SYSTEM CONTROL TECHNICAL CODE

VERSION 1.0

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SYSTEM CONTROL TECHNICAL CODE

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SECTION 1

INTRODUCTION

1.1 AUTHORISATION

This Technical Code sets out:

(a) performance standards of power systems in the Northern Territory,

(b) operation requirements which apply to the operation of System Participants' plant and equipment connected to power systems,

(c) requirements for the operation of power systems under normal and emergency circumstances, the latter including the possibility of a person suffering injury,

(d) operational obligations of System Participants,

(e) procedures which apply if System Control believes that a System Participant's plant or equipment does not comply with the requirements of the Technical Code;

(f) procedures relating to the inspection of a System Participant's plant and equipment;

(g) procedures which apply to system tests and work carried out in relation to all or a part of a power system,

(h) coordinate procedures which apply to the commissioning and testing of new plant and equipment connected to a power system,

(i) procedures which apply to the disconnection of plant and equipment from a power system,

(j) procedures relating to the operation of generating units and other plant and equipment as part of or connected to a power system (including the issue of dispatch instructions and compliance with those instructions),

(k) metering and energy balancing requirements in relation to connections,

(l) information which each System Participant is required to provide to System Control in relation to the operation of plant and equipment connected to a power system at the System Participant's connections and the manner and timing of that information,

(m) requirements in relation to under frequency load shedding with which System Participants shall comply,

(n) any other operational matters relating to a power system or plant and equipment connected directly or indirectly to a power system.

1.2 STATEMENT OF PURPOSE

This Code sets out:

(a) requirements to achieve a Secure System,

(b) procedures for generation plant scheduling and ancillary services in accordance with the Technical Code,

(c) requirements relating to the operation of a power system and equipment connected to a power system,

(d) quality of supply standards which apply at Points of Connection to a power system,

(e) requirements that are placed on all System Participants to ensure that the technical performance of an interconnected power system meets all the requirements of this Technical Code and Network Technical Code.

1.3 APPLICATION

This Code applies to the following organisations and System Participants:

(a) Power system controller and System Control under the System Control Licence;

(b) Network Operators under their Network Operators Licences;

(c) Generators under their Generation Licences;

(d) Retailers under their Retail Licences – in respect of underfrequency load shedding requirements and metering;

(e) Any other customers and users of power and/or elements of power systems as directed by the Utilities Commission.

1.4 INTERPRETATION

(a) In this Technical Code, words and phrases are defined in Attachment 1 and have the meanings given to them in Attachment 1, unless the contrary intention appears.

(b) This Technical Code shall be interpreted in accordance with the rules of interpretation set out in Attachment 2, unless the contrary intention appears.

(c) If there is conflict in relation to power system security and operational issues and procedures between this Code and the Network Technical Code or any other procedures of System Participants, the requirements of this Code shall prevail. All such conflicts will be dealt with by the Power System Controller and the Network Operator, relevant System Participants will also be consulted.

1.5 DISPUTE RESOLUTION

Should a dispute arise between a System Participant and System Control concerning this Technical Code, System Control shall negotiate with the System Participant to determine mutually acceptable outcomes. If agreement cannot be reached between these two parties within 14 days, the dispute shall be arbitrated by the Utilities Commission.

1.6 CONFIDENTIALITY

A System Participant, together with Government agencies shall preserve the confidential nature of the Confidential Information.

1.7 OBLIGATIONS

1.7.1 Obligations of System Participants

All System Participants shall maintain and operate all equipment being part of their facilities in accordance with:

(a) relevant laws,

(b) the requirements of this Code,

(c) the requirements of the Network Technical Code,

(d) good electricity industry practice and applicable Australian Standards.

(e) Respond, within reasonable time, to the reasonable request of the power system controller for operational data or records or relevant operation information of their plant.

1.7.2 Obligations of the Network Operator

(a) Network Technical Code 1.6.2 outlines the obligations of the Network operator

(b) The Network Operator shall comply with the relevant power system performance and quality of supply standards:
- described in this Code and the Network Technical Code,
- in accordance with access agreements with another System Participants .
- in accordance with standards of service set by the Utilities Commission
- Respond , within reasonable time, to the reasonable request of the power system controller for operational data or records or relevant operation information of their plant

1.7.3 Obligations of Generators

A Generator shall comply at all times with applicable requirements and conditions of connection for generating units and, in accordance with any access agreement with the

Network Operator each Generator shall:

(a) comply with the requirements of the Network Technical Code and System Control Technical Code in respect of design and operation requirements of equipment connected to a power system,

(b) permit and participate in inspection and testing of facilities and,

(c) permit and participate in commissioning of facilities and equipment which are to be connected to the power system for the first time,

(d) operate facilities and equipment in accordance with direction given by the Network Operator and the power system controller,

(e) give notice of intended voluntary disconnection.

(f) respond, within reasonable time, to the reasonable request of the power system controller for operational data or records or relevant operation information of their plant.

1.7.4 Obligations of Power System Control

(a) The operational functions of a Power System Controller are set out in section 38 of the Electricity Reform Act 2000:

- power to issue directions to electricity entities that are engaged in the operation of the power system, or contribute electricity to, or take electricity from, the power system; and
- to switch off or re-route a generator;
- to call equipment into service;
- to take equipment out of service;
- to commence operation or maintain, increase or reduce active or reactive power output;
- to shut down or vary operation; and
- to shed or restore customer loads.
- the other powers conferred by the Regulations.

(b) System Control has the function of monitoring and oversee the operation of a power system to ensure that the system operates reliably, safely and securely in accordance with the Access Code, Network Technical Code, System Control Technical Code and other relevant codes and Standards,

(c) System Control is responsible for the setting of target frequency of the power system and the arrangements to provide associated ancillary services for the maintenance of system security

(d) System Control is responsible for the establishment of operating protocol and arrangements for generation dispatch and to maintain power system security.

(e) System Control shall arrange for operation of a power system such that:

- in the satisfactory operating state, electricity may be transferred continuously in a secure and efficient manner;
- the number of interruptions to customers is minimised ,
- restoration of a power system shall occur as soon as reasonably practical following any interruption within the power system.

1.8 VARIATIONS AND EXEMPTIONS FROM, AND AMENDMENTS TO, THE CODE

1.8.1 Variations and Exemptions to the Code

Various clauses throughout this Technical Code permit variations or exemptions from Code requirements to be granted to a System Participant by reference to terms which include:

(a) the agreement of the System Control,

(b) access agreement conditions.

In all cases any such variation or exemption shall be given in writing to System Participants by the power system controller.

1.8.2 Amendments to the Code

(a) The power system controller may amend the Code at anytime, but only with the prior written approval of the Utilities Commission.

(b) System Control shall consult with all electricity entities, which hold a current market Licence, when amending the Code.

SECTION 2

2 OPERATIONAL RESPONSIBILITIES OF SYSTEM CONTROL

System Control assumes the following duties as a System Operator:

2.1 Safety of personnel working on the power system

2.2 Maintain the continuity and security of electricity supply

2.3 Post trip management on network tripping or generation tripping

2.4 Coordinate and sanction plant outage requests

2.5 Regulate system Voltages to the required operation and performance standards

2.6 Maintain system frequency to the required operation and performance standards

2.7 Control system fault level not to exceed the plant making capacity

2.8 Arrange High Voltage busbar & feeder configurations for optimum system security

2.9 Oversee the operation of the power system in accordance with the declared limits of the asset owners.

2.10 Coordinate plant maintenance programme

2.11 Report potential system problems

2.12 Advise System Participants on abnormal incidents

2.13 Design under-frequency load shedding schedules and allocate load to each stage of the schedule

2.14 Issue major incidents reports

2.15 Instigate post-mortem investigation on major plant/power failures

2.16 Medium and Short Term load forecast

In addition, System Control also has the following duties as a Market Operator:

2.17 Energy balance and settlement

2.18 Determine the price of out-of-balance energy

System Control will carry out any other responsibilities which the power system controller considers appropriate or any other responsibilities the Utilities Commission requests the power system controller to carry out.

SECTION 3

3. SYSTEM SECURITY

3.1 TECHNICAL REQUIREMENTS OF SYSTEM PARTICIPANTS' FACILITIES

The Network Technical Code section 3 sets out details of the technical requirements which System Participants shall satisfy as a condition of connection of any plant and equipment to a power system (including embedded generators and embedded customers), except where specifically varied in an access agreement.

3.2 OPERATIONAL PHILOSOPHY

3.2.1 High Voltage Network components of a Power System

System Control will adopt reliability criteria for networks in accordance with the following N or N-1 criteria:

(a) N: A section of a network designed to the N criterion may result in the loss of all load in the area supplied by the sub-network for the loss of a network element.

(b) N-1: A section of a network designed to the N-1 criterion means that an outage of one of the N components that make up the sub-network should allow supply to be maintained to that area without loss of load, at any load level.

3.2.2 Generation components of network

System Control will adopt reliability criteria for generating plant in accordance with the following:

(a) N-1, i.e. there is sufficient stand-by plant in the power system to cater for the loss of a single 'on-line' generator, though in many cases short periods of involuntary load shed may occur.

(b) System Control will utilise available spinning reserve in the system and/or quick start stand-by plant to reconnect customers and restore the power system to normal.

3.3 POWER SYSTEM RELIABILITY AND SECURITY

3.3.1 Electricity Supply Reliability

Electricity supply reliability is related not only to the availability of generation to meet the expected demand, but also to the readiness of sufficient responsive supply reserves to meet credible contingency events.

Supply reliability in any power system is achieved through the continuous provision of:

(a) Sufficient supply options available and in service to meet the forecast instantaneous customer demand for electricity;

(b) Sufficient fast response supply reserves available either as unused generating plant actually in service (spinning/regulating reserve) or as interruptible customer load to cover a nominated level of impact resulting from a credible contingency; and

(c) Sufficient stand-by or short notice supply reserve to accommodate rapidly the impact of a credible contingency, or to cope readily with multiple contingencies with a minimal period of disruption to customer demand.

3.3.2 Power System Reliability

Power system reliability includes consideration of:

(a) Power supply reliability (generation):
This is the ability to meet demand and respond adequately to supply contingencies;
- Availability of fuel supply
- Availability of generating plant
- Availability of stand-by plant

(b) Delivery system reliability (power network):
This is the ability of the transmission system to achieve the necessary transfer of electricity from the generating sources through the bulk delivery substations for distribution to consumers, and the ability to respond adequately to power network contingencies
- Adequate transmission capacity to meet reasonably foreseeable future customer demand;
- a contingency path to allow the credible outage of n-1
- reactive power capability to maintain stable system voltage levels and to cover contingencies and avoid power system voltage collapse.

(c) Fast acting reactive plant to act to stabilise the transmission system voltage levels in the event of a transient disruptive occurrence and so avoid the need for major disconnection or separation of impacted regions due to voltage instability or actual voltage collapse situations.

3.3.3 Power System Security

(a) This includes consideration of the operational ability to ensure that voltage and frequency of the power system are maintained within limits , that the power system is able to withstand most single credible supply or delivery system contingency scenarios, without significant disruption of the frequency or voltage:
- that the power system protection schemes are coordinated
- that the appropriate operating safety margins are maintained
- that the power system voltages remain stable in the disruptions likely under the most credible contingency scenarios.

(b) The characteristic of a secure power system is essentially identified with the existence of stable voltages and frequency throughout the main power system.

3.3.4 System Control's Role on Power System Security:

System Control will arange the required ancillary services to maintain power system security.

(a) maintenance of an adequate power system frequency,

(b) maintaining the power system voltages within the declared standards and limits;

(c) maintaining the stability of the power system;

(d) ensuring that even under critical contingency events, that the components of the power system are not overloaded;

(e) carrying out all appropriate actions to restore the power system to a secure condition following either a minor or major disruptive event.

To carry out these operational activities, particularly during periods when it is necessary to return the power system to a secure state following a disruption, System Control shall have all of the authority commensurate with the expectations of the System Participants to respond promptly, including the necessary indemnities.

3.3.5 Power System Instability

(a) The transmission system and the output of the rotating generation plant both have the potential to be disrupted by numerous events (e.g. generating plant faults, lightning, bush-fires, storms, high voltage switching, transmission equipment faults).

(b) Each of the disruptions represents a potential transient instability situation for the transmission delivery system (resulting in voltage, frequency and potential load fluctuations).

(c) This is normally brought under control by fast-acting correction equipment (fault interruption protection, automatic voltage regulators, generating plant governors, stabilisers, static var compensators, automatic generation control, synchronous condensers, etc).

(d) Any situation which is not corrected quickly will normally result in automatic operation of generating or transmission equipment protection in an attempt to isolate the problem, but may also require intervention by System Control in an attempt to prevent further disruption or to correct the system condition.

(e) In a long interconnected alternating current power system, disruptions at one extremity of the power network can under some circumstances initiate power swings and associated voltage fluctuations at the other extremity of the power system.

(f) The fundamental responsibility of System Control is to provide power system security through actions to ensure that:

- An adequate supply reserve (spare generation or interruptible load) is maintained on the power system above the capacity required to meet the expected customer demand, and that the power network is considered to be able to withstand the disruption resulting from an unexpected disconnection of one generating unit or an item of transmission equipment due to the occurrence of a fault or for any other reason;
- satisfactory voltage levels, frequency levels and reactive power reserves are being maintained on the transmission system;
- the steady state stability of the power network is being maintained; and
- All equipment within the power network is being operated within acceptable ratings.

(g) The sudden failure or forced outage of any major single power system item such as a generator, transmission line, transformer, etc is known as a single contingency event. System Control will manage the power system and generator dispatch process such that, in the event of a single disruption:

- All plant and equipment would operate within ratings in a reasonable period following the initial transient impacts of the disruption;
- customer load would not be unnecessarily disconnected;
- the power system would remain in synchronism;
- damping of any power system instabilities or oscillations would be adequate;
- voltage control criteria would be satisfied; and
- Frequency control criteria would be satisfied.

3.3.6 Action to Maintain Power System Voltage Stability

(a) The power system voltage is impacted by sudden change of reactive power input or by change of a large reactive load. Such incidents include:

- The sudden loss of a generating unit;
- the interruption of a transmission circuit;
- the failure of a major transmission transformer; and
- The sudden increase of reactive load

(b) There are specific dynamic devices installed within a power system to provide fast response to any voltage disturbance, by causing an adjustment in actual reactive power at appropriate locations within the power system. Such devices include:

- SVCs (Static Var Compensators)
- AVRs (Automatic Voltage Control Systems, generator).
- Synchronous condensers with automatic voltage control.
- Power system stabilisers (increasing generator AVR or SVC response during a power system frequency disturbance).

(c) The power system is considered to have undergone a "voltage instability" if the voltage level of the power system (or part of the power system) cannot be returned to an acceptable operating level following a power system disturbance. This voltage collapse may be experience locally or it may lead to a progressive collapse of the power system voltage, possibly resulting in a total blackout.

(d) An under-voltage condition on the power system is a major threat to power system stability. Major transmission and distribution transformers with automatic voltage control systems will invariably add to any reactive power deficiency by attempting to restore the sagging distribution voltage. Conditions may also be worsened if the generating sources of reactive power become limited by reaching a maximum generator rotor current limit, removing their ability to respond to further voltage deficiencies.

(e) In extreme cases, a loss of synchronism can occur between remotely connected generating sources and a further worsening of the power system voltage stability probably with accompanying power and reactive power swings between remote generation units. Unless the situation is recognised promptly and remedial action initiated, the extreme cases may result in a cascade effect potentially leading to a more extensive collapse of the power system voltage.

(f) On recognising a voltage instability or potential power system voltage collapse condition, System Control may attempt to assist those devices by

i) providing active reactive power corrections by shedding of customer loads in the vicinity of the voltage disturbance, or

ii) blocking of automatic on-load transformer tap changers to prevent further cascading voltage decay resulting from a reactive supply shortfall.

iii) Instruct the disconnection of an unstable generating unit

3.4 SYSTEM OPERATING STATES

3.4.1 Satisfactory operating state

The System is in a satisfactory operating state if all the following conditions apply:

(a) all equipment within each High Voltage Network is being operated within rated limits provided by the Network Operator

(b) the High Voltage Networks are electrically connected,

(c) voltage levels and frequency levels are being maintained on each High Voltage Network in accordance with the Secure System Guidelines,

(d) the System is stable in accordance with the Secure System Guidelines,

(e) the level of damping of inter-area oscillation has a halving time of 5 seconds or less,

(f) the level of damping of inter-machine oscillation has a halving time of 3.5 seconds or less,

(g) the fault levels at High Voltage Network busbars do not exceed the rupture rating of equipment connected to those busbars.

3.4.2 Secure operating state

The System is in a secure operating state if:

(a) the System is in a satisfactory operating state; and

(b) the System will promptly return to a satisfactory operating state if the Critical Credible Contingency occurred.

3.4.3 Reliable operating state

The System is in a reliable operating state if:

(a) involuntary load shedding is not occurring; and

(b) involuntary load shedding will not occur if a Critical Credible Contingency occurs; and

(c) the energy and capacity reserve criteria specified in the Secure System Guidelines are satisfied.

3.5 SECURE SYSTEM GUIDELINES

3.5.1 Issue of guidelines

System Control shall issue guidelines setting out the principles for determining:

(a) whether adequate energy and capacity reserves are being maintained on the System,

(b) whether adequate Reactive Power reserves are being maintained on the System,

(c) whether satisfactory voltage levels and frequency levels are being maintained on the High Voltage Networks,

(d) the capacity of on-line generating units and transmission facilities required by a power system in order that it will withstand unexpected disconnection of load taking System Participants,

(e) whether the power system is stable.

3.5.2 Amendment of guidelines

System Control may amend, vary or replace the Secure System Guidelines at any time.

3.5.3 Requirement for consultation

System Control shall consult with System Participants before issuing, amending, varying or replacing Secure System Guidelines

3.5.4 Matters to be taken into account

In conducting the review and in subsequently amending, varying or replacing the reserve principles, System Control shall take into account the following matters:

(a) government policy,

(b) System Control's statutory obligations,

(c) historic levels of reliability,

(d) costs and benefits.

3.5.5 System Control's obligations

(a) Maintenance of a secure system:

- System Control shall endeavour to maintain a Secure System.

- If the System is no longer secure, then System Control shall minimise the risk to public safety and power supplies at Points of Connection to the High Voltage Networks.

(b) Threat to Secure System

If there is a threat to a Secure System, threat to safety of persons or hazard to equipment, then System Control may take action to minimise the threat or hazard, including disconnecting a Point of Connection or taking High Voltage Network equipment out of service, or removal of generator/s from service.

3.6 THREAT TO SECURE SYSTEM ADVICE

3.6.1 System Participant's advice

A System Participant shall promptly advise System Control after the System Participant becomes aware of any circumstance which could be expected to adversely affect the operation of a power system or the continuation of Secure System state.

3.6.2 System Control's advice

System Control shall promptly advise any affected System Participant after System Control becomes aware of any circumstance with respect to the power system which could be expected to adversely affect supply of electricity to or from that System Participant.

3.6.3 Protection not available for service

If**:**

- a Generator becomes aware that one of the major protection systems is not operating correctly or is unavailable for service,
- a Network Operator or System Participant becomes aware that one of the two primary protection systems relating to a Point of Connection to a power system is not operating correctly or is unavailable for service,
- a Network Operator becomes aware that any of its HV Protection Equipment relating to its High Voltage Network is not operating correctly or is unavailable for service,

then it shall promptly:

- notify System Control of that fact; and
- diligently restore the operation of the relevant protection system or put in place alternative protection.

Should the undesirable situation persist, System Control may direct that equipment be taken out of service and a System Participant shall comply with a direction given to it under this clause.

3.7 LACK OF GENERATION STAND-BY CONDITIONS

3.7.1 Declaration of Low Stand-by Notice (LSN)

A Generator shall issue a Low Stand-by Notice to System Control when the Stand-by capacity of that Generator has fallen below the Stand-by requirement defined by the Secure System Guidelines.

3.7.2 Declaration of Lack of Stand-by generation (LOS)

Having received a Low Stand-by Notice, System Control shall assess the overall stand-by availability in the power system. System Control may declare Lack of Stand-by generation **("LOS")** condition as follows:

(a) LOS1 may be declared when the power system is short of stand-by generation plant capacity up to 10 MW, and System Control considers that there is a material risk of involuntary load shedding or the need to carry out Voltage Reduction following the Critical Credible Contingency;

(b) LOS2 may be declared when the power system is short of stand-by generation plant capacity up to 34MW, and System Control considers that there is a material risk of involuntary manual load shedding High Voltage feeders up to Stage 2 of Under-frequency Load Shedding Scheme following the Critical Credible Contingency; and

(c) LOS3 may be declared when the power system is short of stand-by generation plant capacity in excess of 35MW, and System Control considers that there is a material risk of involuntary manual load shedding High Voltage feeders up to Stage 3 of Under-frequency Load Shedding Scheme following the Critical Credible Contingency; and half-hourly rolling outages are imminent

3.7.3 Notice of LOS conditions

System Control shall advise System Participants of the estimated period of the LOS, and the estimated minimum Stand-by and its estimated time of occurrence, at the time the declaration is made.

3.8 FUEL SHORTFALL

3.8.1 Definition of fuel

In this clause fuel in relation to a Power Station means the primary energy source of that Power Station (for example liquid fuel, gas).

3.8.2 Generator to notify

A Generator shall promptly notify System Control after it becomes aware that the accessible fuel for any of its Power Stations falls below the alert level.

3.8.3 Definition of alert level

The alert level in respect of a Power Station is such fuel as would enable all the generating units in the relevant Power Station to continue to generate at the Generated Output required

in the currently applicable schedule instruction for the next 8 hours (or such shorter time period as is advised by System Control to the relevant Generators) assuming that no further fuel becomes accessible to the Power Station

3.8.4 14 day notice on fuel supply outage

For planned outages affecting the primary fuel supply to a power station, 14 days advanced notice is required.

3.9 SYSTEM CONSTRAINT

3.9.1 Generic system constraint

(a) Generic system constraint is an operator-applied function to declare a power system condition.

(b) Generic system constraints are due to transmission network outages, which result in network limitations.

(c) To avoid a generic system constraint, System Control will advise an appropriate time zone for network outage. The decision will be based on system security and economic considerations.

3.9.2 Network constraint

(a) A network constraint is said to have occurred when a limit is required to be placed on the amount of power flowing through a defined element in the power networks.

(b) The majority of network constraints can be replaced by change of generation dispatch mode or network re-configuration, including shift of normal-open points in the 11/22 kV system.

3.10 EMERGENCY DEMAND REDUCTION (LOAD SHEDDING)

3.10.1 Involuntary Load Shedding

(a) Generation Dispatch Policy
- Under normal operating conditions sufficient generating plant with adequate regulating reserve will be provided on line to meet system load.
- Generators have no obligation to keep any sort of spinning reserve
- Some spinning reserve may be available as a result of the difference between generating capacity on line and system demand.
- Regulating Reserve is that capacity of a generating unit or units available to regulate frequency to within defined limits .
- Generators may connect generating units to the system for test run or any other purposes. The Generator must give 24 hours notice to System Control of the impending connection.

(b) Under-frequency Load Shedding (UFLS)
- The UFLS scheme is based on the accepted single credible contingency criterion.

- The scheme provides for different stages of UFLS that would cater for probable contingencies, short of a total loss of generation or load.
- Feeder/Feeders selected on each stage should provide, continuously, a constant load to match the designed load shed quantity on that stage.
- System Control has the responsibility to allocate distribution feeders to UFLS and will consult with the relevant Retails and System Participants
- Feeders with important or essential loads attached are assigned to lower stages to avoid unnecessary interruption to these types of customers.

(c) Manual load shedding by switching feeders

- Manual load shedding may be necessary if there is inadequate generating capacity within a power system and prior to stand-by generation units coming on line. The effect on system frequency may not warrant UFLS but System Control shall take action to prevent prolonged periods of low system frequency.
- System Control shall view Manual load shedding as a last resort .
- Manual load shed by disconnection of high voltage feeders will be undertaken by System Control in a demonstrably equitable manner.

(d) Half-hour rolling outages

- If generation capacity within a power system fails to meet the system load for a period exceeding 30 minutes, System Control may initiate Half-hour rolling outages on 11/22 kV feeders
- Selected feeders will be switched out, in turn, for a period of 30 minutes each.

(e) Inadequate power system generation
System Control shall employ one or more of the above methods to reduce system demand when there is an unexpected shortfall of generation.

(f) Manual involuntary load shedding
System Control will continuously review the magnitude of load shedding requirements whilst manual involuntary load shedding is in progress.

(g) The Network Operator is responsible for the provision and maintenance of UFLS relays for interruptible high voltage feeder circuits

3.10.2 Voltage Reduction

(a) When the generation capacity fails to meet the system load, System Control may initiate Voltage Reduction at Zone Substation 11 or 22kV busbars (1% Voltage Reduction will approximates result in 1% Load).

(b) Voltage reduction shall not exceed 4% of the Voltage Standard.

(c) Unless approved by the power system controller, each period of voltage reduction shall not exceed 30 minutes.

3.10.3 Load Restoration after Involuntary Load Shed

System Control shall ensure that regulating reserve is available to meet the system demand pick-up after load shedding.

3.11 LOAD FORECASTS

3.11.1 System Participants/Customers forecasts

System Participants shall provide the Network Operator and System Control information relating to the user's forecast electricity generation or load.

3.11.2 Indicative Short Term and daily load forecasts.

System Control is responsible for producing indicative Short Term and daily load forecasts.

3.11.3 Methodology for short term load forecast:

(a) Historic day

(b) Equivalent day

(c) Adjustment due to weather information provided by the Bureau of Meteorology

(d) Adjustment due to storm activities in the regions

3.11.4 Load pattern changes

System Participants / Retailers shall advise System Control of any substantial changes in their customer load pattern or loading behaviour, immediately such changes become apparent.

SECTION 4

4. GENERATION SCHEDULING

4.1 REGULATING UNITS

System Control will appoint:

(a) a Power Station to be the Regulating Power Station.

(b) one or more generation units as the regulating units.

(c) a regulating unit in a sub-system islanded from the Grid.

(d) in case of emergency System Control will nominate a power station responsible for frequency control and maintain system frequency as detailed in Clause 5.2 of this code. The nominated power station must comply to the instructions of System Control

4.2 GOVERNOR CONTROL MODE

System Control will determine the generator governor control mode in all grid connected power stations.

4.3 DISPATCH

(a) Dispatch Principles include:
- System reliability
- System security violations
- Ancillary problems
- Lack of reserve

(b) System Control's SCADA system will execute instructions for Automatic Generation Control (AGC) dispatch

(c) Dispatch criteria:
- power system Security
- Frequency Control & dispatch of ancillary services
- Energy market dispatch
- Energy balance
- Unplanned generation & network outages
- Overall efficiency of energy production
- Minimum/maximum load limits of individual generating unit
- Rate of fast pick-up of individual generating unit
- Voltage support.

(d) System Control will determine the setting of frequency bias,

(e) System Control may issue manual dispatch instructions to a Generator

(f) Non-conforming generators:
System Control will :
- monitor the performance of generators connected to the power system,
- instruct a Generator to rectify the performance of the non-conforming generators,
- instruct a Generator to disconnect non-conforming generators if the Generator fails to rectify the associated problems.

4.4 LOAD FOLLOWING

(a) A Generator shall follow the load of its customers plus the network losses, plus whatever transfers commitments to another Generator.

(b) A System Participant being a customer or retailer of power shall ensure that its use of the network is in accord with the Access Agreement and that load is balanced on all three phases.

(c) Power and Water Generation is the 'last resort' source of provision of energy in a power system.

4.5 SYSTEM ISLANDING

(a) System Control shall maintain the frequency on islanded region and sub-systems in accordance with Clause 4.3 of this code.

(b) System Control shall, preferably to, correct the time error of an islanded system prior to reconnection to the Grid System

(c) System Control shall reconnect islanded systems to the Grid System as practicable.

4.6 STAND-BY ARRANGEMENTS

(a) All Generators shall have stand-by plant available for immediate service in the event of a single credible fault.

(b) Generators may satisfy this obligation to have immediately available stand-by plant by contracting for the necessary stand-by generating capacity with another Generator Such agreements should be lodged with System Control

(c) Any such stand-by-capacity agreement between Generators shall be subject to the approval of System Control and will be submitted to System Control for this purpose.

(d) When a Generator becomes aware that an existing stand-by arrangement may terminate or suffer changes to stand-by capacity and availability, the Generator shall immediately notify System Control and provide details of alternative arrangements.

(e) All Generators shall advise System Control of their daily Stand-by arrangements.

SECTION 5

5. ANCILLARY SERVICES

a) System Control may instruct System Participants to provide one or more of the following ancillary services within the declared operating limits of their plant connected to the Grid System.

b) The System Participants may be remunerated for provision of ancillary services based on type and amount of service provided.

5.1 CONTROL OF NETWORK VOLTAGES

5.1.1 Explanation

The continuous transfer of electrical power is facilitated by the level and the stability of the transmission system voltage, which is effectively established by the supplying generating plant and controlled through the adjustment of the reactive power flows through the various parts of the transmission system. This control, initiated by the detection of power system voltage variations, adjusts generator magnetic field currents via an automatic voltage regulator, or connects/disconnects capacitors or reactors to alter the power system impedance, or adjusts transformer variable winding ratios (tap changers), and thus the transmission voltage conditions at key locations within the transmission system.

The loss or disruption of power system voltage has a major impact on the ability of the transmission system to transfer power to the distribution system.

5.1.2 Voltage Control - Network Operator / System Control

(a) The Network Operator shall determine the adequacy of the capacity to produce or absorb reactive power in the control of the network voltages.

(b) The Network Operator shall assess and determine the limits of the operation of the network associated with the avoidance of voltage failure or collapse under credible contingency event scenarios.

(c) The limits of operation of the network shall be translated by the Network Operator, into key location operational voltage settings or limits, power line capacity limits, reactive power production (or absorption) capacity or other appropriate limits to enable their use by the Network Operator in the maintenance of power system security.

(d) System Control shall maintain voltage conditions throughout the network in accordance with the technical requirements specified in the Network Connection Code.

(e) The Network Operator shall arrange the provision of reactive power facilities and power system voltage stabilising facilities in the Power Networks through:
- obligations on the part of Network Users; or under their access agreements,
- provision of such facilities by the Network Operator.

(f) Without limitation, such reactive power facilities may include:
- synchronous generator voltage controls usually associated with tap-changing transformers; or generator AVR set point control (rotor current adjustment);

- synchronous condensers (compensators),
- static VAR compensators (SVC),
- shunt capacitors,
- shunt reactors,
- series capacitors.

5.1.3 Reactive power reserve requirements

(a) System Control shall ensure that sufficient reactive power reserve is available at all times to maintain or restore the power system to a satisfactory operating state after the most critical contingency event as determined by previous analysis or by periodic contingency analysis by the Network Operator.

(b) If voltages are outside acceptable limits, and the means of voltage control set out in this clause are exhausted, System Control shall take actions to restore the voltages to within the relevant limits. Such action may include:
- direct System Participants to reduce demand through selective load shedding from the power system,
- direct Generators to provide additional capacity on line,
- direct a Network Operators to restore a transmission line which has been taken out of service.

(c) System Participant shall comply with any such direction.

5.1.4 Generating Units reactive power output

(a) Each generating unit shall be capable of supplying reactive power at the generating unit terminals at nominal voltage.

(b) Lagging power factor shall be equal to or less than 0.9 of absorbing reactive power

(c) Leading power factor shall be equal to or less than 0.93

(d) Generators are required to comply with System Control instructions to regulate their reactive power output for power system requirements

(e) During substantial fluctuation of power system voltage, Generators shall not attempt to adjust field current or transformer taps unless otherwise instructed by System Control.

(f) If there is clear indication of mal-functioning of AVR of a generating unit, and the Generator switches from AVR to 'manual' control, the Generator shall immediately inform System Control of this change.

5.1.5 Audit and testing

The Network Operator shall arrange, co-ordinate and supervise the conduct of appropriate tests to assess the availability and adequacy of the provision of reactive power devices to control and maintain power system voltages under both satisfactory operating state and contingency event conditions.

5.2 FREQUENCY CONTROL & FREQUENCY OPERATION STANDARDS

5.2.1 System Control objectives in relation to frequency

System Control shall endeavour to:

(a) maintain the power system within the normal operating frequency band (49.8 Hz to 50.2 Hz)

(b) ensure regulating reserves are such that normal load variations do not result in frequency deviations outside the limitations specified in clause 5.2.1 (a).

(c) restore the power system frequency within the normal frequency band in the event of:
- A large sudden & unplanned change in the system load
- Unplanned disconnection of a generating unit
- Unplanned occurrence of a single credible fault

(d) in relation to Clause 5.2.1(c), System Control may shed load to aid recovery of frequency to the range 49.5 Hz to 50.5 Hz in the power system. System Control may then restore power system frequency to within the steady state limits of 49.8 Hz to 50.2 Hz.

(e) No action is necessary to correct the power system frequency if the deviation from target is within +/- 0.05 Hz.

5.2.2 Intervention to Maintain Power System Frequency

(a) Occasionally System Control may be required to exercise judgement during major abnormalities as a result of a contingencies which create a supply shortage. Some of these actions may interrupt supply to some customers.

(b) Following such contingencies and remedial actions it is possible that the power system could fail to be maintained in a secure condition in the event of the next single contingency. In these circumstances System Control shall take immediate action to modify power system conditions to return the system to a secure operating state.

5.2.3 Frequency indicates power supply adequacy

Whilst all system parameters are important, frequency is the most significant indicator of the overall operational adequacy of a power system.

5.3 SCADA COMPUTER TIME SYNCHRONISING

(a) All Power Station Computer time shall be synchronised with the Standard Time.

(b) All clocks shall be synchronised with the System Control SCADA clock on the first working day of each month.

5.4 ELECTRIC TIME ERROR CONTROL

(a) The limit of electric time error is +/- 15 seconds

(b) No action is necessary to correct the time error if it is less than +/- 2 seconds.

(c) System Control shall endeavour to maintain system time error to within the standard limits.

5.5 NETWORK LOADING CONTROL

(a) System Control is responsible for monitoring the network loading and for reporting to the asset owner any impending loading and security problems on the power networks due to excessive network usage.

(b) The Network Operator shall assess and determine the limits of the operation of the network and associated equipment.

(d) The limits of operation of the network and associated equipment shall be determined by the Network Operator for the security and reliability of the assets. Such limits may include, but are not restricted to:

- Nominal thermal limits,
- Nominal Maximum Current rating
- Cyclic Thermal Rating
- 30 minutes Emergency Rating
- De-rating factors for multiple cables in the same cable trench.

5.6 BLACK SYSTEM

5.6.1 Black Start Power Station

System Control will designate Power Stations, which have black start capacity as black start Power Stations.

(a) System Control may advise a Generator with black start capacity if a Black System is imminent.

(b) If System Control advises a Generator to take action for Black Start, then the Generator shall comply with the requirements of the relevant Black System Procedures.

5.6.2 Black System procedures

(a) A Generator shall develop draft Black System Procedures for each of its Power Stations and submit those procedures to System Control.

(b) Black System procedures shall detail the step be step functions to be carried out by the Generator as well as the corresponding instructions from System Control.

(c) Black System Procedures shall be agreed between relevant Generators and System Control.

(d) At any time, System Control may request amendments to the Black System Procedures.

(e) If a Generator disagrees with an amendment requested System Control then it may so notify System Control and the parties shall promptly meet and attempt to resolve the disagreement. In the event that there is failure to resolve the disagreement, the matter shall be referred to the Utilities Commission for resolution .

(f) A Generator shall be deemed to have agreed to an amendment to Black System Procedures unless giving notice to the contrary to System Control within 20 Business Days of receiving the amendment notice from System Control.

(g) A Generator shall review Black System Procedures for each of its Power Stations at least once every three years.

(h) A Generator may propose changes to Black System Procedures for one or more of its Power Stations by notice in writing to System Control.

5.6.3 Actual Black System

(a) Throughout Black System Procedures, a Generator or the Network Operator shall observe all Safety Procedure requirements and maintain close contact with System Control.

(b) System Control will be responsible for every step of High Voltage switching and generator synchronisation.

(c) If there is a Black System, a System Participant shall comply with any and all instruction given to it by System Control with respect to the timing and magnitude of load restoration.

5.7 ENERGY BALANCING

5.7.1 Obligation of the Network User

A network user shall ensure that, for each energy usage period of use of the network:

(a) the input to the power system is equal to the quantity of electrical energy used, plus,

(b) the network energy losses expected between the entry and exit points

5.7.2 Role of System Control

System Control shall:

(a) Monitor a network user’s energy usage.

(b) Establish a methodology to determine the amount of out-of-balance. energy supplied by a Generator.

(c) Monitor the bidding process for the economic dispatch of out of balance energy service for each of the energy usage period

(d) undertake the settlement of the resultant charges between Generators.

(e) Impose charges on the Generator user relating to that imbalance in order to reimburse the Generator, which is responsible for supplying the balancing amount of electricity.

(f) If a network user is out of balance by an amount that, in the System Control's view, is likely to affect the operation of a power system, the System Controller may interrupt or curtail the transfer of electricity to and from one or more connection points in respect of the associated access agreement in order to reduce that material adverse effect.

(g) If no network user bids for the out of balance energy service, the power system controller may give direction to a generator to provide the out of balance energy.

5.7.3 Network Energy Loss Factor

(a) The energy loss factor for a connection point that is a point at which electricity is transferred between differently owned and operated electricity networks or between transmission and distribution systems within an electricity network, is a factor determined by the network provider for specific transfer locations.

(b) The Network Operator shall determine the loss factors between the Entry and Exit point of a Network User.

5.8 ECONOMIC DISPATCH FOR ENERGY BALANCING

5.8.1 Generators on load following duty are deemed to be instructed to provide the out of balance capacity and energy**.**

5.8.2 Generators will provide "sell" and "buy" bids at every energy usage period for the provision of out of balance energy. The frequency control service provider will also provide "buy" and "sell" bids for each energy usage period**.**

5.8.3 While network users bid freely to provide the out of balance energy, System Control will oversee the bid prices of the Frequency Control Ancillary Service provider are fair and equitable, especially in a two Generator scenario.

5.8.4 Market Status

System Control will declare the status of the market for every energy usage period:

a) Over-supplied market: A market situation when the generators are producing more energy than the market requires, and the frequency control service provider has to pull back in production.

b) Under-supplied market: A market situation when the generators are producing less energy than the market requires, and the frequency control service provider has to increase in production

5.8.5 Out of balance energy prices:

a) Over supplied market: the energy price will be the lowest bid of the "buy" prices of generators that are importing for that energy usage period.

b) Under supplied market: the energy price will be the highest bid of "sell" prices of generators that are exporting for that energy usage period.

5.9 OUT OF BALANCE ENERGY SETTLEMENT

a) System Control will advise the relevant network users of the daily out of balance energy transactions.

b) System Control will advise the relevant network users of the monthly out of balance energy settlement.

SECTION 6

6. POWER SYSTEM OPERATIONS

6.1 CONTENTS

Power system Operating Procedures include:

(a) basic electrical safety requirements;

(b) electrical safety instructions;

(c) general operating/field procedures; and

(d) station-specific procedures related to the operation of the power system in that station.

System Control is responsible for short-term operation planning to achieve system security & stability and to ensure the system is operating in an efficient manner.

6.2 PLANT INFORMATION AND OPERATIONAL DATA

System Participants shall lodge a set of the plant information and operational data of their equipment with System Control.

6.3 OPERATION AND SAFETY PROCEDURES MANUAL: NT OPERATING & SAFETY INSTRUCTION MANUAL (GREEN BOOK)

The Operating & Safety Instruction Manual is managed by the Network Operator.

As soon as practical after becoming aware of an amendment to the Operating & Safety Instruction Manual (Green Book), the Network Operator must advise the power system controller and other System Participants such changes.

6.4 APPROVAL OF PERSONNEL

6.4.1 Authorised Officers:

Each electricity entity holding a current market license may nominate Authorised Officers in accordance with the Reform Act Part 6

6.4.2 Electricity Officers

Each electricity entity holding a current market license may nominate Electricity Officers in accordance with the Reform Act Part 4

6.4.3 Registered Operators

a) System Control shall maintain a register of individuals authorised to undertake electrical operations at the interface with a High Voltage Network or on a High Voltage Network.

b) A System Participant may at any time by notice in writing to System Control to delete from the register the name of an individual, but only if that individual was included in the register at the request of the System Participant.

c) System Control shall ensure that electrical operations on or relating to a High Voltage Network are undertaken only by Registered Operators.

d) A System Participant shall ensure that electrical operations performed on its behalf at the interface in the power system are undertaken only by Registered Operators.

e) If a Registered Operator fails to comply with the Greek Book and the relevant operating procedures System Control may delete that individual's name from the register or refuse to include that individual's name in the register. System Control shall promptly notify the relevant System Participant, giving reasons for taking such action.

f) A de-registered operator, following re-training, counseling or re-familiarisation, may re-apply for assessment of Authorisation and registration.

6.5 PLANT OUTAGE PROCEDURES

6.5.1 Types of outages:

(a) Schedule Outages (statutory or required by manufacturer).

(b) Planned Outages (non-urgent work which may wait for an arranged outage time - the condition of the plant does not have significant impact on system security).

(c) Forced Outages (tripped or switched out)

6.5.2 Application for plant outages

Applicants shall advise System Control of:

(a) specify type of work

(b) plant/equipment affected

(c) duration of outage

(d) declare a recall time of outages, if applicable.

(e) give 5 working days notice for any impending planned outage requests

(f) advise System Control and provide an estimation of the revised restoration time if the outage is overrun by a significant amount of time.

6.6 FORCED OUTAGES

System Control has the following responsibilities concerning forced outages:

(a) Maintenance of system stability

(b) Restoration of system frequency and voltages

(c) Restoration of system security

(d) To ensure availability of generation

(e) Restoration of service to customers.

6.7 PROTECTION MAINTENANCE

6.7.1 Partial failure of protection systems

Where there is a failure of one protection of a network element, the System Controller shall determine the most appropriate action. Depending on the circumstances the determination may be:

(a) to leave the network element in service for a limited duration;

(b) to take the network element out of service immediately;

(c) to install or direct the installation of a temporary protection;

(d) to accept a degraded performance from the protection, with or without additional operational measures or temporary protection measures to minimise power system impact;

(e) to operate the network element at a lower capacity.

6.7.2 Complete failure of protection systems

(a) If there is failure of both protection schemes on a network element and the System Controller determines this to be an unacceptable risk to power system security, System Control shall take the network element out of service as soon as possible and advise any affected System Participants immediately this action is undertaken.

(b) Any affected System Participants shall accept a determination made by System Control.

6.7.3 Protection Maintenance with the circuit energised

System Control may accept risk of tripping and approve maintenance work on one of the protection schemes on a piece of equipment with the circuit energised. Such approval will depend upon system conditions and risk assessment.

6.8 OTHER EQUIPMENT OPERATIONS

6.8.1 Automatic Re-close Equipment

(a) A Network Operator may from time to time request that System Control disable Automatic Re-close Equipment in relation to a particular Feeder which has Automatic Re-close Equipment installed on it.

(b) If a Network Operator makes a request under clause 6.8.1 (a), then System Control must comply with the request.

(c) System Control and the relevant Network Operator are not responsible for the consequences of automatic re-closure in relation to a Feeder, except if System Control has not complied with a request under clause6.8.1 (a).

(d) Where Automatic Re-close Equipment is installed on a High Voltage Feeder that connects an Embedded Generator, the Network Operator shall ensure that the relevant Embedded Generator is disconnected from the power system prior to the re-close proceeding.

6.8.2 System Neutral Earthing

(a) No part or section of the system shall be operated without a neutral earth connection.

(b) If high voltage equipment loses its neutral earthing:
- de-energise the equipment/ system immediately
- take action to restore the connection.

6.8.3 Plant Unit Protection Operations:

The equipment shall not be energised unless:

(a) The equipment is checked & inspected by an Authorised technical officer

(b) System Control approves the re-energisation of the equipment

6.9 TIME CONSIDERATIONS

Due to system security considerations, System Control may recommend plant outage times

(a) Time Zones
- Red Zone : 0730-1730 hrs
- Yellow Zone: 0600-0729 hrs 1731-2000 hrs
- Green Zone: 2001-0559 hrs

(b) Time of plant outages
Depending on nature of work, impact on system security and the consequences of a possible 2nd contingency, System Control shall determine the time of plant outages.

6.10 ANNUAL PLANT MAINTENANCE FORECAST

6.10.1 Generators

On or before 15 May each year, each Generator shall submit to System Control for each of its generating units:

(a) a Maintenance Programme for the relevant Unit for the following Financial Year;

(b) an indicative Maintenance Programme for the relevant Unit for each of the 3 Financial Years following the Financial Year to which the Maintenance Programme submitted under paragraph (a) relates.

6.10.2 Network Operators

On or before 15 May each year, each Network Operator shall submit to System Control:

(a) a Maintenance Programme for its transmission High Voltage for the following Financial Year; and

(b) an indicative maintenance Programme for each of the 3 subsequent Financial Year.

6.10.3 System Control Response

System Control shall respond to all such submissions within 30 days.

6.11 COMMISSIONING /REPLACEMENT OF PLANT

System Participants shall refer to and act in accordance with the requirements of Section 4 of the Network Connection Code.

6.12 COMMUNICATION FACILITIES - SYSTEM CONTROL

(a) Each System Participant shall provide, for each nominated contact, two independent communication systems fully compatible with the equipment installed at System Control.

(b) Each System Participant shall provide two speech communication facilities and shall investigate faults within 2 hours of a fault being identified and shall immediately effect repair.

(c) System Control and a Network Operator, HV Consumer or Generator shall establish and maintain a form of Electronic Mail Facility for communication purposes.

6.12.1 Speech Communication channels to System Control

(a) PAB X through switchboard

(b) Direct lines,

(c) Satellite phones,

(d) VHF radios.

6.12.2 Operational speech communication discipline

(a) The receiver of the message shall repeat the operation instruction to the sender. (This applies both to System Control and field personnel)

(b) receiver/Caller identification:
e.g. "Car 45 (receiver) - System Control (caller)"

(c) Terminating a dialogue

(d) Standard phonetic alphabets shall be used on VHF radio communications (Attachment 4)

6.12.3 Records of Speech Operational Communications

(a) Voice recordings of telephone or radio Operational Communications may be undertaken by System Control. System Control shall ensure that, when a telephone or radio conversation is being recorded under this clause, the persons having the conversation receive an audible indication that the conversation is being recorded.

(b) System Control shall also record all Speech Operational Communications in the form of logbook entries.

(c) All Registered Operators shall record all Speech Operational Communications in the form of log book entries.

(d) Records of Speech Operational Communications shall include the time and content of each Communication and shall identify the parties to each Communication.

(e) System Control shall retain all Operational Communications records (including tapes of voice recordings) for a minimum of 7 years.

(f) As part of a dispute resolution process, a System Participant may inspect System Control records of Speech Operational Communications between System Control and that System Participant during normal business hours and may make copies or extracts of those records. A System Participant shall give System Control reasonable notice of its intention to inspect records under this clause.

6.13 TOTAL LOSS OF COMMUNICATIONS TO SYSTEM CONTROL

(a) Every effort shall be made to restore some form of communication.

(b) In case of a Power Station, the local staff shall nominate a Registered Operator in charge of station frequency, circuit loading, voltage and system stability.

(c) The nominated Registered Operator shall give instructions normally given by System Control. All switching and other system operations are logged and shall be reported to System Control when communications are restored.

(d) During this period of time, observations of, and adherence to, the Green Book directives are of paramount importance.

6.14 PLANT NUMBERING, NOMENCLATURE & DRAWINGS

(a) System participants shall lodge with System Control, a copy of the one-line-diagram of their system.

(b) All plant numbers shall be unique.

(c) On a straight high voltage board the numbering system shall start from left-hand side, beginning with No. 1.

(d) All plant nomenclature shall be consistent.

6.15 EMBEDDED GENERATORS IN CUSTOMERS PREMISES

(a) A Retailer shall advise System Control of the details of embedded generators in the premises of customers.

(b) The Retailer shall specify if the embedded generator is capable of parallel operation with the power system.

(c) . The Network Operator will set the requirements for safe parallel operation or impose the interlocking requirements to prevent parallel operation with the power system.

6.16 EMBEDDED CUSTOMERS

Embedded customers of a generator will be tripped with the Generator, unless special arrangements having prior approval of System Control are in place.

6.17 TARIFF METERING

The Network Operator or the metering service provider is responsible for forwarding metering data to System Control for Energy Balancing.

6.18 REMOTE MONITORING & REMOTE CONTROL

(a) System Participants should provide System Control with the remote control and monitoring information on their equipment status, alarm and measure values via communication links to the System Control SCADA system.

(b) Remote Monitoring and Remote Control facilities requirements:

(c) The Network Connection Code Clauses 3.2.5 and 3.3.8 sets out details of the technical requirements which System Participants shall satisfy as a condition of connection of any plant and equipment to a power system.

(d) System Control shall advise the standard alarm and control point names of the SCADA system.

(e) System Participants shall advise System Control of the analogue alarm settings of their equipment for SCADA alarm processing purposes. System Control may request special alarm setting for system requirements

(f) System Participants shall test and calibrate the analogue transducers every 3 years.

(g) System Participants shall respond and attend to the remote monitoring point defects within 3 days.

6.19 PLANT ROUTINE TESTS

(a) Any plant routine tests that may affect power system security or output of generation shall have prior approval of System Control.

(b) Requests for such tests shall be submitted to System Control with 5 working days notice.

6.20 ACCESS TO UNMANNED HIGH VOLTAGE SUBSTATION & POWER STATIONS

(a) System Participants shall advise the Network Operator on entry and exit of unmanned HV substations or Power Stations.

(b) The Network Operator shall log such entry and exit on the logbook.

6.21 DISCONNECTION FROM THE SYSTEM

6.21.1 Voluntary Disconnection

(a) Unless agreed otherwise and specified in an access agreement, a System Participant shall give to the Network Operator notice in writing of its intention to permanently disconnect a facility from a connection point.

(b) A System Participant is entitled, subject to the terms of the relevant access agreement, to require voluntary permanent disconnection of its equipment from the power system in which case appropriate operating procedures necessary to ensure that the disconnection will not threat power system security shall be implemented.

(c) The System Participant shall pay all costs directly attributable to the voluntary disconnection and decommissioning.

6.21.2 Decommissioning Procedures

(a) In the event that a System Participant's facility is to be permanently disconnected from the power system, the Network Operator, the System Participant and System Control shall, prior to such disconnection occurring, follow agreed procedures for disconnection.

(b) The Network Operator shall notify the power system controller relevant System Participants if it considers that the terms and conditions of an access agreement will be affected by procedures for disconnection or proposed procedures agreed with any

other System Participant. The parties shall negotiate any amendments to the procedures for disconnection or to the access agreement that may be required.

(c) Any properly agreed disconnection procedures shall be followed by the all System Participants.

6.21.3 Involuntary Disconnection

(a) The Network Operator or the power system controller may disconnect a System Participant's facilities from a network:

(b) During an emergency,

(c) In accordance with relevant laws,

(d) In accordance with the provisions of the System Participant's access agreement.

(e) In all cases of disconnection by System Control during an emergency, System Control is required to undertake a review and shall then provide a report to the System Participant advising the circumstances requiring such action.

6.21.4 Disconnection Due To Breach of an Access Agreement or threat to system security

(a) System Control may request the Network Operator to disconnect authorise the System Participant's facilities which may, in the view of the power system controller, pose a threat to the system security if the facilities continue to operate and connect to the power system.

(b) In such circumstances System Control will not be liable in any way for any loss or damage suffered or incurred by the System Participant by reason of the disconnection.

(c) A System Participant shall not bring proceedings against System Control to seek to recover any amount for any loss or damage described in this Clause.

(d) A System Participant whose facilities have been disconnected under this code shall pay charges in accordance with the Network Pricing and Charges Schedule (Network Technical Code 4.3.4.6)

6.21.5 Disconnection during an Emergency

Where System Control may disconnect a System Participant's facilities during an emergency, then System Control may:

(a) request the relevant System Participant to reduce the power transfer at the proposed point of disconnection to zero in an orderly manner and then disconnect the System Participant's facility by automatic or manual means; or

(b) Immediately disconnect the System Participant's facilities by automatic or manual means where, it is not appropriate to follow the normal procedure because action is urgently required as a result of a threat to safety of persons, hazard to equipment or a threat to power system security.

(c) During multiple system contingencies (beyond the normal standards for power system security), System Control shall take whatever anticipatory or restorative action is

necessary to balance electricity supply and demand, and ultimately to protect the integrity of the power system. Such action may include the shedding or disconnection of a customer's load and the introduction of power rationing.

(d) System Control will try to maintain or shift customers load if possible.

6.22 ACCESS FOR INSPECTION AND TESTING

If the power system controller considers that a System Participant is not complying with a provision of this Code, System Control may request the Network Operator to inspect the relevant Facility and the operation and maintenance of that facility in order to assess compliance by the relevant System Participant with its obligations under Network Technical Code 4.1.1 (c).

6.23 FAULT AND MAJOR INCIDENT REPORTING PROCEDURES

(a) Each System Participant shall provide a written report on faults and major incident to System Control within 3 working days. When there is no clear finding of cause of fault, an interim report may be acceptable.

(b) System Control may instigate investigations into faults and major incidents.

(c) System Control may request, and System Participants shall comply and provide accurate and complete information associated with system faults and/or incidents.

(d) System Control will issue official reports on major incidents and will distribute such reports to relevant System Participants.

SECTION 7

7. OTHER MATTERS

7.1 COMMUNICATIONS WITH SYSTEM CONTROL

7.1.1 Communications directed to System Control in relation to this Code:

(a) Communications shall be in writing , shall be marked for the attention of the power system controller at the stated address and may be:
- delivered and left at that address,
- sent by prepaid ordinary post to that address,
- sent by facsimile to the facsimile number of the addressee,
- sent by Electronic Mail Facilities to the electronic mail address of the addressee.

(b) Any person or organisation to which this Code applies shall notify the power system Control of its address, facsimile number, electronic mail address and telephone number for the purposes of Communications under this Code immediately after:
- this Code first becomes applicable to it,
- any change to the address, facsimile number, electronic mail address or telephone number previously notified under this clause.

7.1.2 Communication issued by System Control in relation to this Code: (Advice of System Control's Address)

System Control shall, by notice in writing, advise all System Participants of details

(a) postal address,

(b) facsimile numbers,

(c) electronic mail addresses,

(d) telephone numbers.

(e) other related addresses where applicable, immediately following the acquisition of an address or a change to an existing address.

7.2 OPERATIONAL COMMUNICATIONS

7.2.1 Communication from System Control to a System Participant in relation to a particular facility

(a) If in writing , the communication shall be:
- marked to the attention of one of the System Participant's nominated contact personnel, or
- to the facsimile number of the System Participant or sent by Electronic Mail Facilities to the electronic mail address of the System Control.

(b) if by telephone, the communication shall be:
- a conversation with one of the System Participant's nominated contact personnel,
- on one of System Participant's advised telephone numbers.

7.2.2 Communication from a System Participant to System Control in relation to a particular facility

(a) If in writing, the communication shall be:
- marked to the attention of one of System Control's nominated contact personnel, or
- to the facsimile number of System Control or sent by Electronic Mail Facilities to the electronic mail address of the System Control.

(b) If by telephone, the communication shall be:
- a conversation with one of System Control's nominated contact personnel,
- on one of System Control's advised telephone.

7.2.3 System Participant's nominated contact personnel - System Control to be advised

(a) Each System Participant shall advise System Control of nominated contact personnel (identified by title) for the purposes of giving or receiving Operational Communications in relation to each of the System Participant's facilities.

(b) Personnel so nominated shall be those responsible for undertaking the operation of the System Participant's equipment.

(c) The required details of nominated contact personnel are:
- the title of each nominated contact personnel,
- the telephone numbers of the communications systems in relation to the relevant facility,
- the telephone numbers of other available communication systems in relation to the relevant facility,
- a facsimile number for the relevant facility,
- an electronic mail address for the relevant facility.

7.2.4 System Control's nominated contact personnel - System Participants to be advised

(a) System Control shall advise all System Participants of nominated contact personnel (identified by title) for the purposes of giving or receiving Operational Communications at its System Control.

(b) The details to be provided are:
- The title of each nominated contact person,
- the telephone numbers of the System Control,
- a facsimile number for the System Control,
- an electronic mail address for the System Control.

7.2.5 Communications to take effect

A Communication shall take effect as from:

(a) the time that the communication was actually received (or is taken to have been received)
(b) any later time specified in the Communication (provided it was actually received prior to that time).

7.2.6 Confirmation of receipt of communications - Responsibility of originator / issuer of the communication.

(a) Urgent and/or specific facility related communications

Originators/ issuers/senders of urgent and/or specific facility related communications shall contact the intended recipient of communications and shall request confirmation that the recipient has received the subject communication

(b) Routine communications

Originators/ issuers/senders of more routine communications may accept as record of dispatch and receipt of communications:

- facsimile machine reports showing satisfactory dispatch to facsimile numbers of intended recipients ,
- electronic mail reports showing satisfactory dispatch to electronic mail addresses of intended recipients.

7.3 DIRECTIONS ISSUED BY SYSTEM CONTROL - (SYSTEM PARTICIPANTS FAILURE TO RESPOND)

(a) If System Participants fail to respond to a request by System Control on matters concerning:
- Non-conformance with the Codes
- Failure to maintain energy balancing
- Transmission equipment fails to return to service without reasonable explanations
- Violations of power system security
- Persistently low capacity of stand-by plant or absence thereof
- Other relevant non-conformance which may affect power system security and stability.

(b) System Control will then issue a Direction to the System Participant requesting immediate response with advice of compliance.

(c) System Participants shall immediately respond to that Direction.

7.4 SYSTEM CONTROL REPORTS

System Control shall report on the following operational matters:

(a) New System Participants and the relevant installations
(b) Churning of customers
(c) New customers
(d) System Security problems
(e) System black
(f) Excess use of Network
(g) Loss of generation/major transmission lines
(h) Under-frequency load shedding
(i) Weather, storm or bush fire affecting system security
(j) Lack of Reserve/low in Reserve
(k) OH&S issues
(l) Environmental issues

7.4.1 HALF-YEARLY REPORT TO THE UTILITIES COMMISSION

System Control shall submit a Half-yearly Report to the Utilities Commission setting out the performance and major incidents of the power system. The report will be issued on or before 31 January and 31 July each year.

7.4.2 QUARTERLY REPORT TO SYSTEM PARTICIPANTS

System Control shall make available to System Participants a report setting out the performance and major incidents of the Participant and other major incidents related to the Participant: The report will be issued on or before 31 July, 31 October, 31 January and 30 April each year.

7.4.3 ANNUAL REPORTS

System Control shall contribute as resources allow and as requested by the System Participants in relation to information for Annual Reports.

7.5 SYSTEM CONTROL REQUESTS FOR OPERATION & PERFORMANCE INFORMATION

(a) System Control may require operation & performance information from System Participants in order to carry out duties outlined in the System Control Licence.

(b) System Participants shall immediately respond and provide the necessary information.

(c) System Control shall ensure that confidential information is not inadvertently provided to other irrelevant System Participants or to the public.

7.6 SYSTEM CONTROL CHARGES FOR SERVICES

(a) System Control services attract charges which shall be recovered from System Participants in receipt of those services.

(b) The charge will be recovered as a "Postage Stamp Amount" applied to all energy transfers in the power system.

(c) The charge is based on the revenue energy meters of customers and is as approved by the Utilities Commission.

(d) The charge shall be paid monthly.

ATTACHMENT 1

GLOSSARY OF TERMS OF THE CODE

In this Code, unless the contrary intention appears, a word or phrase set out in column 1 of the table below has the meaning set out opposite that word or phrase in column 2 of the table below:

Access agreement	Means a contract or agreement for the provision of network access services entered into between a network operator and a network user under the Network Technical Code, and includes an award made by an arbitrator for the same purpose.
Ancillary services	The following services: voltage control, reactive power control, frequency control, black start and post-trip management.
Automatic governor control, AGC	A generating unit which responses to the regulating signals from the System Control SCADA computing system.
Automatic reclose equipment	In relation to a power line, the equipment which automatically recloses the relevant line's circuit breaker(s) following their opening as a result of the detection of a fault in the power line.
Black start capacity	In relation to a generating unit, the ability to start and synchronise without using supply from the power system.
Black system	The absence of voltage on all or a significant part of the network following a major supply disruption, affecting one or more power stations and a significant number of customers.
Black system procedures	The procedures, described under clause 5.6.2 applicable to a User or a generator as procedures approved by the power system controller from time to time.
Busbar	A common connection point in a power station substation or a transmission network substation.
Business day	Any day other than a Saturday, Sunday, or day that is a public holiday in the City of Darwin.
Capacitor bank	A type of static electrical equipment used to generate reactive power and therefore support voltage levels on network elements.
Change	Includes amendment, alteration, addition or deletion.
Code, Technical Code	This Code called the Technical Code.
Connect, connection	Means to establish an effective link via installation of the necessary connection equipment.
Constraint, constrained	A limitation on the capability of a network, load or a generating unit preventing it from either transferring, consuming or generating the level of electrical power which would otherwise be available if the limitation was removed.
Contingency	disconnection or separation, planned or forced of one or more

	components from the electric system
Contingency event	An event affecting the power system which System Control expects would be likely to involve the failure or removal from operational service of a generating unit or network element.
Control system	Means of monitoring and controlling the operation of the power system or equipment including generating units connected to a network.
Credible contingency event	A contingency event the occurrence of which power system controller considers to be reasonably possible in the surrounding circumstances.
Current rating	The maximum current that may be permitted to flow (under defined conditions) through a power line or other item of equipment that forms part of a power system.
Customer	A person who purchases electricity supplied through a network.
Day	Unless otherwise specified, the 24 hour period beginning and ending at midnight Australian Central Standard Time.
Decommission	In respect of a generating unit, ceasing to generate and disconnecting from a network.
Direction	A direction issued by the power system controller to any System Participant requiring the System Participant to do any act or thing which the power system controller considers necessary to maintain or re-establish power system security or to maintain or re- establish the power system in a reliable operating state in accordance with this Code.
Disconnection, disconnect	In respect of a connection point, means to operate switching equipment so as to prevent the transfer of electricity through the connection point.
Distribution system	That part or those parts of the electricity network used for transporting electricity at nominal voltages of less than 66kV and at a nominal frequency of 50Hz.
Economic dispatch	The dispatch of system generators output that minimises production cost, given transmission constraints
Embedded generator	A generator which supplies on-site loads or distribution network loads and is connected either indirectly (ie. via the distribution network) or directly to the transmission network.
Emergency	Any abnormal system condition which required immediate manual or automatic action to prevent loss of load, equipment damage, or tripping of system elements which might result in cascading and to restore the system to a satisfactory operating state
Energise/ energisation	The act of operation of switching equipment or the start-up of a generating unit, which results in there being a non-zero voltage beyond a connection point or part of the network.
Energy	Active energy and/or reactive energy.
Energy usage period	A time interval defined for reconciliation of energy usage, e.g. 15

	minutes
Energy balancing	Reconciliation of metered electricity provided to the power system by a generator and the metered take of its contracted customers adjusted for network energy losses.
Facility	A generic term associated with the apparatus, equipment, buildings and necessary associated supporting resources provided at, typically: (a) a power station or generating unit, including start-up facilities; (b) a substation or power station substation; (c) a control centre.
Fault level	The current that will flow to a fault on an item of plant when maximum system conditions prevail.
Financial year	A period commencing on 1 July in one calendar year and terminating on 30 June in the following calendar year.
Forced outage	System element not in operation due to breakdowns, storms or other unplanned occurrences
Frequency	For alternating current electricity, the number of cycles occurring in each second. The term Hertz (Hz) corresponds to cycles per second.
Frequency operation standards	The frequency standards set out in clause 5.2.1
Generated	In relation to a generating unit, the amount of electrical energy produced by the generating unit as measured at its terminals.
Generating plant	In relation to a connection point, includes all equipment involved in generating electrical energy.
Generating unit, generator	An electricity generator, and related equipment essential to the generator's operation, which supplies electricity into an electricity network and together function as a single entity.
Generation	The production of electrical energy by converting another form of energy in a generating unit.
Generation dispatch	The act of committing to service all or part of the generation available from a scheduled generating unit.
Good electricity industry practice	The exercise of that degree of skill, diligence, prudence and foresight that reasonably would be expected from a significant proportion of operators of facilities forming part of a power system for the generation, transmission distribution and supply of electricity comparable to those applicable to the relevant facility consistent with applicable laws, the Access Code, the Network Connection Code, System Control Technical Code, licences, industry codes, reliability, safety and environmental protection.
Generator governor	The automatic control system which regulates the speed and power output of a generating unit through the control of the rate of entry into the generating unit of the primary energy input (for

	example, steam, gas or water).
Grid	An electric system linking transmission lines both regionally and locally.
Interconnected	A transmission line or group of transmission lines that connects the transmission networks in adjacent regions.
Interruptible customer load	A load which is able to be disconnected, at the discretion of the power system controller, either manually or automatically initiated, which is provided for the restoration or control of the power system frequency to cater for contingency events or shortages of supply
Load	The amount of electrical energy delivered at a defined instant at a connection point or aggregated over a group of connection points.
Load shedding	Reducing or disconnecting load from the power system.
Month	Unless otherwise specified, the period beginning at 12.00 am on the "relevant commencement date" and ending at 12.00 am on the date in the "next calendar month" corresponding to the commencement date of the period. If the "relevant commencement date" is the 29th, 30th or 31st and this date does not exist in the "next calendar month", then the end date in the "next calendar month" shall be taken as the last day of that month.
Network	The connection assets and network system assets which together are operated by the network provider for the purposes of transporting electricity from generators of electricity to a transfer point or to consumers of electricity.
Network losses	The energy loss incurred in the transportation of electricity from an entry or transfer point to an exit point or another transfer point on an electricity network.
Network energy loss factor	Refer to clause 5.7.3
Network Operator	A body defined as a "network provider" in the Electricity Networks (Third Party Access) Act 1999
Network User, user	any person or body that has entered into and Access Agreement with the Network Operator to convey electricity from and entry point to an exit supply.
Nomenclature standards	The standards approved by the Network Operator and endorsed by the power system controller relating to numbering, terminology and abbreviations used for information transfer by Users as provided for in clause 6.14
Normal operating frequency band	In relation to the frequency of the power system, means the range specified in clause 5.2.1(a).
Operational communication	A communication concerning the arrangements for, or actual operation of the power system in accordance with the Code.
Out of balance energy	The difference between the metered electricity provided by a generator and the metered consumption of electricity by its contracted customers adjusted for network energy losses. Out of

	balance energy can be in surplus or deficit.
Outage	Any planned or unplanned full or partial unavailability of plant or equipment.
Over supplied market	A market situation when the generators are producing more energy than the market requires, and the frequency control service provider has to pull back in production.
Planned outage	System elements not in operation due to planned maintenance or other planned occurrences
Plant	Includes all equipment involved in generating, utilising or transmitting electrical energy.
Post-trip management	The maintenance of system security in the aftermath of trips.
Power and Water Corporation	The body corporate established under the Government Owned Corperation Act 2001
Power factor	The ratio of the active power to the apparent power at a point.
Power flow	A generic term used to describe the type, direction, and magnitude of actual or simulated electrical power flows on electrical systems
Power station	In relation to a Generator, a facility in which any of that Generator's generating units are located.
Power system	The generation facilities and electricity network facilities which together are integral to the supply of electricity, operated as an integrated arrangement.
Power System Controller	See definition in the Electricity Networks (Third Party Access) Act 1999.
Power system operating procedures	The procedures to be followed by Users in carrying out operations and /or maintenance activities on or in relation to primary and secondary equipment connected to or forming part of the power system or connection points, as described in clause 5.10.1.
Power system security	The safe scheduling, operation and control of the power system on a continuous basis in accordance with the principles set out in clause 5.3
Power system stabiliser	An auxiliary control device connected to an excitation control system to provide additional feedback signals to reduce power system oscillations.
Power transfer	The instantaneous rate at which active energy is transferred between connection points.
Protection system	A system which includes all the protection schemes applied to the system.
Quality of supply	Refers to, with respect to electricity, technical attributes to a standard referred to in the Network Connection Technical Code, an access agreement.
Ramp rate	Changing the loading level of a generator in a constant manner over a fixed time directed by computer or manually., It is usually expressed in megawatts per minute (MW/min)

Reactive plant	Plant which is normally specifically provided to be capable of providing and/or absorbing reactive power
Reactive power	The rate at which reactive energy is transferred. Reactive power is a necessary component of alternating current electrical power which is separate from active power and is predominantly consumed in the creation of magnetic fields in motors and transformers and produced by plant such as: (a) alternating current generators (b) capacitors, including the capacitive effect of power lines; (c) synchronous condensers.
Reactive power capability	The maximum rate at which reactive energy may be transferred from a generating unit to a connection point as specified in an access agreement.
Reactive power reserve	Un-utilised sources of reactive power arranged to be available to cater for the possibility of the unavailability of another source of reactive power or increased requirements for reactive power.
Reactor	A device, similar to a transformer, specifically arranged to be connected into the network during periods of low load demand or low reactive power demand to counteract the natural capacitive effects of long transmission lines in generating excess reactive power and so correct any voltage effects during these periods.
Recall time	The lead-time specified on an outage request that the plant can be restored to service.
Region	An area determined by the Network Operator, being an area served by a particular part of the transmission network containing one or more major load centres or generation centres or both.
Regulating reserve	The capability of a generator or generators to provide the marginal increase or decrease of system demand.
Regulating Unit	Generating plant arranged by System Control and specifically allocated to frequency regulating duty. Such plant can be automatically controlled or directed by System Control to ensure that all normal load variations do not result in frequency deviations outside designated limits as specified in the System Control Technical Code
Reliability	The probability of a system, device, plant or equipment performing its function adequately for the period of time intended, under the operating conditions encountered.
Reliable	The expression of a recognised degree of confidence in the certainty of an event or action occurring when expected.
Reliable operating state	In relation to the power system, has the meaning given in clause 3.4.3.
Remote monitoring facilities	Equipment installed to enable monitoring of a facility from a control centre, including a remote terminal unit (RTU).

R**eserve**	The active power and reactive power available to the power system at a nominated time but not currently utilised.
Revenue energy meter	A device complying with Australian Standards which measures and records the production or consumption of electrical energy that is used for obtaining the primary source of revenue metering data.
Satisfactory operating state	In relation to the power system, has the meaning given in clause 3.4.1
SCADA system	Supervisory control and data acquisition equipment which enables the power system controller to continuously and remotely monitor, and to a limited extent control, the import or export of electricity from or to the power system.
Scheduling generating unit	A generating unit which is dispatched by the power system controller.
Secure operating state	In relation to the power system has the meaning given in clause 3.4.2
Settlements	The activity of producing bills and credit notes for Users.
Single credible fault	A single credible fault considered by power system controller, in particular circumstances, to have the potential for the most significant impact on the power system at that time. This would generally be the instantaneous loss of the largest generating unit or a fault on a major network element on the power system. Under normal conditions, the design or operation of the relevant part of the power system would adequately cater for a single credible fault, so as to avoid significant disruption to power system security.
Spinning reserve	The ability to immediately and automatically increase generation or reduce demand in response to a fall in frequency.
Standby power	The amount of electrical energy which could be supplied to a load user in accordance with the terms of a standby generation agreement.
Static VAR compensator	A device specifically provided on a network to provide the ability to generate and absorb reactive power and to respond automatically and rapidly to voltage fluctuations or voltage instability arising from a disturbance or disruption on the network.
Substation	A facility at which lines are switched for operational purposes. May include one or more transformers so that some connected lines operate at different nominal voltages to others.
Supply	The delivery of electricity.
Synchronise	The act of synchronising a generating unit to the power system.
Synchronising, synchronisation	To electrically connect a generating unit to the power system.
Synchronous condensers	Plant, similar in construction to a generating unit of the synchronous generator category, which operates at the equivalent

	speed of the frequency of the power system, specifically provided to generate or absorb reactive power through the adjustment of excitation current.
Synchronous generator voltage control	The automatic voltage control system of a generating unit of the synchronous generator category which changes the output voltage of the generating unit through the adjustment of the generator excitation current and effectively changes the reactive power output from that generating unit.
Synchronous generator,	The alternating current generators which operate at the equivalent of the frequency of the power system in its satisfactory operating state
System Control	The business unit under the direction of the power system controller for monitoring and supervising the minute to minute operation of the power system.
System Controller	A person employed by a power system controller engaged in the activities of controlling and overseeing the operation of the power system
System participant	A person or body, licensed by the Utilities Commission, who inputs, transports, controls, operates or takes electricity from any part of a power system.
Tap-changing transformer	A transformer with the capability to allow internal adjustment of output voltages which can be automatically or manually initiated and which is used as a major component in the control of the voltage of the networks in conjunction with the operation of reactive plant.
Time	Central Australian Standard Time, as defined by the National Measurement Act, 1960.
Transformer	A plant or device that reduces or increases the voltage of alternating current.
Transmission	Activities pertaining to a transmission network including the conveyance of electrical energy.
Transmission capacity	The capacity of the transmission network to transmit power between two or more points under the full range of operating conditions likely to be experienced in service.
Transmission line	A power line that is part of a transmission network.
Transmission network	That part or those parts of the electricity network used for transmitting electricity at nominal voltages of 66kV or higher and at a nominal frequency of 50Hz.
Under supplied market	A market situation when the generators are producing less energy than the market requires, and the frequency control service provider has to increase in production.
Unit protection	Generally, a protection scheme that compares the conditions at defined primary plant boundaries and can positively identify whether a fault is internal or external to the protected plant. Unit protection schemes can provide high speed (less than 150 milliseconds) protection for the protected primary plant.

	Generally, unit protection schemes will not be capable of providing back up protection.
Unplanned outage	Outages of system element not noticed in advance to System Control
Voltage	The electronic force or electric potential between two points that gives rise to the flow of electrical energy.
Voltage control	Keeping network voltages within operational limits in normal operation and in the aftermath of trips by automatic regulation of generation MVAr output or by voltage control equipment such as capacitor banks and automatic tap-changers.

ATTACHMENT 2

RULES OF INTERPRETATION

Subject to the Interpretation Act, this Code shall be interpreted in accordance with the following rules of interpretation, unless the contrary intention appears:

(a) a reference in this Code to a contract or another instrument includes a reference to any amendment, variation or replacement of it;

(b) a reference to a person includes a reference to the person's executors, administrators, successors, substitutes (including, without limitation, persons taking by novation) and assigns;

(c) if an event shall occur on a day which is not a business day then the event shall occur on the next business day;

(d) any calculation shall be performed to the accuracy, in terms of a number of decimal places, determined by the Network Operator in respect of all Users;

(e) if examples of a particular kind of conduct, thing or condition are introduced by the word "including", then the examples are not to be taken as limiting the interpretation of that kind of conduct, thing or condition;

(f) a connection is a User's connection or a connection of a User if it is the subject of an access agreement between the User and the Network Operator; and

(g) a reference to a half hour is a reference to a 30 minute period ending on the hour or on the half hour and, when identified by a time, means the 30 minute period ending at that time.

ATTACHMENT 3

COMMUNICATIONS TO SYSTEM CONTROL

POWER SYSTEM CONTROLLER

ADDRESS: POWER AND WATER CORPORATION
ENERGY HOUSE
18-20 CAVENAGH STREET

GPO BOX 1921
DARWIN
NT 0801

TELEPHONE: 08-89246501

FAX: 08-89470816

DUTY SYSTEM CONTROLLERS:

TELEPHONE: 08-89246506
08-89470375

FAX: 08-89470816

ATTACHMENT 4

STANDARD PHONETIC ALPHABETS

A.	**Alpha**
B.	**Bravo**
C.	**Charlie**
D.	**Delta**
E.	**Echo**
F.	**Foxtrot**
G.	**Golf**
H.	**Hotel**
I.	**India**
J.	**Juliet**
K.	**Kilo**
L.	**Lima**
M.	**Mic**
N.	**November**
O.	**Oscar**
P.	**Papa**
Q.	**Quebec**
R.	**Romio**
S.	**Siera**
T.	**Tango**
U.	**Uniform**
V.	**Victor**
W.	**Whisky**
X.	**X-ray**
Y.	**Yanky**
Z.	**Zulu**