System Control Technical Code

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Prepared by: Power System Controller

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Power and Water Corporation
ABN 15 947 352 360
www.powerwater.com.au

PowerWater

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SECTION 1

1 INTRODUCTION

1.1 AUTHORISATION

This *Technical Code* is issued pursuant to clause 27A of the Electricity Networks (Third Party Access) Code and establishes the:

(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 Participant*s;

(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 unit*s 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 *connection*s;

(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 connection*s and the manner and timing of that information;

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

(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*;

(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*; and

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

1.3 APPLICATION

This *Code* applies to the following organisations and *System Participant*s:

(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 under*frequency load shedding* requirements and metering; and

(e) any other *customer*s and *users* of power and/or elements of *power system*s 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 Participant*s, 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.

(d) If there is conflict in relation to market operational issues and procedures between this *Code* and the Ring Fencing Code, the requirements of the Ring Fencing Code shall prevail. All such conflicts will be dealt with by the *Power System Controller* and the Utilities Commission; 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; and

(e) respond, within reasonable time, to any 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 outlines the obligations of the *Network Operator*.

(b) The *Network Operator* shall comply with the relevant *power system* performance and *quality of supply* standards:

  (1) described in this *Code* and the Network Technical Code;

  (2) in accordance with *access agreements* with another *System Participants*; and

  (3) in accordance with standards of service set by the Utilities Commission

(c) The *Network Operator* shall 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 unit*s 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;

(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 30 days notice of intended voluntary *disconnection*; and

(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 the *Power System Controller*

(a) The operational functions and powers of the *Power System Controller* are set out in Section 38 of the *Electricity Reform Act* and are carried out by *System Control*:

  (1) power to issue *direction*s to electricity entities that are engaged in the operation of the *power system*, or contribute electricity to, or take electricity from, the *power system*;

  (2) to switch off or re-route a *generator*;

  (3) to call *equipment* into service;

  (4) to take *equipment* out of service;

  (5) to commence operation or maintain, increase or reduce active or *reactive power* output;

  (6) to shut down or vary operation;

  (7) to shed or restore *customer loads*; and

  (8) other powers conferred by the Regulations.

(b) *System Control* has the function of monitoring and overseeing the operation of each regulated *power system* to ensure that the system operates reliably, safely and securely in accordance with the Ring Fencing Code, Electricity Network (Third Party 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:

(1) in the *satisfactory operating state*, electricity may be transferred continuously in a secure and efficient manner;

(2) the number of interruptions to *customer*s is minimised, and

(3) restoration of a *power system* shall occur as soon as reasonably practical following any interruption within the *power system*.

(f) *System Control* is responsible for ensuring that the technical parameters of *Network equipment* and *System Participant*s' *equipment* comply with the standards set out in the Network Technical Code or as set out in an *Access Agreement* with the *System Participant*.

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 *System Control*; and

(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) Any *System Participant* or electricity entity that holds a current market Licence may propose an amendment to this *Code*.

(b) A proposal to amend the *Code* shall be made in writing by the *System Participant* or electricity entity to the *Power System Controller* and shall be accompanied by:

(1) the reasons for the proposed amendment to the *Code*; and

(2) an explanation of the effect on *System Participants* of the proposed amendment to the *Code*.

(c) The *Power System Controller* shall review the proposed amendment to the *Code* and within 30 days advise the *System Participant* or electricity entity:

(1) whether the proposed amendment to the *Code* is accepted or rejected; and

(2) the reasons for the acceptance or rejection of the proposed amendment to the *Code*.

(d) The *Power System Controller* shall review the operation of this *Code* at intervals of no more than 5 years and may seek submissions from *System Participants* and the Utilities Commission during the course of the review.

(e) The *Power System Controller* may amend the *Code* at any time, but only with the prior written approval of the Utilities Commission.

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

SECTION 2

2 OPERATIONAL RESPONSIBILITIES OF *THE POWER SYSTEM CONTROLLER* AND *SYSTEM CONTROL*

The Power System Controller has the following responsibilities which on a day to day basis are carried out or coordinated by *System Control*.

2.1 GENERAL RESPONSIBILITIES

The general responsibilities of the *Power System Controller* and *System Control* are:

(a) Ensuring the safety of personnel working on the *power system*; and

(b) Coordinating the *plant* maintenance programme.

2.2 *POWER SYSTEM* SECURITY RESPONSIBILITIES

The *power system security* responsibilities of the *Power System Controller* and *System Control* are set out in clause 3.3 and include:

(a) maintaining the continuity and security of electricity *supply*;

(b) post trip management on *network* tripping or *generation* tripping;

(c) coordinating and sanctioning *plant outage* requests;

(d) regulating system *Voltage*s to the required operation and performance standards;

(e) maintaining system *frequency* to the required operation and performance standards;

(f) controlling *system fault level* so as not to exceed the *plant* making capacity;

(g) arranging High *Voltage busbar* & feeder configurations for optimum system security;

(h) overseeing the operation of the *power system* in accordance with the declared limits of the asset owners;

(i) reporting potential system problems;

(j) advising *System Participants* on abnormal incidents;

(k) designing under-*frequency load shedding* schedules and allocate *load* to each stage of the schedule;

(l) issuing major incidents reports;

(m) instigating post-mortem investigations of major *plant*/power failures; and

(n) developing Medium and Short Term *load* forecasts.

2.3 *MARKET OPERATOR* RESPONSIBILITIES

The *Market Operator* responsibilities of the *Power System Controller* and *System Control* are set out in chapter 5 and include:

(a) developing arrangements for the procurement of *ancillary services*;

(b) managing the *energy* balance and settlements arrangements; and

(c) determining 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 *POWER SYSTEM* SECURITY

3.1 PURPOSE

This section:

(a) Provides the framework for achieving and maintaining a secure *power system*.

(b) Provides the conditions under which *System Control* can dispatch *generators* and dispatchable *loads* and issue *directions* to Participants so as to maintain or re-establish a secure and *reliable power system*.

(c) Has the following aims:

(1) to detail the principles and guidelines for achieving and maintaining *power system security*;

(2) to establish the processes for the assessment of the adequacy of *power system reserves*;

(3) to establish processes to enable the *Power System Controller* to plan and conduct operations within the *power system* to achieve and maintain *power system security*; and

(4) to establish processes for the actual dispatch of scheduled *generating units*, *semi-scheduled generating units*, scheduled *loads*, scheduled *network* services and *ancillary services* by the *Power System Controller*.

3.2 DEFINITIONS AND PRINCIPLES

3.2.1 *Power system*

(a) The *power system* is made up of the following *interconnected* components:

(1) *Generators*;

(2) *loads*; and

(3) the *transmission* and distribution *networks* that *connect generators* with *loads*.

3.2.2 High *Voltage network* components of a *power system*

System Control will adopt *reliability* criteria for *networks* to provide *reliability* performance for the *network* consistent with the security provisions contained in the Network Planning Criteria. These criteria are established with regard to the types of *Network Users* and the consequences of credible system contingencies.

3.2.3 *Generation* components of a *power system*

(a) Each *generating unit* connected to the *power system* is classified in accordance with the Network Technical Code as:

(1) a *generator*;

(2) a small *generator*; or

(3) a small inverter energy system.

(b) Each *generating unit* shall be further classified by the *Power System Controller* as:

(1) a *scheduled generating unit*, if the output of the *generating unit* is capable of being varied to match the demand on the *power system* in response to the requirements of *System Control*;

(2) a *semi-scheduled generating unit*, if the output of the *generating unit* is intermittent; or

(3) a *non-scheduled* generating unit, if the output of the generator is not capable of being varied by in response to the requirements of *System Control*.

(c) Small *generators* and small inverter energy systems shall be classified as *non-scheduled generators*.

(d) The *Power System Controller* will adopt *reliability* criteria for *generating plant* generally in accordance with the following:

(1) 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; and

(2) *System Control* will utilise available *spinning reserve* in the system and/or quick start stand-by *plant* to reconnect *customer*s and restore the *power system* to normal, in accordance with the ancillary services procurement arrangements established in clause 5.1.

3.2.4 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 event*s.

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.

3.2.5 *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;

(1) availability of fuel *supply*;

(2) availability of *generating plant*; and

(3) 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:

(1) adequate *transmission capacity* to meet reasonably foreseeable future *customer* demand;

(2) a *contingency* path to allow the credible *outage* of n-1; and

(3) *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.

3.2.6 *Satisfactory operating state*

The *power system* is in a *satisfactory operating state* if all the following conditions apply:

(a) the *frequency* at all *energised busbars* of the *power system* is within the normal operating *frequency* range set out in the Network Technical Code, except for brief excursions outside the *normal operating frequency band* but within the abnormal operating *frequency* excursion band set out in the Network Technical Code;

(b) the *voltage* levels of all *energised busbars* at any switchyard or *substation* of the *power system* are within the relevant limits set out in the Network Technical Code or in any *connection* agreement with a *System Participant*;

(c) the current flows on all *transmission lines* and *equipment* of the *power system* are within the ratings (accounting for time dependency in the case of *emergency ratings*) provided by the *Network Operator*;

(d) the High Voltage *networks* are electrically *connected*;

(e) the *power system* is stable and in accordance with the Secure System Guidelines issued by the *Power System Controller* in accordance with clause 3.5; and

(f) the configuration of the *power system* is such that the severity of any potential fault is within the capability of circuit breakers to *disconnect* the faulted circuit or *equipment*.

3.2.7 Credible and *non-credible contingency event*s

(a) A *contingency event* means an event affecting the *power system* which the System Operator expects would be likely to involve the failure or removal from operational service of one or more *generating units*, *transmission* elements or *loads*.

(b) A *credible contingency event* means a *contingency event*, the occurrence of which the System Operator considers to be reasonably possible in the surrounding circumstances. Without limitation, examples of *credible contingency event*s are likely to include:

(1) the unexpected automatic or manual *disconnection* of, or the unplanned reduction in capacity of, one operating *generating unit*; or

(2) the unexpected *disconnection* of one major item of *transmission plant* (e.g. *transmission line*, *transformer* or reactive *plant*) other than as a result of a three phase electrical fault anywhere on the *power system*.

(c) A *non-credible contingency event* is a *contingency event* other than a *credible contingency event*. Without limitation, examples of *non-credible contingency event*s are likely to include:

(1) three phase electrical faults on the *power system*;

(2) certain *busbar* faults; or

(3) simultaneous disruptive events such as multiple *generating unit* failures; or double circuit *transmission line* failure (such as may be caused by tower collapse).

3.2.8 Re-classifying *contingency event*s

(a) Abnormal conditions are conditions posing added risks to the *power system* including, without limitation, severe weather conditions, lightning, storms and bush fires.

(b) *System Control* shall take all reasonable steps to ensure that it is promptly informed of abnormal conditions, and when abnormal conditions are known to exist shall:

(1) on a regular basis, make reasonable attempts to obtain all information relating to how the abnormal conditions may affect a *contingency event*; and

(2) identify any *non-credible contingency event* which is more likely to occur because of the existence of the abnormal conditions.

(c) As soon as practicable after *System Control* identifies a *non-credible contingency event* which is more likely to occur because of the existence of abnormal conditions, the *Power System Controller* shall provide *System Participants* with a notification specifying:

(1) the abnormal conditions; and

(2) the relevant *non-credible contingency event*.

(d) Whether the *Power System Controller* has reclassified this *non-credible* contingent event as a *credible contingency event* under clause 3.2.8(c), the *Power System Controller* shall provide *System Participants* with a notification specifying:

(1) information (other than confidential information) in its possession that is relevant to its consideration under clause 3.2.8(c), the source of that information and the *time* that information was received or confirmed by *System Control*;

(2) the *time* at which the notification has been issued; and

(3) the *time* at which an updated notification is expected to be issued, where this might be necessary.

(e) The *Power System Controller* shall update a notification issued in accordance with clause 3.2.8(c) as it becomes aware of new information that is material to its consideration under clause 3.2.8(b), and in any event no later than the *time* indicated in the original notification under clause 3.2.8(d)(3), until such *time* as it issues a notification specifying that the abnormal conditions have ceased to have a material effect on the likely occurrence of the *non-credible contingency event*.

3.2.9 *Secure operating state*

The *power system* is in a *secure operating state* if in the reasonable opinion of the System Operator, taking into consideration the appropriate *power system security* and *reliability* principles described in clauses 3.2.10 and 3.2.11:

(a) the *power system* is in a *satisfactory operating state*; and

(b) the *power system* will promptly return to a *satisfactory operating state* following the occurrence of any *credible contingency event* in accordance with the Secure System Guidelines.

3.2.10 General principles for maintaining *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*:

(1) that the *power system* protection schemes are coordinated;

(2) that the appropriate operating safety margins are maintained; and

(3) that the *power system voltage*s 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 *voltage*s and *frequency* throughout the main *power system*.

(c) The *power system security* principles are as follows:

(1) To the extent practicable, the *power system* should be operated such that it is and will remain in a *secure operating state*.

(2) Following a *contingency event* (whether or not a *credible contingency event*) or a significant change in *power system* conditions, *System Control* should take all reasonable actions to adjust, wherever possible, the operating conditions with a view to returning the *power system* to a *secure operating state* as soon as it is practical to do so, and, in any event, within thirty minutes.

(3) Adequate *load shedding* facilities initiated automatically by *frequency* conditions outside the normal operating *frequency* excursion band should be available and in service to restore the *power system* to a *satisfactory operating state* following significant multiple *contingency event*s.

(4) Sufficient system restart *ancillary services* should be available in accordance with the system restart standard to allow the restoration of *power system security* and any necessary restarting of *generating units* following a major *supply* disruption.

3.2.11 *Reliable operating state*

The *power system* is in a *reliable operating state* if in the reasonable opinion of the System Operator, taking into consideration the appropriate *power system security* principles described in clause 3.2.10:

(a) involuntary *load shedding* is not occurring;

(b) involuntary *load shedding* will not occur if a *credible contingency* occurs; and

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

3.3 *POWER SYSTEM SECURITY* RESPONSIBILITIES AND OBLIGATIONS

3.3.1 Responsibilities of the *Power System Controller*

The *power system security* responsibilities of the *Power System Controller* are exercised by *System Control* and are to:

(a) maintain *power system security*;

(b) monitor the operating status of the *power system*;

(c) co-ordinate *Network* operational personnel in undertaking certain of its activities and operations and monitoring activities of the *power system*;

(d) ensure that *high voltage* switching procedures and arrangements are utilised by the *Network* to provide adequate protection of the *power system*;

(e) assess potential infringement of *Power System Operating Procedures* which could affect the security of the *power system*;

(f) ensure that all *plant* and *equipment* under its control or co-ordination is operated within the appropriate operational or *emergency* limits which are advised to *System Control* by the *Network Operator* or *System Participants*;

(g) assess the impacts of technical and any operational *plant* on the operation of the *power system*;

(h) arrange the dispatch of scheduled *generating units*, *semi-scheduled generating units*, scheduled *loads*, scheduled *network* services and *ancillary services* (including dispatch by remote control actions or specific *direction*s) in accordance with the Secure System Guidelines;

(i) determine any potential *constraint* on the dispatch of *generating units*, *loads* and *ancillary services* and to assess the effect of this *constraint* on the maintenance of *power system security*;

(j) assess the availability and adequacy, including the dynamic response, of *contingency* capacity *reserves* and *reactive power reserves* in accordance with the *power system security* and *reliability* standards and to ensure that appropriate levels of *contingency* capacity *reserves* and *reactive power reserves* are available to:

  (1) ensure the *power system* is, and is maintained, in a *satisfactory operating state*; and

  (2) arrest the impacts of a range of significant multiple *contingency event*s to allow a prompt restoration or recovery of *power system security*, taking into account under-*frequency* initiated *load shedding* capability provided under *connection* agreements or otherwise;

(k) determine the required levels of short term capacity *reserves* and medium term capacity *reserves* in accordance with the *power system security* and *reliability* standards, and to assess the availability of the actual short term capacity *reserve* and actual medium term capacity *reserve* in accordance with the Secure System Guidelines;

(l) make available to *System Participants* as appropriate, information about the potential for, or the occurrence of, a situation which could significantly impact, or is significantly impacting, on *power system security*, and advise of any low *reserve* condition for the relevant periods where the short term capacity *reserve* and/or medium term capacity *reserve* is assessed as being less than that determined in accordance with the short term capacity *reserve* standard or medium term capacity *reserve* standard respectively;

(m) refer to *System Participant*s, as *System Control* deems appropriate, information of which *System Control* becomes aware in relation to significant risks to the *power system* where actions to achieve a resolution of those risks are outside the responsibility or control of *System Control*;

(n) utilise resources and services provided or procured as *ancillary services* or otherwise to maintain or restore the *satisfactory operating state* of the *power system*;

(o) procure adequate *black start* capacity in accordance with clause 5.7.1 to enable *System Control* to co-ordinate a response to a major *supply* disruption

(p) approve *Generators' Black System Procedures* in accordance with clause 5.7.2;

(q) develop a *Black System Restart Procedure* in accordance with clause 5.7.3;

(r) interrupt, subject to clause 6.21, *System Participant connections* as necessary during *emergency* situations to facilitate the re-establishment of the *satisfactory operating state* of the *power system*;

(s) issue a *direction* or instruction (as necessary) to any *System Participant*;

(t) co-ordinate and direct any rotation of widespread interruption of demand in the event of a major *supply* shortfall or disruption;

(u) determine the extent to which the levels of *contingency* capacity *reserves* and *reactive power reserves* are or were appropriate through appropriate testing, auditing and simulation studies;

(v) investigate and review all major *power system* operational incidents and to initiate action plans to manage any abnormal situations or significant deficiencies which could reasonably threaten *power system security*. Such situations or deficiencies include without limitation:

(1) *power system* frequencies outside those specified in the definition of *satisfactory operating state*;

(2) *power system voltages* outside those specified in the definition of *satisfactory operating state*;

(3) actual or potential *power system* instability; and

(4) unplanned/unexpected operation of major *power system equipment*; and

(w) ensure that the *Network Operator* satisfactorily interacts with the *Power System Controller* for both *transmission* and *distribution network* activities and *operations*, so that *power system security* is not jeopardised by *operations* on the *connected transmission networks* and *distribution networks.*

3.3.2 *System Control*'s role in *power system security*

System Control will arrange 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 under *credible contingency events*, that the components of the *power system* are not overloaded; and

(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.

3.3.3 Responsibility of the *Network Operator*

(a) The Network Technical Code sets out details of the technical requirements which the *Network Operator* shall satisfy as a condition of *connection* of any *plant* and *equipment* to a *power system*.

(b) The *Network Operator* shall respond to any *direction* or reasonable request of the *Power System Controller* issued in accordance with clause 3.3.

(c) The *Network Operator* shall participate in any audit or investigation of system technical matters by the *Power System Controller*.

(d) The *Network Operator* shall rectify any technical non-compliance identified by the *Power System Controller* within the time specified by *the Power System Controller*.

3.3.4 Responsibility of *System Participant*s

(a) The Network Technical Code 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 *customer*s), except where specifically varied in an *access agreement*.

(b) *System Participants* shall respond to any *direction* or reasonable request of the *Power System Controller* issued in accordance with clause 3.3.

(c) *System Participants* shall participate in any audit or investigation of system technical matters by *Power System Controller*.

(d) A *System Participant* shall rectify any technical non-compliance identified by the *Power System Controller* within the time specified by *the Power System Controller*.

3.4 SYSTEM SECURITY CONSIDERATIONS

3.4.1 *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, and *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 compensator*s, 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:

(1) 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;

(2) satisfactory *voltage* levels, *frequency* levels and *reactive power reserves* are being maintained on the *transmission system*;

(3) the steady state stability of the power *network* is being maintained; and

(4) 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:

(1) all *plant* and *equipment* would operate within ratings in a reasonable period following the initial transient impacts of the disruption;

(2) *customer load* would not be unnecessarily *disconnected*;

(3) the *power system* would remain in synchronism;

(4) damping of any *power system* instabilities or oscillations would be adequate;

(5) *voltage control* criteria would be satisfied; and

(6) *frequency* control criteria would be satisfied.

3.4.2 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:

(1) the sudden loss of a *generating unit*;

(2) the interruption of a *transmission* circuit;

(3) the failure of a major *transmission transformer*; and

(4) 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 but are not limited to:

(1) SVCs (*Static VAR compensator*s);

(2) AVRs (Automatic *Voltage Control system*s, *generator*);

(3) *synchronous condensers* with automatic *voltage control*; and

(4) *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 experienced 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 *transformer*s with automatic *voltage control system*s 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:

(1) providing active *reactive power* corrections by shedding of *customer loads* in the vicinity of the *voltage* disturbance;

(2) blocking of automatic on-*load transformer* tap changers to prevent further cascading *voltage* decay resulting from a reactive *supply* shortfall; or

(3) direct the *connection* / *disconnection* of *generating units*.

3.5 *SECURE SYSTEM* GUIDELINES

3.5.1 Issue of guidelines

The *Power System Controller* shall issue guidelines setting out the principles for determining:

(a) whether adequate *energy* and capacity *reserves* are being maintained on the *power system*;

(b) whether adequate *reactive power reserves* are being maintained on the *power 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*; and

(e) whether the *power system* is stable.

3.5.2 Amendment of guidelines

The *Power System Controller* may amend, vary or replace the Secure System Guidelines at any time.

3.5.3 Requirement for consultation

The *Power System Controller* 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, the *Power System Controller* shall take into account the following matters:

(a) government policy;

(b) the *Power System Controller's* statutory obligations;

(c) historic levels of *reliability*; and

(d) costs and benefits.

3.5.5 *System Control*'s obligations

(a) Maintenance of a *secure system*:

(1) *System Control* shall endeavour to maintain a *secure system*.

(2) If the *power 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 *network*s.

(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

Duplicate protection systems are specified for *transmission equipment* and *connections* on the *power system* in accordance with the requirements of the Network Technical Code.

(a) If**:**

(1) a *Generator* becomes aware that one of the major *protection system*s is not operating correctly or is unavailable for service; or

(2) a *Network Operator* or other *System Participant* becomes aware that one of the two primary *protection system*s relating to a *point of connection* to a *power system* is not operating correctly or is unavailable for service; or

(3) a *Network Operator* becomes aware that any of its High Voltage protection *equipment* relating to its High Voltage *network* is not operating correctly or is unavailable for service;

then the relevant Participant shall promptly:

(4) notify *System Control* of that fact; and

(5) diligently restore the operation of the relevant *protection system* or put in place alternative protection.

(b) *System Control* in consultation with the *Network Operator* shall assess the risks to the continued operation of the *power system* and determine the most appropriate course of action as set out in clause 6.7.1.

(c) Should the 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 lack of stand-by *generation* (LOS)

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 an amount specified in the Secure System Guidelines, 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 an amount specified in the Secure System Guidelines, and *System Control* considers that there is a material risk of involuntary manual *load shedding* 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 an amount specified in the Secure System Guidelines, and *System Control* considers that there is a material risk of involuntary manual *load shedding* following the Critical Credible *Contingency*; and half-hourly rolling *outage*s are imminent.

3.7.2 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* sources 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 station*s 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*.

Alert Levels are specified in the Secure System Guidelines.

3.8.4 14 *day* notice on fuel *supply outage*

For *planned outage*s affecting the primary fuel *supply* to a *power station*, 14 *day*s 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 *constraint*s are due to *transmission network outage*s, 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 *network*s.

(b) The majority of temporary *network constraint*s can be managed in the short term by change of *generation dispatch* mode or *network* re-configuration, including shift of normal-open points in the 11/22 kV system.

(c) Permanent *network constraints* are usually overcome by the augmentation of the *network* or *generating capacity*, where it is economic to do so.

3.10 *EMERGENCY* DEMAND REDUCTION (*LOAD SHEDDING*)

3.10.1 Involuntary *load shedding*

(a) *Generation dispatch* Policy

(1) Under normal operating conditions sufficient *generating plant* with adequate *regulating reserve* will be provided on line to meet system *load*.

(2) *Generators* have no obligation to keep any sort of *spinning reserve*

(3) Some *spinning reserve* may be available as a result of the difference between generating capacity on line and system demand.

(4) *Regulating reserve* is that capacity of a *generating unit* or units available to regulate *frequency* to within defined limits.

(5) *Generators* may *connect generating units* to the system for test run or any other purposes. The *Generator* shall give 24 hours notice to *System Control* of the impending *connection*.

(b) Under-*frequency Load shedding* (UFLS)

(1) The UFLS scheme is based on the accepted single *credible contingency* criterion.

(2) The scheme provides for different stages of UFLS that would cater for probable contingencies, short of a total loss of *generation* or *load*.

(3) Feeder/feeders selected on each stage should provide, continuously, a constant *load* to match the designed *load* shed quantity on that stage.

(4) *System Control* has the responsibility to allocate distribution feeders to UFLS and will consult with the relevant Retailers and *System Participants*

(5) Feeders with important or essential *loads* attached are assigned to lower stages to avoid unnecessary interruption to these types of *customer*s.

(c) Manual *load shedding* by switching feeders

(1) 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*.

(2) *System Control* shall view Manual *load shedding* as a last resort.

(3) Manual *load* shed by *disconnection* of high *voltage* feeders will be undertaken by *System Control* in a demonstrably equitable manner.

(d) Half-hour rolling *outage*s

(1) 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 *outage*s on 11/22 kV feeders.

(2) 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 *System Control*, 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 Participant*s / *Customer*s 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 medium, short term and daily *load* forecasts

System Control is responsible for producing indicative medium term, short term and daily *load* forecasts.

3.11.3 Methodology for *load* forecasts

The methodology for preparing the forecasts may include but is not limited to the following approaches:

(a) historic *day*;

(b) equivalent *day*;

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

(d) expected new *load* connections or growth in existing *loads*; and

(e) adjustment due to weather conditions in the *region*s

3.11.4 *Load* pattern changes

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

SECTION 4

4 *GENERATION* SCHEDULING

4.1 *REGULATING UNIT*S

System Control, in consultation with the *power stations,* will appoint:

(a) A *power station* to be the regulating *power station*.

(b) One or more *generation* units as the *regulating unit*s.

(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 5.3 of this *Code*. The nominated *power station* shall comply with the instructions of *System Control*.

4.2 GOVERNOR CONTROL MODE

(a) The requirements for a *generating unit governor control system* are set out in the Network Technical Code and in the *access agreement* for the *Generator*.

(b) The normal mode of *operation* for the *governor system* of a *generating unit* is in 'droop' mode.

(c) The *access agreement* for the *Generator* may permit *operation* in 'block load' mode provided that it automatically changes to 'droop' mode if the *generating unit* is islanded from the *system*.

(d) A *Generator* shall advise the *System Operator* prior to a *generating unit* being *operated* in a mode where the *Generating Unit* will be unable to respond as specified in the *access agreement*.

(e) *System Control* will determine the *generator governor* control mode in all *grid connected power station*s.

4.3 DISPATCH

(a) Dispatch Principles include:

(1) system *reliability*;

(2) system security violations;

(3) ancillary problems; and

(4) lack of *reserve*

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

(c) Dispatch criteria include:

(1) *power system security*;

(2) *frequency* Control & dispatch of *ancillary services*;

(3) *energy* market dispatch;

(4) *energy* balance;

(5) unplanned *generation* & *network outage*s;

(6) overall efficiency of *energy* production;

(7) minimum/maximum *load* limits of individual *generating unit*;

(8) rate of fast pick-up of individual *generating unit*; and

(9) *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:

(1) monitor the performance of *generators connected* to the *power system*;

(2) instruct a *Generator* to rectify the performance of the non-conforming *generators*; and

(3) 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 *customer*s 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) The *Power System Controller* shall procure sufficient 'last resort' source of provision of *energy* for the *power system* in accordance with the *ancillary service* arrangements established in clause 5.1.

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 correct the *time* error of an islanded system prior to re*connection* 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 maintain stand-by *plant* available for immediate service in the event of a *single credible fault,* in accordance with the arrangements for the procurement of *ancillary services* in clause 5.1.

(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 shall 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*

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.

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

5.1 ARRANGEMENTS FOR THE PROCUREMENT OF *ANCILLARY SERVICES*

The *Power System Controller* shall develop a regulatory mechanism for the procurement and responsibility for *ancillary services*, including:

(a) *voltage* control services;

(b) *frequency* control services; and

(c) black start services.

In developing the regulatory mechanism for the procurement of *ancillary services*, the *Power System Controller* shall consult with relevant *System Participants* and the Utilities Commission.

5.2 CONTROL OF *NETWORK VOLTAGES*

5.2.1 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*.

5.2.2 *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 Technical Code.

(e) The *Network Operator* shall arrange the provision of *reactive power* facilities and *power system voltage* stabilising facilities in the Power *Network*s through:

(1) obligations on the part of *Network Users*; or under their *access agreement*s; and

(2) the provision of such facilities by the *Network Operator*.

(f) Without limitation, such *reactive power* facilities may include:

(1) *synchronous generator voltage control*s usually associated with tap-changing *transformer*s; or *generator* AVR set point control (rotor current adjustment);

(2) *synchronous condensers* (compensators);

(3) *static VAR compensator*s (SVC);

(4) shunt capacitors;

(5) shunt *reactor*s; and

(6) series capacitors.

5.2.3 ***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 *credible contingency event* as determined by previous analysis or by periodic *contingency* analysis by the *Network Operator*.

(b) If *voltage*s 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 *voltage*s to within the relevant limits. Such action may include:

(1) direct *System Participants* to reduce demand through selective *load shedding* from the *power system*;

(2) direct *Generators* to provide additional capacity on line; and

(3) direct a *Network Operator* to restore a *transmission line* which has been taken out of service.

(c) *System Participants* shall comply with any such *direction* or immediately advise *System Control* if it is not possible to follow the *direction*.

5.2.4 *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* capability shall be no less than the limit specified in the Network Technical Code or as specified in the relevant *access agreement*.

(c) Leading *power factor* capability shall be no less than the limit specified in the Network Technical Code or as specified in the relevant *access agreement*.

(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 a *generating unit* changes *voltage* regulation mode, such as from 'automatic' to 'manual' control or an alternate AVR is brought into service; or if any over-excitation limiter or under-excitation limiter has operated, the *Generator* shall immediately inform *System Control* of this change and any known consequences thereof.

(g) If any *scheduled generating unit* is operating beyond the values specified in the Secure System Guidelines for lack of *reactive power reserve*, the *Generator* shall immediately inform *System Control*.

5.2.5 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 voltage*s under both *satisfactory operating state* and *contingency event* conditions.

5.3 *FREQUENCY* CONTROL AND *FREQUENCY* OPERATING STANDARDS

5.3.1 *System Control* objectives in relation to *frequency*

System Control shall endeavour to:

(a) Maintain the *power system* within the *normal operating frequency band* set out in the Network Technical Code.

(b) Ensure *regulating reserves* are such that normal *load* variations do not result in *frequency* deviations outside the limitations specified in clause 5.3.1(a).

(c) Restore the *power system frequency* within the *normal operating frequency band* in the event of:

(1) a large sudden & unplanned change in the system *load*;

(2) unplanned *disconnection* of a *generating unit*; or

(3) unplanned occurrence of a *single credible fault*.

(d) in relation to clause 5.3.1(c), *System Control* may shed *load* to aid recovery of *frequency* to within the *abnormal frequency band* set out in the Network Technical Code. *System Control* may then restore the *power system frequency* to within the *normal operating frequency band*.

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

5.3.2 Intervention to maintain *power system frequency*

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

(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*.

5.3.3 *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*.

5.4 *SCADA* COMPUTER *TIME SYNCHRONISING*

(a) All *power station* computer *time* shall be *synchronised* with the Standard Time, as determined by *System Control*. *Time synchronised* to GPS systems is considered acceptable.

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

5.5 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.

5.6 *NETWORK LOAD*ING 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 *network*s due to excessive *network* usage.

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

(c) 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:

(1) nominal thermal limits;

(2) nominal maximum *current rating*;

(3) cyclic thermal rating;

(4) 30 minutes *emergency rating*; and

(5) de-rating factors for multiple cables in the same cable trench.

5.7 *BLACK SYSTEM*

5.7.1 *Black start power station*

System Control will designate *power station*s that have *black start capacity* as black start *power station*s.

(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*.

5.7.2 *Black System Procedures*

(a) A *Generator* shall develop a draft *Black System Procedure* for each of its *power stations.*

(b) *Black System Procedures* shall detail the step by step functions to be carried out by the *Generator* as well as the corresponding instructions from *System Control* in the event of a *black system*.

(c) *Generators' Black System Procedures* shall be:

(1) submitted by the *Generator* to *System Control*; and

(2) approved by *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 by *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 day*s of receiving the amendment notice from *System Control*.

(g) A *Generator* shall review *Black System Procedures* for each of its *power station*s 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*.

5.7.3 *Black System Restart Procedure*

(a) The *Power System Controller* shall develop a *Black System Restart Procedure* for each of the regulated *power systems*.

(b) *The Black System Restart Procedure* shall incorporate the relevant *Generator black start* procedures and is designed to restart and restore the *power system* so as to minimise disruption to *System Participants.*

(c) The *Power System Controller* shall review the *Black System Restart Procedure*:

(1) by 31 October each year;

(2) when the availability of a *Generator* may be affected for an extended period; or

(3) if a *Generator* proposes a change to its *Black* Start Procedure in accordance with clause 5.7.2(h).

5.7.4 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.

5.8 *ENERGY BALANCING*

5.8.1 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.

5.8.2 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 *System Control*'s view, is likely to affect the operation of a *power system*, *System Control* 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*.

5.8.3 *Network energy loss factor*

(a) The *energy loss factor* for a *connection* point, which is a point at which electricity is transferred between differently owned and operated electricity *network*s or between *transmission* and *distribution system*s 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*.

5.9 *ECONOMIC DISPATCH* FOR *ENERGY BALANCING*

5.9.1 *Load* following duty

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

5.9.2 Buy and sell bids

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*.

5.9.3 *System Control* overview

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

5.9.4 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.

5.9.5 ***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*.

5.10 ***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 *monthl*y *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* in accordance with the requirements and time frame set out in the Network Technical Code.

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* shall advise the *Power System Controller* and other *System Participants* of 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 *Electricity 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 *Electricity Reform Act* Part 4.

6.4.3 Registered operators

(a) A *System Participant* 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*, and provide this maintained list to *System Control*.

(b) 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. *System Control* may confirm by random audit that such electrical operations are undertaken by Registered Operators.

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

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

6.5 *PLANT OUTAGE* PROCEDURES

6.5.1 Types of *outage*s

(a) Scheduled outages (statutory or required by manufacturer).

(b) *Planned outage*s (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 outage*s (tripped or switched out).

6.5.2 Application for *plant outage*s

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 *outage*s, if applicable;

(e) give 10 working days notice for any impending *planned outage* requests; and

(f) an estimation of the revised restoration time if the *outage* is overrun by a significant amount of time.

6.6 *FORCED OUTAGE*S

System Control has the following responsibilities concerning *forced outage*s:

(a) maintenance of system stability;

(b) restoration of system *frequency* and *voltage*s;

(c) restoration of system security;

(d) to ensure availability of *generation*; and

(e) restoration of service to *customer*s.

6.7 PROTECTION MAINTENANCE

6.7.1 Partial failure or unavailability of *protection system*s

Where there is a failure of one protection of a *network* element, *System Control* in consultation with the *Network Operator* 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; or

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

6.7.2 Complete failure or unavailability of *protection system*s

(a) If there is failure of both protection schemes on a *network* element and *System Control* 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 *energise*d

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 *energise*d. 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* shall 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 clause 6.8.1(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:

(1) de-*energise* the *equipment* / system immediately; and

(2) take action to restore the *connection*.

(3) Clauses 6.8.2(a) and (b) do not apply to the delta connected windings of *generating units* which may not be effectively earthed.

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; and

(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

(1) Red Zone: 0730-1730 hrs

(2) Yellow Zone: 0600-0729 hrs 1731-2000 hrs

(3) 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 second *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*; and

(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* and High Voltage *networks* for the following *financial year*; and

(b) an indicative maintenance programme for each of the 3 subsequent *financial years*.

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 the Network Technical 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*, High Voltage 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) PABX through switchboard.

(b) Direct lines.

(c) Satellite phones.

(d) Radio (HF, VHF, UHF etc.).

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)".

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* may 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*, and *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 AND 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) 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 *customer*s.

(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 *CUSTOMER*S

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

6.17 REVENUE METERING

The *Network Operator* or the metering service provider is responsible for forwarding interval or consumption data from metering used for revenue, tariffs or other purposes to *System Control* for *energy balancing*.

6.18 REMOTE MONITORING AND REMOTE CONTROL

(a) *System Participants* shall 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* as specified in the Network Technical Code or an *access agreement*.

(b) The Network Technical Code 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*.

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

(d) *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

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

(f) *If a System Participant* or *System Control* becomes aware that any remote monitoring or remote control point *equipment* is defective*:*

(1) the *System Participant* shall respond to the remote monitoring point defect immediately;

(2) if the nature of the defect is such that it cannot be repaired within 3 days, the *System Participant* shall develop a plan to rectify the defect and submit the plan to *System Control* for approval; and

(3) if the nature of the defect is such that the safety or security of the *power system* would be jeopardised by the remote monitoring or control defect *System Control* shall take whatever action is necessary, including removing the *System Participant's equipment* from service.

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 *day*s notice.

6.20 ACCESS TO UNMANNED HIGH *VOLTAGE SUBSTATION*S AND *POWER STATION*S

(a) *System Participants* shall advise the *Network Operator* on entry and exit of unmanned High Voltage *substation*s or *power station*s.

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

6.21 DIS*CONNECTION* 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* shall provide a minimum of 30 *days* notice of intention to permanently *disconnect* a *facility* unless a shorter period is specified in an *access agreement*.

(c) 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.

(d) The *System Participant* shall pay all costs directly attributable to the voluntary *disconnection* and *decommission*ing.

6.21.2 *Decommission*ing 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* and 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 Participant*s.

6.21.3 Involuntary *disconnection*

The *Network Operator* or the *Power System Controller* may *disconnect* a *System Participant's* facilities from a *network*:

(a) during an *emergency*;

(b) in accordance with relevant laws; and

(c) in accordance with the provisions of the *System Participant's access agreement*.

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 Dis*connection* due to breach of an *access agreement* or threat to system security

(a) *System Control* may request the *Network Operator* to *disconnect* 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 of the Network Technical Code.

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*.

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.

System Control will try to maintain or shift *customer*s' *load* if possible.

6.22 AUDITING AND INSPECTION OF TECHNICAL REQUIREMENTS

6.22.1 Requirement for technical audit and inspection

(a) The security, *reliability* and *quality of supply* to all *System Participants* requires that all *Network* and *System Participant equipment* meet and maintain the technical requirements set out in the Network Technical Code.

(b) *System Control* shall be responsible for establishing a Schedule of Audit and Inspection of *Network* and *System Participant equipment* to ensure that the *equipment* meets and maintains the technical requirements and specifications set out in the Network Technical Code.

(c) The Schedule of Audit and Inspection shall be established with regard to:

(1) the security implications of the *Network* or *System Participant equipment* being non-compliant;

(2) the economic consequence of the *Network* or *System Participant equipment* being non-compliant; and

(3) the likelihood that the *Network* or *System Participant equipment* is non-compliant.

(d) *System Control* shall develop an initial Schedule of Audit and Inspection by 1 July 2012.

(e) *System Control* shall reissue the Schedule of Audit and Inspection by 1 July each year.

(f) *System Control* shall issue the Schedule of Audit and Inspection to the Participants whose *equipment* is involved

(g) *System Control* shall arrange audit and inspection activities in accordance with the Audit and Inspection Schedule.

6.22.2 Requirement to participate in technical audit

(a) The *Network Operator* and *System Participants* shall be obliged to permit the audit and inspection of their *equipment* in accordance with the Schedule of Audit and Inspection.

(b) *System Participants* shall not unreasonably refuse access to *equipment* or records by *System Control* for the purpose of audit and inspection under clause 6.22.1.

6.23 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.

6.24 GENERATOR CAPABILITY PERFORMANCE

(a) Consistent with the Network Technical Code, each *Generator* shall periodically perform tests to confirm *scheduled generating unit* performance capabilities for each and every *scheduled generating unit*. Each *Generator* shall be responsible for all costs associated with performance capability verification.

(b) The nature and periodicity of such tests shall be determined by the *Power System Controller* in consultation with the *Generator*, and recorded in the participant-specific (ring-fenced) components of the Secure System Guidelines.

(c) Actual performance of the tests shall be negotiated and coordinated with *System Control* and subject to appropriate *power system security* considerations.

(d) The results of all such tests shall be the basis for provision and/or amendment of Performance Capability Information, to the *Network Operator* and the *Power System Controller* and recorded in the Participant-specific (ring-fenced) components of the Secure System Guidelines.

(e) Performance Capability Information shall be reviewed and updated by the *Generator* as detailed below:

(1) All information - on any major change of *plant* or subsystem or *control system* or algorithm, or on direct request by the *Power System Controller.*

(2) Information specifically required to achieve the outcomes identified in this *Technical Code* – at least annually;

(3) Information specifically required to achieve the outcomes identified in the Secure System Guidelines – at least annually;

(4) Type R2 data as defined in the Network Technical Code – every 4 years; and

(5) Other information as required by the *Power System Controller* on a case by case basis (to allow for differing technologies, age of *plant*, or other unique characteristics) – as defined by the *Power System Controller*.

(f) Each *Generator* shall take all reasonable endeavours to ensure the performance of *scheduled generating units* meets the latest Performance Capability Information provided to the *Power System Controller*.

(g) Each *Generator* shall immediately advise the *Power System Controller* of amended Performance Capability Information as soon as they become aware of

a situation or circumstance that will result in a *change* to notified Performance Capability Information.

(h) The *Power System Controller* may request that a *Generator* review and amend Performance Capability Information if the *Power System Controller* believes that the *plant* does not meet the notified Capability Information. The *Generator* shall respond promptly with amended Capability data.

SECTION 7

7 *POWER SYSTEM* INCIDENT REPORTING PROCEDURES

7.1 CONTENTS

Power system incident reporting procedures include:

(a) investigation and reporting process;

(b) the *Power System Controller*'s obligation to investigate and report on incidents; and

(c) role of the Utilities Commission.

7.2 INVESTIGATION AND REPORTING ON *REPORTABLE INCIDENTS*

(a) Each *System Participant* shall provide a written report on *reportable incidents* to *System Control* within 7 working *day*s. When there is no clear finding of cause of fault, an interim report may be acceptable.

(b) *System Control* will issue official reports on *major reportable incidents* and will distribute such reports to relevant *System Participant*s.

(c) *System Control* may request, and *System Participants* shall comply and provide accurate and complete information associated with *reportable incidents*.

(d) *System Control* will investigate and report on *reportable incidents* according to these incident reporting procedures.

(e) *System Control* is to be guided by *good electricity industry practice* for ensuring a *power system* operates reliably, safely and securely, in determining if an event is a *reportable incident* requiring an investigation.

7.3 THRESHOLDS FOR *REPORTABLE INCIDENTS*

7.3.1 *Reportable incident*

A *reportable incident* is a *power system* event that had, or could have had, a significant adverse effect on security or *reliability* of electricity *supply*, due to an event affecting:

(a) the *energy* production capability or capacity of electricity *generation* assets; or

(b) the *energy* transport capability or capacity of the electricity *transmission* and distribution *network*s assets.

7.3.2 *Major reportable incident*

A *major reportable incident* includes an event that caused:

(a) loss of *load* arising from a failure of a *generation* asset;

(b) loss of *load* arising from a failure of a *transmission* asset (or equivalent) of more than 0.1 system minute, excluding any incident where *load* is shed as agreed by contract;

(c) an *outage* lasting longer than 15 minutes arising from *equipment* failure or operator error in a zone *substation*;

(d) an *outage* lasting longer than 6 hours affecting more than 200 *customer*s and that, in the opinion of the *Power System Controller*, should be classified as a major incident requiring comprehensive investigation; or

(e) an *outage* lasting longer than 30 minutes affecting more than 1000 *customer*s and that, in the opinion the *Power System Controller*, should be classified as a major incident requiring comprehensive investigation.

7.3.3 *Minor reportable incident*

A *minor reportable incident* includes an event that caused:

(a) an *outage* lasting longer than 6 hours affecting more than 200 *customer*s and that, in the opinion of the *Power System Controller*, can be classified as a minor incident; or

(b) an *outage* lasting longer than 30 minutes affecting more than 1000 *customer*s and that, in the opinion of the *Power System Controller*, can be classified as a minor incident.

7.3.4 Incident reporting guideline

Subject to this provision, *System Control* may develop and maintain a guideline describing criteria for classifying events as *reportable incidents*.

In developing a guideline describing *reportable incidents*, *System Control* shall take into account *good electricity industry practice*.

7.4 INVESTIGATION AND REPORTING PROCESS

System Control shall conduct a review and report on every reportable operating incident in order to assess the adequacy of the provision and response of facilities or services, and the appropriateness of actions taken to restore or maintain *power system security* or electricity *supply*.

System Control is to be guided by *good electricity industry practice* for investigating and reporting on *reportable incidents*, including in regard to the level of investigation appropriate to the consequences or potential consequences of an incident.

Subject to the requirements of this *Code*, *System Control* may develop and maintain a guideline describing the investigation and reporting process.

7.4.1 Notification of a *reportable incident*

The *Power System Controller* is to advise relevant *System Participants* and the Utilities Commission as soon as reasonably practical after the event occurred that an event was a *reportable incident*, and that an investigation will be conducted.

The form and manner of the notification of a *reportable incident* is to be determined by *System Control*.

7.4.2 Reporting by a *System Participant*

System Participants are to advise *System Control* as soon as reasonably practical after an event, where there is potential for that event to be classified as a *reportable incident*.

Relevant *System Participants* should provide a written report, with detail appropriate to the consequences or potential consequences of an incident, to *System Control* on an event and incident within 7 working *days* or as soon as reasonably practical after receipt of notification of a *reportable incident* by *System Control*.

A *System Participant* should provide an interim written report when there is no clear finding of cause of fault and an investigation is ongoing.

7.4.3 Initial report by *System Control*

System Control is to provide the Utilities Commission with an initial report within 14 working *days* of a *reportable incident*, containing key details of the event and incident, and the scope of the investigation.

7.4.4 Final report by *System Control*

System Control is to provide a *major reportable incident* investigation report to *System Participants* and the Utilities Commission as soon as reasonably practical after the event occurred.

System Control is to report on *minor reportable incidents* in its half yearly reports to the Utilities Commission.

Information included in reports on *reportable incidents* by *System Control* and *System Participants* should reflect *good electricity industry practice* and should include such minimum information as *System Control* may specify in a Guideline.

7.5 PUBLIC REPORTING

Nothing in this *Code* prevents the publication of a public report by *System Control* or by the Utilities Commission.

7.6 INDEPENDENT INVESTIGATION OF A *REPORTABLE INCIDENT*

The Utilities Commission may direct *System Control* to engage an independent expert to undertake an investigation and prepare the final report.

The terms of reference for the independent investigation will be developed by *System Control*, and approved by the Utilities Commission.

System Control and *System Participants* will cooperate with, and provide all necessary information to the independent expert.

The cost of the independent investigation will be met by *System Control.*

SECTION 8

8 OTHER MATTERS

8.1 COMMUNICATIONS WITH *SYSTEM CONTROL*

8.1.1 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:

(1) delivered and left at that address;

(2) sent by prepaid ordinary post to that address;

(3) sent by facsimile to the facsimile number of the addressee; or

(4) 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 Controller* of its address, facsimile number, electronic mail address and telephone number for the purposes of Communications under this *Code* immediately after:

(1) this *Code* first becomes applicable to it; or

(2) any *change* to the address, facsimile number, electronic mails address or telephone number previously notified under this clause.

8.1.2 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; and

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

8.2 *OPERATIONAL COMMUNICATIONS*

8.2.1 Communication from *System Control* to a *System Participant* in relation to a particular *facility*

(a) If in writing, the communication shall be:

(1) marked to the attention of one of the *System Participant's* nominated contact personnel, or

(2) to the facsimile number of the *System Participant* or sent by Electronic Mail Facilities to the electronic mail address of the *System Participant*.

(b) if by telephone, the communication shall be:

(1) a conversation with one of the *System Participant's* nominated contact personnel; and

(2) on one of *System Participant's* advised telephone numbers.

8.2.2 Communication from a *System Participant* to *System Control* in relation to a particular *facility*

(a) If in writing, the communication shall be:

(1) marked to the attention of one of *System Control*s nominated contact personnel, or

(2) to the facsimile number of *System Control* or sent by Electronic Mail Facilities to the electronic mail address of *System Control*.

(b) If by telephone, the communication shall be:

(1) a conversation with one of *System Control*s nominated contact personnel; and

(2) on one of *System Control*s advised telephone.

8.2.3 *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:

(1) the title of each nominated contact personnel;

(2) the telephone numbers of the communications systems in relation to the relevant *facility*;

(3) the telephone numbers of other available communication systems in relation to the relevant *facility*;

(4) a facsimile number for the relevant *facility*; and

(5) an electronic mail address for the relevant *facility*.

8.2.4 *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 *System Control*.

(b) The details to be provided are:

(1) The title of each nominated contact person;

(2) the telephone numbers of *System Control*;

(3) a facsimile number for *System Control*; and

(4) an electronic mail address for *System Control*.

8.2.5 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); or

(b) any later *time* specified in the communication (provided it was actually received prior to that *time*).

8.2.6 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:

(1) facsimile machine reports showing satisfactory dispatch to facsimile numbers of intended recipients; or

(2) electronic mail reports showing satisfactory dispatch to electronic mail addresses of intended recipients.

8.3 *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:

(1) non-conformance with the Codes;

(2) failure to maintain *energy balancing*;

(3) *transmission equipment* fails to return to service without reasonable explanations;

(4) violations of *power system security*;

(5) persistently low capacity of stand-by *plant* or absence thereof; or

(6) 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*.

8.4 *SYSTEM CONTROL* REPORTS

System Control shall report on the following operational matters:

(a) new *System Participants* and the relevant installations;

(b) system security problems;

(c) system black;

(d) excess use of *Network*;

(e) loss of *generation*/major *transmission lines*;

(f) under-*frequency load shedding*; and

(g) lack of *Reserve*/low in *Reserve*.

8.4.1 Half yearly report to the Utilities Commission

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

8.4.2 Quarterly report to *System Participants*

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

8.4.3 Annual reports

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

8.5 *SYSTEM CONTROL* REQUESTS FOR OPERATION AND 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.

8.6 *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 meter*s of *customer*s and is as approved by the Utilities Commission.

(d) The charge shall be paid *month*ly.

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	Refers to the following services provided by *Generators* or other *System Participants*: *voltage control*, *reactive power* control, *frequency* control, and *black start* capability.
Automatic governor control, AGC	A *generating unit* which responds 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 station*s and a significant number of *customer*s.
Black System Procedures	The procedures, described under clause 5.7.2 applicable to a *User* or a *Generator* as procedures approved by the *Power System Controller* from time to time.
Black System Restart Procedures	The procedures described in clause 5.7.3 developed by the *Power System Controller* for the restart of a *power system* following a *black system*.
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, connected, 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 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 as defined in clause 3.2.7.
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 as defined in clause 3.2.7.
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 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 *voltage*s 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 constraint*s.

Embedded generator	A *generator* which supplies on-site *loads* or distribution *network loads* and is *connected* either indirectly (i.e. 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*.
Emergency ratings	In respect of a *transmission* line, *transformer* or other element of *equipment* on the *power system*, a rating in excess of the continuous capacity of the *equipment* which may be safely used for limited periods or in specified weather conditions. *Emergency ratings* are advised by the *Network Operator* in accordance with clause 5.6(c).
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 *customer*s 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*; or (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 5.3.1.

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 Electricity Networks (Third Party Access) Code, the Network Technical 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 line*s both *regionally* and locally.
Interconnected	A *transmission line* or group of *transmission lines* that *connects* the *transmission network*s in adjacent *region*s.
Interruptible customer load	A *load* which is able to be *disconnected*, at the discretion of *System Control*, either manually or automatically initiated, which is provided for the restoration or control of the *power system frequency* to cater for *contingency event*s 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*.
Major reportable incident	Refer to clause 7.3.2.
Market Operator	A role fulfilled by the *Power System Controller* in accordance with clause 2.3.
Minor reportable incident	Refer to clause 7.3.3.

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 5.8.3.
Network Operator	A body defined as a "*network* provider" in the *Electricity Networks (Third Party Access) Act*.
Network User, User	Any person or body that has entered into an *access agreement* with the *Network Operator* to convey electricity from an entry point to an exit *supply*.
Nomenclature , 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
Non-scheduled generating unit	A *generating unit* which is classified by the *Power System Controller* as non-scheduled in accordance with 3.2.3(b) or as defined in clause 3.2.3(c).
Non-credible contingency event	A *contingency event* other than a *credible contingency event* as defined in clause 3.2.7.
Normal operating frequency band	In relation to the *frequency* of the *power system*, means the range specified in clause 5.3.1(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 *customer*s 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, equipment	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 Corporations Act*.
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 flow*s 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*.
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 6.1.
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 Technical Code, or as agreed in an *access agreement* with the Network User.
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 *transformer*s and produced by *plant* such as: (a) alternating current *generators*; (b) capacitors, including the capacitive effect of power lines; or (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 line*s 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.
Registered operator	A person approved by the *Power System Controller* to *operate power system equipment*.
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 3.2.11.
Remote monitoring facilities	*Equipment* installed to enable monitoring of a *facility* from a control centre, including a remote terminal unit (RTU).
Reportable incident	A *power system* event that had, or could have had, a significant effect on the security or *reliability* of *supply*, as defined in clause 7.3.1.
Reserve, reserves	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 3.2.6.
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*.
Scheduled generating unit	A *generating unit* which is dispatched by *System Control*.
Secure system, secure operating state	In relation to the *power system* has the meaning given in clause 3.2.9.
Semi-scheduled generating unit	A *generating unit* which is classified by the *Power System Controller* as semi-scheduled in accordance with 3.2.3(b).
Settlements	The activity of producing bills and credit notes for *Users*.
Single credible fault	A *single credible fault* considered by *System Control*, 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, generation	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 *transformer*s so that some *connected* lines operate at different nominal *voltage*s 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 *voltage*s which can be automatically or manually initiated and which is used as a major component in the control of the *voltage* of the *network*s in conjunction with the operation of *reactive plant*.
Time	Central Australian Standard Time, as defined by the *National Measurement Act*.

Transformer	A *plant* or device that reduces or increases the *voltage* of alternating current.
Transmission, transmission system	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 *voltage*s 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	*Outage*s 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 voltage*s 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 DOCUMENT REVISION HISTORY

Version 1 Published July 2002

Version 2 Published June 2008

- Amended and clarified references to Secure System Guidelines.
- Established asset owner responsibilities to maintain a register of those who can operate on their High Voltage *network*.
- Removed Attachment 3, direct contact details for individuals within *System Control*, as this is inappropriate information for the System Control Technical Code.
- Removed Attachment 4, standard phonetic alphabet, as this is inappropriate information for the System Control Technical Code.

Version 3 Published May 2010

- Introduced requirement for *Generator* Performance Capability Reporting and Compliance.
- Amended reporting requirements in regards to *Generator* AVR reporting.
- Included references to and confirmed hierarchy of interpretation of Ring Fencing Guidelines.
- Simplified management of Low *Standby Generation* Conditions.
- Simplified management of *Time* Correction obligations.
- Rationalised *System Control* reporting obligations.

Version 4 Published June 2012

- Section 3 augmented – greater detail on responsibilities of *Power System Controller* and *System Participants*, *System Control* responsibility in defining and re-defining *credible contingency events*.
- Provisions of clause 3.2.11 aligned with proposed *Network Planning Criteria.*
- *Black system* procedures in clause 5.7.2 clarified, clause 5.7.3 added.
- Clause 6.14(c) removed to accommodate audit finding.
- Clause 6.18(f) changed to clarify *participant* obligations on failure of *remote monitoring* or alarms.
- Clause 6.22 added – auditing of *equipment* technical standards.
- New Section 7 on *power system* reporting procedures. Existing Section 7 on Other Matters renumbered as Section 8.
- Alterations to glossary to accommodate these changes.