System Control Technical Code

Version No: ~~5.0~~6.0 (as marked up for consultation)

~~April 2015~~December 2018

[THIS VERSION IS MARKED UP AS AT 21 JUNE 2019 TO SHOW FURTHER CHANGES MADE SINCE DECEMBER 2018 IN LIGHT OF CONSULTATION FEEDBACK, AND FURTHER TECHNICAL AND LEGAL ADVICE]

Prepared by: Power and Water Corporation as the System Control Licence holder

Approved by: NT Utilities Commission

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

Version History – see Attachment 3

Table of Contents

SECTION 1

1 INTRODUCTION

1.1 AUTHORISATION

This ~~*Technical* Code~~ is prepared pursuant to the system control licence issued by the Utilities Commission and clause 38 of the Electricity Reform Act 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 a *power system*;

(c) requirements for the operation of a *power system* 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 the *Power System Controller* 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 settlements* requirements in relation to *connection*s;

(l) information which each *System Participant* is required to provide to the *Power System Controller* 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*;

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

(f) provisions pursuant to which the *I-NTEM* will be operated and administered with respect to the *Darwin Katherine power system*.

1.3 APPLICATION

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

(a) *Power System Controller* under the System Control Licence;

(b) *Market Operator*, a function of the *Power System Controller* and pursuant to the *Electricity Reform (Administration) Regulations*;

(c) *Network Operators* under their Network Operators Licences;

(d) *Generators* under their Generation Licences;

(e) *Market Customers* under their Retail Licences; and

(f) any other *customer*s ~~and~~ or *Network Users* of power systems, and/or elements of *power system*s, ~~as directed~~ that are regulated 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.

1.4.1 DISPUTE RESOLUTION

(a) Should a dispute arise between a *System Participant* and the *Power System Controller* concerning this ~~*Technical Code*~~, the *Power System Controller* shall negotiate with the *System Participant* to determine mutually acceptable outcomes. If agreement cannot be reached between these two parties within 14 *days*, the parties must request the assistance of the Utilities Commission to resolve the dispute.

(b) Should a dispute arise between a *Market Participant* and the *Market Operator*, the *Market Operator* shall negotiate with the *Market Participant* to determine mutually acceptable outcomes. If agreement cannot be reached between these two parties within 14 *days*, the parties must request the assistance of the Utilities Commission to resolve the disputes.

1.5 CONFIDENTIALITY

A *System Participant*, together with Government agencies shall preserve the confidential nature of the *confidential information*.

1.6 OBLIGATIONS

1.6.1 Obligations of *System Participant*s

(a) All *System Participants* shall:

(1) maintain and operate all *equipment* being part of their facilities in accordance with:

(i) relevant laws;

(ii) the requirements of this *Code*;

(iii) the requirements of the *Network Technical Code*;

(iv) *good electricity industry practice* and applicable Australian Standards; and

(b) respond, within reasonable *time*, to any reasonable request of the *Power System Controller* for data or records, including any metering data or relevant operational information, in *connection* with the operation of the *power system* or the *I-NTEM*.

1.6.2 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 agreement*s with another *System Participant*; 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*.

(d) The *Network Operator* must fulfil the responsibilities and comply with the requirements and obligations imposed upon it in Attachment 6 and Attachment 7.

1.6.3 Obligations of *Generators*

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

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

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

(c) permit and participate in commissioning of facilities and *equipment* which are to be *connected* to a *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*;

(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*; and

(g) comply with the requirements and obligations imposed upon it in Attachment 6 and Attachment 7.

1.6.4 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 the System Control Licence holder:

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

~~(1)~~(2) Without limiting paragraph (1), ~~the~~ directions ~~(~~to electricity entities (~~,~~ referred to in the *Code* as *System Participants*) may include directions:

a. to switch off or re-route a *Generator*;

b. to call *equipment* into service;

c. to take *equipment* out of service;

d. to commence operation or maintain, increase or reduce active or *reactive power* output;

e. to shut down or vary operation;

f. to shed or restore *customer loads*; and

g. in relation to other powers conferred by the Regulations.

(b) The *Power System Controller* 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~~the Electricity Reform Act, ~~,~~ *Network Technical Code*, System Control Technical Code and other relevant Codes and Standards.

(c) The *Power System Controller* 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) The *Power System Controller* is responsible for the establishment of operating protocol and arrangements for *generation dispatch* and to maintain *power system security*.

(e) The *Power System Controller* 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;

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

(f) The *Power System Controller* 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*; and

(g) The *Power System Controller* must fulfil the responsibilities and comply with the requirements and obligations imposed upon it in Attachment 6 and Attachment 7.

1.6.5 Obligations of the *Market Operator*

(a) The *Market Operator* must fulfil the responsibilities and comply with the requirements and obligations imposed upon it in Attachment 6.

1.7 VARIATIONS AND EXEMPTIONS FROM, AND AMENDMENTS TO, THE *CODE*

1.7.1 Variations and exemptions to the *Code*

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

(a) the agreement of the *Power System Controller*; 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*.

1.7.2 Amendments to the *Code*

(a) Any *System Participant* or electricity entity that holds a current 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) The *Power System Controller* shall consult with all electricity entities that hold a current market Licence, when amending the *Code*.

(g) The *Power System Controller* must *publish* the consultation submissions of stakeholders at the time of the *Code's* approval by the Utilities Commission unless advised in writing that the submission contains commercially sensitive information and a reason is included to justify that request.

1.8 *I-NTEM* TRANSITIONAL PROVISIONS

If the *Power System Controller* is required to consult with *System Participants* or electricity *Market Participants* before:

(a) making a determination;

(b) *publishing* a document;

(c) exercising a power; or

(d) discharging an obligation,

under this *Code* ('consultation obligation'), any consultation undertaken by the *Power System Controller* prior to the approval of the *Code* will be deemed to constitute consultation undertaken by the *Power System Controller* under the *Code*.

SECTION 2

2 OPERATIONAL RESPONSIBILITIES OF THE *POWER SYSTEM CONTROLLER*

2.1 GENERAL RESPONSIBILITIES

The general responsibilities of the *Power System Controller* 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* 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* and feeder configurations for optimum system security;

(h) overseeing the operation of the *power systems* 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.

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 the *Power System Controller* can dispatch *generating units* and dispatchable *loads* and issue *directions* to *System 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 a *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) A *power system* is made up of the following *interconnected* components:

(1) *Generators*;

(2) *Loads*; and

(3) The *transmission* and distribution *network*s that *connect Generators* with *loads*.

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

The *Power System Controller* will adopt *reliability* criteria for *network*s to provide *reliability* performance for the *network* consistent with the security provisions contained in the *Network Technical Code* and 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 a *power system* is classified in accordance with the *Network Technical Code* and Network Planning Criteria as:

(1) a ~~Generation~~ *generating unit*;

(2) a ~~Small~~ 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 relevant *power system* in response to the requirements of the *Power System Controller*, or

~~(1)~~(2) *a semi-scheduled generating unit*; or

~~(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 the *Power System Controller*.

(c) Small g~~G~~enerators and small inverter energy systems shall be classified as *non-scheduled* or *semi-scheduled generating unit*~~Generators~~.

[Note: As per the materiality threshold outlined in 3.3.1 of the Network Technical Code, all generators 2MW or larger will be classified as scheduled. Generators smaller than 2MW will be assessed on a case by case basis and may still be classified as scheduled in accordance with clause 3.2.3(b)(1) above].

(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 a *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) The *Power System Controller* will utilise available *spinning reserve* in the system, quick starting or stand-by *plant* to reconnect *customer*s and restore the relevant *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 event*; and

(c) sufficient stand-by or short notice *supply reserve* to accommodate rapidly the impact of a *credible contingency event*, 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*

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

(a) the *frequency* at all *energised busbars* of a *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 a *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 a *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) a *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 a *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 a *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 a *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 a *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) The *Power System Controller* 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 the *Power System Controller* 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 the *Power System Controller*;

(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*

A *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 relevant *power system* is in a *satisfactory operating state*; and

(b) the relevant *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 a *power system* are maintained within limits, that a *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 relevant *power system* protection schemes are coordinated;

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

(3) that the relevant *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 a *power system*.

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

(1) To the extent practicable, a *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, the *Power System Controller* should take all reasonable actions to adjust, wherever possible, the operating conditions with a view to returning a *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 a *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*

A *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 event* 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 to:

(a) maintain *power system security*;

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

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

(d) ensure that High Voltage switching procedures and arrangements are utilised by ~~the *Network*~~ *System Participants* to provide adequate protection of a *power system*;

(e) assess potential infringement of *Power System Operating Procedures* which could affect the security of a *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 the *Power System Controller* by the *Network Operator* or *System Participants*;

(g) assess the impacts of technical and any operational *plant* on the operation of a *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 *directions*) 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 *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 a *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 *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 the *Power System Controller* deems appropriate, information of which the *Power System Controller* becomes aware in relation to significant risks to a *power system* where actions to achieve a resolution of those risks are outside the responsibility or control of the *Power System Controller*;

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

(o) procure adequate *black start capacity* in accordance with clause 5.7.1 to enable the *Power System Controller* 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 a *power system*;

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

For the avoidance of doubt, the *Network Operator* as a *System Participant* shall have contractual arrangements in place to allow *directions* or instructions from the *Power System Controller* to be acted on by un-licenced *Network Users, and vice-versa,* in accordance with the mechanism specified in clause 3.3.3.

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

~~(t)~~(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;

~~(u)~~(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 voltage*s outside those specified in the definition of *satisfactory operating state*;

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

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

~~(v)~~(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 The *Power System Controller's* role in *power system security*

The *Power System Controller* will arrange the required *ancillary services* to maintain *power system security*:

(a) maintenance of an adequate *power system frequency*;

(b) maintaining *power system voltage*s within the declared standards and limits;

(c) maintaining the stability of a *power system*;

(d) ensuring that under *credible contingency event*s, that the components of a *power system* are not overloaded; and

(e) carrying out all appropriate actions to restore a *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 a *power system* to a secure state following a disruption, the *Power System Controller* 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*.

~~(a)~~(b) the *Network Operator* is to ensure that it has the rights prescribed in its *access agreements* with all un-licenced *Network Users* that permits the provisions in ~~clause 3.3.3(b)(2)~~the *Code* to be fulfilled by the relevant *Network User*, and in a time consistent with the urgency of the direction or request; and

(c) The *Network Operator*, in its role as a *System Participant*, shall respond to any *direction* or reasonable request of the *Power System Controller* issued in accordance with clause 3.3. In particular if that direction or request involves an action required to be performed by an un-licenced *Network User*, the *Network Operator* is to pass that direction on to ~~the~~ that *Network User*.~~:~~

~~the *Network Operator* is to ensure that it has the rights prescribed in its access agreements with all un-licenced *Network Users* that permits the provision in clause 3.3.3(b)(2) to be fulfilled by the relevant *Network User*, and in a time consistent with the urgency of the direction or request; and~~

~~if that direction or request involves an action required to be performed by an un-licenced *Network User*, the *Network Operator* is to pass that direction on to the that *Network User*.~~

(d) The *Network Operator*, in its role as *System Participant*, shall pass on to ~~one or more~~ un-licenced *Network Users* relevant information or reports on *power system* matters that it receives ~~is provided to it~~ from time to time from ~~by~~ the *Power System Controller*.

(e) The *Network Operator*, in its role as *System Participant*, shall inform the *Power System Controller* of nominated contact personnel from un-licenced *Network Users*, identified by the *Power System Controller*, for the purpose of giving or receiving *operational communications* in relation to its facilities.

(f) The *Network Operator*, in its role as *System Participant* and through ~~the~~ access agreements, shall oblige relevant un-licenced *Network Users* to comply with ~~establish~~ any operating protocol and arrangements ~~with the *Power System Controller*, as~~ determined from time to time by the *Power System Controller* in accordance with clause 1.7.4.

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

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

Notes:

For the avoidance of doubt, the *Network User* will either be a licenced entity by virtue of clause 14 'Requirement for Licence' of the Electricity Reform Act (licenced *Network User*) or un-licenced (un-licenced *Network User*).

- A licenced *Network User* contributes to the pool of *System Participants* for the purpose of this *Code* and can be directed by the *System Controller* to take-action in regard to power system security matters.
- An un-licenced *Network User* will receive its directions from the *Network Operator* (who is also a *System Participant* for the purpose of this *Code*) in regard to *power system security* matters.

3.3.4 Responsibility of *System Participants*

(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 *customers*), 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 the *Power System Controller* 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 a power *network* can under some circumstances initiate power swings and associated *voltage* fluctuations at the other extremity of that *power system*.

(f) The fundamental responsibility of the *Power System Controller* is to provide *power system security* through actions to ensure that:

(1) an adequate *supply reserve* (spare *generation* or interruptible *load*) is maintained on a *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*. The *Power System Controller* will manage the relevant *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 relevant *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) *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 relevant *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) A *power system* is considered to have undergone a "*voltage* instability" if the *voltage* level of a *power system* (or part of the relevant *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 *power system voltage*, possibly resulting in a total blackout.

(d) An under-*voltage* condition on a *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 *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 *power system voltage*.

(f) On recognising a *voltage* instability or potential *power system voltage* collapse condition, the *Power System Controller* 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 a *power system*;

(b) whether adequate *reactive power reserves* are being maintained on a *power system*;

(c) whether satisfactory *voltage* levels and *frequency* levels are being maintained on the High Voltage *network*s;

(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 Participant*s; and

(e) whether a *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 The *Power System Controller*'s obligations

(a) Maintenance of a *secure system*:

(1) The *Power System Controller* shall endeavour to maintain a *secure system*.

(2) If a *power system* is no longer secure, then the *Power System Controller* 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 the *Power System Controller* 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 the *Power System Controller* 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 *The Power System Controller's* advice

The *Power System Controller* shall promptly advise any affected *System Participant* after the *Power System Controller* becomes aware of any circumstance with respect to a *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 a *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 *System Participant* shall promptly:

(4) notify the *Power System Controller* of that fact; and

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

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

(c) Should the situation persist, the *Power System Controller* 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)

The *Power System Controller* shall assess the overall stand-by availability in the *power system*. The *Power System Controller* may declare lack of stand-by *generation* ("LOS") condition as follows:

(a) LOS1 may be declared when a *power system* is short of stand-by *generation plant* capacity up to an amount specified in the *Secure System Guidelines*, and the *Power System Controller* 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 a *power system* is short of stand-by *generation plant* capacity up to an amount specified in the *Secure System Guidelines*, and the *Power System Controller* considers that there is a material risk of involuntary manual *load shedding* following the Critical Credible *Contingency*; and

(c) LOS3 may be declared when a *power system* is short of stand-by *generation plant* capacity in excess of an amount specified in the *Secure System Guidelines*, and the *Power System Controller* 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

The *Power System Controller* 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 the *Power System Controller* 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 the *Power System Controller* 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*, the *Power System Controller* will advise an appropriate *time* zone for a *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 the *Power System Controller* 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) The *Power System Controller* 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 the *Power System Controller* shall take action to prevent prolonged periods of low system *frequency*.

(2) The *Power System Controller* shall view Manual *load shedding* as a last resort.

(3) Manual *load* shed by *disconnection* of High Voltage feeders will be undertaken by the *Power System Controller* 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, the *Power System Controller* 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*

The *Power System Controller* 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*

The *Power System Controller* 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*, the *Power System Controller* may initiate *voltage* reduction at Zone *Substation* 11 or 22kV *busbars* (1% *voltage* Reduction will approximately result in 1% *Load*).

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

(c) Unless approved by the *Power System Controller*, each period of *voltage* reduction shall not exceed 30 minutes.

3.10.3 *Load* restoration after involuntary *load* shed

The *Power System Controller* 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 the *Power System Controller* information (including profiles and accuracy) relating to the *Network User*'s forecast for:

(a) *generation* capability for active power in the following format:

(1) a 30 day ahead forecast for capacity on a daily basis, updated daily; and

(2) a 7 day ahead forecast for capacity for every 30 minute interval updated daily~~as specified in the *Secure System Guidelines*;~~

~~(c)~~ ~~(b)~~ electricity *generation* or *load*.
(b)

3.11.2 Indicative medium, short term and daily *load* forecasts

The *Power System Controller* 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 the *Power System Controller* 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 UNITS*

The *Power System Controller*, in consultation with the *power stations,* will appoint:

(a) (Deleted).

(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*, the *Power System Controller* 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 the *Power System Controller*.

4.2 GOVERNOR CONTROL MODE

(a) The requirements for a *generating unit generation 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 *Power System Controller* 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) The *Power System Controller* will determine the *Generator's generation control* mode for *synchronised generating units* in all grid connected *power station*s.

4.3 DISPATCH

(a) Dispatch Principles include:

(1) system *reliability*;

(2) system security violations;

(3) ancillary problems;

(4) lack of *reserve;*

(5) *economic dispatch* (for the *Tennant Creek power system* and *Alice Springs power system*); and

(6) *Security Constrained Economic Dispatch* (for the *Darwin-Katherine power system*).

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

(c) Dispatch criteria include:

(1) *power system security*;

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

(3) *energy market* dispatch;

(4) (deleted);

(5) unplanned *generation* and *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) The *Power System Controller* will determine the setting of *frequency* bias;

(e) The *Power System Controller* may issue manual *dispatch instructions* to a *Generator*;

(f) Non-conforming *Generators*:
The *Power System Controller* will:

(1) monitor the performance of *Generators connected* to a *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 (Deleted)

(a) (Deleted).

(b) (Deleted).

(c) (Deleted).

4.4A MINIMUM *GENERATION* CAPACITY

(a) A *Generator* user must have sufficient generating capacity installed or contracted to meet its *Market Customers'* peak demand, which may include capacity provided via stand-by arrangements with other *Generators*.

(b) The *Generator* must comply with any guidelines developed and *published* by the Utilities Commission in *connection* with the assessment of whether a *Generator's* generating capacity is sufficient to meet the *Generator's* obligations under subclause (a).

(c) Any guidelines developed and published under subclause (b) must:

(1) take account of the impact on economic efficiency, and therefore have regard to factors including the efficient location of and level of overall capacity, *reserve* capacity and imbalance capacity on the system; and

(2) have regard to the efficient allocation of costs of capacity to different *customers* supplied by a power system.

(d) The Utilities Commission may review a *Generator's* actual generating capacity against the capacity required by compliance with the guidelines.

(e) If as the result of a review under subclause (d) the Utilities Commission considers that the *Generator*'s actual generating capacity is materially less than required by compliance with the guidelines, the *Generator* user must comply with any orders issued by the Utilities Commission aimed at ensuring

compliance with the guidelines which may include, but are not limited to, procurement of contracts for anticipated demand, *reserve* and imbalance services to eliminate this deficiency.

(f) The Utilities Commission may require that a *Generator* furnish the *Power System Controller* in advance with satisfactory evidence that the user has contracted, or otherwise secured sufficient capacity, to the extent that this is required to assist the *Power System Controller* in the operation of a power system.

(g) The Utilities Commission may determine the form of the evidence required under subclause (f).

4.4B GENERATION COMMITMENT AND DISPATCH SUBMISSIONS IN RESPECT OF THE DARWIN-KATHERINE POWER SYSTEM

(a) This clause 4.4B applies only to the *Darwin-Katherine power system*.

(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*.

(c) *Generators* must make *commitment and dispatch submissions* in respect of *scheduled generating units* each *day* in accordance with the market timetable in a form, and containing the information, specified in a document published by the *Power System Controller* pursuant to subclause (e).

(d) *Commitment and dispatch submissions* must classify each *scheduled generating unit* as *self-committed* or *fast start* for the *trading day.*

(e) The *Power System Controller* may publish, and may amend from time to time by *publishing* a document specifying the form of, and information to be contained in, *commitment and dispatch submissions* in order to facilitate determination by the *Power System Controller* of the dispatch order in accordance with this *Code.* The *Power System Controller* must consult with *System Participants* prior to *publishing* such document. The form of, and information required to be contained in *commitment and dispatch submissions*, may differ as between *self-committed generating units* and *fast start generating units*, but must be reasonably required by the *Power System Controller* to determine the order of loading.

(f) Until such *time* as the *Power System Controller publishes* a document pursuant to subclause (d), *commitment and dispatch submissions* must contain the information and data described in Attachment 4.

(g) Subject to subclause (h), prices submitted in *commitment and dispatch submissions* must approximate:

(1) in respect of the dispatch of *self-committed generating units* above the minimum loading specified in the relevant submission; or

(2) in respect of the dispatch of *generating units* classified as *fast start*, the *dispatch cost* that would be incurred or avoided as appropriate by such dispatch.

(h) *Generators* must maintain a written record of the basis for the prices submitted in their *commitment and dispatch submissions* and provide this record to the Utilities Commission on request.

(i) In respect of *trading days* prior to 1 November 2015, *Generators* other than Territory Generation:

(1) may only classify *generating units* as *self-committed*, and

(2) in respect of capacity above minimum loading, must submit a price of zero.

4.4C LOAD FOLLOWING WITHIN TENNANT CREEK AND ALICE SPRINGS POWER SYSTEMS

(a) This clause 4.4C applies only to the Tennant Creek power system and the Alice Springs power system.

(a) A *Generator* shall follow the *load* of its *customer*s plus the *network losses*, after allowing for any transfer commitments to and/or from other *Generators*.

(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 relevant *power system* in accordance with the *ancillary service* arrangements established in clause 5.1.

(d) To meet its obligations under subclause (b), a *Generator* must either:

(1) nominate a proportion of its *generation* capacity as being available to *supply load following services* to the relevant power system as a whole; or

(2) opt to provide its own *load* following services by using reasonable endeavours to ensure that its own use of the network is in balance.

(e) A *Generator* may alter its nomination under subclause (e)(1) with 30 *days'* notice to the *Power System Controller*.

(f) A *Generator* who nominates a proportion of its *generation* capacity to *supply load* following services to the relevant power system as a whole will be subject to *economic dispatch* arrangements developed by the *Power System Controller* as part of the *Code* and approved by the Utilities Commission.

(g) If the *Power System Controller* becomes aware that energy usage is out of balance by an amount that, in the *Power System Controller's* view, is likely to result in the operation of the relevant power system being materially affected or users being materially affected, the *Power System Controller* may interrupt or curtail the transfer of electricity to and from one or more *connection points* in respect of the associated *access agreement* in a manner consistent with efficient operation of the relevant power system in order to reduce that material adverse effect.

(h) If a *Generator's* available generating capacity during any *energy usage period* is shown to have been insufficient to meet its *customers' load* during that period, the *Generator* must reimburse the *Generator*, or *Generators*, responsible for supplying any balancing amount of generating capacity.

(i) The measurement of out of balance capacity, and any charges imposed on a *Generator* under subclause (h), are regulated by the provisions of Attachment 7 of this *Code*.

(j) A *Generator's* use of the *network* will be in balance under subclause (e)(2) if, after allowing for *network energy losses*, the quantity of *energy* at the *entry*

point for the relevant *power system* by the *Generator* for each *energy usage* period is equal to the quantity of *energy* at the *exit point* of its *Customers* for that period.

(k) If a *Generator's energy* usage is shown to have been out of balance, and so has benefited from *load* following services provided by other Generators, that user must reimburse the *Generator* or *Generators* responsible for supplying the balancing amount of *energy*.

(l) The measurement of *out of balance energy*, and any charges imposed on a *Generator* under subclause (a) and subclause (i), are regulated by the provisions of Attachment 7 of this *Code*.

4.5 SYSTEM ISLANDING

(b) The *Power System Controller* shall maintain the *frequency* on islanded *region* and sub-systems in accordance with clause 4.3 of this *Code*.

(c) The *Power System Controller* shall correct the *time* error of an islanded system prior to re*connection* to the *Grid* System

(d) The *Power System Controller* shall reconnect islanded systems to the *Grid* System as practicable.

4.6 STAND-BY ARRANGEMENTS IN TENNANT CREEK AND ALICE SPRINGS POWER- SYSTEMS

(1) This clause 4.6 applies only in respect of the *Tennant Creek power system* and the *Alice Springs power system.*

(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 *Power System Control* and will be submitted to the *Power 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.

4.7 COMMITMENT AND DISPATCH ARRANGEMENTS FOR *I-NTEM* OPERATION

(a) This clause 4.7 applies only in respect of the *Darwin-Katherine power system*.

(b) A *Generator* must use reasonable endeavours to ensure that a *generating unit* classified as *self-committed* supplies the minimum loading submitted in the *commitment and dispatch submissions* unless the *Power System Controller* instructs that *Generator* not do so, in which case the *Generator* must use

reasonable endeavours to ensure that the *generating unit* complies with the instruction.

(c) The *Power System Controller* must assess the need for:

(1) dispatch of *generating units* classified as *self-committed* above minimum loading; and

(2) *synchronisation* and dispatch of *generating units* classified as *fast start,*

in order to meet total demand and must determine an order of loading and issue *dispatch instructions* on the basis primarily of the principle of *Security Constrained Economic Dispatch* and the prices contained in the *commitment and dispatch submissions* and also having regard to the Dispatch Principles set out in clause 4.3(a), the Dispatch criteria set out in clause 4.3(c), other relevant information in the *commitment and dispatch submissions,* other relevant information regarding the operation of the *I-NTEM* and any other relevant provisions of this *Code*.

(d) A *Generator* must use reasonable endeavours to comply with a *dispatch instruction* issued to it by the *Power System Controller* unless to do so would, in the *Generator's* reasonable opinion be a hazard to public safety or materially risk damaging *equipment*.

4.8 INTERIM *ENERGY MARKET PRICE*

(a) This clause 4.8 applies only in respect of the *Darwin-Katherine power system*.

(b) The *Market Price Principle* is that the *Market Price* for each *trading interval* represents the marginal value of *supply* to balance *supply* and demand in accordance with the principle of *Security Constrained Economic Dispatch.*

(c) The *Power System Controller* may *publish*, and may amend from time to time by *publishing* a document specifying the methodology by which the *Market Price* is to be determined to give effect to the *Market Price Principle.* The *Power System Controller* must consult with *System Participants* prior to *publishing* such document.

(d) Until such *time* as the *Power System Controller publishes* a document pursuant to subclause (b) the *Market Price* must be determined in accordance with the methodology set out in Attachment 5.

(e) The *Power System Controller* must use its reasonable endeavours to determine the *Market Price* for each *trading interval* of the previous *trading day(s)* as soon as reasonably practicable but no later than 1500 hours the following *business day*.

(f) If the *Power System Controller* fails to determine the *Market Price* for a *day* by 1500 hours in accordance with this clause it must *publish* the reason it was unable to do so and determine the *Market Price* for relevant *trading day(s)* as soon as reasonably possible.

SECTION 5

5 *ANCILLARY SERVICES*

The *Power System Controller* 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. Nothing in this section 5 limits the ability of the *Power System Controller* to determine an order of loading and issue *dispatch instructions* in accordance with clause 4.7.

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 *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 / Power System Controller*

(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) The *Power System Controller* 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) The *Power System Controller* shall ensure that sufficient *reactive power reserve* is available at all times to maintain or restore a *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, the *Power System Controller* 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 relevant *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 the *Power System Controller* if it is not possible to follow the *direction*.

5.2.4 *Generating unit*s *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 the *Power System Controller* 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 the *Power System Controller*.

(f) If a *generating unit* c*hanges 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 the *Power System Controller* 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 the *Power System Controller*.

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 *Power System Controller* objectives in relation to *frequency*

The *Power System Controller* shall endeavour to:

(a) Maintain the *power system* within the relevant *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 *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), the *Power System Controller* may shed *load* to aid recovery of *frequency* to within the *abnormal frequency band* set out in the *Network Technical Code*. The *Power System Controller* may then restore *power system frequency* to within the *normal operating frequency band*.

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

5.3.2 Intervention to maintain *power system frequency*

(a) Occasionally the *Power System Controller* 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 a *power system* could fail to be maintained in a secure condition in the event of the next single *contingency*. In these circumstances the *Power System Controller* 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 the *Power System Controller*. *Time synchronised* to GPS systems is considered acceptable.

(b) All clocks shall be confirmed to be *synchronised* with the *Power System Controller 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) The *Power System Controller* shall endeavour to maintain system *time* error to within the standard limits.

5.6 *NETWORK LOAD*ING CONTROL

(a) The *Power System Controller* 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*

The *Power System Controller* will designate *power station*s that have *black start capacity* as black start *power station*s.

(a) The *Power System Controller* may advise a *Generator* with *black start capacity* if a *black system* is imminent.

(b) If the *Power System Controller* 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 the *Power System Controller* in the event of a *black system*.

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

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

(2) approved by the *Power System Controller*.

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

(e) If a *Generator* disagrees with an amendment requested by the *Power System Controller* then it may so notify the *Power System Controller* 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 the *Power System Controller* within 20 *Business day*s of receiving the amendment notice from the *Power System Controller*.

(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 *change*s to *Black System Procedures* for one or more of its *power station*s by notice in writing to the *Power System Controller*.

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 a *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 the *Power System Controller*.

(b) The *Power System Controller* 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 the *Power System Controller* with respect to the timing and magnitude of *load* restoration.

5.8 *ENERGY BALANCING* IN THE *TENNANT CREEK* AND *ALICE SPRINGS POWER SYSTEMS ONLY*

This clause 5.8 applies only in respect of the *Tennant Creek power system* and the *Alice Springs power system*.

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 points* and *exit points.*

5.8.2 Role of the *Power System Controller*

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

(g) If no *Generator* 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 *energy loss factors* between the *entry point* and *exit point* of a *Network User*.

5.9 *ECONOMIC DISPATCH* FOR *ENERGY BALANCING* IN THE *TENNANT CREEK* AND *ALICE SPRINGS POWER SYSTEMS*

5.9.1 Scope of clause

This clause 5.9 applies only in respect of the *Tennant Creek power system* and the *Alice Springs power system*.

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 *Generators* bid freely to provide the *out of balance energy*, the *Power System Controller* 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

The *Power System Controller* 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*.

5.9.6 *Out of balance energy* settlement

(a) The *Power System Controller* will advise the relevant *Generators* of the daily *out of balance energy* transactions.

(b) The *Power System Controller* will advise the relevant *Generators* of the *monthly out of balance energy* transactions.

5.10 (Deleted)

5.11 *SYSTEM PARTICIPANT* INFORMATION

(a) This clause 5.11 applies only to the *Darwin-Katherine power system*

(b) The *Power System Controller* must, from a date as soon as practicable after the commencement of the *I-NTEM*, provide to relevant *system participants*:

(1) By 1600 hours on a *business day*, at least 72 hours ahead of the *trading day*:

(i) Forecast total system demand for each half hour for the *trading day.*

(2) As soon as reasonably possible in the *day* ahead of the *trading day*:

(i) Pre-dispatch targets and pre-dispatch clearing prices for the *trading day.*

(c) The *Power System Controller* must provide to the *Market Operator* for *publication*:

(1) The *Market Price* for each half hour of the previous *trading day* calculated pursuant to clause 4.8(e).

(2) From a date as soon as practicable after the commencement of the *I-NTEM*:

(i) the *pre-dispatch schedule* for the *trading day*.

(ii) the actual dispatch schedule for the *trading day*.

(iii) the actual *constraints* for each *trading interval* in the *trading day*.

(iv) the total system demand for each *trading interval* in the *trading day*.

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 a *power system* in that station.

The *Power System Controller* is responsible for short-term operation planning to achieve system security and 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 the *Power System Controller* 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 *change*s.

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 the *Power Systems Controller*.

(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*. The *Power System Controller* 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 the *Power System Controller* 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. The *Power System Controller* 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 *outages*

The following outage types may be identified by a *System Participant* or where relevant the *Power System Controller*:

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

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

(c) *Forced outages* (tripped or switched out).

~~(c)~~(d) *Performance issue outages* (work required by the *Power System Controller* or *System Participant* to address issues that impact on *secure system* operation).

6.5.2 Application for *plant outages*

Applicants shall advise the *Power System Controller* of:

(a) specify type of work;

(b) *plant* / *equipment* affected;

(c) duration of *outage*;

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

(e) give 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 OUTAGES* AND *PERFORMANCE ISSUE OUTAGES*

The *Power System Controller* has the following responsibilities concerning *forced outages* and *performance issue outages*:

(a) maintenance of system stability;

(b) restoration of system *frequency* and *voltages*;

(c) restoration of system security;

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

(e) restoration of service to *customers*.

6.7 PROTECTION MAINTENANCE

6.7.1 Partial failure or unavailability of *protection systems*

Where there is a failure of one protection of a *network* element, the *Power System Controller* 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 systems*

(a) If there is failure of both protection schemes on a *network* element and the *Power System Controller* determines this to be an unacceptable risk to *power system security*, the *Power System Controller* 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 the *Power System Controller*.

6.7.3 Protection maintenance with the circuit *energised*

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

6.7.4 Protocols for protection or control system abnormality

Where an operating protocol is required to be developed, it must contain arrangements for informing relevant parties, including mitigating actions, when any *protection system* or *control system* becomes defective or unavailable for service and where it may have an impact on power system security.

6.8 OTHER *EQUIPMENT* OPERATIONS

6.8.1 *Automatic reclose equipment*

(a) A *Network Operator* may from time to time request that the *Power System Controller* disable *automatic reclose equipment* in relation to a particular feeder which has *automatic reclose equipment* installed on it.

(b) If a *Network Operator* makes a request under clause 6.8.1 (a), then The *Power System Controller* shall comply with the request.

(c) The *Power System Controller* and the relevant *Network Operator* are not responsible for the consequences of automatic re-closure in relation to a Feeder, except if the *Power System Controller* has not complied with a request under clause 6.8.1(a).

(d) Where *automatic reclose 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 relevant *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 and inspected by an Authorised technical officer; and

(b) The *Power System Controller* approves the re-*energisation* of the *equipment*.

6.9 *TIME* CONSIDERATIONS

Due to system security considerations, the *Power System Controller* may recommend *plant outage time*s:

(a) *Time* Zones

(1) Red Zone: 0730-1730 ~~hrs~~ hours

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

(3) Green Zone: 2001-0559 ~~hrs~~hours.

(b) *Time* of *plant outage*s

Depending on nature of work, impact on system security and the consequences of a possible second *contingency*, the *Power System Controller* shall determine the *time* of *plant outage*s.

6.10 ANNUAL *PLANT* MAINTENANCE FORECAST

6.10.1 *Generators*

On or before 15 May each year, each *Generator* shall submit to the *Power System Controller* 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 the *Power System Controller*:

(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 *Power System Controller* response

The *Power System Controller* 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 — *POWER SYSTEM CONTROLLER*

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

(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) The *Power System Controller* 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 the *Power System Controller*

(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 the *Power System Controller* and field personnel).

(b) Receiver/Caller identification:

~~e.g.~~for example "Car 45 (receiver) — *Power System Controller* (caller)".

6.12.3 Records of speech *operational communications*

(a) Voice recordings of telephone or radio *operational communications* may be undertaken by the *Power System Controller*. The *Power System Controller* 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) The *Power System Controller* 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) The *Power System Controller* shall retain all *operational communications* records (including tapes of voice recordings) for a minimum of ~~7~~ seven years.

(f) As part of a dispute resolution process, a *System Participant* may inspect the *Power System Controller* records of speech *operational communications* between the *Power System Controller* and that *System Participant* during normal business hours and may make copies or extracts of those records. A *System Participant* shall give the *Power System Controller* reasonable notice of its intention to inspect records under this clause.

6.13 TOTAL LOSS OF COMMUNICATIONS TO THE *POWER SYSTEM CONTROLLER*

(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 the *Power System Controller*. All switching and other system operations are logged and shall be reported to the *Power System Controller* 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

Subject to paragraph (l), t~~T~~he standards approved by the *Network Operator* and endorsed by the *Power System Controller* relating to numbering, terminology and abbreviations used for information transfer by *System Participants* and *Network Users* are to be formed and applied by the relevant parties in accordance with the following principles:

(a) The standards are to be used when conveying information on the *power system* between all *System Participants* and *Network Users*.

(b) The *Network Operator* shall establish the *nomenclature standards* for *network* equipment.

(c) A *Network User* shall use the *nomenclature standards* for *network* equipment and apparatus as agreed with the *Network Operator* or failing agreement, as determined by the *Network Operator*.

(d) A *Network User* shall use reasonable endeavours to ensure that its representatives comply with the *nomenclature standards* in any operational communications with the *Power System Controller*.

(e) A *Network User* shall ensure that name plates on its equipment relevant to operations at any point within the *power system* conform to the requirements set out in the *nomenclature standards*.

(f) A *Network User* shall use reasonable endeavours to ensure that nameplates on its equipment relevant to operations within the power system are maintained to ensure easy and accurate identification of equipment.

(g) A *Network User* shall ensure that technical drawings and documentation provided to the *Network Operator* comply with the *nomenclature standards*.

(h) All *nomenclature* shall be unique, uniform and unambiguous.

(i) The *Network Operator* is responsible for the making any changes to enable all *nomenclature* to be unique, uniform and unambiguous.

(j) The *Network Operator* shall, by notice in writing, request a *Network User* to change the existing numbering or *nomenclature* of *network* equipment and apparatus of the *Network User* for purposes of uniformity, and the *Network User* shall comply with such request provided that if the existing numbering or *nomenclature* conforms with the *nomenclature standards*, the *Network Operator* shall pay all reasonable costs incurred in complying with the request.

(k) *System Participants* shall lodge with the *Power System Controller,* a copy of the one-line-diagram of their system.

~~(a)~~(l) A *Generator* who has been granted a relevant derogation under clause 12.1 of the *Network Technical Code* is not required to change the nomenclature of existing plant to conform with the principles in paragraphs (a) to (k), unless the *Network Operator* requests the change, and agrees to bear the associated costs. However, that *Generator* must conform with the above principles for any new plant that is connected to the power system.

~~(b) All *plant* numbers shall be unique.~~

~~All *plant nomenclature* shall be consistent.~~

6.15 *EMBEDDED GENERATORS* IN *CUSTOMERS'* PREMISES

(a) A Retailer shall advise the *Power System Controller* 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 a *power system*.

(c) The *Network Operator* will set the requirements for safe parallel operation or impose the interlocking requirements to prevent parallel operation with a *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 the *Power System Controller* are in place.

6.17 REVENUE METERING

In respect of the *Tennant Creek power system* and the *Alice Springs power system*, 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 the *Power System Controller* for *energy balancing*.

6.18 *REMOTE MONITORING* AND REMOTE CONTROL

(a) *System Participants* shall provide the *Power System Controller* with the remote control and monitoring information on their *equipment* status, alarm and measure values via communication links to the *Power System Controller 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) The *Power System Controller* shall advise the standard alarm and control point names of the *SCADA system*.

(d) *System Participants* shall advise the *Power System Controller* of the analogue alarm settings of their *equipment* for *SCADA* alarm processing purposes. The *Power System Controller* 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 the *Power System Controller* 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 the *Power System Controller* for approval; and

(3) if the nature of the defect is such that the safety or security of a *power system* would be jeopardised by the *remote monitoring* or control defect the *Power System Controller* 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 the *Power System Controller*.

(b) Requests for such tests shall be submitted to the *Power System Controller* with ~~5~~ five working ~~*days* notice~~*days'* notice.

6.20 ACCESS TO UNMANNED HIGH VOLTAGE *SUBSTATIONS* AND *POWER STATIONS*

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

(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~~*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 a *power system* in which case appropriate operating procedures necessary to ensure that the *disconnection* will not pose a threat to *power system security* shall be implemented.

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

6.21.2 *Decommissioning* procedures

(a) In the event that a *System Participant's facility* is to be permanently *disconnected* from a *power system*, the *Network Operator*, the *System Participant* and the *Power System Controller* 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 all *System Participants*.

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 the *Power System Controller* during an *emergency*, the *Power System Controller* 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) The *Power System Controller* 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 a *power system*.

(b) In such circumstances the *Power System Controller* 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 the *Power System Controller* 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 set in accordance with the ~~Network Pricing and Charges Schedule pursuant to the Network Access Code~~ *NT NER*.

6.21.5 Disconnection during an *emergency*

Where the *Power System Controller* may *disconnect* a *System Participant's* facilities during an *emergency*, then the *Power System Controller* 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*), the *Power System Controller* shall take whatever anticipatory or restorative action is necessary to balance electricity *supply* and demand, and ultimately to protect the integrity of a *power system*. Such action may include the shedding or *disconnection* of a *customer*'s *load* and the introduction of power rationing.

The *Power System Controller* will try to maintain or shift *customers*' *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) The *Power System Controller* 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) The *Power System Controller* shall develop an initial Schedule of Audit and Inspection by 1 July 2012.

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

(f) The *Power System Controller* shall issue the Schedule of Audit and Inspection to the Participants whose *equipment* is involved.

(g) The *Power System Controller* 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 the *Power System Controller* 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*, the *Power System Controller* 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 the *Power System Controller* 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 *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 the *Power System Controller* within ~~7~~ seven working *days*. When there is no clear finding of cause of fault, an interim report may be acceptable.

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

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

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

(e) The *Power System Controller* 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~~ six 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~~ six 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, the *Power System Controller* ~~may~~ shall develop and maintain a guideline describing criteria for classifying events as *reportable incidents* (the Incident Reporting Guideline).

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

7.4 INVESTIGATION AND REPORTING PROCESS

The *Power System Controller* 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*.

The *Power System Controller* 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*, the *Power System Controller* 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 the *Power System Controller* in accordance with any conditions specified in the Incident Reporting Guideline.

7.4.2 Reporting by a *System Participant*

System Participants are to advise the *Power System Controller* 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 the *Power System Controller* on an event and incident within ~~7~~ seven working *days* or as soon as reasonably practical after receipt of notification of a *reportable incident* by the *Power System Controller*.

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 the *Power System Controller*

The *Power System Controller* 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 the *Power System Controller*

The *Power System Controller* 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.

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

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

7.5 PUBLIC REPORTING

(a) Nothing in this *Code* prevents the *publication* of a public report by the *Power System Controller* or by the Utilities Commission.

~~(a)~~(b) The *Power System Controller* shall include in the Incident Reporting Guidelines provisions for advising un-licenced *Network Users* of *power system* incidents where they are affected or potentially affected by *power system emergency* conditions.

7.6 INDEPENDENT INVESTIGATION OF A *REPORTABLE INCIDENT*

The Utilities Commission may direct the *Power System Controller* 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 the *Power System Controller*, and approved by the Utilities Commission.

The *Power System Controller* 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 the *Power System Controller.*

8 OTHER MATTERS

8.1 COMMUNICATIONS WITH THE *POWER SYSTEM CONTROLLER*

8.1.1 Communications directed to the *Power System Controller* 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 the *Power System Controller* in relation to this *Code*: (Advice of the *Power System Controller*'s Address)

The *Power System Controller* 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 the *Power System Controller* 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 the *Power System Controller* in relation to a particular *facility*

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

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

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

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

(1) a conversation with one of the *Power System Controller* nominated contact personnel; and

(2) on one of the *Power System Controller's* advised telephones.

8.2.3 *System Participant's* nominated contact personnel — the *Power System Controller* to be advised

(a) Each *System Participant* shall advise the *Power System Controller* 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 The *Power System Controller* nominated contact personnel — *System Participants* to be advised

(a) The *Power System Controller* shall advise all *System Participants* of nominated contact personnel (identified by title) for the purposes of giving or receiving *operational communications* by the *Power System Controller*.

(b) The details to be provided are:

(1) The title of each nominated contact person;

(2) the telephone numbers of the *Power System Controller*;

(3) a facsimile number for the *Power System Controller*; and

(4) an electronic mail address for the *Power System Controller*.

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 THE *POWER SYSTEM CONTROLLER* (*SYSTEM PARTICIPANTS* FAILURE TO RESPOND)

(a) If *System Participants* fail to respond to a request by the *Power System Controller* on matters concerning:

(1) non-conformance with the Codes;

(2) (Deleted);

(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.

The *Power System Controller* will then issue a *Direction* to the *System Participant* requesting immediate response with advice of compliance.

(b) *System Participants* shall immediately respond to that *Direction*.

8.4 *POWER SYSTEM CONTROLLER* REPORTS

The *Power System Controller* 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

The *Power System Controller* 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*

The *Power System Controller* 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

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

8.5 *POWER SYSTEM CONTROLLER* REQUESTS FOR OPERATION AND PERFORMANCE INFORMATION

(a) The *Power System Controller* may require operation and 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) The *Power System Controller* shall ensure that *confidential information* is not inadvertently provided to other irrelevant *System Participants* or to the public.

8.6 *POWER SYSTEM CONTROLLER* CHARGES FOR SERVICES

(a) The *Power System Controller* 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 relevant *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 an ~~contract or~~ agreement for the provision of *network* access services entered into between a *Network Operator* and a *Network User* whether under the *NT NER* or Network Access Code or otherwise~~Electricity Network (Third Party Access) Act and its associated Code, and includes an award made by an arbitrator for the same purpose~~.
Alice Springs power system	The *power system* located in the *region* of Alice Springs operated pursuant to licences issued by the Utilities Commission pursuant to Part 3 of the Electricity Reform Act.
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 generation control, generation control, AGC	A *generating unit* which responds to the regulating signals from the *Power System Controller 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 a *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 *Network 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*, also called the *Technical Code*~~ System Control Technical Code, prepared under clause 38(1) of the Electricity Reform Act ~~.~~

Commitment and dispatch submission	A notice submitted by a *Generator* to the *Power System Controller* relating to the dispatch of a *scheduled generating unit* in accordance with the requirements of clause~~s [~~4.4B~~.(d)] and [4.4B(c)©].~~
Confidential information	In relation to a *Market Participant,* or the *Power System Controller*, information which is or has been provided to that *Market Participant* or *Power System Controller* under or in *connection* with the *Code* and which is stated under the *Code* or by *Power System Controller* or by the *Utilities Commission* to be *confidential information* or is otherwise confidential or commercially sensitive. It also includes any information which is derived from such information.
Connect, connected, connection	Means to establish an effective link via installation of the necessary *connection equipment*.
connection point	The point of *supply* between a *Network Operator* and a *Network User*.
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 *power system*
Contingency event	An event affecting a *power system* which the *Power System Controller* 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 the *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*.
Darwin-Katherine power system	The *power system* located in, and between, the *regions* of Darwin and Katherine operated pursuant to licences issued by the Utilities Commission pursuant to Part 3 of the Electricity Reform Act.
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 a *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*.
Dispatch cost	The cost to the relevant *Generator* associated with fuel, start-up and variable operation, maintenance and other items of the same nature calculated on the basis that the relevant *generating unit* will be dispatched during the *trading day* in accordance with the ~~*Generat'or's*~~*Generator's* expectation.
Dispatch instruction	An instruction given to a *Generator* pursuant to clause 4.7 to *synchronise*, desynchronise, *supply ancillary services* including *spinning reserve* or *supply energy.*
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 *generating units* that minimises production cost, given *generating unit* and *network constraint*s.
Electricity market	The *electricity market* in its various stages (such as the *I-NTEM*).
Electricity Reform Act	The *Electricity Reform Act 2000* (NT)
Embedded generator	A ~~*Generator*~~ 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 a *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 balancing	In respect of operation in the *Tennant Creek power system* and the *Alice Springs power system*, 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*.
Energy loss factor	The amount determined in accordance with clause A6.3.

Energy Loss Factor Code	The most recently published version of the document entitled Northern Territory Energy Loss Factor Code prepared and published by the Utilities Commission.
Energy usage period	A *time* interval defined for reconciliation of *energy* usage, e.g. 15 minutes.
Entry point	A connection point at which electricity is more likely to be transferred to the electricity network than to be transferred from the electricity network.
Exit point	A connection point at which electricity is more likely to be transferred from the electricity network than to be transferred to the electricity network.
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.
Fast start	*Generating units* for which the *Power System Controller* determines whether to *synchronise* (or de-*synchronise*) the unit to a power system.
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 system	A system comprising one or more *generating units connected* to a *Network* at a single *connection point.*
Generating unit	The actual *Generator* of electricity and all the related *equipment* essential to the *generating* ~~*un*~~*it's*unit's operation and functioning as a single entity.
Generator	A person who engages in the activity of owning, controlling or operating a *generating system* that is *connected* to a *Network* and, in respect of a *generating system connected* to the *Darwin-*

	Katherine power system, is either registered by the *Market Operator* as a *Generator* or, intends to register with the *Market Operator* as a *Generator*.
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*.
Governor system	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.
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 Reform Act~~Electricity Networks (Third Party Access) Code~~, the *Network Technical Code*, System Control Technical Code, licences, industry codes, *reliability*, safety and environmental protection.
Interconnected	A *transmission line* or group of *transmission lines* that *connects* the *transmission network*s in adjacent *region*s.
IES	Indigenous Essential Services Pty Ltd
I-NTEM	The Interim Northern Territory Electricity Market, as applied to the *Darwin-Katherine power system*.
Interruptible customer load	A *load* which is able to be *disconnected*, at the discretion of the *Power System Controller*, either manually or automatically initiated, which is provided for the restoration or control of the *power system frequency* to cater for *contingency 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 following services	Where a *Generator* follows the *load* of its *customers* plus *network losses*, plus whatever transfer commitments to another *Generator*.
Load shedding	Reducing or *disconnecting load* from a *power system*.
Major reportable incident	Refer to clause 7.3.2.
Market Customer	*Customers* who make payments or virtual payments (as the case may be) for purchase of electricity direct to one or more *Generator* or the *Market Operator*.
Market Information	The *Market Information* specified in Attachment 6.12
Market Operator	A role fulfilled by the *Power System Controller* in accordance with clause 1.7.5.

Market Participant	A *Generator* or *Market Customer* who registers for participation in the *electricity market*.
Market Price	The price determined for each *trading interval* in accordance with clause 4.8 and the methodology provided in Attachment 5.
Market Price Principle	The principle set out in clause 4.8(b).
Minor reportable incident	Refer to clause 7.3.3.
Month	Unless otherwise specified, the period beginning at 12.00 am on ~~th~~ the "relevant commencement ~~da~~ date" and ending at 12.00 am on the date in ~~th~~ the "next calendar ~~*mon~~ *month* corresponding to the commencement date of the period. If ~~th~~ the "relevant commencement ~~da~~ date" is the 29th, 30th or 31st and this date does not exist in ~~th~~ the "next calendar ~~*mon~~ *month*", then the end date in ~~th~~ the "next calendar ~~*mon~~ *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 energy losses	The *energy* loss incurred in the transportation of electricity from an *entry point* or transfer point to an *exit point* or another transfer point on a *network*.
Network Operator	~~A body defined as a "*network* provider" in the Electricity Networks (Third Party Access) Act.~~ person defined as a 'network provider" under section 4(1) of the *Electricity Reform Act* as in force at 1 June 2019.
Network Technical Code	The Code specified in the Electricity Reform Act and prepared by Power and Water under its Network Licence.
Network 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~~ point*.
Nomenclature , nomenclature standards	The ~~standards approved by the *Network Operator* and endorsed by the *Power System Controller*~~ principles relating to numbering, terminology and abbreviations used for information transfer by *System Participants* and *Network Users* ~~as provided for in~~ in accordance with 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).
NT NER	The National Electricity Rules as applicable in the Northern Territory.

Off-peak period	The 12 hour period ending at 0600 hours over adjacent weekdays as well as the 60 hour period ending 0600 hours on the first *day* after a weekend (note that a public holiday is classified as a weekday for this definition).
Operating protocol	A document prepared and published by the Power System Controller that details the communications and control systems required to be in place to enable and support the dispatch process and to monitor performance.
Operational communication	A communication concerning the arrangements for or actual operation of a *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*, inclusive of *performance issue outages*.
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.
Peak period	The 12 hour period ending at 1800 hours on a weekday (note that a public holiday is classified as a weekday for this definition).
Performance issue outages	*Power System Controller* or *System Participant* required outages to address performance issues such as forecasting errors, insufficient ancillary service contributions, auxiliary equipment performance, and any other performance issues that might impact on the secure operation of the *power system*.
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	The entity licenced by the Utilities Commission pursuant to section 30 of the Electricity Reform Act.

Power System Operating Procedures	The procedures to be followed by *Network Users* in carrying out operations and /or maintenance activities on or in relation to primary and secondary *equipment connected* to or forming part of a *power system* or *connection points*, as described in clause 6.1.
Power system security	The safe scheduling, operation and control of a *power system* on a continuous basis in accordance with the principles set out in clause3.3
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*.
Pre-dispatch schedule	A schedule for each *trading interval* determined on the basis of information including *commitment and dispatch submissions* and setting out forecasts of the *Market Price*, system demand and dispatch levels for each *generating unit* that was offered by a *Generator*.
Protection system	A system which includes all the protection schemes applied to the system.
Publish, publishing, publication	The provision of a document in the public domain that can be readily accessed by the general public.
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 *power system* demand.
Regulating unit	*Generating plant* arranged by the *Power System Controller* and specifically allocated to *frequency* regulating duty. Such *plant* can be automatically controlled or directed by the *Power System Controller* 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 a *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 a *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.
Ring Fencing Code	The Northern Territory Electricity Ring-Fencing Code made by the *Utilities Commission* pursuant to section 24 of the *Utilities Commission Act.*
Satisfactory operating state	In relation to a *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 a *power system*.
Scheduled generating unit	A *generating unit* which is dispatched by the *Power System Controller*.

Secure system, secure operating state	In relation to a *power system* has the meaning given in clause 3.2.9.
Secure System Guidelines	The guidelines prepared by the *Power System Controller* which contains the principles specified in clause 3.5.1.
Security Constrained Economic Dispatch	*Economic Dispatch* which achieves a *secure operating state*.
Self-commitment, Self-committed	*Generating units* for which the *Generator* makes the (primary) decision to *synchronise* (or de-*synchronise*) the unit to a power system (subject to permission to proceed from the *Power System Controller*).
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 virtual invoices and virtual credit notes for *Market Participants*.
Settlements period	For the *I-NTEM*, a period of one calendar *month*.
Single credible fault	A *single credible fault* considered by the *Power System Controller*, in particular circumstances, to have the potential for the most significant impact on a *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 a *power system*. Under normal conditions, the design or operation of the relevant part of a *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*.
SPRINT	SPRay INTercooling, a technique used in turbine engines to enhance the efficiency and output of the engine.
Stand-by power, generation	The amount of electrical *energy* which could be supplied to a *load* user in accordance with the terms of a stand-by *generation* agreement.
Statement of Calculation	A document of 1 page or more that carries the information specified in clauses A6.10 and A6.11 applicable to the relevant *Market Participant*.
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 a *power system*.
Synchronising, synchronisation	To electrically *connect* a *generating unit* to a *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 a *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 a *power system* in its *satisfactory operating state*
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*.
Tennant Creek Power System	The *power system* located in the *region* of Tennant Creek operated pursuant to licences issued by the Utilities Commission pursuant to Part 3 of the Electricity Reform Act*.*
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.
Trading interval	A 30 minute period ending on the hour (Australian Central Standard Time) or on the half hour and, where identified by a *time*, means the 30 minute period ending at that *time*.
Trading day	The 24 hour period ending at 0400 hours on a calendar *day*.
Transaction Reference Point	The *connection point* on the *Power and Water Corporation*'s *electricity network* that relates to a *Market Customer`s supply* of electricity*.*
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 commitment	Contained in the definition of Dispatch Instruction, as part of the synchronisation process.
Unit de-commitment	Contained in the definition of Dispatch Instruction, as part of the de-synchronisation process.
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 notified in advance to the *Power System Controller*.
Virtual Settlements Statement	A document of 1 page or more that carries the information as specified in clause A6.7(d), as applicable to the relevant *Market Participant*.
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.
Wet Mode	That range of capacity of a gas turbine unit where water injection is applied. One technique used to provide water injection is known as *SPRINT*. This term is used in the *Generator* standing data.

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

(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*; and

(h) the italicised expressions in this *Code* are recorded in Attachment 1.

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 *Stand-by 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*.

Version 5 Published May 2015

- This version provides for the operation of an interim competitive *electricity market* (*I-NTEM*) in the *Darwin-Katherine power system*. The provisions are the first step towards more sophisticated and complete market arrangements and further *change* is anticipated as

experience and facilities allow. The initial market provisions are by design extensions of previous processes.

- *Changes* to the role of the *Power System Controller* include:
  - Removal of the references to an *energy balancing* market in the *Darwin-Katherine power system*;
  - Arrangements to permit *Generators* to *self-commit* or to *fast start*;
  - *Changes* to the dispatch process in that a *pre-dispatch schedule* will be produced in addition to real *time* dispatch;
  - Calculation of a *Market Price* for each half hour (*trading interval*).
- The role of a *Market Operator* has been enhanced in this version to support the commencement of the *I-NTEM*.

Version 6 Consultation Draft December 2018

Amended to accommodate changes to the NTC to remove duplication, provided consistency between the two documents, correct minor typos, and make minor editorial changes to improve readability.

Substantive changes have been made to the following provisions:

- Clause 3.3.3 Responsibilities of the Network Operator.
- Clause 6.7.4 Protocols for protection or control system abnormality.
- Clause 6.14 Plant numbering, Nomenclature and Drawings.

Minor changes have been made to the following provisions:

- Clause 1.1 opening paragraph. Delete 'Technical' and in all other instances throughout the Code.
- Clause 1.2(e) apply italics to Network Technical Code. Define in Glossary.
- Clause 1.3 Application. Change to paragraph (f).
- Clause 1.4 Interpretation. Change paragraph (d).
- Clause 1.7.4 Obligations of the Power System Controller. Change paragraph (a).
- Clauses 3.1(c)(4), 3.2.3(b)(2), 3.3.1(h): delete reference to semi-scheduled generating unit.
- Clause 3.3.1 Responsibility of System Controller. Change to paragraph (d).
- Clause 3.3.1 Responsibility of System Controller. Change to paragraph (s).
- Clause 7.3.4 Incident reporting guideline. Change may to shall and define term Incident Reporting Guideline.
- Clause 7.4.1 Notification of a reportable incident.
- Clause 7.5 Public reporting. New paragraph (b).
- Glossary definitions.
  - New definitions: Network Technical Code, Ring Fencing Code, Secure System Guidelines, unit commitment, unit de-commitment.
  - Changes to: Code, dispatch instruction, embedded generator, nomenclature, network energy losses, Network User.
  - Deletion: Semi-scheduled generating unit, Technical Code.

ATTACHMENT 4 *GENERATOR* COMMITMENT AND DISPATCH TEMPLATE

The Commitment and Dispatch Template is shown below. The instructions for filling out the template are contained within the template. Generating unit standing data is to be provided elsewhere (within the Market Participant Registration process).

For trading day commencing	**Issuer**	**<<name of person sending Offer>>**
<<dd/mm/yyyy>>		**<<title of person sending Offer>>**
	Date of issue	**<<dd/mm/yyyy>>**
	Issues version	**<<v1>>**
	Company	**<<company name>>**

				Self-commitment units											**Fast start units**										
Primary order index		**Standard Unit ID**		**off-load order**		**Time of sync (on-line)**	**Time of de-sync (off-line)**	**B1: minimum stable load**	**B1 OFFER**	**B2: incremental capacity**	**B2 OFFER**	**B3: incremental capacity**	**B3 OFFER**	**total offered capacity (check)**	**T1: Time to start**	**T2: Time to reach min load**	**T3: Minimum run time**	**T4: Time to reduce to zero**	**B1 minimum stable load**	**B2: incremental capacity**	**B2 OFFER - LONG RUN (Set 1)**	**B2 OFFER - SHORT RUN (Set 2)**	**B3: incremental capacity**	**B3 OFFER**	**total offered capacity (check)**
				Number		hhmm	hhmm	MW	$/MWh	MW	$/MWh	MW	$/MWh	MW	mm	mm	mm	mm	MW	MW	$/MWh	$/MWh	MW	$/MWh	MW
1														0											0
2														0											0
3														0											0
4														0											0
5														0											0
6														0											0
7														0											0
8														0											0
9														0											0
10														0											0
11														0											0
12														0											0
13														0											0
14														0											0
15														0											0
16														0											0
17														0											0
18														0											0
19														0											0
20														0											0
21														0											0
22														0											0
23														0											0
24														0											0
		Band totals						0		0		0							0	0			0		

ATTACHMENT 5 INITIAL MARKET PRICE METHODOLOGY

The following methodology is to be applied to the determination of the *Market Price* for each half hour period in accordance with clause 4.8.

The *Market Price* for each *trading interval* is the price of the highest priced band of flexible (or unconstrained) *generation* which is dispatched in that *trading interval.* The calculation of the *Market Price* must, to the extent it is consistent with the above statement, be undertaken by the following steps:

Input data:

A 30 minute *energy* produced by each *scheduled generating unit*

B Price-volume data in final *commitment and dispatch submissions*

C Information and data relating to *energy* that has been *constrained* on as a result of system or *network constraints* by the *Power System Controller* or by a *Generator* in accordance with a minimum loading of a *generating unit* classified as a *self-committed generating unit* for each *scheduled generating unit*.

Calculation steps

1. Allocate Input data A to price bands described by Input data B
2. Allocate Input data C to price bands described by Input data B
3. For each half hour and each scheduled *Generator* subtract the result of Calculation step 2 from Calculation step 1.
4. Set *Market Price* in each half hour to the highest priced MW in Calculation step 3.

ATTACHMENT 6 *MARKET OPERATOR*

The duties of the *Market Operator* for the *I-NTEM* are set out in this Attachment 6.

A6.1 RESPONSIBILITIES OF THE *MARKET OPERATOR*:

The *Market Operator* responsibilities include:

(a) Administering *Market Participant* registration process.

(b) Managing the *electricity market settlements* arrangements. This includes:

(1) Calculation of the virtual charges for *Market Customers* and the virtual payments to *Generators* for the *supply* of *energy* to *Market Customers*;

(2) The provision of virtual invoices and credit notes for the *supply* of *energy* to *Market Customers*, as appropriate, to *market participants* whilst the *I-NTEM* is operating on a virtual basis;

(3) The calculation of *ancillary services* financial transactions and the issue of *Statements of Calculation* for those transactions to the relevant parties;

(4) The calculation of financial transactions for *out of balance energy* and the issue of *Statements of Calculation* for those transactions to the relevant parties.

For the removal of doubt:

(i) The *Market Operator* is responsible for the calculation of *Statements of Calculation* in respect to *ancillary services* and *out of balance energy* financial transactions.

(ii) It is for the Generators to invoice each other directly for *ancillary services* and *out of balance energy* financial transactions based on the *Statements of Calculation* issued by the *Market Operator*.

(c) Daily *publication* of the *Market Price*, *pre-dispatch schedule*, actual dispatch targets, actual *constraints*, and total system demand, or as otherwise established in accordance with clause 4.8(f);

(d) Prepare and *publish* plans, specifications and designs (or similar) for market operation processes and systems necessary for the efficient operation of the *I-NTEM*;

(e) Prepare and *publish* procedures and guidelines (or similar) where appropriate for deployment by *Market Participants* and / or the *Market Operator* necessary for the efficient operation of the *I-NTEM*.

(f) Conduct reasonable consultation with *electricity market* stakeholders prior to the *publication* of the documents specified in A6.1 (d) and (e).

A6.2 *MARKET PARTICIPANT* REGISTER

The *Market Operator* must develop (in consultation with *electricity market* stakeholders) and administer a register of *Market Participants* who elect to participate in the *electricity market*, including the relevant attributes specified by the *Market Operator* that the *Market Operator* reasonably believes are required for the *Power System Controller* and the *Market Operator* to perform their duties.

A6.3 *NETWORK ENERGY LOSS FACTOR*

(a) The *Network Operator* must provide the following information to the *Market Operator* in accordance with the timeframe agreed between those parties:

(1) The *energy loss factor* for all *connection points* other than *Generator connection points*, as determined by the *Network Operator* pursuant to the *Energy Loss Factor Code*; and

(2) The *energy loss factor* for a *Generator's connection point*, which shall be 1.0 per unit unless otherwise advised by the *Network Operator*.

(b) The *Network Operator* shall review and update the *energy loss factors* annually.

A6.4 REVENUE METERING DATA

(a) The *Network Operator* is responsible for forwarding interval or consumption data from suitable meters to the *Market Operator* for use in *settlements* for the *I-NTEM*.

(b) Wherever practicable data for *settlements* of the *electricity market* is to be based on:

(1) Revenue class meters used for *customer* billing where that data records *energy* consumed over *trading intervals* and is reliably available no later than four *business days* after the end of each *settlements period.*

(2) Revenue class meters used for determining *Generator* sent out *energy* where that data records *energy generated* over *trading intervals* and is reliably available no later than four *business days* after the end of each *settlements period*.

(3) Meters that are not revenue class and can be used on a temporary basis until revenue class meters become available.

(c) If interval meter data is not available for some *customers*, *settlements* is to be based on:

(1) *Peak period* meter data and *off-peak period* meter data; or

(2) Calculated data that represents a reasonable estimate of the missing meter data and may include use of calculation by difference between data based on available meter data and deemed load profile procedures.

(d) Consumption meter data for *IES customers* is to be profiled in *trading intervals* (or otherwise in *peak period* and *off-peak period* until a suitable *trading interval* algorithm is determined by the *Market Operator*) according to an algorithm developed, consulted with *electricity market* stakeholders and *published* by the *Market Operator*.

(e) Interval meter data is to be used where it is readily available or at a minimum for those *connection points* where the *customer* consumes over 750 MWh per annum.

(f) Interval meter data is to be used from *Generators* on a *generating unit* sent-out basis as soon as reasonably possible or, until suitable *generating unit* metering is available, as agreed between the *Network Operator* and the *Market Operator*.

A6.5 *SETTLEMENTS* CYCLE

(a) The *settlements* cycle is to be based on the *settlements period*.

(b) The timing of preliminary, final and revision *settlements* statements is to be as specified in the *settlements* timetable in accordance with sub-section A6.6. The *Market Operator* may perform adhoc revisions from time to time in accordance with requirements specified in a procedure.

(c) For the purposes of assessing the veracity of the calculation of quantities for *settlements*, a comparison between quantities determined according to clause A6.4 and quantities available

from the sum of all forms of physical metering is to be undertaken every three *months*. This clause will not apply if the metering for the quantities being compared use the same source;

(d) The comparison under A6.5(c) may be in the form of commentary or other form at the discretion of the *Market Operator*.

A6.6 *SETTLEMENTS* TIMETABLE

(a) The *Market Operator* must *publish* a *settlements* timetable for the *I-NTEM*.

(b) The *settlements* timetable is to be *published* within one *month* of *I-NTEM* commencement.

(c) The *settlements* timetable is to be revised as and when required by the *Market Operator*.

(d) The *settlements* timetable is to apply to the *virtual settlements statements* only.

A6.7 *SETTLEMENTS* STATEMENTS AND *STATEMENTS OF CALCULATION*

(a) Statements are to carry the description of *virtual settlements statement* or *Statements of Calculation* as the case may be for the *I-NTEM*.

(1) A *virtual settlements statement* does not require a *Market Participant* to pay or entitle a *Market Participant* to receive any amounts specified on the statement.

(2) A *Statement of Calculation* triggers a right for a *Market Participant* to issue an invoice to another *Market Participant* for the amounts specified on the statement. A *Market Participant* who receives an invoice based on a *Statement of Calculation* must pay the invoice.

(b) *Trading interval* meter data is to be used where relevant in preparing *settlements* statements (or otherwise *peak period* and *off-peak period* meter data is to be used until *trading interval* meter data becomes readily available to the *Market Operator*).

(c) *Virtual settlements statements* and *Statements of Calculation*, as the case may be, are to contain information that has been determined in accordance with clauses A6.8, A6.9. A6.10. A6.11.

(d) The *virtual settlements* statements produced by the *Market Operator* must include at least the following information:

(1) For *Generators*:

(i) Total daily sent out *energy* for each *Generator*.

(ii) Total *monthly* sent out *energy* for each *Generator*, including *peak period* and *off-peak period* components.

(iii) Total daily revenue for each *Generator*.

(iv) Total *monthly* revenue for each *Generator*, including *peak period* and *off-peak period* components.

(v) Average daily price for each *Generator*.

(vi) Average *monthly* price for each *Generator*.

(2) For *Market Customers*:

(i) The total daily *energy* by each *Market Customer*.

(ii) The total *monthly energy* by each *Market Customer,* including *peak period* and *off-peak period* components.

(iii) The total daily amount (that would otherwise be payable) by each *Market Customer*.

(iv) The total *monthly* amount (that would otherwise be payable) by each *Market Customer*, including *peak period* and *off-peak period* components.

(v) Average daily price for each *Market Customer*.

(vi) Average *monthly* price for each *Market Customer*.

(vii) *Monthly* market volume weighted *peak period* and *off-peak period* prices for each *Market Customer*.

A6.8 *SETTLEMENTS* CALCULATIONS

(a) The arrangements in clause A6.8 are to apply for *virtual settlements statements*.

(b) The *Market Operator* must calculate virtual amounts payable to *Generators* and virtual amounts receivable from *Market Customers* in respect of each *trading interval* (or otherwise in *peak periods* and *off-peak periods* until *trading interval* data becomes readily available to the *Market Operator*) within each *settlements period*.

(c) Amounts payable to *Generators* shall be calculated according to the following formula:

GP = MP X MSO X LF(G)

Where:

GP is amount payable to a *Generator* in respect of the *trading interval*

MP is the *Market Price* determined in accordance with clause 4.8

MSO is the *Metered Sent Out energy* determined in accordance with clause A6.4

LF(G) is the *loss factor* applicable to the *Generator's connection point* as specified in clause A6.3(a)(2).

(d) Amounts payable by *Market Customers* shall be calculated according to the following formula:

MCP = MP X MCM X LF(C)

MCP is amount payable by a *Market Customer* for the *trading interval,* unless otherwise determined by the *Market Operator* in consultation with the relevant *Market Customer*.

MP is the *Market Price* determined in accordance with clause 4.8.

MCM is the *Market Customer's* metered consumption determined in accordance with clause A6.4

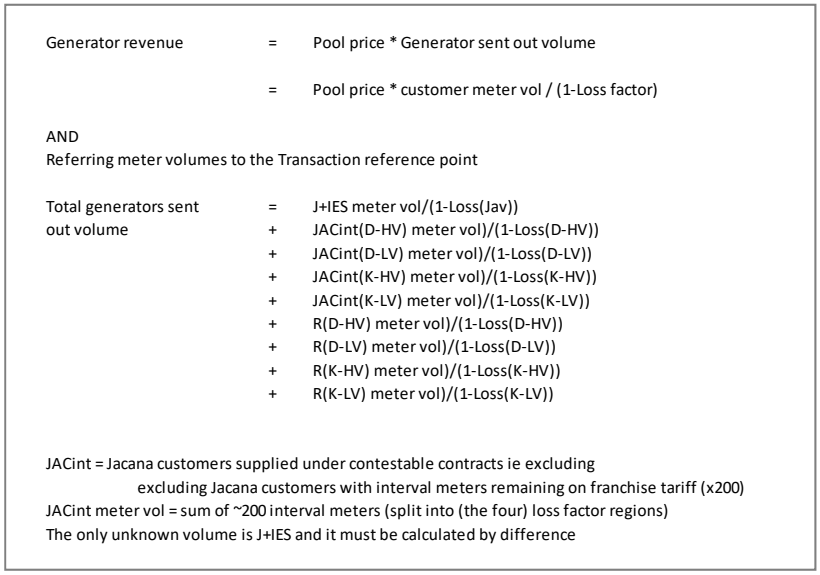
LF(C) is the *loss factor* applicable to the *customer* determined in accordance with A6.3(a)(1).

(e) The *Market Operator* shall aggregate the amounts payable to each *Generator* and payable by each *Market Customer* in each *trading interval* over a *settlements period* (in accordance with the *settlements* statement requirements in clause A6.7(d)) and advise each *Generator* and *Market Customer* of the amounts payable to or payable by each individual entity, as appropriate.

A6.9 CALCULATED DATA FOR JACANA ENERGY

(a) The arrangements in clause A6.9 are to apply for *virtual settlements statements*.

(b) The following figure specifies the first part of the calculation to be performed for determining Jacana Energy's consumption data:



Generator revenue = Pool price * Generator sent out volume

= Pool price * customer meter vol / (1-Loss factor)

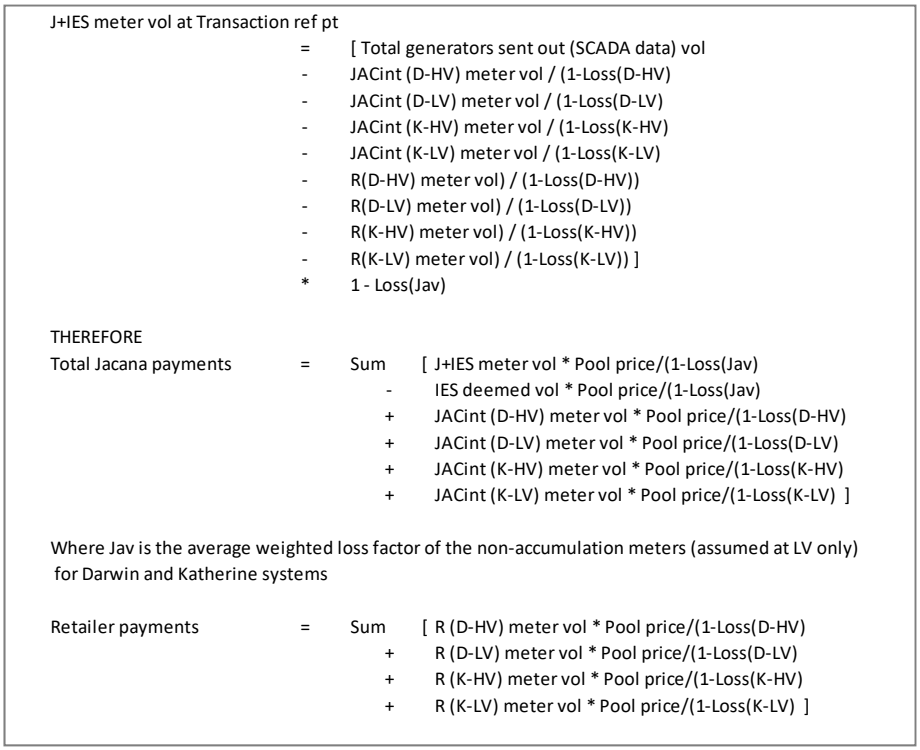
AND
Referring meter volumes to the Transaction reference point

Total generators sent out volume	=	J+IES meter vol/(1-Loss(Jav))
	+	JACint(D-HV) meter vol)/(1-Loss(D-HV))
	+	JACint(D-LV) meter vol)/(1-Loss(D-LV))
	+	JACint(K-HV) meter vol)/(1-Loss(K-HV))
	+	JACint(K-LV) meter vol)/(1-Loss(K-LV))
	+	R(D-HV) meter vol)/(1-Loss(D-HV))
	+	R(D-LV) meter vol)/(1-Loss(D-LV))
	+	R(K-HV) meter vol)/(1-Loss(K-HV))
	+	R(K-LV) meter vol)/(1-Loss(K-LV))

JACint = Jacana customers supplied under contestable contracts ie excluding
excluding Jacana customers with interval meters remaining on franchise tariff (x200)
JACint meter vol = sum of ~200 interval meters (split into (the four) loss factor regions)
The only unknown volume is J+IES and it must be calculated by difference

Figure A6.1 – first part of the calculations for *Jacana Energy's consumption data*

(c) The following figure specifies the second part of the calculation to be performed for determining Jacana Energy's consumption data:



J+IES meter vol at Transaction ref pt

	=	[Total generators sent out (SCADA data) vol
	-	JACint (D-HV) meter vol / (1-Loss(D-HV)
	-	JACint (D-LV) meter vol / (1-Loss(D-LV)
	-	JACint (K-HV) meter vol / (1-Loss(K-HV)
	-	JACint (K-LV) meter vol / (1-Loss(K-LV)
	-	R(D-HV) meter vol) / (1-Loss(D-HV))
	-	R(D-LV) meter vol) / (1-Loss(D-LV))
	-	R(K-HV) meter vol) / (1-Loss(K-HV))
	-	R(K-LV) meter vol) / (1-Loss(K-LV))]
	*	1 - Loss(Jav)

THEREFORE

Total Jacana payments	=	Sum	[J+IES meter vol * Pool price/(1-Loss(Jav)
		-	IES deemed vol * Pool price/(1-Loss(Jav)
		+	JACint (D-HV) meter vol * Pool price/(1-Loss(D-HV)
		+	JACint (D-LV) meter vol * Pool price/(1-Loss(D-LV)
		+	JACint (K-HV) meter vol * Pool price/(1-Loss(K-HV)
		+	JACint (K-LV) meter vol * Pool price/(1-Loss(K-LV)]

Where Jav is the average weighted loss factor of the non-accumulation meters (assumed at LV only) for Darwin and Katherine systems

Retailer payments	=	Sum	[R (D-HV) meter vol * Pool price/(1-Loss(D-HV)
		+	R (D-LV) meter vol * Pool price/(1-Loss(D-LV)
		+	R (K-HV) meter vol * Pool price/(1-Loss(K-HV)
		+	R (K-LV) meter vol * Pool price/(1-Loss(K-LV)]

Figure A6.2 – second part of the calculations for Jacana Energy consumption data

A6.10 *OUT OF BALANCE ENERGY CALCULATIONS*

(a) The calculations in clause A6.10 are to be prepared as *Statements of Calculation*.

(b) A *Generator* will be out of balance by a quantity Q in the event it generates more (surplus) or less (deficit) than the sum of its *Market Customer*(s)' contracted load (meter data and/or aggregated data), where:

(1) Quantity (Q) = An amount to be determined by the *Market Operator* based on the contracts entered between *Generators* and *Market Customers* and the principle that it represents the difference between the loss adjusted quantity of *energy* produced by or on behalf of a *Generator* (which may be under a stand-by contract with another *Generator*) and the aggregate quantity of *energy* consumed pursuant to contracts between that *Generator* and *Market Customers*.

(2) Q is to be determined for each *trading interval* over the *settlements* period.

(3) The detailed workings in producing Q are to be made available to the affected *Generators*.

(c) The *Market Operator* is to determine Q as specified in subclause A6.10(b) in accordance with a method contained in a document prepared and duly approved by the relevant *Generators*.

(1) The method specified in this subclause is to be acceptable to the *Market Operator*, whose acceptance cannot be unreasonably withheld.

(2) The document specified in this subclause may be amended from time to time by the *Generators* in accordance with a process agreed by the relevant *Generators*.

(3) The detailed workings in determining Q for each *settlements period* are to be made available to the affected *Generators*.

For the removal of doubt:

(i) the *Market Operator* is not required to determine Q if the method specified in this subclause has not been presented or is not reasonably acceptable to the *Market Operator*;

(ii) the *Market Operator* must prepare retrospective calculations of Q if the document specified in this subclause is not available to the *Market Operator* until some time after the commencement of the I-*NTEM*.

(d) The out of balance energy price ('OOBPrice') is $65/MWh.

(e) In accordance with subclauses A6.10(b) and A6.10(c), the *Market Operator* is to determine a payment for *out of balance energy* in accordance with the following formula:

Payment = Q x OOBPrice

Where:

A *Generator* in surplus will be entitled to receive a payment and the *Generator* in deficit must pay that amount to the other *Generator*.

(f) The affected *Generators* are to provide within two *business days* after the end of the *settlements period* the *Market Operator* with sufficient information per *trading interval* in order to determine the *out of balance energy*.

(1) The *Market Operator* must provide the *Statements of Calculation* to the affected *Generators* within five *business days* after the receipt of the information provided in subclause A6.10(f).

(g) The information determined in accordance with subclauses A6.10(b) and (e) is to be provided to the *Generators* in the form of a *Statement of Calculation*.

(h) After receipt of a *Statement of Calculation* for a *settlements period*, a *Generator* in surplus must issue an invoice to the *Generator* in deficit for the amount stated in the *Statement of Calculation*.

(i) The *Generator* in deficit must pay the invoice within thirty calendar days of the date of the invoice.

(j) A *Generator's* right to be paid or credited an amount in an invoice issued in accordance with this subclause A6.10 is enforceable between the relevant parties as a contract.

A6.11 *ANCILLARY SERVICES CALCULATIONS*

(a) The calculations in clause A6.11 are to be prepared as *Statements of Calculation*.

(b) In respect of every *trading interval* a *Generator* must make a payment to Territory Generation in respect of *ancillary services*. The amount of the payment is to be calculated in accordance with the following formula:

Payment = ASQuantity x ASPrice

Where:

ASQuantity = The *energy* produced (by one or more *Generators*) on a sent out basis for the *Market Customers* of a *Generator* (other than Territory Generation) in any one *settlements period*.

ASPrice = $5.40/MWh (sent out) unless the *Market Operator publishes* a notice amending this price

(c) The *Market Operator* is to determine the ASQuantity as specified in subclause A6.11(b) in accordance with a method contained in a document prepared and duly approved by the relevant *Generators*.

(1) The method specified in this subclause is to be acceptable to the *Market Operator,* whose acceptance cannot be unreasonably withheld.

(2) The document specified in this subclause may be amended from time to time by the *Generators* in accordance with a process agreed by the relevant *Generators*.

(3) The detailed workings in determining the ASQuantity for each *settlements period* are to be made available to the affected *Generators*.

(d) The affected *Generators* are to provide within two *business days* after the end of the *settlements period* the *Market Operator* with sufficient information per *trading interval* in order to determine the ASQuantity.

(1) The *Market Operator* must provide the *Statements of Calculation* to the affected *Generators* within five *business days* after the receipt of the information provided in subclause A6.11(d).

(e) The information calculated in accordance with subclauses A6.11(b) and (c) is to be provided to the relevant *Generators* in the form of a *Statement of Calculation*.

(f) After receipt of a *Statement of Calculation* for a *settlements period*, a *Generator* in surplus must issue an invoice to the *Generator* in deficit for the amount stated in the *Statement of Calculation*

(g) The *Generator* that receives an invoice under subclause A6.11(f) must pay the invoice within thirty calendar days of the date of the invoice.

(h) A *Generator's* right to be paid or credited an amount in an invoice issued in accordance with this subclause A6.11 is enforceable between the relevant parties as a contract.

A6.12 *MARKET INFORMATION*

The *Market Operator* must *publish* the following information as soon as reasonably possible:

(a) *Market Price* for each *trading interval* for the previous *trading day*, or otherwise when available in accordance with clause 4.8(f);

(b) *Monthly* market volume weighted *Market Price* for the *peak period* and *off-peak period*;

(c) *Pre-dispatch schedule* for the previous *trading day*;

(d) Actual dispatch schedule for the previous *trading day*;

(e) Actual *constraints* for each *trading interval* in the previous *trading day*;

(f) Total system demand for each *trading interval* in the previous *trading day*.

(g) The results of the comparison determined in accordance with clause A6.5(c).

ATTACHMENT 7 OUT OF BALANCE WITHIN TENNANT CREEK AND *ALICE SPRINGS POWER SYSTEMS*

This Attachment 7 applies only in respect of the *Tennant Creek power system* and the *Alice Springs power system*.

A7.1 Pricing objectives

When determining guidelines or dispatch arrangements which may affect the prices for any *out of balance energy* services, the Utilities Commission and the *Power System Controller* must ensure that these guidelines and arrangements result in prices which best promote:

(a) the efficient provision of out of balance capacity and *out of balance energy*; and

(b) the efficient operation and ongoing development of a *power system* as a whole.

A7.2 Settlement of *out of balance energy* services

(a) A *Generator* that produces an amount of *energy* different to its *Market Customers'* demand in an *energy usage period* must pay to the *Generator* or *Generators* responsible for providing or purchasing the *energy* difference an amount equal to the product of:

(1) the applicable system imbalance *energy* price; and

(2) the difference between the actual and required amount of *energy*.

(b) Where any *out of balance energy* is produced by *generating plant* in excess of the *plant* necessary to meet the *Generator's* own aggregate *Market Customer load*, the *Generator* that produces less than its *Market Customers'* demand must pay to the *Generator* or *Generators* responsible for providing the necessary additional *generation* capacity an amount equal to the product of:

(1) the applicable system imbalance capacity price; and

(2) the additional *generation* capacity involved.

(c) The *Power System Controller's* assessment of the *out of balance energy* supplied or demanded by a *Generator* must take full account of *network losses* where such losses are:

(1) estimated in accordance with clause A7.5; or

(2) as otherwise determined from time to time by the *Power System Controller*.

(d) The system imbalance prices are to take into consideration:

(1) the type of out-of-balance transfer involved;

(2) the magnitude of the loading or deloading of *generation plant* providing the *out of balance energy*; and

(3) the *time* of *day*, *day* of week and season of the year in which the *out of balance energy* service provision occurred.

(e) Procedures for the settlement of any out of balance virtual payments between the *Generators*, and the role to be played by the *Power System Controller* in the settlement process:

(1) are to be developed by the *Power System Controller* in consultation with licensed *Generators*; and

(2) are subject to the approval of the Utilities Commission.

(f) The Utilities Commission must approve the procedures developed under subclause A7.2(e)(1) only if the Utilities Commission considers the procedures to be consistent with the pricing principles in clause A7.1.

(g) The means of establishing the system imbalance prices referred to in this clause are set out in clauses A7.3 and A7.4.

A7.3 Determination of the system imbalance *energy* price

(a) The system imbalance *energy* price to apply in a particular *energy usage period* will depend upon whether or not dispatch of *generating units* is affected by system *constraint* or system security considerations.

(b) In circumstances where dispatch of *generating units* is unaffected by system *constraint* or system security considerations, the system imbalance *energy* price is to be defined by reference to the marginal operating costs of *generating units* instructed by the *Power System Controller* to deviate from their expected level of output.

(c) In the circumstance applying under clause A7.3(b), the price must be either:

(1) the highest marginal operating cost of any *generating unit* instructed to increase output, in the event that additional *supply* is required; or

(2) the lowest marginal operating cost of any *generating unit* instructed to decrease output, in the event that the market is oversupplied.

(d) Where system *constraints* or system security requirements affect the dispatch of particular *generating units*, the *Power System Controller* is to both:

(1) instruct the dispatch of *generating units*; and

(2) set the associated system imbalance *energy* price, in accordance with *constraints* management and system security procedures approved by the Utilities Commission.

(e) In approving the procedures authorised under clause A7.2(e), the Utilities Commission is to ensure that the procedures and associated pricing are, in the Utilities Commission's opinion, as consistent as is practicable in the circumstances with the efficient operation of a *power system*.

(f) For the purpose of this clause, *Generators* that are on *load* following duty are deemed to be instructed.

A7.4 Determination of the system imbalance capacity price

(a) The system imbalance capacity price to apply in a particular *energy usage period* must be defined by reference to the incremental capital cost of *generating units* instructed by the *Power System Controller* to commence output.

(b) The price must be the highest incremental capital cost of any additional *generating unit* instructed to commence output, in the event that additional *supply* is required.

(c) For the purpose of this clause, *Generators* that are on *load* following duty are deemed to be instructed.

A7.5 *Energy loss factor* formula

(a) The *energy loss factor* for a *connection point* is the factor established by the *Network Operator* pursuant to the *Energy Loss Factor Code*.