shall provide circuit breaker fail protection on Grid Connection Point circuit breakers installed in new T & D stations.

CC.10.9 Generators

CC.10.9.1 Generators shall provide:

(a) differential protection on the Generator Transformer. The connections between the Grid Connection Point circuit breaker and the HV terminals of the Generator Transformer shall be included in the protected zone of this differential protection.

(b) backup protection (to the T & D System) on Generation Units. The GO acting reasonably shall require one or more of the following to be installed: generator overcurrent protection, voltage controlled generator overcurrent protection or generator distance protection;

(c) under frequency protection; and

(d) Generation Unit loss of excitation protection.

CC.10.9.2 The GO may require an individual Generator, or group of Generators, to install additional protection and/or control schemes, where the GO can reasonably show that it is prudent or necessary to do so. These schemes may include but are not limited to the following:

(a) Generation Unit over/under-voltage protection.

(b) Generation Unit over-frequency protection.

(c) Generation Unit transformer neutral displacement voltage detection.

(d) loss-of-mains protection (rate of change of frequency or vector shift).

(e) Generation Unit pole slip protection.

(f) Power System stabiliser.

CC.10.9.3 Distance protection shall be provided by the GO on the Grid Connection Point circuit breaker of Generator Transformers.

CC.10.10 Demand Customer

CC.10.10.1 Demand Customers shall provide differential-protection on Grid Connected Transformers.

CC.10.10.2 The GO may require Demand Customers to install additional protection schemes, where the GO can reasonably show that it is prudent or necessary to do so, which may include the following:

(a) directional overcurrent protection or distance protection on Grid Connected Transformer(s) where the User System contains Embedded Generation;

(b) neutral voltage displacement protection on HV side of Grid Connected Transformer(s);

(c) loss of mains protection where the User System contains Embedded Generation;

(d) under/over voltage protection where the User System contains Embedded Generation; and

(e) under/over frequency protection where the User System contains Embedded Generation.

CC.10.10.3 Distance protection or over-current protection shall be provided by the GO on the Grid Connection Point circuit breaker(s).

Users shall ensure that their connection to the T & D System does not result in the level of distortion or fluctuation of the supply Voltage on the T & D System, at the Connection Point, exceeding that allocated to them following consultation with the GO.

Distortion and fluctuation limits are outlined in IEC/TR3 61000-3-6 (Harmonics) and IEC/TR3 61000-3-7 (Voltage fluctuation). Users shall also operate their Plant in a manner which will not cause the requirements contained in CENELEC Standard EN 50160 to be breached.

CC.10.10.4 The aggregate power factor for a Demand Customer is calculated in accordance with the following formula:

$$\frac{Sum\ P}{APF} = \sqrt{(Sum\ P)^2 + (Sum\ Q)^2}$$

where:

APF is the Aggregate Power Factor for the Demand Customer

Sum P is the Energy exchanged with the Demand Customer at the Connection Point for any half-hour period; and

Sum Q is the Reactive Energy exchanged with the Demand Customer at the Connection Point for the same half-hour period.

CC.10.10.5 A Demand Customer shall ensure that at any load above 50% of Maximum Import Capacity the aggregate power factor as determined at the Connection Point in any half-hour period shall be within the range 0.90 lagging to unity.

CC.11 Communication Facilities

CC.11.1 The communication facilities required to be provided by Users are addressed in the Operating Codes.

CC.12 Signals to be Provided by Users

CC.12.1 Each User shall provide such signals and indications in relation to the User's Plant and Apparatus as are reasonably required by the GO in accordance with the Connection Agreement.

CC.12.2 Signals and indications required to be provided by Users will include but shall not be limited to the following:

(a) LV switchgear positions pertinent to the status of each Grid Connected Transformer through a set of two potential free auxiliary contacts (one contact normally open and one contact normally closed when circuit breaker

is open) for each circuit breaker;

(b) kV at transformer low Voltage terminals; and

(c) a minimum of four sets of normally open potential free auxiliary contacts in each transformer LV bay for fault indication.

(d), (e), (f), (g), (h) and (i) are applicable to Generators and DREPS only

(d) MW and +/-Mvar at alternator terminals of each Generation Unit;

(e) kV at Generator Transformer LV terminals;

(f) Generator Transformer tap position;

(g) Measured or derived MW output on each fuel, from Generation Units that can continuously fire on more than one fuel simultaneously;

(h) Where it is agreed between the GO and the Generator that signals are not available on the HV terminals, +/- MW and +/- Mvar shall be provided at the Grid Connected Transformer low Voltage terminals; and

(i) Remaining Secondary Fuel capability (where applicable) in MWh equivalent when running at Registered Capacity;

(j) and (k) are applicable to Demand Customers only,

(j) MW and +/- Mvar at the HV terminals of the Grid Connected Transformer;

(k) Grid Connected Transformer tap position.

(l), (m), (n), (o), (p), (q), (r) and (s) are applicable to Demand Side Aggregator Operators who represent a Demand Side Aggregator:

(l) Demand Side Aggregator MW Response from Generation operating in Continuous Parallel Mode or Shaving Mode;

(m) Demand Side Aggregator MW Response from avoided Demand consumption and Generation operating in Lopping Mode, Standby Mode or Automatic Mains Failure Mode;

(n) Remaining Demand Side Aggregator MW Availability;

(o) Demand Side Aggregator MW Response from each Individual Demand Site with a Demand Side Aggregator MW Capacity of greater than or equal to 20 kW;

(p) MW Output from Generation Units with a Capacity greater than or equal to 20 kW;

(q) Mvar Output from Generation Units with a Capacity greater than or equal to 20 kW at Individual Demand Sites with a Maximum Export Capacity specified in the Connection Agreement or DSO Connection Agreement as applicable, as required by the GO;

(r) Aggregate MW Output from Generation Units with a combined Capacity of greater than or equal to xx MW on an Individual Demand Site, as required by the GO; and

(s) Demand Side Aggregator MW Response from each Individual Demand Site that comprises the Demand Side Aggregator, as required by the GO.

CC.12.3 Where signals or indications required to be provided by the User under CC.12.2 become unavailable or do not comply with applicable standards due to failure of the Users' technical equipment or any other reason under the control of the User, the User shall, acting in

accordance with Good Industry Practice, restore or correct the signals and/or indications as soon as possible.

CC.12.4 Signals to be provided by Users shall be presented in such form as is nominated by the GO.

CC.12.5 Where, the GO, acting reasonably, determines that because of a Modification to the T & D System or otherwise to meet a T & D System requirement, additional signals and/or indications in relation to a User's Plant and Apparatus are required, the GO shall notify that requirement to the User. On receipt of such a notification the User shall promptly, and in accordance with Good Industry Practice, ensure that such signals and/or indications are made available at the relevant marshalling rack.

CC.12.6 Demand Side Aggregator Operators and Generator Aggregators shall provide the GO the specification of the method of aggregation of SCADA from multiple sites. The minimum specifications shall be agreed with the GO in advance and shall include:

(b) signals from Demand Side Aggregator Operators shall be relayed to the GO Telecommunication Interface Cabinet which reflect the Demand Side Aggregator MW Response to an accuracy of within 5% of the actual Demand Side Aggregator MW Response within 15 seconds of change occurring to the Demand Side Aggregator MW Response; and

(c) a single failure of an item of the Demand Side Aggregator Operator's equipment will not result in:

(i) loss of control of more than one Individual Demand Site;

(ii) loss of Demand Side Aggregator MW Response of more than one Individual Demand Site; or

(iii) the Demand Side Aggregator MW Response from Generation or Demand Side Aggregator MW Response from avoided Demand consumption signals being incorrect by more than the Demand Side Aggregator MW Capacity of the Individual Demand Site with the highest Demand Side Aggregator MW Capacity comprising the Demand Side Aggregator

CC.13 Power Supplies

CC.13.1 Each User shall provide:

(a) 400 V ac / 230 V ac power supplies as required by the GO for T & D Station facilities, the capacity and detail of which shall be as specified by the GO and provided for in the User's Connection Agreement;

(b) a standby supply for all ac power supplies for T & D Station facilities by a diesel generator, unless alternative means are agreed with the GO. Such agreement not to be unreasonably withheld. In the event of loss of mains, standby supplies shall be capable of being sustained for a minimum of 10 hours.

CC.14 Responsibility for Safety

CC.14.1 For each User Site and in consultation with the User, the GO shall detail in the Operation Instructions the demarcation of responsibility for safety of persons carrying out work or testing at the User's Connection Site and on circuits which cross the User's Site at any point.

CC.14.2 More detailed information on procedures and responsibilities involved in safety procedures is set out in 10.4.

CC.15 Commissioning and Notification

CC.15.1 The GO and the User shall, in accordance with the provisions set out in the Connection Agreement, meet to discuss Commissioning, including Commissioning Tests and Grid Code Tests. The User's obligations in relation to Testing set out in this CC.15 are in addition to the requirements under the Connection Agreement.

CC.15.2 Users are required to carry out such tests (which are defined to be Grid Code Tests) as are required in order to confirm that the User's Plant and Apparatus meets all the requirements of the Grid Code which must be met prior to the Operational Date. The GO may, under the Connection Agreement, notify to the User such Grid Code Tests as it requires the User to carry out. The GO may not necessarily test for CC.7.3.1.1 (a), (b), (c), (d) and (e) but reserve the right to test to establish design and operational compliance. For the avoidance of doubt it is the responsibility of Users at all times to ensure their compliance with the Grid Code and testing successfully or otherwise shall not in any way diminish or reduce such responsibilities.

CC.15.3 Where Commissioning is likely to involve a requirement for Dispatch for Test purposes, the User shall, as soon as possible, notify the GO of this requirement, including reasonable details as to the duration and type of Testing required. Users shall give the GO reasonable advance notice (being not less than fifteen (15) Business Days) of the time of carrying out of the Commissioning Tests. The time and date of such commissioning shall be reconfirmed not less than three (3) Business Days before the time of carrying out such tests. In the event that, having given such confirmation the User (acting reasonably) determines that such tests must be carried out prior to the time and the date previously confirmed, then provided the User gives the GO reasonable notice of the re-scheduled tests, he shall not be deemed to have failed to give the notices required. The User shall as soon as it becomes aware of the same, subsequently notify the GO of any material changes in the requirement and details so notified.

CC.15.4 The information provided under CC.15.3 is for indicative purposes only, and the User shall subsequently make a formal request to the GO for a Commissioning Test requiring Dispatch in accordance with the following provisions of this CC.15, and shall not carry out such a Commissioning Test except as Dispatched in accordance with this CC.15.

CC.15.5 Users shall make a request in writing to the GO for every Commissioning Test requiring Dispatch, in accordance with CC.15.4.

CC.15.5.1 Such request to include the following information:

a) Details of the proposed Commissioning Test;

b) Dispatches, where necessary, required by Users for completion of the Commissioning Test, if any, including the duration of the Dispatch;

c) Where the User may not know the entire Dispatches required for completion of the Test until part of the Test is completed then the User when proposing the Test shall:

1) divide the Commissioning Test into sections as appropriate;
2) indicate and discuss which sections of the Commissioning Test can be completed in stages and which cannot;
3) indicate possible variations of the Commissioning Test for the sections which can be completed in stages.

CC.15.5.2 Users shall outline:

a) the factors which influence the completion of the stages to the GO, (namely, if the procedure to be followed for a certain stage depends on the outcome of a previous stage);

b) the preferred time or times for the Commissioning Test;

c) interrupted by the GO after completion the milestones for individual sections of the Commissioning Test (if any) which can be completed separately, and/or do not require to be repeated if the Commissioning Test is of each section.

CC.15.6 Generators will be subject to SDC a minimum of seven (7) days prior to the Operational Date and the Generation Unit and DREPS will be available for Dispatch from the Operational Date.

CC.15.7 Following the Connection Date but not later than the Operational Date Users shall verify (by giving the GO such evidence as it may reasonably require including, without limitation, the results of the relevant Commissioning Test or Grid Code Test) technical data provided under the Planning Code and other technical data which the GO reasonably requires to be verified to assess compliance with the Grid Code or the Connection Agreement.

CC.15.8 The values as confirmed or verified under CC.15 shall be included in the User's Registered Operating Characteristics and Registered Data

6 OPERATING CODE

OC.1 Demand Forecasting

OC.1.1 Introduction

OC1.1.1 OC1 is concerned with Demand forecasting for operational purposes. In order to match Generation with Demand for electricity it is necessary to undertake Demand forecasting. It is also necessary to undertake Demand forecasting of Reactive Power. OC1 deals with the provision of data on Demand Control in the Operational Planning Phase, the Programming Phase, the Control Phase and the Post Control Phase.

OC1.1.2 In the Operational Planning Phase, Demand forecasting shall be conducted by the GO taking account of Demand forecasts furnished by Users who shall provide the GO with Demand forecasts and other information in the form set out in this OC1.

OC1.1.3 In the Programming Phase and Control Phase, the GO will conduct its own Demand forecasting taking into account information to be furnished by Users and the other factors referred to in OC1.6.1.

OC1.1.4 In OC1.4, which relates to data required from Users in the Operational Planning Phase, Demand means demand of MW and Mvar of electricity relating to each Grid Supply Point plus that to be met by an Embedded Generation Plant. Reactive Power Demand includes the series Reactive Power losses of the User's System but excludes any network B and any Reactive Power compensation on the User's System. The GO will obtain the lumped network B and details of reactive compensation from the requirements to submit data under the Planning Code.

OC1.1.5 In this OC1, Year 0 means the current year, Year 1 means the next year after year 0, Year 2 means the year after Year 1, and so on.

OC1.1.6 The reference in this OC1 to a "day" shall mean the period covered by the "Trading Day", even though that may not be a calendar day.

OC1.1.7 References in OC1 to data being supplied on 30 minutes basis refer to it being supplied for each period of 30 minutes ending on the hour and 30 minutes hour in each hour.

OC.1.2 Objectives

OC1.2.1 Ensure the provision of data to the GO by Users in the Operational Planning Phase, Programming Phase, Control Phase and Post Control Phase.

OC1.2.2 Describe the factors to be taken into account by the GO when Demand forecasting in the Programming Phase and Control Phase.

OC.1.3 Scope

OC.1.3.1 OC1 applies to the GO and to all Users, which term in this OC1 means:

(a) Generators;

(b) The T&D System Operator;

(c) Suppliers;

(d) Demand Customers; and

(e) Dispatchable Renewable Power Stations (DREPS)

(f) Demand Side Aggregator (DSA)

OC.1.4 Data Required by the GO in the Operational Planning Phase

OC1.4.1 Each User shall provide the GO with the data requested in the relevant parts of OC1.4 below (except Demand solely related to Power Station Auxiliary Plant when fed in accordance with pre-agreed feeding arrangements).

OC1.4.2 For year 1 the following shall be supplied to the GO In Writing by week 26 in year 0:

a) The DSO (where applicable), the DSA and Demand Customers or an dedicated Department of PUC, shall supply typical profiles of the anticipated Demand (averaged over any half hour on any Grid Supply Point) on 30 minutes basis and Grid Supply Point basis for defined categories of day type as determined by the GO;

b) The DSO (where applicable), the DSA and Demand Customers an dedicated Department of PUC shall supply MW profiles of the amount and duration of anticipated Demand Control which may result in a Demand change of 20% or more (averaged over any 30 minutes on any Grid Supply Point) on 30 minutes and Grid Supply Point basis;

c) The DSO (where applicable) and the DSA shall supply typical MW profiles for the operation, or Availability as appropriate, of Embedded Generation where the total Registered Capacity of Generation Units on a single Site exceeds 20 kW for defined categories of day type as determined by the GO. The method for submitting MW schedules and/or Availability shall be agreed between the GO and the DSO (where applicable) and the DSA;

d) Notwithstanding OC1.4.2 (c), the DSO (where applicable) and the DSA shall supply typical MW profiles for the operation, or availability as appropriate, of Embedded Generation where the total Registered Capacity of Generation Units on a single Site exceeds 20 kW, for defined categories of day type as determined by the GO, if the GO considers the Site to be critical for T & D System operation. The method for submitting MW schedules and/or Availability shall be agreed between the GO and the DSO (where applicable) and the DSA,

OC1.4.3 The DSO (where applicable), the DSA and Demand Customers shall inform the GO of any changes to the information supplied under OC1.4.2 as soon as this information is available. This information will be provided In Writing, or as otherwise agreed between the DSO (where applicable), the DSA or Demand Customers and the GO,

(a) In particular, the DSO (where applicable), the DSA and Demand Customers shall provide to the GO In Writing information pertaining to new connections greater than 20 kW immediately this information is available. This information must include: anticipated connection date, location of connection, size of connection category of connection (e.g. residential, industrial etc.) and the typical profiles of the anticipated Demand on half hourly basis for defined categories of day type as determined by the GO;

(b) In particular, The DSO (where applicable), the DSA and Demand Customers shall provide to the GO In Writing information pertaining to disconnection of existing Demand as soon as

this information is available. This information must include: anticipated disconnection date, location of connection, size of connection, and the revised typical profiles of the anticipated Demand on a half hourly basis at the Grid Supply Point for defined categories of day type as determined by the GO;

OC1.4.4 Five Business Day before the end of every month, the DSO (where applicable), the DSA and Demand Customers shall verify In Writing that the most recently submitted MW Demand profiles for the following two months are in accordance with their current best estimate of these values.

OC.1.5 Post Control Phase

OC.1.5.1 The following is required by the GO In Writing (or by such electronic data transmission facilities as have been agreed with the GO) by 14.00 hours each day in respect of Active Power data and Reactive Power data:

(a) MW profiles for the previous "Trading Day" of the amount and duration of Demand reduction achieved from the use of Demand Control of 100 kW or more (averaged over any 30 minutes on any Grid Supply Point), on a 30 minutes and Grid Supply Point basis, from the DSO and/or DSA;

(b) MW profiles of the amount and duration of Demand reduction achieved from the use of Customer Demand Management of 100 kW or more on a half hourly basis during the previous Trading Day, from Suppliers and Demand Customers;

(c) Details of 30 minutes Active Power output and Reactive Power produced or absorbed by Embedded Generation, with a single Site with Registered Capacity in excess of 200 kW, during the previous "Trading Day", from the DSO;

(d) (Where requested by the GO), details of Active Power output and Reactive Power produced or absorbed by the Generation Plant during the previous Trading Day, from the Generators.

OC.1.6 The GO Demand Forecast

OC.1.6.1 The following factors will be taken into account by the GO when conducting Demand forecasting in the Programming Phase and Control Phase:

(a) Historic Demand data;

(b) Weather forecasts and the current and historic weather conditions;

(c) The incidence of major events or activities which are known to the GO in advance;

(d) T & D System losses;

(e) Embedded Generation;

(f) Demand Control of 200 kW or more (averaged over any hour at any Grid Supply Point) proposed to be exercised by the DSO and DSA and of which the GO has been informed;

(g) Customer Demand Management of 100 kW or more (averaged over any hour) proposed to be exercised by Suppliers and of which the GO has been informed;

(h) Other information supplied by Users, and

(i) Growth rates.

OC1.6.2 Taking into account the factors specified in OC1.6.1 the GO uses Demand Forecast methodology to produce forecasts of Demand.

OC1.6.3 The methodology will be based upon factors (a), (b), (c) and (d) above to produce, by statistical means, unbiased forecasts of Demand including that to be met by Embedded Generation. Demand will be calculated from these forecasts but will also take into account factors (e), (f), (g), (h) and (i) above.

OC.2 Operational Planning

OC.2.1 Introduction

OC2.1.1 Secure operation of an electricity system requires that maintenance of production facilities (Generation Units, Dispatchable Renewable Power Station, Aggregated Generating Units and Demand Side Aggregators) should be carried out in a timely and orderly fashion. This is essential in order to enable the GO to fulfil its obligations relating to operation of the T & D System, and to enable Active Users to plan their Outages in an orderly way with due regard to Plant requirements and resource limitations. The mechanisms by which this is achieved are formalised in this Operational Planning Code (Generation).

OC.2.2 Objective

OC2.1.2 The primary objective of OC2 is to promote the development and implementation of a coordinated Generation Outage Programme, consistent with security of supply and requirements for the secure and economic operation of the T & D System, and with the needs of the Active Users in respect of Plant maintenance requirements and resource limitations.

In order to achieve this objective, OC2 defines:

(a) the procedure for formal notification of Outages by Generators, Generator Aggregators, DREPS and Demand Side Aggregator Operators to the GO;

(b) the procedures by which the Indicative, Provisional and Committed Outage Programmes are reviewed by the GO, in consultation with Generators, Generator Aggregators, DREPS or Demand Side Aggregator Operators;

(c) the co-ordination of Outage planning; and

(d) the procedure for formal notification by Generators, Generator Aggregators, DREPS or Demand Side Aggregator Operators of:

(i) a decision to cancel a major Outage of a Generating Unit or DREPS;

(ii) the findings during or following a major Outage of a Generating Unit or DREPS;

(iii) an unexpected and unplanned failure of a Generating Unit or DREPS.

OC2 shall apply to all proposed Outages that may affect the ability of a Generation Unit, DREPS, Aggregated Generating Unit and Demand Side Aggregator to achieve, in accordance with its Registered Operating Characteristics, either its full Registered Capacity, appropriate to each Registered Fuel, or its Demand Side Aggregator MW Capacity as the case maybe.

OC2.7 also requires Generators, DREPS, Generator Aggregators and Demand Side Aggregator Operators to inform the GO of other proposed maintenance of a Generation Unit, DREPS, Aggregated Generating Unit, Demand Side Aggregator or any associated Plant or Apparatus, where such maintenance will affect the availability of Ancillary Services in respect of that Generation Unit.

OC.2.3 Scope

OC2.3.1 Operational Planning applies to the GO and to the following, each of which is a User under this OC2:

(a) Generators and DREPS which for the purposes of OC2 includes all Generators with Registered Capacity greater than 200 kW or which are subject to Central Dispatch;

(b) Generator Aggregators;

(c) Demand Side Aggregator Operators; and

(d) The Distribution System Operator (DSO).

OC.2.4 Outage Scheduling

OC2.4.1 Throughout OC2 the current year shall be defined as year n, the following year as Year n+1, and so on. The Outage planning process in respect of a Generation Unit, DREPS, Aggregated Generating Unit and Demand Side Aggregator shall commence not later than one (1) year prior to the Scheduled Operational Date or from the date of the relevant agreements, whichever is the later.

OC2.4.2 In rolling over the Generation Outage Programme from one year to the next, for every year except the first year of the planning process:

(a) submissions by the Active Users for year n+2 should reflect the current Provisional Outage Programme for year n+3; and

(b) submissions by the Active users for year n+1 should reflect the current Provisional Outage Programme for year n+2.

except, in any such case, to the extent that the Generator, DREPS, Generator Aggregator or Demand Side Aggregator Operator is reasonably responding to changed circumstances. This does not require Generators, DREPS, Generator Aggregators or Demand Side Aggregator Operators to explain changes unless required to do so by the GO. The aggregate of all Generators' Outage Programmes is the Generation Outage Programme that will comprise the Committed Outage Programme (COP) and Provisional Outage Programme (POP).

OC2.4.3 By the end of June in year n, Generators, DREPS, Generator Aggregators and Demand Side Aggregator Operators shall submit to the GO, for each Generation Unit, Aggregated Generating Unit or Demand Side Aggregator, details of Outages and estimates of the Forced Outage Probabilities for inclusion in:

(a) the Committed Outage Programme (COP) for year n+1. Other than in the first year after the planning process has commenced, this will be based on the previous year's Provisional Outage Programme for year n+2, which period through the passage of time has now become year 1, and any changes may only reflect the Generator's, DREPS, Generator Aggregator's, and Demand Side Aggregator Operator's reasonable response to changed circumstances;

(b) the Provisional Outage Programme (POP) for years 2 and 3.

In the case of Aggregated Generating Units, and Demand Side Aggregators which consist of Aggregated Demand Sites, the Generator Aggregator or Demand Side Aggregator Operator shall provide the aggregated Outages, and upon request from the GO the Generator Aggregator or Demand Side Aggregator Operator shall provide the Outage for each individual site, in a reasonable time period.

Generators, DREPS, Generator Aggregators and Demand Side Aggregator Operators shall specify with regard to each of their Generation Units, DREP, Aggregated Generating Units or Demand Side Aggregators, the start date and time and the duration of each Outage.

OC2.4.4 In scheduling Outages, and in relation to all other matters under OC2, the Active Users must act reasonably and in good faith. Without limitation to such obligation, each the Active Users should act in accordance with Good Industry Practice in planning their Outages; in particular, they have to avoid a situation arising in which the Active Users is obliged to schedule an Outage at short notice by reason of obligations imposed upon the Active Users by statute; this as a consequence of the Active Users not having planned in accordance with Good Industry Practice, for example, by not having planned sufficiently in advance its Outages for any statutory time limit.

OC2.4.5 When submitting proposed Outages for inclusion in the COP and POP, Generators, DREPS, Generator Aggregators and Demand Side Aggregator Operators shall, unless they reasonably substantiate that an Outage is inflexible, specify:

(a) an alternative preferred window(s) of opportunity within each year for any Outage;

(b) the minimum Outage duration which would be acceptable, if less than the scheduled Outage duration;

(c) situations where the paralleling of Outages of two or more of its Generation Units, DREPS, Aggregated Generating Units, Demand Side Aggregators or Aggregated Demand Side Aggregators may be required, desirable, undesirable or not possible;

(d) a priority order associated with the various Outages scheduled by the Generator, DREPs, Generator Aggregators and Demand Side Aggregator Operator;

(e) any Outages where it is particularly desirable that they should take place within the year scheduled; or

(f) any Outage where its timing is dependent on Generation Unit run hours, equivalent run hours or starts.

OC2.4.6 Generators, DREPs, Generator Aggregators, Demand Side Aggregator Operators are required to signal adequately in advance of major Outages which could impact on capacity adequacy or on the GO's T & D outage maintenance and development. In rolling over the Generation Outage Programme from one year to the next each Generator, Generator Aggregator and Demand Side Aggregator Operator shall not be constrained in making any submission by any previous Provisional Outage Programme.

OC2.4.7 Between 30th of June and 31st of December of year n, the GO shall carry out a security analysis of years n+1 to n+7 in light of proposed Outages and other relevant matters including:

(a) Outages of other Active Users; and

(b) T & D outages,

(c) Load growth and

(d) Fuel security.

In the event that a proposed the Active Users outage has a detrimental effect on Capacity Adequacy or system security in the T & D System, the GO will highlight the shortfall to all the Active Users.

OC2.4.8 Any concerns which the GO may have with the Generation Outage Programme for year n+1, must be notified to all the Active Users by the 31st of July in year n.

OC2.4.9 If there is a concern in accordance with OC2.4.8, between the 31st of July in year n and the 31st of August in year n the GO will enter into discussions with the Active Users to find a resolution. If by the end of 31st of August in year n no resolution has been agreed and in the opinion of the GO there is a capacity shortfall in year n+1, the GO will issue a System Capacity Shortfall Warning.

OC2.4.10 The GO shall issue to each the Active Users a Generation Outage Programme for that the Active Users for years n+1 to n+3 by the last Business Day of month of August in year n, including the COP for year n+1.

OC.2.5 Changes to the Committed Outage Programme (COP) Within the Implementation Year (Year n)

OC2.5.1 A request for a change to an Outage included in the Committed Outage Programme or an additional Outage may be initiated either by the GO or by a Generator, DREP, Generator Aggregator or Demand Side Aggregator Operator at any time.

OC.2.5.2 Request initiated by the GO

OC2.5.2.1 The GO may at any time request from the Active Users a change in the timing or duration of any Outage of one of the Active Users or an Individual Demand Site which constitutes the Demand Side Aggregator in the Committed Outage Programme.

OC2.5.2.2 Active Users may respond either by declining the request, or by agreeing to the request (in which case the COP shall be deemed to be amended accordingly). the Active Users shall make every reasonable effort to co-operate with changes requested by the GO.

OC2.5.2.3 If the Active Users responds by agreeing to the request subject to specific conditions, the GO may respond by either confirming agreement to those conditions, in which case the conditions specified by the Active Users tor shall be deemed to have been accepted, or by declining agreement. Where the GO agrees to the conditions the COP shall be deemed to be amended accordingly. Where the GO declines to agree to the conditions, then the GO may negotiate with the Active Users as to revised or alternative conditions, which would be acceptable.

OC2.5.2.4 In case no agreement is achieved between parties, GO acts in accordance with Good Industry Practice.

OC.2.5.3 Outage Change initiated by the Generator, DREP, Generator Aggregator or Demand Side Aggregator Operator

OC2.5.3.1 Active Users may at any time request the GO for a change in the timing or duration of any Outage of one of the Generator's Generation Units, one of the DREP units or Demand Side Aggregator Operator's Demand Side Aggregators or an Individual Demand Site which constitutes the Demand Side Aggregator in the Committed Outage Programme.

OC2.5.3.2 Where a change to the COP is proposed by a Generator, Generator Aggregator or Demand Side Aggregator Operator, the GO shall evaluate whether the change is likely to have a detrimental effect on Capacity Adequacy or on the secure operation of the T & D System. This shall be done within a reasonable time frame, taking into consideration the extent of the change and the timing of the Outage.

OC2.5.3.3 Where, in accordance with OC2.4, the request is not likely to have a detrimental effect on Capacity Adequacy or the secure operation of the T & D System then the GO shall amend the COP accordingly. The Generator, DREP, Generator Aggregator or Demand Side Aggregator Operator shall be advised by the GO that the change has been accepted.

OC2.5.3.4 Where, in accordance with OC2.4, the Outage change is likely to have a detrimental effect on Capacity Adequacy or requirements for the secure operation of the T & D System then the GO shall not amend the COP. The GO shall contact the Active Users and inform the Active Users that the change to the COP has not been accepted, the GO shall at the Active Users' request enter into discussions with the Active Users to facilitate an alternative modification which may meet the requirements of the Active Users while not having an unacceptable effect on Capacity Adequacy or requirements for secure operation of the T & D System. In the event that the Active Users wishes to avail of an alternative modification, it shall submit a change request in accordance with OC2.5.3.1.

OC2.5.3.5 Where any Active User has been notified that the change to the COP has not been accepted, but in the view of the Active User it must force the Active User to be unavailable due to technical or safety issues, then the Active User shall inform the GO immediately in accordance with the requirements to submit an Availability Notice.

OC.2.6 Other Information to be Notified

OC2.6.1 Generators and DREPs will inform the GO of any proposed maintenance, in addition to Outages, which will, or is likely to, affect the capability of the Generation Unit or DREPs to provide Ancillary Services, as soon as is reasonably possible.

OC2.6.2 The GO may, where security of supply or the secure operation of the T & D System would be at risk, request alterations to maintenance notified under Section OC2.6.1. The GO shall make reasonable endeavours to give as much notice as possible for such requests for alterations. Where the GO makes such a request, the Generator, Generator Aggregator or Demand Side Aggregator Operator shall use reasonable endeavours to comply with the request in arriving at the User's final programme for such maintenance.

OC2.6.3 The DSO shall co-operate with the GO and Embedded Generators, DREPs and Demand Side Aggregator Operators in all phases of Outage planning to promote Capacity Adequacy and ensure system security.

OC2.6.4 Generators and DREPs must immediately notify the GO on making the decision to cancel a major Outage of a Generation Unit. Acceptance is at discretion of GO depending on the capability of GO to implement the new changes.

OC2.6.4.1 Following the decision by a Generator or a DREP to cancel a major Outage of a Generation or DREP Unit the Generator or DREP must report to the GO, on an on-going basis, practical, useful, and proportionate information to allow the GO to make the necessary assessments and propose mitigation measures in relation to security of supply.

OC2.6.4.1.2 The reports should cover the following:

(a) an explanation for the cancellation of a major Outage;

(b) annual notification of major changes to the operational intentions of the Generator/DREP and/or characteristics of the Generation/DREP Unit as a result of the decision not to proceed with the major Outage;

(c) assessments covering the risks of sudden and catastrophic failure.

OC2.6.5 A Generator/DREP must immediately notify the GO in the event of sudden and catastrophic failure of a Generation/DREP Unit.

OC2.6.5.1 The Generator/DREP must report to the GO the impact of the failure of the Generation/DREP Unit and the future operation of the Generation/DREP Unit.

OC2.6.5.2 The GO must notify the Regulatory Authority if the assessments covering the sudden and catastrophic failure of a Generation/DREP Unit highlight the emergence of potential risks to the security of supply and the operation of the System.

OC.3 System Services

OC3.1 Introduction

OC3.1.1 System Services refers to the services essential to the proper functioning of the Power System which electricity utilities collectively provide for their customers in addition to the

provision of electrical power, the supply of electric energy, and the T & D and distribution of this energy, and which thus determine Power Quality:

(a) Frequency Control;

(b) Voltage Control;

(c) Network Control;

(d) Operating Margin; and

(e) Black Start.

In order to ensure secure operation, the GO shall have control over all System Services; i.e. the GO shall specify what System Services are to be provided when and by whom.

OC3.2 Scope

OC3.2.1 OC3 applies to the GO and to the following, each of which is a User under this OC3:

(a) Grid Connected Generators with Registered Capacity greater than 200 kW;

(b) Demand Customers

(c) The Distribution System Operator (DSO); and

(d) DREPSs with Registered Capacity greater than 200 kW.

OC3.3 Frequency Control

OC3.3.1 Introduction

OC3.3.1.1 In order to maintain the security and integrity of the T & D System it is necessary that the GO operates the T & D System and Dispatches in such a manner as to provide adequate Frequency Control so as to achieve operation within applicable Frequency limits at all times.

OC3.3.2 Objective

OC3.3.2.1 The objectives of OC3.3 are:

(a) to set out the procedures required to ensure that adequate Frequency Control capability is provided on the T & D System to enable operational Frequency Control by the GO so as to achieve the applicable limits; and

(b) to set out the procedures required to enable the GO to control the T & D System Frequency and (insofar as possible) to maintain Frequency within the limits set out in CC8.2.1.

OC3.3.3 Description of Frequency Control

OC3.3.3.1 Frequency Control occurs in two time scales, namely:

(a) Primary Frequency Control; and

(b) Secondary Frequency Control.

OC3.3.3.2 Primary Frequency Control

OC3.3.3.2.1 Primary Frequency Control takes place in the period of up to 30 seconds after a change in Frequency and is achieved by automatic corrective responses to Frequency deviations occurring on the T & D System. This automatic correction arises from:

(a) natural frequency demand relief of motor load;

(b) automatic MW output adjustment of Generation Units initiated by Governor Droop or other responses including peaking of Combustion Turbine Units, condensate stop or frequency triggered response of pumped storage units;

(c) automatic MW output adjustment of DREPs if Wind or PV combined with BESS;

(d) automatic MW output reduction of DREPs (in case of frequency increase) if Solar;

(e) automatic load adjustment via Demand Side Aggregators (see Demand Control, OC.4);

(f) automatic load shedding (see Demand Control, OC.4).

OC3.3.3.2.2 Automatic Primary Frequency Control actions in response to normal Frequency fluctuations, within the levels specified in CC.8.2.1 (a), on the T & D System can be termed as "Frequency Regulation".

Inadequate Frequency Regulation can result in:

(a) unscheduled operation because Generation Units are moving away from their Dispatched MW levels due to Frequency drift; and

(b) failure to meet the applicable Frequency limits.

OC3.3.3.2.3 Frequency deviations, outside the levels specified in CC8.2.1(a) such as those that may occur on the loss of Generation Unit(s), DREPS or other MW input into, the T & D System or the Distribution System are corrected through the use of Operating Reserve.

OC3.3.3.3 Secondary Frequency Control

OC3.3.3.3.1 Secondary Frequency Control takes place in the time scale from 5 seconds up to 10 minutes after the change in Frequency. It is provided by a combination of automatic and manual actions.

OC3.3.3.3.2 Improved Secondary Frequency Control can be achieved by use of a Secondary Frequency Regulation System which acts directly on the MW Outputs of participating Generation/DREPS Units. This automatic action facilitates more frequent MW output adjustments than is practicable by means of Dispatch Instructions and manual setpoint adjustment, thus allowing more frequent and rapid Frequency correction.

OC3.3.4 Frequency Response System

OC3.3.4.1 Requirements of Generation Unit Governor Systems

OC3.3.4.1.1 In order that adequate Frequency Regulation is maintained on the T & D System at all times, Generators are required to comply with the provisions of OC3.3.4.1.

OC3.3.4.1.2 Other than as permitted in accordance with OC3.3.4:

(a) Generation Units when Synchronised to the T & D System shall operate at all times under the control of a Governor Control System, unless otherwise specified by the GO, with characteristics within the appropriate ranges as specified in Connection Conditions;

(b) DREPS Units when Synchronised to the T & D System, , shall operate at all times under the control of the ACDC inverter interface, unless otherwise specified by the GO, with characteristics within the appropriate ranges as specified in Connection Conditions;

(b) no time delays other than those necessarily inherent in the design of the Governor Control System and the Inverter Control System shall be introduced;

(c) A Frequency Deadband of no greater than +/- 15mHz may be applied to the operation of the Governor Control and the Inverter Control Systems. The design, implementation and operation of the Frequency Deadband shall be agreed with the GO prior to the Commissioning.

OC3.3.4.1.3 The Generator/DREPs may only restrict governor/inverter control action in such a manner as to contravene the terms of OC3.3.4.1.2 where:

(a) the action is essential for the safety of personnel and/or to avoid damage to the Plant, in which case the Generator/DREPs shall inform the GO of the restriction without delay; or

(b) in order to (acting in accordance with Good Industry Practice) secure the reliability of the Generation Unit/DREPs unit; or

(c) the restriction is agreed between the GO and the Generator/DREPs in advance; or

(d) the restriction is in accordance with a Dispatch Instruction given by the GO.

OC3.3.4.1.4 In the event that the GO in accordance with OC3.3.4.1.3 either agrees to a restriction on governor/inverter action or instructs such a restriction, the GO shall record the nature of the restriction, the reasons, and the time of occurrence and duration of the restriction.

OC3.3.4.1.5 Action required by Generators/eligible DREPs in response to low Frequency:

(a) If System Frequency falls to below 49.80 Hz each Generator/Eligible DREPS will be required to check that each of its CDGUs/DREPS is achieving the required level of response including that required from the Governor/Inverter Control System, where applicable in order to contribute to containing and correcting the low System Frequency.

(b) Where the required level of response is not being achieved appropriate action should be taken by the Generator/DREPS without delay and without receipt of instruction

from the GO to achieve the required levels of response, provided the Generator's/DREPS'ss local security and safety conditions permit,

OC3.3.4.1.6 Action required by Generators/DREPs in response to high Frequency:

If System Frequency rises to or above 50.2 Hz each Generator/DREPS will be required to ensure that its CDGUs/DREPSs has responded in order to contribute to containing and correction the high System Frequency by automatic or manually reducing MW Output without delay and without receipt of instruction from the GO to achieve the required levels of response, provided the Generator's/DREPS's local security and safety conditions permit.

OC3.3.5 Dispatch Instruction

OC3.3.5.1 When the GO determines it is necessary, by having monitored the System Frequency, it may, as part of the procedure set out in SDC2, issue a Dispatch Instruction (including Target Frequency where applicable) in order to seek to regulate Frequency to meet the requirements for Frequency Control. The GO will give, where applicable, 15 minutes notice to each relevant User of variation in Target Frequency.

OC3.3.6 Automatic Generator Control (AGC)

OC3.3.6.1 The secondary Frequency regulation system operational on the T & D System is known as the "Automatic Generator Control" (AGC).

OC3.3.6.2 Generation Units and DREPS with a Registered Capacity of 200 kW or greater are, under Connection Conditions, required to be connected to AGC. The AGC Control Range is a Registered Operating Characteristic.

OC3.3.6.3 Other than as provided for in OC3.3.6.4 and OC3.3.6.5 all Generation/DREP Units fitted with AGC shall operate under the control of AGC when within their AGC Control Range.

OC3.3.6.4 In the event that the Generator/DREPS (acting in accordance with Good Industry Practice) considers that it is necessary to secure the reliability of a Generation/DREPS Unit or for the safety of personnel and/or Plant, to prevent a Generation/DREPS Unit from operating under AGC and commences to control the MW output manually, then the Generator/DREPS shall inform the GO of this without delay. Generators/DREPSs shall also inform the GO of the reasons for not operating the Generating/DREPS Unit under AGC, and the course of action being taken to rectify the problem forthwith. When the problem has been rectified, the Generator/DREPS shall contact the GO to arrange for the Generation/DREPS Unit to return to operation under the control of AGC.

OC3.3.6.5 The GO may issue a Dispatch Instruction to a Generator/DREPs to prevent a Generation/DREPS Unit (fitted with AGC) from operating under AGC, in accordance with SDC2.

OC3.3.6.6 Generation/DREPS Units not operating under AGC for reasons set out in OC3.3.6.4 and OC3.3.6.5 shall nevertheless continue to follow MW Dispatch Instructions as required by SDC2.

OC3.4 Voltage Control

OC3.4.1 Introduction

OC3.4.1.1 In order to maintain security and integrity of the T & D System, to avoid damage to the T & D System and to User Plant, and to maintain Voltages at User Connection Points within the limits specified in the Connection Conditions, it is necessary for the GO to control T & D System Voltages.

OC3.4.1.2 Voltage control of power systems requires that a Mvar demand is met and that sufficient dynamic Voltage control capability is available on the T & D System to cover changes in the Mvar demand such as result from Demand variations, to facilitate controlled Voltage adjustment and to limit the duration and extent of Voltage fluctuations under fault conditions. To control T & D System Voltages, the GO will utilize a variety of methods of dynamic and static control.

OC3.4.1.3 Voltage control strategies used by the GO include:

a) transformer tap-changing, cable switching, reactor and capacitor switching, and other control methods which involve utilisation of T & D System Plant only;

b) tap-changing on Generator Transformers;

c) Demand power factor correction;

d) utilisation of Generation/DREPS Unit Reactive Power capability, both by means of AVR control and also Mvar Dispatch Instructions issued by the GO to Generators/DREPS;

OC3.4.2 Objectives

OC3.4.2.1 The objective of OC3.4 is to set out the control strategies used by the GO, in conjunction with Users where appropriate, in controlling T & D System Voltages.

OC3.4.2.2 OC3.4 sets out the procedures required (in conjunction with those in SDC2 to enable the GO to:

(a) maintain voltage stability of the T & D System;

(b) maintain T & D System Voltages at User Connection Points within operational limits as specified in the Connection Conditions.

OC3.4.2.3 OC3.4 sets out the procedures for the utilisation of User Plant or facilities by the GO for the purposes of T & D System Voltage control, where appropriate.

OC3.4.2.4 Some procedures for implementation of Voltage control strategies (e.g. Generation Unit Mvar Dispatch) are addressed under the provisions of SDC2 and therefore this OC4.4 shall be read in conjunction with these provisions.

OC3.4.3 Description of Voltage Control

OC3.4.3.1 Voltage Control is achieved by ensuring sufficient availability of dynamic and static reactive power from contributions listed in OC3.4.3.2. The factors, which are obviously most readily

subject to control by the GO, are the Mvar produced and absorbed by Generation/DREPS Units, and installed dedicated Voltage Control facilities.

OC3.4.3.2 The GO shall endeavour to maintain sufficient availability of dynamic and static reactive power in order to operate T & D System Voltages at Connection Points within the levels specified in CC.8.3, at all times. Factors, which will influence the required Mvar capacity, include the following:

a) The charging capacitance of the T & D System
b) Customer Mvar Demand
c) T & D System Mvar losses
d) Generation Unit Mvar production or absorption
e) DREPS units Mvar production or absorption
f) Voltage Control facilities, such as capacitor banks and reactors.

OC3.4.3.3 The effects of T & D System capacitance can be controlled and to some extent utilised by controlled variation of the T & D System Voltage. Thus at times of high Mvar Demand (normally times of high MW Demand), the T & D System Voltage may be operated towards the upper portion of the allowable control range, and at times of low Mvar Demand (normally times of low MW Demand), the T & D System Voltage may be operated towards the lower portion of the allowable control range. This daily variation is typically required for operation of the T & D System.

OC3.4.3.4 Due to the electrical characteristics of a T & D System, the Voltage (for Plant operated at the same nominal Voltage) will not be the same at all points on the T & D System.

OC3.4.4 Voltage Control Policy

OC3.4.4.1 The GO shall control system voltage in order to minimise system losses and cost of use of Ancillary Services. The GO shall determine and modify as appropriate general procedures for its use in controlling Voltage on the T & D System. The procedures shall be formulated having due regard to relevant economics of T & D System operation and Power System reliability. In particular, the Voltage Control shall take cognisance of daily, weekly and seasonal factors and the GO shall determine:

(a) suitable target Voltages in order to limit/control the effect of T & D capacitance;

(b) best utilisation of dedicated Voltage Control facilities; and

(c) Mvar dynamic reserve requirements.

OC3.4.5 Methods Utilised in Exercising Voltage Control

OC3.4.5.1 T & D System Voltages shall be continuously monitored by the GO. Appropriate Voltage operating points shall be determined by the GO, taking account of OC3.4.4 and in particular of System conditions pertaining at the time of operation.

OC3.4.5.2 The GO shall adjust System Voltages, using control facilities that are available so as to achieve the Mvar capacity necessary in order to operate T & D System Voltages at Connection Points within the levels specified in CC.8.3 and retain a dynamic Mvar capability to deal with changing System conditions which result from changes in Demand or changes in

T & D or generation configuration, whether as a result of control actions or faults. This may necessitate the modification of Generation/DREPS Unit MW output transfer to the T & D System.

OC3.4.5.3 The excitation system of each Generation/DREPS Unit shall normally be operated under the control of a continuously acting AVR, which shall be set so as to maintain a constant terminal voltage. The Generator/DREPS may not disable or restrict the operation of the AVR except in accordance with OC3.4.5.5, in which event the Generator shall notify the GO without delay.

OC3.4.5.5 The Generator/DREPS may only disable or restrict AVR action where:

(a) the action is essential for the safety of personnel and/or Plant; or

(b) in order to (acting in accordance with Good Industry Practice), secure the reliability of the Generation/DREPS Unit; or

(c) the restriction is agreed between the GO and the Generator/DREPS in advance.

OC3.4.5.6 In the event of a Generation/DREPS Unit not operating under AVR, the GO may impose restrictions on the operation of the Generation/DREPS Unit in accordance with Prudent Utility Practice, to the extent necessary to provide for safe and secure operation of the T & D System and operation within prescribed standards, including where necessary instructing the Generator/DREPS to De-Energise the Generation/DREPS Unit. Where the GO takes such action, the GO shall consult with the Generator/DREPS as soon as practicable in order to determine a safe operating regime, which causes minimum restriction on the operation of the Generation/DREPS Unit.

OC3.4.5.7 The GO shall, by means of Dispatch Instructions (as provided in SDC2), instruct Generators/DREPS to adjust the Reactive Power output of Generation/DREPS Units, and the relevant provisions of SDC2 shall apply.

OC3.4.5.8 Other facilities which shall be utilised by the GO, where appropriate, in order to exercise Voltage Control shall include:

(a) switching in or out of dedicated Voltage Control facilities, such as capacitor banks and reactors;

(b) tap-changing on 33/11kV T & D System transformers;

(c) switching out of T & D HV cables (and occasionally T & D lines) in order to reduce the capacitive contribution of the T & D System.

OC3.4.5.9 The extent to which Voltage Control mechanisms can be utilised may be limited by System conditions and other limitations of Plant and Apparatus.

OC3.4.5.10 On some occasions it shall be necessary to reschedule Generation/DREPS Units away from their desired output in order to achieve T & D System Voltages at Connection Points within the levels specified in CC.8.2.

OC3.4.6 Emergency or Exceptional Voltage Control

OC3.4.6.1 Additional Voltage Control mechanisms may be utilised in the event of System Emergency Conditions. These shall include the following:

a) Generators/DREPS may be requested to operate Generation/DREPS Units at Mvar production or absorption levels outside their currently declared Technical Parameters. This will be done by agreement between the Generator/DREPS and the GO and Generators/DREPS will not be penalised for non-compliance with this clause.

b) Changes in System Voltage can be achieved by instructing, as a form of Dispatch Instruction under OC3.4, Generators/DREPS to carry out a Simultaneous Tap Change/Inverter Control. In the event that the GO considers it necessary to carry out a Simultaneous Tap Change/Inverter Control, Generators/DREPS shall comply with the GO's instructions.

c) Demand control may be used to prevent Voltage from contravening low Voltage limits at Connection Points.

OC3.5 Network Control

OC3.5.1 Introduction

OC3.5.1.1 In implementing the T & D Outage Programme, in routine operation of the T & D System and in responding to emergency and fault situations on the T & D System, the GO shall carry out network switching and Control Actions which may from time to time affect the operations of Users or security of supply to Users.

OC3.5.1.2 The purpose of this OC3.5 is to set out the actions which may be taken by the GO in controlling the T & D System, to set out the procedures whereby the GO shall inform Users, where practicable, as to network Control Actions which will or may be likely to significantly affect a User's operations and to identify where the GO shall, insofar as reasonably practicable, consult with Users and take into consideration Users' reasonable requirements.

OC3.5.2 Objective

OC3.5.2.1 The first objective of OC3.5 is to identify the Control Actions that may be taken by the GO, in order that the GO may carry out maintenance and operation of the T & D System and respond to T & D System faults and emergencies.

OC3.5.2.2 The second objective of OC3.5 is to establish procedures whereby the GO will:

(a) where practicable, inform Users who will be or are likely to be significantly affected by network Control Actions of relevant details of intended Control Actions and the effect of those Control Actions;

(b) consult with Users as appropriate in order to find out and take into consideration reasonable objections raised by Users so affected.

OC3.5.3 Network Control Actions

OC3.5.3.1 The GO needs to carry out operational network switching for a number of purposes, which will include:

(a) Outages of T & D Plant and Apparatus for the purposes of maintenance, new works, System Tests, protection testing and work by Users;

(b) Outages of T & D Plant due to suspected or potential faults and emergency repairs;

(c) Voltage Control;

(d) Limiting power flows on the T & D System to levels consistent with the capabilities of the T & D Plant and system security.

OC3.5.3.2 Additionally, network switching may occur automatically and without advance warning due to operation of protection equipment in isolating or clearing faults on T & D Plant or on User's Plant which is connected to the T & D System.

OC3.5.3.3 Automatic switching sequences may also be established to limit power flows or Voltage or Frequency deviations in the event of faults elsewhere on the System.

OC3.5.4 Notification to Users of Network Control

OC3.5.4.1 All network Control Actions carried out on the T & D System have the potential in a given set of circumstances to affect Users. To attempt to inform Users of every Control Action is not practicable and in most cases the information will not be of value to the User as the User will not invoke any specific action as a result of receipt of the information.

OC3.5.4.2 Where it is identified and agreed, in accordance with the terms of the Connection Agreements and/ or Operating Agreements, between the GO and a User that a specific Control Action (usually an action affecting the T & D System configuration) has an Operational Effect on a User and that there is merit in notifying the User in advance of the Control Action, then the GO will notify the User of the Control Action (if planned and where time permits), in accordance with any standing agreement that may be agreed with the User.

OC3.5.4.3 Typical examples of actions notified in accordance with OC3.5.4.2 may include:

a) Notification to the DSO of a significant reduction in supply security to a Grid Supply Point, where the DSO may arrange standby feeding arrangements at lower Voltages;

b) Notification to Demand Side Aggregator of a significant reduction in supply security to a Grid Supply Point (such as the Outage of one of two T & D connections) where the Demand Side Aggregator can order appropriate demand reduction to eligible Customers;

c) Notification to a Demand Customer of a significant reduction in supply security to a Grid Supply Point (such as the Outage of one of two T & D connections) where the Demand Customer may arrange standby supply or run in-house Generation.

OC3.5.4.4 Where it is necessary to carry out urgent switching or other network Control Actions resulting from a System condition or fault, then it may not be possible for the GO to inform Users in advance of the switching or other Control Actions. The GO shall endeavour to inform Users where time permits, but this shall not delay timely implementation of Control Actions as required. Where the GO is unable to inform Users prior to the Control Actions, then the provisions of OC3.5.5 shall apply.

OC3.5.5 Control Under Fault or Emergency Conditions

OC3.5.5.1 In the event of a System fault or protection operation or other automatic operation, it will not be possible to invoke standing procedures in accordance with OC3.5.4 prior to the occurrence of the Control Action;

OC3.5.5.2 In the circumstances referred to in OC3.5.5.1 or in the event that the GO needs to implement Control Actions urgently and without informing Users, then unless the situation is of a temporary nature and has been rectified to normal, the GO shall inform Users of the occurrence of the actions;

OC3.5.5.3 The GO shall also inform Users as to the likely duration of the condition and shall update this prognosis as appropriate. The GO shall additionally inform Users when the condition has ended.

OC3.5.6 De-Energization of Users by GO

OC3.5.6.1 De-Energisation of a User's Plant and Apparatus may be effected at any time and from time to time if the GO reasonably considers it necessary in order to provide for safe and secure operation of the T & D System within prescribed standards, including in circumstances which otherwise cause or in the GO's view are likely to cause one or more of the following:

(a) risk to the safety of personnel;

(b) risk to the stability of the T & D System;

(c) risk to the T & D System or any User's Plant or Apparatus;

(d) T & D System elements to become loaded beyond their emergency limits;

(e) Voltage excursions on the T & D System outside the ranges specified in CC.8.3;

(f) any behaviour causing sustained operation outside the normal T & D System operating Frequency range;

(g) any material breach of a Connection Condition; and

(h) any action or inaction which places the GO in breach of any legal or statutory or regulatory obligation.

OC3.6 Operating Margin

OC3.6.1 Introduction

OC3.6.1.1 In order to cater for Demand forecast variations and to cover against a sudden loss of generation from the T & D System, it is necessary that an Operating Margin is maintained through the Operational Control Phase.

OC3.6.1.2 The Operating Margin is the amount of reserve (provided by additional Generation or Demand reduction measures) available above that required to meet the expected System Demand. Prudent Utility Practice requires that a continuum of Operating Margin is provided

to adequately limit, and then correct, the potential Frequency deviation which may occur due to a Generation/Demand imbalance.

OC3.6.1.3 OC3.6 describes different types of reserve, as provided in a number of reserve time scales, which the GO expect to utilise in the provision of the Operating Margin.

OC3.6.1.4 Minimum connection and operating requirements for Generators/DREPSs/DSAs are outlined in the Connection Conditions.

OC3.6.1.5 Procedures for the Monitoring and Testing of Operating Reserve as outlined in Chapter 9.

OC3.6.2 Objective

OC3.6.2.1 The objective of OC3.6 is to describe the various time scales for which reserves are required, to describe the policy which will govern the dispatch of the reserves, and to describe the procedures for monitoring the performance of Generation/DREPSs Units, participating DSAs and other reserve providers.

OC3.6.3 Constituents of Operating Margin

OC3.6.3.1 The Operating Margin consists of Operating Reserve (which is further broken down into 4 time-scales), Replacement Reserve, Substitute Reserve and Contingency Reserve.

OC3.6.3.2 Operating Reserve

OC3.6.3.2.1 Operating Reserve is additional MW output provided from Generation/DREPS plant, reduction or increase of Active Power transfer to the T & D System, to/from an External System or reduction in Customer Demand, via DSA and/or load shedding procedures which must be achievable in real time operation to contain and correct any potential T & D System Frequency deviation to an acceptable level.

OC3.6.3.2.2 Operating Reserve definitions relate to the time elapsed from the occurrence of an event which has initiated a Frequency disturbance. The definition of the time at which the event is deemed to have occurred and other associated definitions are addressed in OC3.6.4.

OC3.6.3.3 Primary Operating Reserve (POR)

OC3.6.3.3.1 Primary Operating Reserve (POR) is the additional MW output (and/or reduction in Demand) required at the Frequency nadir (minimum), compared to the pre-incident output (or Demand) where the nadir occurs between 5 and 15 seconds after an Event.

OC3.6.3.3.2 If the actual Frequency nadir is before 5 seconds or after 15 seconds after the event, then for the purpose of POR monitoring the nadir is deemed to be the lowest Frequency which did occur between 5 and 15 seconds after the Event.

OC3.6.3.4 Secondary Operating Reserve (SOR)

OC3.6.3.4.1 Secondary Operating Reserve (SOR) is the additional MW output (and/or reduction in Demand) required compared to the pre-incident output (or Demand), which is fully available and sustainable over the period from 15 to 90 seconds following an Event.

OC3.6.3.5 Tertiary Operating Reserve

OC3.6.3.5.1 Tertiary Operating Reserve band 1 (TOR1) is the additional MW output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully available and sustainable over the period from 90 seconds to 5 minutes following an Event.

OC3.6.3.5.2 Tertiary Operating Reserve band 2 (TOR2) is the additional MW output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully available and sustainable over the period from 5 minutes to 20 minutes following an Event.

OC3.6.3.6 Replacement Reserve is the additional MW output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully available and sustainable over the period from 20 minutes to 4 hours following an Event.

OC3.6.3.7 Substitute Reserve is the additional MW output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully available and sustainable over the period from 4 hours to 24 hours following an Event.

OC3.6.3.8 Contingency Reserve (CR) is the margin of Availability over forecast Demand, which is required in the period from 24 hours ahead down to real time, to cover against uncertainties in availability of generation capacity and also against weather forecast and Demand forecast errors. Contingency Reserve is provided by generation plant which is not required to be Synchronised, but which must be held available to Synchronise within a limited time scale.

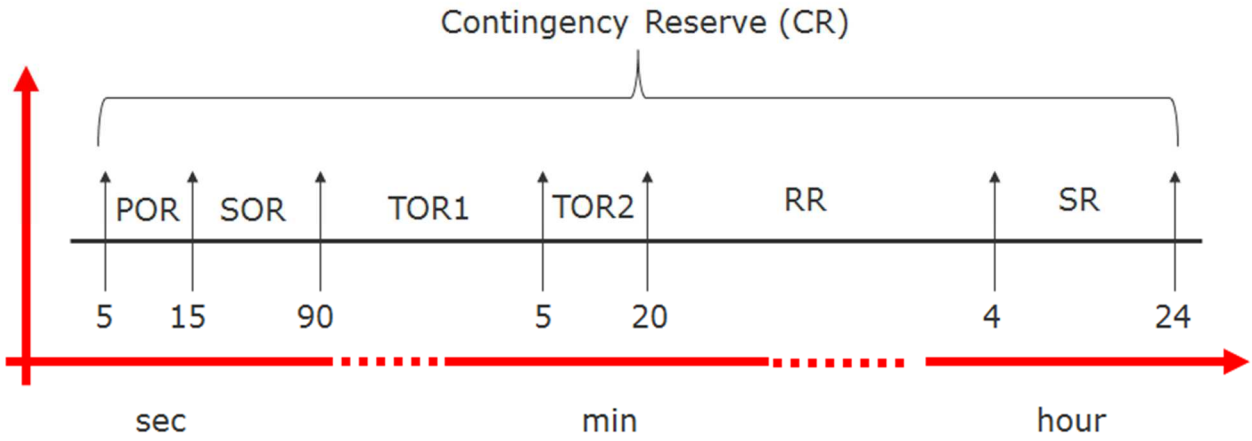

Figure 6-1: Operating Reserve Timeframes

OC3.6.4 Definitions Associated with an Operating Reserve Incident

OC3.6.4.1 Following the occurrence of a significant Frequency disturbance, the GO shall monitor, and analyse the adequacy of the provision of Operating Reserve. For the purposes of this performance analysis, the following criteria have been defined.

OC3.6.4.2 A significant Frequency disturbance event is deemed to have occurred if the Frequency falls below 49.25 Hz.

OC3.6.4.3 The time of occurrence of the event is defined as the last time at which the Frequency fell through the level of 49.25 Hz, prior to the occurrence of the Frequency nadir.

OC3.6.4.4 The pre-incident Frequency value is the average T & D System Frequency between 60 and 30 seconds prior to the Event.

OC3.6.4.5 The pre-incident value of MW output of a Generation Unit, MW Demand of a Customer, is the appropriate MW value averaged over the period between 60 and 30 seconds prior to the Event.

OC3.6.5 Operating Margin Policy

OC3.6.5.1 Contingency Reserve

OC3.6.5.1.1 The GO shall determine the amount of Contingency Reserve required for each time scale up to 24 hours ahead, taking due consideration of relevant factors, including but not limited to the following:

(a) historical Availability Factor and reliability performance of individual Generation Units;

(b) notified risk to the reliability of individual Generation Units; and

(c) Demand forecasting uncertainties; and

(d) statistical output of connected RES .

(e) available amount of DSAs

OC3.6.5.2 Operating Reserve

OC3.6.5.2.1 The GO shall determine the amount of Primary Operating Reserve, Secondary Operating Reserve, Tertiary Operating Reserve and Replacement Reserve to be carried at any time to ensure system security. Due consideration will be taken of relevant factors, including but not limited to the following:

(a) the relevant GO operating policy in existence at that time;

(b) the extent to which Customer disconnections allowed under the relevant standard have already occurred within the relevant period;

(c) the elapsed time since the last Customer disconnection incident;

(d) particular events of national or widespread significance, which may justify provision of additional Operating Reserve;

(e) the cost of providing Operating Reserve at any point in time;

(f) the magnitude and number of the largest generation infeeds to the T & D System at that time, and also over single T & D feeders within the T & D System and also the amount of Generation/DREPS that could be lost following a single Contingency;

(g) ambient weather conditions, insofar as they may affect (directly or indirectly) Generation/DREPS Unit and/or T & D System reliability;

(h) the predicted Frequency drop on loss of the largest infeed as may be determined through simulation using a dynamic model of the Power System;

(j) uncertainty in future Generation/DREPS output.

OC3.6.5.3 The GO shall keep records of significant alterations to the Operating Reserve policy so determined under OC3.6.6.2.

OC3.6.6 Responsibilities of the GO in Respect of Operating Reserve

OC3.6.6.1 The GO shall in accordance with Prudent Utility Practice make reasonable endeavors to Dispatch generation and otherwise operate the system in compliance with the GO's determinations as to Operating Margin policies made from time to time.

OC3.6.6.2 The GO's sole responsibility, having met its obligations under the preceding provisions of OC3.6, shall be to, acting in accordance with Prudent Utility Practice, Dispatch such Generation/DREPS Units and DSAs as are available required to meet:

(a) System Demand; and

(b) the level of Operating Reserve required by the GO's then Operating Reserve policies.

OC3.7 Black Start

OC3.7.1 Introduction

OC3.7.1.1 In order to recover the T & D System from a Partial Shutdown or Total Shutdown, it is necessary to have certain Power Stations ("Black Start Stations") available which have the ability for at least one of its Generation Units to Start-Up from Shutdown and to energise a part of the Total System, or be Synchronised to the System, upon instruction from the GO.

OC3.7.2 Objective

OC3.7.2.1 The objectives of OC3.7 is to set out the requirements of Black Start Stations to enable recovery of the T & D System from a Partial Shutdown or Total Shutdown.

OC3.7.3 Requirements of Black Start Stations

OC3.7.3.1 In order that adequate security is maintained on the T & D System at all times, Black Start Stations are required to comply with the provisions of OC3.7.3.

OC3.7.3.2 Other than as permitted in accordance with OC3.7.3.3:

During a Black Start situation, instructions in relation to Black Start Stations will be in the format required for instructions to Units in SDC, and will recognise any differing Black Start operational capabilities (however termed) set out in the relevant Ancillary Services Agreement in preference to the declared operational capability as registered pursuant to SDC1 (or as amended from time to time in accordance with SDC1 and SDC2). For the purposes of these instructions the Black Start will be an emergency circumstance. For Power Stations which are not Black Start Stations, Dispatch instructions will recognise each Unit's declared operational capability as registered pursuant to SDC1 (or as amended from time to time in accordance with SDC1 and SDC2).

OC3.7.3.3 If during the Demand restoration process any Generation Unit or External System that is part of a Black Start Station cannot, because of the Demand being experienced, keep within its safe operating parameters, the Generator or External System shall inform the GO. The GO will, where possible, either instruct Demand to be altered or will re-configure the T & D System or will instruct a User to re-configure its System in order to alleviate the problem being experienced by the Generator. However, the GO accepts that any decision to keep a Unit operating, if outside its safe operating parameters, is one for the Generator or External System and accepts that the Generator or External System may change generation on that Unit if it believes it is necessary for safety reasons (whether relating to personnel or Plant and/or Apparatus). If such a change is made without prior notice, then the Generator or External System shall inform the GO as soon as reasonably practical

OC.4 Demand Control

OC4.1 Introduction

OC4.1.1 OC4 is concerned with the provisions to be made by the DSO and, by the GO in relation to Demand Customers, to permit the reduction of Demand in the event of available Generating Plant being insufficient to meet Demand, or in the event of breakdown or operating problems such as in respect of System Frequency, Voltage levels or Thermal Overloads on any part of the T & D System. The Demand Control arrangements may also apply where there are insufficient Generating Plant or transfers to meet Demand in all or any part of the T & D System .

OC4.1.2 OC4 deals with the following:

a) Customer Demand reduction instructed by the GO;

b) Customer Demand reconnection instructed by the GO;

c) Automatic low Frequency Demand Disconnection;

d) Automatic low Voltage Demand Disconnection; and

e) Automatic Frequency Restoration.

The term "Demand Control" is used to describe any or all of these methods of achieving Demand reduction, or in the case of (b) and (e), a Demand increase.

OC4.1.3 The procedures set out in OC4 includes a system of Alerts, issued to Users, to give advance notice of Demand Control that may be required by the GO under this OC5.

OC4.1.4 Data relating to Demand Control shall include details relating to MW.

OC4.1.5 Demand Control shall not, so far as is possible, be exercised in respect of Priority Customers. OC4, therefore, applies subject to this exclusion.

OC4.1.6 Demand Control shall be exercised equitably in respect of Customers connected to the T&D System and Demand Customers.

OC4.1.7 Explanation

OC4.1.7.1 Demand Control is exercised through operation of the T & D System. Demand Control relates to the physical organisation of the total System, and not to any contractual arrangements that may exist. Where Demand Control is needed in a particular area, the GO might not know which Supplier to contact and (even if it were to) the resulting Demand Control implemented, because of the diversity of contracts, might not produce the required result.

OC4.1.7.2 Therefore, in most instances of Demand Control, Demand Control will be exercisable by a specific PUC department for Load Control (LDC), which has the full knowledge of Demand Control obligations and procedures. Other Suppliers should note, however, that, although implementation of Demand Control in respect of their Customers may not be exercisable by them, their Customers may be affected by Demand Control.

OC4.2 Objective

OC4.2.1 The overall objective of OC4 is to require the provision of facilities by DSO and Demand Customers to enable the GO to achieve the reduction in Demand that will either avoid or relieve operating problems on the T & D System, and subject to the circumstances set out in OC4.1.1, in whole or in part, and thereby to enable the GO to instruct Demand Control in a manner that does not unduly discriminate against, or unduly prefer, any one or any group of Users. It is also to ensure that the GO is notified of any Demand Control utilised by Users other than following an instruction from the GO.

OC4.3 Scope

OC4.3.1 OC4 applies to the GO and to all Users, which term in this OC4 means:

(a) The LDC of PUC;

(b) Suppliers; and

(c) Demand Customers.

OC4.4 Procedure for the Implementation of Demand Control on the Instructions of the GO

OC4.4.1 Where a shortage of generation capacity or other reason for the exercising of Demand Control is foreseen, the GO (LDC) will alert Demand Customer/Supplier by means of a Demand Control Alert.

OC4.4.2 Where reasonable notice of the need for Demand Control is available, the GO (LDC) will initiate the Rota Load Shedding Plan and Demand Control will be implemented in accordance with the Rota Load Shedding Plan. The GO (LDC) will be responsible for maintaining procedures and will co-operate with each other so as to provide for the implementation of Demand Control in accordance with the Rota Load Shedding Plan.

OC4.4.3 Where the requirement for Demand Control arises at short notice, it may be necessary for practical reasons to implement Demand Control other than in accordance with the Rota Load Shedding Plan. The GO will maintain procedures to provide that Demand Control can be exercised rapidly when required, in accordance with the GO's instructions.

OC4.4.4 In the event of Demand Control being exercised other than in accordance with the Rota Load Shedding Plan (due to reasons of short notice or otherwise), and if the Demand Control is expected to be sustained, then the GO will arrange for the Rota Load Shedding Plan to be implemented as soon as practicable. The GO may instruct certain modifications in the application of the Rota Load Shedding Plan to provide for those Customers which have been subject to shedding in the initial phase prior to the initiation of Planned Rota Load Shedding.

OC4.4.5 The Rota Load Shedding Plan provides for disconnection and reconnection of defined blocks of demand on instruction from the GO, In this way the GO can instruct the necessary level of disconnection (and reconnection) required by the circumstances at the time. The DSO shall comply with instructions issued by the GO in accordance with the Rota Load Shedding Plan, and in particular will not reconnect Demand other than in accordance with the GO's instructions.

OC4.4.6 The Rota Load Shedding Plan shall also provide for the issue of information to Customers through the media of the expected duration of Demand Control, and which blocks of Customers are at most risk of disconnection at which times.

OC4.4.7 The GO (LDC) will maintain records of the disconnection and reconnection of customers exercised under the Rota Load Shedding Plan, (and, for the avoidance of doubt, of any Demand Control exercised in accordance with OC4.4.3).

OC4.5 Automatic Low Frequency Demand Disconnection

OC4.5.1 The GO (LDC) shall make arrangements that will enable automatic low Frequency Disconnection of a percentage of its total peak Customer Demand (based on Annual SLR Conditions) , in order to seek to limit the consequences of a major loss of Generation/DREPS or an event on the total system which leaves part of the total system with a Generation deficit, provided that, so far as possible, Demand of Generation Units which is required to enable the Generation Units to start-up shall not be subject to automatic low Frequency Disconnection. The GO retains the right to specify the Frequency settings on percentages of Demand subject to automatic low Frequency Disconnection.

OC4.5.2 The Demand subject to automatic low Frequency Disconnection will be split into discrete MW blocks. The number, location, size and the associated low Frequency settings of these blocks, will be as specified by the GO by week 39 in every two calendars year following discussion with the Demand Customers and will be reviewed every three years by the GO. The distribution of the blocks will be such as to give reasonably uniform Disconnection within the T&D System across all Grid Supply Points.

OC4.5.3 Demand Customers shall provide automatic low Frequency Disconnection, which will be split into discrete blocks. The number and size of blocks and the associated low Frequency settings will be as specified by the GO by week xx every xxx calendar years following discussion with the Demand Customers. In the case of a User, it is not necessary for it to provide automatic low Frequency Disconnection under OC4.5 if it is providing low Frequency Disconnection at a higher level of Frequency as an Ancillary Service.

OC4.6 Automatic Frequency Restoration

OC4.6.1 The GO (LDC) will make arrangements that will enable automatic Frequency restoration of Demand that is subject to automatic low Frequency Demand Disconnection. The GO retain the right to specify the Frequency settings on blocks of Demand subject to automatic Frequency restoration.

OC4.6.2 Once an automatic low Frequency Demand Disconnection has taken place, the GO instructs to reconnect Customers or otherwise in accordance with agreed procedures.

OC4.6.3 Where conditions are such that, following automatic low Frequency Demand Disconnection, it is not possible to restore a large proportion of the total Demand so Disconnected within a reasonable period of time, the GO (LDC) may implement additional Demand Disconnection manually, and restore an equivalent amount of the Demand that had been Disconnected automatically. The purpose of such action is to ensure that a subsequent fall in Frequency will again be contained by the operation of automatic low Frequency Demand Disconnection. If the requirement for Demand Control is expected to continue for a sustained period of time, then the GO will initiate the implementation of the Rota Load Shedding Plan in accordance with OC4.4.

OC4.6.4 Once the Frequency has recovered, GO coordinates reconnection, and/or shall implement agreed procedures for Demand reconnection, without undue delay.

OC4.7 Automatic Low Voltage Demand Disconnection (ALVDD)

OC4.7.1 The GO may from time to time determine that there is a requirement for automatic low Voltage Disconnection of Customer Demand, in order to limit the consequences of the loss of a Generation Unit(s), or an event on the Total System, which otherwise would result in part of the Total System with Voltages outside the levels specified in CC.8.3.

OC4.7.2 The GO may exercise the required Automatic Low Voltage Demand Disconnection, depending on the extent of ALVDD required, and in order not to disconnect more Customer Demand than reasonably required in response to a specific incident or set or circumstances, it may be preferable that ALVDD is carried out at the lowest possible voltage level .

OC4.7.3 GO will design and implement of ALVDD at locations on the Distribution System, where it is more appropriate, in accordance with OC4.7.2. The GO will retain full control over the enabling/disabling of the ALVDD, and the Voltage settings at which ALVDD will be initiated in each circumstance. In general, the settings will be specified by the GO by week xx in every xxx calendars year, but the specification of settings may be altered by the GO at other times to address specific circumstances pertaining at the time.

OC.5 Emergency Control and Power System Restoration

OC5.1 Introduction

OC5.1.1 Normal operation of the T & D System by the GO is in accordance with the principles and procedures as set out in this Grid Code and obligations under the Energy Act 2012. There will be emergency situations when security of the T & D System is subject to abnormal levels of risk (e.g. during major lightning storms) and this OC.5 provides for specific requirements to address such situations.

OC5.1.2 Experience has shown that electricity supply systems can suffer Partial Shutdown or Total Shutdown. Collapses can result from a number of root causes but might most typically be due to a high number of Plant failures (Generation and/or transmission) resulting from severe weather conditions and/or maloperation of protection systems.

OC5.1.3 It is therefore necessary in the Grid Code to provide for how to deal with a Partial Shutdown or Total Shutdown of the T & D System, and to ensure that the necessary procedures and facilities are in place to support rapid re-establishment of the shutdown parts and restore supply to Customers.

OC5.1.4 A Partial Shutdown or Total Shutdown represents one of the most serious fault situations liable to occur on the T & D System, having a major effect on both Users and Customers. Due to the significance of such an incident and the urgency in restoring supply to all Customers, it is imperative that all Users should maintain a high level of awareness and training in respect of Power System Restoration.

OC5.2 Objective

OC5.2.1 The objective of OC5 is to ensure that in the event of a Partial Shutdown or Total Shutdown of the T & D System, normal supply is restored to all Customers as quickly and as safely as practicable in accordance with Prudent Utility Practice. This objective can be subdivided:

(a) to outline the general restoration strategy which will be adopted by the GO in the event of a Partial Shutdown or Total Shutdown of the T & D System;

(b) to establish the responsibility of the GO to produce and maintain a comprehensive Power System Restoration Plan, covering both Partial Shutdowns and Total Shutdowns;

(c) to establish the responsibility of Users to co-operate with the formation and execution of the Power System Restoration Plan;

(d) to ensure that the GO and User personnel who will potentially be involved with the Power System Restoration Plan, should be adequately trained and fully familiar with the relevant details of the plan.

OC5.3 Scope

OC5.3.1 OC5 applies to the GO and to all Users, which term in this OC5 means:

(a) Generators which for the purposes of OC.5 includes all Generators with Registered Capacity greater than 5 MW;

(b) Demand Customers; and

(c) Demand Side Aggregators

OC5.4 System Alerts

OC5.4.1 In the event of a System Emergency Condition or imminent shortfall of MW capacity, the GO may issue any of several Alerts to the Generator, key T & D Stations, Distribution Control Centres and Demand Side Aggregators. These Alerts may include an Amber Alert, Red Alert or Blue Alert, or other Alerts as may be agreed from time to time.

OC5.4.2 Alerts will normally (except in the case of a failure of the Electronic Alert System when it will be given verbally) be transmitted to the User via the Electronic Alert System. The Alert shall cause an alarm in the receiving location, which must be acknowledged by the User in accordance with their Alert procedures.

OC5.4.3 Amber Alerts

OC5.4.3.1 An Amber Alert may be issued when a single Event would give rise to a reasonable possibility of failure to meet the Power System Demand, or of Frequency or Voltage departing significantly from normal, or if multiple Events are probable due to prevailing weather conditions.

OC5.4.3.2 Standing procedures to be activated in response to an Amber Alert will be developed by the GO, in consultation with Users, and notified to each User as appropriate. These standing procedures will not impose obligations on the User which are not already implicit in the Grid Code.

OC5.4.3.3 Each User is responsible for internal procedures necessary to execute the standing procedures.

OC5.4.4 Red Alerts

OC5.4.4.1 A Red Alert may be issued when, the Frequency or Voltage has deviated significantly from normal, or User's Demand has been disconnected, or, in the period immediately ahead there is a high probability of failing to meet the Power System Demand or to maintain normal Voltage.

OC5.4.4.2 Standing procedures to be activated in response to a Red Alert will be developed by the GO, in consultation with Users, and notified to each User as appropriate.

OC5.4.4.3 Each User is responsible for internal procedures necessary to execute the standing procedures.

OC5.4.5 Blue Alerts

OC5.4.5.1 The issuing of a Blue Alert other than as provided for in OC5.5.4, by the GO signifies that either a Partial Shutdown or a Total Shutdown of the Power System has taken place.

OC5.4.5.2 Standing procedures to be activated in response to a Blue Alert will be developed by the GO, in consultation with Users, and notified to each User as appropriate. These standing procedures will not impose obligations on the User which are not already implicit in the Grid Code.

OC5.4.5.3 Each User is responsible for internal procedures necessary to execute the standing procedures. In developing internal procedures to apply following the activation of Blue Alert standing procedures, each User shall consult with the GO.

OC5.5 Power System Restoration

OC5.5.1 The Power System Restoration Plan will be developed and maintained by the GO in consultation with other Users as appropriate. The GO will promulgate the Power System Restoration Plan in accordance with Prudent Utility Practice.

OC5.5.2 The procedure for Power System Restoration shall be notified by the GO to the User at the time of a Partial Shutdown or Total Shutdown. Each User shall abide by the GO's instructions during the restoration process, subject to safety of personnel and the GO's and the User's Plant and Apparatus.

OC5.5.3 It shall be the responsibility of the User to ensure that any of its personnel who may reasonably be expected to be involved in Power System Restoration are familiar with, and are adequately trained and experienced in their standing instructions and other obligations so as to be able to implement the procedures and comply with any procedures notified by the GO under OC5.5.2.

OC5.5.4 The GO shall in consultation with each User and on at least one occasion each year, issue a Blue Alert to the User for the purposes of assisting training. The content of the tests shall be notified in advance to the User, and a date and time for execution of the tests shall be agreed. The User must, acting in accordance with Good Industry Practice, co-operate with any such testing.

OC5.6 De-Energization of the User's Plant by the GO

OC5.6.1 De-Energisation of a User's Plant and Apparatus is also provided for in OC3.5.6. It may be effected at any time and from time to time if and to the extent that the GO, acting in accordance with Prudent Utility Practice, considers it necessary in order to provide for safe and secure operation of the T & D System within prescribed standards, including:

(i) during a System Emergency Condition;

(ii) during Power System Restoration; and

(iii) following the issue of a Blue Alert.

7 DATA INFORMATION EXCHANGE

7.1 Notification of Events and Operations

7.1.1 This sets out the requirements for the exchange of information in relation to Operations and/or Events on the Power System which have had (or may have had) or will have (or may have) an Operational Effect, and thereby have become:

(a) Significant System Incidents on the T & D System in the case of an Operation and/or Event occurring on a User System; and

(b) Significant System Incidents on a User System in the case of an Operation and/or Event occurring on the T & D System.

(c) significant system incidents on the T & D System in the case of an Operation and/or Event occurring on the T & D System.

7.1.2 The requirement to notify relates generally to notification of what is expected to happen or what has happened. However, when an Event or Operation has occurred on the T & D System which itself has been caused by (or exacerbated by) an Operation or Event on a User System, the GO in reporting the Event or Operation on the T & D System to another User as the case may be, can pass on what it has been told by the User in relation to the Operation or Event on the first User System.

7.1.3 Much of the information that the GO will require to analyze Significant System Incidents may be available by means of:

(a) the GO's SCADA system(s) and other data collection systems; and

(b) information provided to the GO by Users under other codes of the Grid Code.

7.1.4 In order to ensure that the GO receives as rapidly as practicable the information it needs to operate the T & D System, and to ensure that no information is missed, this section sets out a comprehensive set of requirements. It also provides for information to be submitted to Users, in order to assist Users.

Objective

7.1.5 The objective is to provide for the exchange of information so that the implications of an Operation and/or Event can be considered, possible risks arising from it can be assessed and appropriate action taken by the relevant party in order to assist in maintaining the integrity of the Power System.

Scope

7.1.6 This applies to the GO and to Users, which term means:

(a) Generators;

(b) Dispatchable REPSs;

(c) Distribution System Operator;

(d) Demand Customers; and

(e) Demand Side Aggregators.

7.1.7 It is required that as part of the fulfilment of obligations, both the GO and Users will take into account information they have received from third parties in determining whether an Operation or an Event is to occur, or has, occurred.

Requirement to Notify

7.1.8 While in no way limiting the general requirements to notify set out in this section, the GO and Users shall agree to review (during the Grid Code Review Panel and Revision, GC.5 and GC.6) which Operations and Events are required to be notified.

Notification of an Operator

7.1.9 The GO will notify the User of Operations on the T & D System, which will have (or may have), in the reasonable opinion of the GO, an Operational Effect on the User. Except as agreed with the GO, the User may not pass on the information contained in a notification to it from the GO to any other person.

7.1.10 In circumstances where it is not possible to invoke standing procedures prior to the occurrence of an Operation or in the event that the GO needs to implement Operations urgently and without informing the User then, unless the situation is of a temporary nature, i.e. less than 15 minutes, and has been rectified to normal, the GO shall inform the User of the occurrence of the Operations, without undue delay. The GO shall also inform the User as to the likely duration of the condition and shall update this prognosis as appropriate. The GO shall additionally inform the User as soon as reasonably possible when the condition has ended.

7.1.11 The User will notify the GO of Operations on the User's System which will have (or may have) an Operational Effect on the T & D System. The GO may use this information in notifying any other User(s) on whose System(s) the operation will have, or may have, in the reasonable opinion of the GO, an Operational Effect.

Form of Notification of an Operator

7.1.12 A notification of an Operation shall be of sufficient detail to describe the Operation (although it need not state the cause) and to enable the recipient of the notification reasonably to consider and assess the implications and risks arising.

7.1.13 A notification will include the name (and job title) of the individual reporting the Operation on behalf of the GO or the User, as the case may be.

7.1.14 The recipient of the notification may ask questions to clarify the notification and the giver of the notification will, insofar as he is able, answer any questions raised.

Recording of an Operator

7.1.15 The notification shall be given In Writing whenever possible before carrying out an Operation. If there is insufficient time before the Operation is scheduled to take place for notification to be given In Writing, then the notification shall be given orally and if either the User or the GO requests, it shall be submitted In Writing.

Timing in Respect of an Operator

7.1.16 A notification will be given as far in advance as possible and in any event shall be given in sufficient time as will reasonably allow the recipient to consider and assess the implications and risks arising.

Notification of Events

7.1.17 The GO will notify the User of Events which in the reasonable opinion of the GO are Significant System Incidents having an Operational Effect on the User. Except as agreed with the GO, the User may not pass on the information contained in a notification to it from the GO to any other person.

7.1.18 The User will notify the GO of Events which may be Significant System Incidents affecting the T & D System. The GO may use this information in notifying any other Users on whose System(s) the Significant System Event will have, or may have, in the reasonable opinion of the GO, an Operational Effect.

Form of Notification of an Event

7.1.20 A notification (and any response) of an Event, will describe the Event, although it need not state the cause of the Event, and, subject to that, will be of sufficient detail to enable the recipient of the notification to reasonably consider and assess the implications and risks arising.

7.1.21 A notification will include the name (and job title) of the individual reporting the Event on behalf of the GO or the User, as the case may be.

7.1.22 The recipient of the notification may ask questions to clarify the notification and the giver of the notification will, insofar as he is able (although he need not state the cause of the Event) answer any questions raised.

Provision of Further Information

7.1.23 When an Event has been reported to the GO by a Generator, and it is necessary in order for the Generator to assess the implications of the Event on their system more accurately, the Generator Operator may ask the GO for details of the fault levels from the T & D System to their Generation Unit at the time of the Event, and the GO will, as soon as reasonably practicable, give the Generator that information provided that the GO has that information.

Recording of an Event

7.1.24 Notification of an Event shall be given orally in the first instance. Significant System Incidents must be reported In Writing if requested by either the User or the GO.

Timing in Respect of an Event

7.1.25 A notification of an Event shall be given as soon as practicable after the occurrence of the Event, or time that the Event is known of or anticipated by the giver of the notification, and in any event, except in an emergency, within fifteen minutes of such time.

7.2 Operational Communication and Data Retention

7.2.1 It is necessary that adequate communication facilities and procedures are established between the GO and Users to allow the timely transfer of information, in order that the GO may fulfil its obligations with regard to the operation of the T & D System.

Objective

7.2.2 The objectives are:

(a) to establish contact locations for the GO and each class of User;

(b) to detail the communication facilities required between the GO and each class of User;

(c) to establish the general procedures (notwithstanding any specific procedures which may be established in other sections of this Grid Code) for communication of information between the GO and Users;

(d) to establish the general procedures (notwithstanding any specific procedures which may be established in other sections of this Grid Code) for the authorization of the GO personnel to act on behalf of the GO and User personnel to act on behalf of the User in the communication of information between the GO and Users; and

(e) to establish the general procedures (notwithstanding any specific procedures which may be established in other sections of this Grid Code) for the retention of data.

7.2.3 Both the GO and Users will be obliged to adopt the use of new technologies and methodologies for communication of information, where there is a recognizable benefit from doing so, and to do so would be reasonable in the circumstances.

7.2.4 This covers the general procedures for all forms of communication of operational information between the GO and Users, other than pre-connection communication that is dealt with in the Connection Conditions. Data relating to Commercial (Energy) Metering is specifically not covered.

Scope

7.2.5 This applies to the GO and to Users, which term means:

(a) Generators;

(b) Dispatchable REPS;

(c) Distribution System Operator;

(d) Demand Customers; and

(e) Demand Side Aggregators.

Contact Location – The Grid Operator

7.2.6 The contact location within the GO for communication on matters pertaining to the real time operation of the T & D System shall be the National Control Centre (NCC) or if designated elsewhere the Emergency Control Centre (ECC).

7.2.7 The GO will, from time to time, notify to Users the relevant points of contact in the GO (and their contact details) and any changes to such points of contact and/or details for the purposes of each section of this Grid Code (including, where appropriate, for specific purposes under each section), and the User shall, as required, contact the relevant notified points of contact.

7.2.8 The GO shall from time to time distribute to each User an organizational chart and list of personnel and contact numbers in order to assist the User in communicating with the GO.

Contact Location – Generators

7.2.9 The Generator contact locations and personnel shall be notified by the Generator to the GO prior to connection and thereafter updated as appropriate.

7.2.10 The Generator is required to provide a Control Facility. Acting in accordance with Good Industry Practice, the Generator shall ensure that the Control Facility is staffed at appropriate staffing levels at all times.

7.2.11 The Control Facility shall be staffed by a Responsible Operator(s) who shall respond to communications from the GO without undue delay (except where otherwise provided for by agreement between the Generator and the GO, such agreement not to be unreasonably withheld) and are of suitable experience and training and are authorised to perform the following functions on behalf of the Generator:

(a) to accept and execute Dispatch Instructions;

(b) to receive and acknowledge receipt of requests, for amongst other matters, operation outside the Declared values of Availability, Ancillary Service capability,

or Operating Characteristics of the Generation Units during System Emergency Conditions.

7.2.12 At any point in time, a single person shall be designated by the Generator and notified to the GO as the Responsible Manager. The Responsible Manager shall be responsible for dealing with the GO on matters relating to the Grid Code. In the event that the Responsible Manager is not a person on duty at the Control Facility, then the Responsible Manager must be capable of being contacted from the Control Facility at all times, and in the event that the GO issues a request to the Control Facility requiring the Responsible Manager to contact the NCC, the Responsible Manager shall comply with the request without undue delay and in any case within 15 minutes of the request.

7.2.13 The Responsible Manager shall be authorised by the Generator to perform the following functions on behalf of the Generator:

(a) to make estimates in accordance with Good Industry Practice as to the Availability, Ancillary Service capability and Operating Characteristics of each Generation Unit;

(b) to make Declarations for each Generation Unit;

(c) to communicate with respect to issues regarding Outages of each Generation Unit.

The Generator may, from time to time, notify a replacement contact location and personnel which meets the foregoing requirements.

Demand Customers

7.2.14 The Demand Customers contact locations and personnel referred to in this Section shall be notified by the Demand Customer to the GO prior to connection and thereafter updated as appropriate.

7.2.15 The Demand Customer is required to provide the GO with the contact information of a Responsible Operator(s) who shall respond to communications from the GO without undue delay (except where otherwise provided for by agreement between the Demand Customer and the GO, such agreement not to be unreasonably withheld) and are of suitable experience and training and are authorized to perform functions on behalf of the Demand Customer.

7.2.16 The Responsible Operator shall have the ability to attend the Site of the Demand Customer within 45 minutes of an instruction to do so being issued by the GO.

7.2.17 At any point in time, a single person shall be designated by the Demand Customer and notified to the GO as the Responsible Manager. The Responsible Manager shall be responsible for dealing with the GO on matters relating to the Grid Code. In the event that the Responsible Manager is not a person on duty at the Site of the Demand Customer, then the Responsible Manager must be capable of being contacted from the Site of the Demand Customer at all times, and in the event that the GO issues a request to the Site of the Demand Customer requiring the Responsible Manager to contact the NCC, the Responsible Manager shall comply with the request without unreasonable delay and in any case within 15 minutes of the request.

Dispatchable REPs

7.2.18 The Dispatchable REPS's contact locations and personnel referred to in this Section shall be notified by the Dispatchable REPS to the GO prior to connection and thereafter updated as appropriate.

7.2.19 The Dispatchable REPS is required to provide a Control Facility. The Dispatchable REPS shall ensure acting in accordance with Good Industry Practice that the Control Facility is staffed at appropriate staffing levels at all times.

7.2.20 The Control Facility shall be staffed by a Responsible Operator(s) who shall respond to communications from the GO without undue delay (except where otherwise provided for by agreement between the Dispatchable REPS and the GO, such agreement not to be unreasonably withheld) and are of suitable experience and training and are authorised to perform the following functions on behalf of the Dispatchable REPS:

(a) to accept and execute Dispatch Instructions; and

(b) to receive and acknowledge receipt of requests, for amongst other matters, operation outside the Declared values of Availability, Ancillary Service capability, or operation of the Dispatchable REPS during System Emergency Conditions.

7.2.21 At any point in time, a single person shall be designated by the Dispatchable REPS and notified to the GO as the Responsible Manager. The Responsible Manager shall be responsible for dealing with the GO on matters relating to the Grid Code. In the event that the Responsible Manager is not a person on duty at the Control Facility, then the Responsible Manager must be capable of being contacted from the Control Facility at all times, and in the event that the GO issues a request to the Control Facility requiring the Responsible Manager to contact the NCC, the Responsible Manager shall comply with the request without undue delay and in any case within 15 minutes of the request.

7.2.22 The Responsible Manager shall be authorised by the Dispatchable REPS to perform the following functions on behalf of the Dispatchable REPS:

(a) to submit and revise an Availability Notice and other data for the Dispatchable REPS;

(c) to communicate with respect to issues regarding Outages of the Dispatchable REPS.

The Dispatchable REPS may, from time to time, notify a replacement contact location and personnel which meets the foregoing requirements.

Demand Side Aggregators

7.2.23 Demand Side Aggregators are required to provide a Control Facility. The Demand Side Aggregators shall ensure acting in accordance with Good Industry Practice that the Control Facility is staffed with appropriate staffing levels at all times.

7.2.24 For Demand Side Aggregators, the Control Facility shall be staffed by a Responsible Operator(s) who shall respond to communications from the GO without undue delay (except where otherwise provided for by agreement between the Demand Side Aggregators and the GO, such agreement not to be unreasonably withheld) and are of suitable experience and training and are authorised to perform functions on behalf of the Demand Side Aggregators as follows:

(a) to accept and execute Dispatch Instructions;

(b) to receive and acknowledge receipt of requests, for amongst other matters, operation outside the Declared values of Demand Side Aggregators MW Availability.

7.2.25 At any point in time, a single person shall be designated by the Demand Side Aggregators and notified to the GO as the Responsible Manager. The Responsible Manager shall be responsible for dealing with the GO on matters relating to the Grid Code. In the event that the Responsible Manager is not a person on duty at the Control Facility of the Demand Side Aggregators, then the Responsible Manager must be capable of being contacted from the Control Facility of the Demand Side Aggregator Operator at all times, and in the event that the GO issues a request to the Control Facility of the Demand Side Aggregator Operator requiring the Responsible Manager to contact the NCC, the Responsible Manager shall comply with the request without unreasonable delay and in any case within 15 minutes of the request.

7.2.26 The Responsible Manager shall be authorised by the Demand Side Aggregators to perform the following functions on behalf of the Demand Side Aggregators:

(a) to make estimates in accordance with Good Industry Practice as to the Demand Side Aggregator MW Availability;

(b) to make Declarations of the Demand Side Aggregator MW Availability for Demand Side Aggregators; and

(c) to communicate with respect to issues regarding Outages of each Individual Demand Site within the Demand Side Aggregators.

The Demand Side Aggregators may, from time to time, notify a replacement contact location and personnel which meets the foregoing requirements.

7.2.27 Unless otherwise agreed with the GO, each Individual Demand Site Aggregator shall have the capability to control a single Demand Side Aggregator and shall be able to respond for each Individual Demand Site within 1 hour of request at any query or issue from the Responsible Operator at the Control Facility of the Demand Side Aggregator or the GO.

7.3 Communication Facilities

7.3.1 The minimum communications facilities which are to be installed and maintained between the GO and the User are defined in this Section.

7.3.2 All equipment to be provided by Users under this Section shall comply with the applicable International Telecommunications Union (ITU) and International Electrotechnical Commission (IEC) standards for SCADA and communications equipment and shall meet such standards as notified by the GO, acting reasonably, in advance of their design or procurement (whichever is later) and shall be provided at the cost of the User, except where otherwise specified.

Supervisory Control and Data Acquisition (SCADA)

7.3.3 SCADA remote terminal equipment shall be required in the control room of the T & D Station at the User Site for the T & D of signals and indications to and from the NCC. The signals and indications which must be provided by Users for T & D by SCADA equipment to the NCC

are the signals and indications referred to under Connection Conditions together with such other information as the GO may from time to time by notice to Users reasonably require.

7.3.4 For Demand Side Aggregators, SCADA remote terminal equipment shall also be required at the Control Facility for the T & D of signals and indications to and from the NCC. The signals and indications which must be provided by Demand Side Aggregators for T & D by SCADA equipment to the NCC are the signals and indications referred to under Connection Conditions together with such other information as the GO may from time to time, by notice to Demand Side Aggregators, reasonably require.

7.3.5 Interface cabinets shall be installed in the control room of the T & D Station at the User Site and also on the User's Site or, in the case of a Demand Side Aggregators, in the User's Control Facility. Provision and maintenance of wiring and signaling from the User's Plant and Apparatus to the User's interface cabinet shall be the responsibility of the User. The GO shall provide the cables to interconnect these interface cabinets.

Computer Equipment

7.3.6 Each User shall comply with the GO requirements and provide appropriate computer and data networking equipment to allow data exchange such as electronic mail, dispatch instructions etc. between the GO and the User. The equipment shall only be used by the User for operational communications with the GO.

7.3.7 Each User shall be responsible for optimizing the reliability and security of the computer equipment, including the provision, at no charge, of an uninterruptible power supply.

Telephone/Facsimile

7.3.8 Each User shall be responsible for the provision and maintenance (at the cost of the User) of telephone and facsimile equipment as required.

7.3.9 The GO may arrange for the provision of one or more telephone extensions to be connected to the optical telecom system. This facility shall be reserved for operational purposes only, and shall be continuously attended by a person and answered without undue delay. Users shall be responsible for the provision at no charge of an uninterruptible power supply.

7.3.10 Users shall provide a Public Switched Telephone Network circuit to the Communications and Control Room.

7.3.11 Users shall provide no fewer than two separate Public Switched Telephone Network circuits to the Control Facility.

7.3.12 Users shall provide no fewer than one telefacsimile unit, connected to a dedicated Public Switched Telephone Network circuit at the Control Facility.

Access and Security

7.3.13 All SCADA, metering equipment, computer and communications equipment that interfaces with the GO and the information carried by it must be secure from unauthorized access. Procedures governing security and access shall be agreed with Users pursuant to the

Operation Instructions, but shall allow for adequate access to the equipment and information by the GO or its service providers for the purposes of maintenance, repair, testing and the taking of readings.

Time Standards

7.3.14 Time will be set by a standard determined by the GO. The time standard will be broadcast to relevant telecommunications devices in order to maintain time coherence.

Communications

7.3.15 Other than where specifically provided for in other sections of the Grid Code, communication between the GO and Users on matters pertaining to the real time operation of the T & D System shall take place between the NCC and the User's Control Facility.

7.3.16 If the NCC is to be moved to a different location the GO shall ordinarily notify Users not more than one Business Day after the move, but in the event of an emergency it may instead notify Users as soon as practicable after the move.

7.3.17 Unless otherwise specified in the Grid Code, all instructions given by NCC and communications between NCC and the User's Control Facility shall be given by means of the facilities.

7.3.18 Any automatic recording (by whatever means) of communications given by means of telephony, electronic means, facsimile transfer or telex will be accepted by the GO and Users as evidence of those instructions or communications.

Data and Notices

7.3.19 Data and notices to be submitted to the GO or to Users under the Grid Code (other than data and notices which are the subject of a specific requirement of the Grid Code as to the manner of their delivery) shall be In Writing and shall be delivered by hand or sent by pre-paid post, by telex, receipted email or telefacsimile transfer.

7.3.20 Data and notices to be submitted to the GO under the Grid Code shall be addressed to the person, and at the address, notified by the GO to Users for such purpose, following entry into the Connection Agreement or for a Demand Side Aggregator prior to issuance of the Operational Certificate, or to such other person or address, as the GO may notify to Users from time to time.

7.3.21 Data and notices to be submitted to Users under the Grid Code shall be addressed to the User's nominated representative (at the address notified by Users to the GO following entry into the Connection Agreement or for a Demand Side Aggregator prior to issuance of the Operational Certificate for such purpose (and failing such notification to the principal office of the addressee)), or to such other person or address as Users may notify to the GO from time to time.

7.3.22 All data items, where applicable, will be referenced to nominal Voltage and Frequency unless otherwise stated.

7.3.23 All Operational Data is to be supplied in accordance with the timetables set out in the Grid Code.

Data Retention

7.3.24 Operational Data is all data required to be supplied by either the GO or Users under the Grid Code any other data expressly provided to be Operational Data under the Grid Code. Operational Data to be supplied by the User must be submitted to the department or address as the GO may from time to time advise.

7.3.25 The GO and Users will keep all Operational Data confidential.

7.3.26 The GO shall maintain a complete and accurate record of all Operational Data supplied or maintained under the Grid Code. The format for the retention of records shall be as the GO may reasonably determine. All Operational Data shall be so maintained for a period of not less than 5 years commencing from the date the Operational Data was first supplied (or first created, if earlier).

7.3.27 The GO shall afford Users access to its records (and copies thereof) of Operational Data.

8 OPERATIONAL TESTING

8.1 Introduction

8.1.1 This section deals with the responsibilities and procedures for arranging and carrying out Operational Tests which may have an effect on the Systems of the GO and Users.

8.1.2 By their nature, Operational Tests may involve either or both of:

(a) the GO's responsibilities in respect of the T & D System, including Dispatch of generation and Demand Side Aggregators MW Availability; and

(b) the operations of Users and the quality and continuity of supply of electricity to Users.

8.1.3 To minimise disruption to the operation of the T & D System and to the Systems of other Users, it is necessary that tests which affect the operation of the T & D System or Users' Systems, are subject to central co-ordination and control.

8.1.4 To achieve the primary objective, this section sets out procedures for establishing and reporting Operational Tests.

8.2 Objective

8.2.1 The primary objective is to establish procedures for central co-ordination and control of an Operational Test required by the GO or a User, where such test will or may:

(a) affect the secure operation of the T & D System; or

(b) have a significant effect on the operation of the T & D System, or a User's System; or

(c) affect the economic operation of the T & D System or a User's System; or

(d) affect the quality or continuity of supply of electricity to Users.

8.2.2 The list of tests is not intended to be exhaustive and other tests which fall within the definition of Operational Tests shall also be covered.

8.2.3 Note that this section is not intended to deal with tests which may be called routinely by the GO in order to assess compliance of Users with their design, operating and connection requirements as specified in the Grid Code or other specific tests related to contractual agreements for service provisions and which are part for instance of each User's Connection Agreement, Ancillary Services Agreements and System Support Agreement, or to assess that Generators are in compliance with their Registered Data as notified by Declarations, where appropriate, or to determine that Generation Units are in compliance with Dispatch Instructions. These issues are covered under Monitoring, Testing and Investigation section (GC.9).

8.3 Scope

8.3.1 This applies to the GO and to all Users, which term means:

(a) Generators which includes all Generators with units with Registered Capacity greater than 100 kW and Generator Aggregators;

(b) Demand Side Aggregators;

(c) The Distribution System Operator; and

(d) Demand Customers.

8.4 Tests Required by the GO

8.4.1 The GO as operator of the T & D System will in accordance with Prudent Utility Practice, need to carry out Operational Tests in order to maintain and develop operational procedures, to train staff, and to acquire information in respect of Power System behaviour under abnormal system conditions. The GO will endeavour to limit the frequency of occurrence, scope, extent of effects and type of Operational Tests to those that are required by Prudent Utility Practice.

8.4.2 Operational Tests required by the GO from time to time shall include, but shall not be limited to the following:

(i) Tests involving the controlled application of Frequency and/or Voltage variations aimed at gathering information on Power System behaviour;

(ii) Power System Restoration Tests;

(iii) Testing of standing procedures for System Emergency Conditions and Alert conditions

(iv) Testing or monitoring of Power Quality under various Power System conditions and Dispatch configurations.

8.4.3 Where the GO intends to carry out an Operational Test, in the GO's reasonable opinion, such an Operational Test will or may have an Operational Effect on a User's System, the GO shall, in accordance with Data Information Exchange procedures provide such notice to the User of the scheduled time and effect of the Operational Test as is reasonable in all the circumstances and shall keep the User informed as to any changes to the scheduled time and nature of the Operational Test.

8.4.4 Where a User, having been informed about an Operational Test may, acting reasonably, contact the GO to request additional time to consider the impact of the test on the User. The GO shall co-operate with the User to assess the risks. The test shall not proceed until all Users are satisfied unless, in the GO's view, a User is acting unreasonably.

8.5 Tests Required by the Users

8.5.1 Operation of Users' Plant in accordance with Good Industry Practice requires Operational Testing in order to maintain and develop Operational Procedures, develop and measure Plant performance, comply with statutory or other industry obligations and to train staff.

8.5.2 In accordance with Good Industry Practice each User shall endeavour to limit the frequency of occurrence of Operational Tests and to limit the effects of such Operational Tests on the T & D System.

8.5.3 Operational Tests can comprise of a Full-Day Test and/or a Within-Day Test.

8.6 Procedure for Requesting Operational Test

8.6.1 Users shall submit proposals for an Operational Test 1 month earlier than the proposed test day in accordance with Information Exchange or alternative procedures agreed with the GO.

8.6.2 As part of the proposal Users, when requesting an Operational Test, shall supply sufficient detail to the GO to allow any operational consequences of the test to be adequately assessed. This shall include the following information:

(i) the reason for the proposed test indicating whether the Operational Test is a test required by statute, required for compliance with licence conditions, statutory regulations, or safety codes, which may require that execution of the Operational Test be expedited and given priority over other Operational Tests;

(ii) the preferred time or times for the test;

(iii) the milestones for individual stages of the Operational Test (if any) which can be completed separately, and/or do not require to be repeated if the Operational Test is interrupted by the GO after completion of each stage;

(iv) whether there may be an adverse material impact on the User if the Operational Test is cancelled at short notice or delayed (reasonable detail being given by the User to the GO of the impact);

(v) where the User is a Generator, Generator Aggregator or Demand Side Aggregators, the Dispatch or Dispatches required by the Generator, Generator Aggregator or Demand Side Aggregator for completion of the test, if any, including the duration of Dispatch shall be supplied to the GO as part of the proposal. Where the Generator, Generator Aggregator or Demand Side Aggregator may not know the entire Dispatches required for completion of the test until part of the test is completed then the Generator, Generator Aggregator or Demand Side when proposing the test shall:

(a) divide the test into sections as appropriate;

(b) indicate and discuss with the GO which sections of the test can be completed in stages and which cannot; and

(c) indicate possible variations of the test for the sections that can be completed in stages.

Additionally, the factors that influence the completion of the stages should be outlined to the GO, namely, if the procedure to be followed for a certain stage depends on the outcome of a previous stage.

8.6.3 A request by the Generator, Generator Aggregator or Demand Side Aggregators for an Operational Test requiring a Generation Unit, Demand Side Aggregator to be Dispatched to a particular MW Output or operating condition shall not be considered a Re-declaration of Availability, Ancillary Service capability or Operating Characteristics.

8.7 Evaluation of Proposed Operational Tests

8.7.1 The GO shall, on receipt of an Operational Test request from the User, assess the impact of the proposed test on the operation of the Power System. The GO may request additional information from the User required to evaluate the impact or impacts of the test.

8.7.2 The GO will evaluate the impact (in terms of continuity and quality of supply only) of the Operational Test with significantly affected Users. Any reasonable objections from any such Operationally Affected Users shall be considered. When discussing the Operational Test with any affected User, the GO shall not disclose what it reasonably believes to be commercially sensitive or otherwise potentially sensitive information to Users without the consent of the User requesting the test.

8.7.3 Where an Operational Test proposed by a Generator, Generator Aggregator or Demand Side Aggregator in respect of one of its Generation Units, Demand Side Aggregator requires a Dispatch that exceeds the currently declared values of Availability, Ancillary Service capability where applicable, or Operating Characteristics of the Generation Unit, Demand Side Aggregators, then the GO may so Dispatch the Generation Unit, Demand Side Aggregators for the period required for the Operational Test, in accordance with the relevant provisions of the Grid Code.

8.8 Approval for Operational Testing

8.8.1 Following receipt of an Operational Test proposal and evaluation of the Operational Test's likely impact, including discussions of test requirements with the User requesting the Operational Test and with Operationally Affected Users as appropriate, the GO will decide if approval for the requested Operational Test is granted.

8.8.2 The criteria for approving Operational Test include:

(a) the impact of the Operational Test on T & D System operation security;

(b) the impact of the Operational Test on T & D System operation economics;

(c) the impact of the Operational Test on other Users' Systems;

(d) the effect of the Operational Test on continuity and quality of electricity supply.

8.8.3 On approval by the GO of an Operational Test proposed by a User, the GO shall contact the User outlining the proposed Dispatch procedure and schedule.

8.8.4 On receipt of the proposed Dispatch procedure and schedule of the Operational Test, the Test Proposer shall notify the GO without undue delay, of the Test Proposer's acceptance or rejection of the proposed Dispatch procedure and schedule for the test.

8.8.5 On notification of rejection of the proposed Dispatch procedure and schedule for the Operational Test by the Test Proposer, then the Operational Test shall not take place. The Test Proposer may enter into discussions with the GO as to an alternative schedule for the Operational Test, or may request a different Operational Test or may request the Operational Test at an alternative time.

8.8.6 On notification of acceptance of the proposed Dispatch procedure and schedule for the Operational Test by the Test Proposer, the GO shall inform other Users as to the scheduled time and nature of the test, if in the opinion of the GO those Users will or may be significantly affected by the test, or otherwise as dictated by standing arrangements.

8.8.7 If Operationally Affected Users are not satisfied with the proposed Operational Test, they shall advise the GO of their concerns. The GO shall not cancel proposed Operational Test unless these objections are reasonable. If Operationally Affected Users are still not satisfied with the Operational Test being approved, then they may appeal the decision to the SEC.

8.8.8 Notification by the GO to the Test Proposer of the proposed Dispatch procedure and schedule for an Operational Test, or notification by the Test Proposer to the GO of acceptance of the proposed Dispatch procedure and schedule, does not constitute a Dispatch Instruction from the GO to the Test Proposer.

8.8.9 On rejection of the proposed Operational Test by the GO, the Test Proposer may enter into discussions with the GO as to an alternative schedule for the Operational Test, or may request a different Operational Test or may request the Operational Test at an alternative time. If the amended proposal for an Operational Test is approved by the GO, and the User requesting the Operational Test is a Generator, then 8.8.3 shall apply.

8.8.10 If the Test Proposer is not satisfied that there are reasonable grounds for rejecting the proposed Operational Test, then they may appeal to the SEC.

8.9 Scheduling of Operational Tests

8.9.1 Operational Tests will usually, but not necessarily, be scheduled by the GO.

8.9.2 Where a Full-Day Test is requested by a User, the User shall submit a Nomination Profile consistent with planned Operational Tests as part of its Commercial Offer Data consistent with planned Operational Tests. The User shall also submit all other data as normal as required under the scheduling and dispatch code.

8.9.3 The GO shall use reasonable endeavours to prioritise Operational Tests where the Test Proposer has notified the GO that Operational Tests are required in accordance with license conditions, statutory regulations or safety codes or a delay in the execution of the tests may have an adverse material impact on a User.

8.10 Dispatching of Operational Tests

8.10.1 Dispatch Instructions for Operational Tests shall be issued by the GO in the normal manner for issuing Dispatch Instructions.

8.10.2 The GO shall use reasonable endeavours to ensure that scheduled Operational Tests are dispatched in accordance with the agreed Dispatch procedures.

8.10.3 Where the GO foresees a requirement or likely requirement to cancel, postpone or otherwise significantly alter an agreed Dispatch procedure and schedule, then the GO shall inform the Test Proposer as soon as reasonably possible.

8.10.4 Where the GO assesses that the impact of an Operational Test on T & D System security or on the continuity and quality of supply or operation of a User may or is likely to be significantly greater than originally estimated, the GO may contact the Test Proposer to discuss a revised test procedure or schedule.

8.10.5 The GO may where it considers it necessary cancel, interrupt or postpone an Operational Test at any time, but shall where possible utilise the procedures outlined under 8.10.4 prior to taking such action where the cancellation, interruption or postponement is for other than technical reasons.

8.10.6 If the Test Proposer wishes to cancel a Full-Day Test either before commencement of the test or during the test, the GO must be notified by the Test Proposer. Availability Notices, Technical Parameters Notices and Dispatch Instructions shall remain valid when Operational Tests are cancelled.

8.10.7 If the Test Proposer wishes to cancel a Within-Day Test, either before commencement of the test or during the test, the GO must be notified by the Test Proposer. The GO will recompile the Indicative Operations Schedule and Dispatch the unit accordingly.

8.11 Test Reporting

8.11.1 Upon conclusion of the scheduled time for an Operational Test the Test Proposer shall notify the GO as to whether the test has been completed, or sections of the test if divided into sections have been completed.

8.11.2 At the conclusion of the Operational Test, the Test Proposer shall be responsible for preparing a written report on the Operational Test (the "Final Report") which shall be available within three months of the conclusion of the Operational Test to the GO, Operationally Effected Users and the SEC on request.

8.11.3 The Final Report shall not be submitted to any person who is not a representative of the GO or the Test Proposer unless the GO and the Test Proposer having reasonably considered the confidentiality issues arising, shall have unanimously approved such submission.

8.11.4 The Final Report shall include a description of the Plant and/or Apparatus tested and a description of the System Test carried out together with the results, conclusions and recommendations as they relate to the GO and Operationally Effected Users.

8.12 Disputes

8.12.1 Operationally Affected Users who consider that the implementation of the proposed Operational Test will have a significant negative impact on them may appeal to the SEC providing details of their objections.

8.12.2 The Test Proposer has right of appeal to the SEC if it considers that rejection of the proposed Operational Test is unreasonable.

9 MONITORING, TESTING & INVESTIGATION

9.1 Introduction

9.1.1 In order to discharge its responsibilities in respect of the safe, secure and economic operation of the T & D System and in respect of generation Dispatch, the GO will need to carry out certain Monitoring, Testing and Investigation in respect of the performance of Users' Plant.

9.1.2 This does not apply to Operational Tests, which may be required by the GO or by Users. The procedures by which Operational Tests are notified, and approved, executed and reported, are covered under Operational Testing.

9.2 Objective

9.2.1 The primary objectives of this section are to establish procedures for Testing that Users are operating within their design, operating and connection requirements, as specified in the Grid Code, Connection Agreements, Ancillary Services Agreements and System Support Agreements between Users and the GO.

9.2.2 In order to achieve the primary objective set out, this section establishes procedures for Monitoring, Testing and Investigation. In particular, this facilitates adequate assessment of each of the following:

(a) whether Centrally Dispatched Generation Units (CDGU), and Demand Side Aggregators comply with Dispatch Instructions;

(b) whether Generators, Demand Side Aggregators and Generator Aggregators are in compliance with Declarations of Availability, Ancillary Services capabilities, Operating Characteristics and any other data required to be registered by those Generators, and Demand Side Aggregators under the Grid Code;

(c) whether Power Quality of Users conforms with International Electro technical Commission Standards: 'Electromagnetic Compatibility-Limits-Limitation of emission of harmonic currents for equipment connected to medium and high voltage power supply systems [IEC/TR3 61000-3-6] and 'Electromagnetic Compatibility-Limits-Limitation of voltage fluctuation and flicker for equipment connected to medium and high voltage power supply systems '[IEC/TR3 61000-3-7];

(d) whether Users are in compliance with protection requirements and protection settings under the Grid Code, Users' Connection Agreements, Ancillary Service Agreements and System Support Agreements between Users and the GO;

9.3 Scope

9.3.1 Applies to the GO and to the following Users:

(a) Generators which include all Generators with Generation Unit(s) subject to Central Dispatch or with Generation Unit(s) that have a total Registered Capacity greater than 100 kW on a single Site;

(b) The Distribution System Operator;

(c) Suppliers;

(d) Demand Customers;

(e) Demand Side Aggregators in respect of their Demand Side Customer; and;

(f) Generator Aggregators in respect of the Generation Units which they represent.

Monitoring

9.3.2 Monitoring is normally continuous or continuous for periods of time, and is carried out by monitoring, data recording and analysis or by such other methods as the GO shall reasonably determine are appropriate in the circumstances. It does not require advance notification from the GO to Users.

9.3.3 Where a data recording and analysis system is used for Monitoring, the GO shall inform the User that such data recording and analysis system is being used and, on request from the User, shall make available to the User reasonable information in respect of the data recording and analysis system.

9.3.4 Monitoring may be carried out at any time by the GO and may result, without the application of further Testing, in the evaluation by the GO of User non-compliance. Where the User disputes a finding of non-compliance, the GO shall provide the User with any data collected during Monitoring over the period of alleged non-compliance and such other documentation as is reasonably necessary to show evidence of non-compliance.

9.3.5 Performance parameters that the GO shall Monitor may include, but are not limited to, the following:

a) compliance with Dispatch Instructions;

b) compliance with Declarations including, without limitation, in respect of:

c) Primary, Secondary and Tertiary Operating Reserve provided by each of a Generator's Generation Units, following a low Frequency Event on the T & D System;

d) Frequency Regulation provided by each Generation Unit (to confirm that it is consistent with the Declared Governor Droop); and

e) Tertiary Operating Reserve 2 and Replacement Reserve provided by each of a Generator's Generation Units.

9.4 Monitoring Systems and Procedures

9.4.1 Procedures and systems used for assessment of compliance will be either generic procedures (which will be provided by the GO) or otherwise agreed between the GO and the User, such agreement not to be unreasonably withheld.

9.4.2 Compliance of Demand Side Aggregators with Dispatch Instructions:

The following validation will be performed in real time:

i A Demand Side Aggregators shall be deemed compliant if the SCADA signal confirms that the Demand Side Aggregator MW Response is within 5% of the Dispatch Instruction.

The following validation will be performed post event:

ii A Demand Side Aggregator shall be deemed to be compliant with the Dispatch Instruction if the difference between the Demand Side Aggregator Energy Profile and the metered Demand plus the Demand Side aggregator MW Response is within 5% of the Demand Side Aggregator Energy Profile.

iii For Demand Side Aggregators which are not Dispatched but have been declared Available in an Availability Notice, the Demand Side Aggregator shall be deemed to be compliant with its declared Demand Side Aggregator Energy Profile if the difference between the Demand Side Aggregator Energy Profile and the metered Demand is within 5% of the Demand Side Aggregator Energy Profile.

9.5 Testing

9.5.1 Testing may involve attendance by the GO or the GO representative at User Sites in order to carry out Tests in accordance with the testing procedures set out.

9.5.2 For the purposes of this section a Test shall be carried out pursuant to a Dispatch Instruction from the GO or by such alternative procedure as is required or permitted.

9.5.3 A Test may require the User to carry out specific actions in response to a Dispatch Instruction.

9.5.4 The results of a Test may be derived from the Monitoring of performance during the Test.

9.5.5 The GO may, from time to time, carry out Tests in order to determine that a User is complying with its Connection Conditions, Registered Operating Characteristics and Declarations. The GO may:

(a) from time to time and for the purposes of Testing, issue a Dispatch Instruction;

(b) induce controlled Power System Frequency or Voltage conditions or variations for the purpose of determining that the Generation Unit's response is in accordance with its Declared Availability, Ancillary Service capabilities and Operating Characteristics; and

(c) having given 5 Business Days notice, or less where agreed, (identifying the Ancillary Service and/or Operating Characteristic to be tested), send a representative to the Generator's Site to verify by Testing in accordance with the Test procedures, that the Generator is in compliance with its Declared values.

9.5.6 If the GO subcontracts Testing work on a User's Site, then the User and the GO must be in agreement on the selection of a suitable subcontractor.

Black Start Testing

9.5.7 The GO may require a Generator with a Black Start Station to carry out a test (a "Black Start Test") on a CDGU in a Black Start Station either while the Black Start Station remains connected to an external alternating current electrical supply (a "Black Start Unit Test") or while the Black Start Station is disconnected from all external alternating current electrical supplies (a "Black Start Station Test"), in order to demonstrate that a Black Start Station has a Black Start Capability.

9.5.8 Where the GO requires a Generator with a Black Start Station to carry out a Black Start Unit Test, the GO shall not require the Black Start Test to be carried out on more than one CDGU at that Black Start Station at the same time, and would not, in the absence of exceptional circumstances, expect any other CDGU at the Black Start Station to be directly affected by the Black Start Unit Test.

9.5.9 The GO may require a Generator with a Black Start Station to carry out a Black Start Unit Test at any time (but will not require a Black Start Unit Test to be carried out more than once in each calendar year in respect of any particular CDGU unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test, and will not require a Black Start Station Test to be carried out more than once in every two calendar years in respect of any particular CDGU unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test).

9.5.10 When the GO wishes a Generator with a Black Start Station to carry out a Black Start Test, it shall notify the relevant Generator at least 5 Business Days prior to the time of the Black Start Test with details of the proposed Black Start Test.

9.5.11 All Black Start Tests shall be carried out at the time specified by the GO in the notice given and shall be undertaken in the presence of a reasonable number of representatives appointed and authorised by the GO, who shall be given access to all information relevant to the Black Start Test.

Test Procedures

9.5.12 The proposed procedure for a Test will be notified to the User by the GO in advance of the Test. For an existing procedure, 5 Business Days notice shall be given. For a new procedure, 10 days notice shall be given and following receipt of such notification the User, acting in good faith, may, by 5 days notice to the GO, reasonably object to the proposed procedure on the grounds that there will be a material risk to the safety of the User's Plant or personnel, or that the proposed procedure is technically infeasible or inappropriate to the purpose (in accordance with Good Industry Practice), giving full details of its concerns. In the event that the User so objects, the GO shall, as it considers necessary, modify the procedure and re-notify the User.

9.5.13 The GO shall treat information collected from Users during monitoring and testing as confidential.

9.6 Investigation

9.6.1 The GO may, if it reasonably considers that there may be an issue of non-compliance by the User, carry out an Investigation to acquire or verify information relevant to Users' Plant and/or Apparatus design, operation or connection requirements under the Grid Code, Connection Agreements, Ancillary Service Agreements and System Support Agreements between Users and the GO.

9.6.2 Investigation by the GO usually applies to information not collected on a regular basis by means of Monitoring and Testing. The GO may, having given reasonable notice, send a representative or subcontractor to a User's Site in order to Investigate any equipment or operational procedure on or applicable to the User Site insofar as the condition of that equipment or operational procedure is relevant to compliance with the Grid Code, Connection Agreements, and/or other agreements between Users and the GO.

9.7 Consequences of Monitoring, Testing and Investigation

9.7.1 When the GO considers that a Generator, a Demand Side Aggregator or a Generator Aggregator is not in compliance with a Dispatch Instruction then the GO shall inform the Generator, the Demand Side Aggregator or the Generator Aggregator by agreed methods, identifying the relevant Generation Unit or Demand Side Aggregator, and identifying the Dispatch Instruction and the time of issue of the Dispatch Instruction with which the GO considers the Generator, the Demand Side Aggregator or the Generator Aggregator is not in compliance. This shall be known as a "Warning for non-compliance with a Dispatch Instruction". The Warning is to contain a Dispatch Instruction which may be identical to the original Dispatch Instruction or which may differ from it. The occurrence of the Warning shall be logged by the GO and by the Generator, the Demand Side Aggregator or the Generator Aggregator.

9.7.2 On receipt of a Warning for non-compliance with a Dispatch Instruction, the Generator, the Demand Side Aggregator or the Generator Aggregator must as soon as possible, and in any case within ten (10) minutes of the receipt of the Warning:

(a) commence to comply with the Dispatch Instruction included with the Warning (this may be the original or a modified Dispatch Instruction); or

(b) reply to the GO, disputing in good faith the validity of the original Dispatch Instruction, detailing the grounds on which the validity is being disputed; or

(c) reply to the GO, disputing in good faith the validity of the assessment of non-compliance. In this event the Generator, the Demand Side Aggregator or the Generator Aggregator must as soon as is reasonably practicable, inform the GO in detail of the grounds on which the assessment of non-compliance is being disputed; or

(d) reply to the GO, giving a reason for inability to comply with the Dispatch Instruction, and making a revised Declaration in respect of the Availability, Ancillary Service capabilities or Operating Characteristics, as appropriate.

9.7.3 If the Generator, Demand Side Aggregator or Generator Aggregator complies in accordance with 9.7.2 (a), no further action shall arise.

9.7.4 In the event of the Generator, Demand Side Aggregator or Generator Aggregator making a revised Declaration under 9.7.2 (d), the GO shall then issue a new Dispatch Instruction, consistent with the revised Declaration. The revised Declaration will be backdated to the time of issue of the relevant Dispatch Instruction. Notwithstanding the backdating of the revised Declaration, the Generator, Demand Side Aggregator or Generator Aggregator will still be deemed under 9.7.1 as having failed to comply with a Dispatch Instruction.

9.7.5 In the event of 9.7.2 (b) or 9.7.2 (c) applying, the GO shall consider the substance of the Generator's, Demand Side Aggregator's or Generator Aggregator's disputation. The GO shall, where the GO considers appropriate, communicate with the Generator, Demand Side Aggregator or Generator Aggregator to clarify aspects relating to the issue and receiving of the Dispatch Instruction, and the Generator's, Demand Side Aggregator's or Generator Aggregator's actions. The GO shall acting reasonably determine the validity of the Generator's, Demand Side Aggregator's or Generator Aggregator's disputation, and shall inform the Generator, Demand Side Aggregator or Generator Aggregator as to its decision. The GO shall record both its decision, and also all pertinent information relating to the event, including the Generator's, Demand Side Aggregator's or Generator Aggregator's disputation and such information shall be deemed to be Operational Data.

9.7.6 Where the GO, acting reasonably, is of the view that a disputation given by a Generator, Demand Side Aggregator or Generator Aggregator is not valid or not wholly valid or if the Generator, Demand Side Aggregator or Generator Aggregator has not replied in accordance with 9.7.2, the GO shall inform the Generator, Demand Side Aggregator or Generator Aggregator that it is overriding, by means of a Post Event Notice, the Generator's Declaration in respect of the Availability, Ancillary Service capabilities or Operating Characteristics of the Generation Unit as appropriate. The Post Event Notice shall govern until such times as the Generator, Demand Side Aggregator or Generator Aggregator submits a revised Availability Notice.

9.7.7 Where the GO gives a Post Event Notice under 9.7.6, the Post Event Notice shall be backdated to the time of issue of the relevant Dispatch Instruction, or the latest time for which there exists compelling evidence that the Generation Unit, and Demand Side Aggregator was acting in compliance with the Dispatch Instruction, whichever is the later. The Post Event Notice shall set the level of Declared Availability, Declared Ancillary Service capability or declared Technical Parameter, as the case may be, at such level as the Monitoring, Testing or Investigation indicates the Generation Unit actually achieved. Notwithstanding the backdating of the Post Event Notice, the User will still be deemed under 9.7.1 as having failed to comply with a Dispatch Instruction.

9.7.8 In the event that the Demand Side Aggregator is deemed by the GO in accordance with the provisions of this section to be in non-compliance with its Dispatch Instructions, that is the Demand Side Aggregator failed to comply with three (3) Dispatch Instructions in a one calendar month period then the GO shall notify the Demand Side Aggregator of the continued non-compliance. The Demand Side Aggregator shall take immediate action to remedy such non-compliance. The terms shall be without prejudice to the rights of the GO to instruct the Market Operator that the Demand Side Aggregator is in breach of the Grid Code. In such cases the GO may set the Demand Side Aggregator's Availability to zero or to a level as deemed appropriate by the GO until Testing is completed on compliance with Dispatch Instructions.

9.8 Non-Compliance by a Generator Operator with Declared Operating Reserve

9.8.1 In evaluating the adequacy of the performance of a Generation Unit as the case may be, the GO shall compare the actual performance as measured, with the expected performance for that Generation Unit. The expected performance from the Generation Unit shall be calculated based on the Frequency deviation from the Pre-Incident Frequency, and the Generation Unit's then Declared values of Availability, POR, SOR, TOR1, TOR2 and Governor Droop;

9.8.2 Where the performance of a Generation Unit is deemed by the GO to be in non-compliance with Declared Operating Reserve, then the GO shall notify the Generator Operator, of the non-compliance, identifying the system or procedure by which non-compliance was measured. The GO shall by means of a Post Event Notice override the Generator's Operator's Declaration in respect of Operating Reserve. The revised Declaration shall be effective from the time of commencement of the Test or Event on which the non-compliance has been assessed, or such later time as may, in the opinion of the GO acting reasonably, be appropriate if the non-compliance did not apply to the full period of the Test or Event.

9.8.3 Following the notification of non-compliance, the GO shall make available to the Generator within three Business Days relevant data in relation to the system Frequency and Generation Unit performance, that the Generator may reasonably require substantiating the assessment of non-compliance.

9.9 Non-Compliance by a Generator, Demand Side Aggregator or Generator Aggregator with an Availability Notice

9.9.1 In the event that the performance of a Generation Unit, Demand Side Aggregator or Aggregated Generator is deemed by the GO to be in non-compliance with its Declared Availability, then the GO shall notify the Generation Unit, Demand Side Aggregator or the Generator Aggregator of the non-compliance.

9.9.2 Having so informed the Generation Unit, Demand Side Aggregator or Generator Aggregator, the GO shall, by means of a Post Event Notice, override the User's Availability Notice, with a value as appropriate to the outcome of the Test or Investigation. The revised Declaration shall be effective from the time of commencement of the Test or Investigation on which the non-compliance has been assessed, or such later time as may, in the opinion of the GO acting reasonably, be appropriate if the non-compliance did not apply to the full period of the Test or Investigation.

9.9.3 The economic consequence of non-compliance by a Generator, Demand Side Aggregator or Generator Aggregator with Declared Availability may be addressed by SEC.

9.10 Non-Compliance by a Generator, Demand Side Aggregator with Declared Ancillary Services or Declared Technical Parameters

9.10.1 In the event that the performance of a Generation Unit, Demand Side Aggregator is deemed by the GO to be in non-compliance with its Declared Ancillary Services capability or Operating Characteristics, then the GO shall notify the Generator, Demand Side Aggregator of the non-compliance, and having so informed the Generator, Demand Side Aggregator then the GO shall by means of a Post Event Notice override the Generator's Declaration, Demand Side Aggregator's Declaration in respect of Ancillary Services or Operating Characteristics as appropriate.

9.10.2 The consequences of non-compliance by a Generator, Demand Side Aggregator or with Declared Ancillary Services or Declared Technical Parameters will be addressed in by SEC and other agreements to define economic compensation as appropriate.

9.11 Non-compliance by a User with a Connection Condition or Registered Operating Characteristics

9.11.1 In the event that the performance of a Generation Unit is deemed by the GO in accordance with the provisions of this section to be in non-compliance with its Operating Characteristics or with a Connection Condition, then the GO shall notify the Generator of the non-compliance and the Generator shall take immediate action to remedy such non-compliance.

9.11.2 In the event that the performance of a Demand Side Aggregator is deemed by the GO to be in non-compliance with its Operating Characteristics, including Demand Side Aggregator Energy Profile, or with a Connection Condition, then the GO shall notify the Demand Side Aggregator of the non-compliance and the Demand Side Aggregator shall take immediate action to remedy such noncompliance.

Failure of Black Start Test

9.11.3 A Black Start Station shall fail a Black Start Test if the Black Start Test shows that it does not have a Black Start Capability (i.e. if the relevant Generating Unit fails to be Synchronised to the System within two hours of the Auxiliary Gas Turbine(s) or Auxiliary Diesel Engine(s) being required to start).

9.11.4 If a Black Start Station fails to pass a Black Start Test the Generator must provide the GO with a written report specifying in reasonable detail the reasons for any failure of the test so far as they are then known to the Generator after due and careful enquiry. This must be provided within 5 Business Days of the test. If a dispute arises relating to the failure, the GO and the relevant Generator shall seek to resolve the dispute by discussion, and if they fail to reach agreement, the Generator may require the GO to carry out a further Black Start Test within 36 hours which shall be carried out following the agreed procedure as the case may be, as if the GO had issued an instruction at the time of notice from the Generator.

9.11.5 If the Black Start Station concerned fails to pass the re-test and a dispute arises on that re-test, either party may use the Disputes Resolution Procedure for a ruling in relation to the dispute, which ruling shall be binding.

9.11.6 If following the procedure in 9.11.4 and 9.11.5 it is accepted that the Black Start Station has failed the Black Start Test, within 4 weeks, or such longer period as the GO may reasonably agree, following such failure, the relevant Generator shall submit to the GO in writing for approval, the date and time by which that Generator shall have brought that Black Start Station to a condition where it has a Black Start Capability and would pass the Black Start Test, and the GO will not unreasonably withhold or delay its approval of the Generator's proposed date and time submitted. Should the GO not approve the Generator's proposed date and time (or any revised proposal) the Generator shall revise such proposal having regard to any comments the GO may have made and resubmit it for approval.

9.11.7 Once the Generator has indicated to the GO that the Generating Station has a Black Start Capability, the GO shall either accept this information or require the Generator or to demonstrate that the relevant Black Start Station has its Black Start Capability restored, by means of a repetition of the Black Start Test.

9.12 Dispute of Assessment on Non-compliance by a User

9.12.1 In the event that a User has received notification from the GO of an assessment of non-compliance and/or application of a Post Event Notice, then the User may reply to the GO disputing in good faith the validity of either the assessment of non-compliance and/or the content of the Post Event Notice, detailing the grounds on which the validity is being disputed. Any disputation should be submitted within 24 hours although additional information in support of the disputation may follow within 5 Business Days.

9.12.2 If a User submits a disputation to the GO, then the GO shall consider the substance of the User's disputation. The GO may, where the GO considers appropriate, communicate with the User to clarify aspects of the assessment of non-compliance or the User's disputation.

9.12.3 The GO shall determine the validity of the User's disputation, and shall inform the User within 5 Business Days as to its decision. The GO shall alter or revise any assessment of non-compliance and/or Post Event Notices as appropriate.

9.12.4 In the event that there is still disagreement as to the outcome, the dispute shall if requested by either the GO or the User, be referred to the SEC.

10 SAFETY CO-ORDINATION

10.1 Introduction

10.1.1 In order to adequately maintain and repair damage to T & D System Plant and/or Apparatus it will be necessary for the GO and/or its agents to work on or in close proximity to T & D System Plant and Apparatus, or in close proximity to User's Plant and Apparatus.

10.1.2 Users and/or their agents will similarly need to work on or in close proximity to User's Plant and Apparatus which is connected to, or capable of being connected to in an approved manner, the T & D System, and from time to time to work in close proximity to T & D System Plant and Apparatus.

10.1.3 It will also be necessary to facilitate work by third parties in close proximity to T & D System Plant and Apparatus.

10.1.4 In order to ensure safe working conditions for each of the above situations, the GO, Users, and/or their respective agents shall comply with their applicable PUC Safety Rules and Seychelles Health and Safety Legislation.

10.1.5 In the event of a conflict between Safety Co-ordination and any other section of the Grid Code, Safety Co-ordination shall take precedence.

10.2 Objective

10.2.1 The objective of this section is to ensure that the GO, Users and their respective agents operate in accordance with approved safety rules, which ensure the safety of personnel working on or in close proximity to T & D System Plant and Apparatus or personnel who may have to work at or use the equipment at the interface between the T & D System and the User System.

10.2.2 This will normally involve making electrical Plant dead and suitably isolating / disconnecting (from all sources of Energy) and Earthing that Plant such that it cannot be made live.

10.2.3 The Safety Rules shall also cover work on live T & D System Plant and Apparatus.

10.3 Scope

10.3.1 Applies to the GO and to the following Users:

(a) Generators;

(b) the Distributor System Operator;

(c) Demand Customers;

(d) Demand Side Aggregators;

(e) agents of the GO or agents of any User (as defined in (a), (b), (c) and (d)).

10.4 Safety Rules

10.4.1 The safety of personnel working on or in close proximity to T & D System Plant and Apparatus for or on behalf of the GO is governed by the PUC Electrical Safety Rules.

The safety of personnel working on or in close proximity to User Plant and Apparatus is governed by the PUC Electrical Safety Rules or Users Safety Rules, as appropriate.

10.4.2 In the event of a conflict between the provisions of this Code and the provisions of PUC Electrical Safety Rules, the provisions of the PUC Electrical Safety Rules shall take precedence.

10.4.3 Where clarification is required regarding the correct interpretation of a rule within PUC Electrical Safety Rules, the GO shall issue the interpretation to the User as provided by the person responsible for the PUC Electrical Safety Rules following consultation with the relevant parties.

10.5 Safety at the Interface Between the T&D System and the User System

10.5.1 There shall be a Designated Operator for each User Site.

10.5.2 Operation Instructions for each User Site shall, following consultation with the relevant User, be issued by the GO to the User and will include:

(a) detail on the demarcation of responsibility for safety of persons carrying out work or testing at the User's Site and on circuits which cross the User's Site at any point;

(b) detailed switching sequences for voluntary, fault and emergency switching;

(c) control and operational procedures;

(d) identification of operational boundaries;

(e) identity of the representatives of the GO and the User(s) and/or their respective agents who will attend the T & D Station and/or facility for operation and during emergencies;

(f) other matters agreed between the GO and User.

10.5.3 The GO and each User shall co-operate in developing procedures and agreement on any matters that may be relevant for ensuring overall Site safety and, in particular, the overall safety of equipment at the interface between the T & D System and the User System.

10.5.4 In the event of a Modification or a change in operational practices, which may have an Operational Effect on a User Site, the GO and the User shall review the adequacy of overall Site safety.

10.5.5 Adequate means of isolation / disconnection (from all sources of Energy shall be provided at the interface between the T & D System and the User System to allow work to be carried out safely at, or either side of this point, by the GO and each User.

10.5.6 Where necessary adequate facilities for Earthing and short circuiting shall be applied to Plant and/ or Apparatus at either side of the interface between the T & D System and the User System, to allow work to be carried out safely at or either side of this point.

APPENDIX A REPORTS

A.1. Policy and Legislative Review and Future Framework

Introduction

Seychelles has taken several steps in the past few years to consolidate its national energy laws, policies and programs, and to establish the development of renewable energy technologies in the country as a national priority. Among the recent steps in this direction have been: a) the establishment in 2009 of a Seychelles Energy Commission; b) the formulation of the Seychelles Energy Policy 2010-2030; c) the enactment of the Energy Act 2012; d) introduction of promotional/incentives schemes example VAT exemption, low-interest loan scheme (SEEREP) and PV rebate scheme.

Seychelles Energy Commission (SEC)

The Seychelles Energy Commission (SEC) is a statutory body established by the Seychelles Energy Commission Act of 2009, which was replaced by the Energy Act, 2012. The object of the Commission is to regulate electricity related activities for adequate, reliable, cost effective and affordable electricity while protecting and conserving the environment. In addition, the Commission promotes the use of energy efficient technologies and renewable resources.

Energy Policy 2010 – 2030

The Energy Policy 2010 – 2030 which was approved by cabinet in 2010, is designed to ensure that Seychelles achieves: "A modern, efficient, diversified and environmentally sustainable energy sector providing affordable and accessible energy supplies."

The Energy Policy examined the energy situation we face and proposed a range of options and strategies which Seychelles should pursue over the short, medium and longer term. These options range from incorporating energy efficiency and conservation measures in our daily lives, through modernizing Seychelles' energy infrastructure to diversifying our energy base, as previously mentioned.

It places priority attention on three key areas:

1. Land transport
2. Consumption of electricity
3. Production of electricity

By focusing on these three priority areas listed above, the Energy Policy ensures that Seychelles minimizes the effect of volatile and rising crude oil prices, takes advantages of renewable resources and promotes conservation and efficiency in the use of energy resources amongst all sectors of society. The policy proposes key changes to the institutional and regulatory framework for energy in the country, including strengthening the Seychelles Energy Commission, creation of an independent Energy Regulator, and clearly defined IPP regulations to promote renewable energy development.

The Energy Policy sets a national target of 15% of energy demand met by renewable energy by 2030 and a target of 30% of electricity generation from renewable energy by 2030.

Other policy documents which have some relevance to the energy sector and promotion of renewable energy are:

1. the National Climate Change Strategy (2009) which identifies five strategic objectives:

(i) advance understanding of climate change, its impacts and appropriate responses

(ii) put in place measures to adapt, build resilience and minimize vulnerability to the impacts of climate change

(iii) achieve sustainable energy security through reduction of greenhouse gas emissions

(iv) mainstream climate change considerations into national policies, strategies and plans

(v) build capacity and social empowerment at all levels to adequately respond to climate change.

2. The Seychelles Sustainable Development Strategy 2011-2020 - like the National Climate Change Strategy, identifies the "promotion of renewable and alternative energy at the national level" as one of 5 strategic objectives for the energy sector in the country.

Energy Act

The existing legislative framework in the electricity sector consists mainly of the Energy Act, 2012 (which re-establishes Seychelles Energy Commission, SEC, as policy implementer and regulator and outlines the SEC functions regarding the Energy and Electricity sector), and other relevant regulations and legislations. The Energy Act, 2012 was needed as part of the Strategy to implement the Energy Policy 2010-2030. In particular, the Energy Act defined the new setting in the energy and electricity sector with a view to promote electricity generation from Renewable Energy by private investors. The Energy Act, 2012 is aimed to be the main piece of legislation to guide the development of the electricity sector.

The Act opened up the generation sector of electricity to allow private participants to enter the electricity market in the Seychelles. Within the Act it was envisage that more emphasis will be placed on generation of electricity based on renewable energy resources in line with energy policies and strategies. To date the Public Utilities Corporation (PUC) remains the main actor in the generation, transmission and distribution of electricity. The Energy Act, 2012 also made provision for the development and deployment of energy efficiency and renewable energy and ensures that these becomes part of the energy landscape in Seychelles. Several investors have shown their interests in investing in renewable energy projects in Seychelles, especially in solar PV, but the necessary regulations need to be in force to provide for the relevant rules and procedures for such projects to materialise.

Future Policy and Regulatory Framework

As previously indicated, the Government of Seychelles is committed to strengthening our energy security through the development of RE and EE. Currently the Ministry of Environment, Energy and Climate Change is exploring a 100 % RE scenario. Whether this is achievable or not, it clearly shows that GoS is targeting a higher penetration of RE, higher than the 15% sets in the energy Policy 2010-2030. The Government will look at undertaking resource assessments to establish our potential as well as develop other incentives to accelerate the adoption of RE. There has been discussions on FIT and the need for appropriate frameworks for distributed generation and utility-scaled RE plant.

From a regulatory perspective, the Grid Code is an integral part of the legislative framework. It should clearly provide the technical requirement and rules for the network operator/utility, the users or market participants to ensure operational stability of the system and security of supply. Grid code is crucial for supporting RE development in Seychelles and should be clearly defined.

The Energy Act has prompted the need to relook our electrical system. By making provision for others to participate in the generation activity, the utility model will have to change from a vertically integrated system into a single buyer model. PUC will have to unbundle itself on activity-level, i.e. generation, transmission, distribution and supply. However, given 100% coverage PUC will be the sole transmission and distribution operator or network operator. Guided by the regulator, the network operator will ensure the reliability, stability and security of the supply through, inter alia, the enforcement of the grid code.

In addition to centralised RE plants, battery storage, small-scale distributed generation, we envisage development of microgrids and smart grids, smart meters, other grid stabilising measures such as flywheel, supercapacitors to play a major role in a transformation of the current predominantly conventional energy supply system to a future energy system. Furthermore, given the limitation of the grid to integrate variable RE (VRE) especially PV, there are export limitation technologies that will control the amount of power from a PV systems that is exported to the grid thus allowing consumers to install their desire capacity without disrupting the integrity of the grid. Lastly, VRE will have an impact on the stability of the grid. Hence it is important the grid code considers and provide for grid stability strategies and measures (technological and operational) according to the level of RE integration (low, medium and high penetration).

A.2. Renewables & Power Technologies Report

Enclosed.

The Climate Technology Centre and Network (CTCN) fosters technology transfer and deployment at the request of developing countries through three core services: technical assistance, capacity building and scaling up international collaboration. The Centre is the operational arm of the UNFCCC Technology Mechanism, it is hosted and managed by the United Nations Environment and the United Nations Industrial Development Organization (UNIDO), and supported by more than 300 network partners around the world.

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