System Control Technical Code

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Version History – see Attachment 3
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SECTION 1

1 INTRODUCTION

1.1 AUTHORIZATION

This 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 Participants;
(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 Code;
(f) procedures relating to the inspection of a System Participant’s plant and equipment;
(g) procedures which apply to system tests and work carried out in relation to all or a part of a power system;
(h) coordinate procedures which apply to the commissioning and testing of new plant and equipment connected to a power system;
(i) procedures which apply to the disconnection of plant and equipment from a power system;
(j) procedures relating to the operation of generating units and other plant and equipment as part of or connected to a power system (including the issue of dispatch instructions and compliance with those instructions);
(k) metering and energy settlements requirements in relation to connections;
(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 connections 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 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 Participants:

(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 customers or Network Users of power systems, and/or elements of power systems, that are regulated by the Utilities Commission.

1.4 INTERPRETATION

(a) In this 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 Code shall be interpreted in accordance with the rules of interpretation set out in Attachment 2, unless the contrary intention appears.
(c) If there is conflict in relation to power system security and operational issues and procedures between this Code and the Network Technical Code or any other procedures of System Participants, the requirements of this Code shall prevail. All such conflicts will be dealt with by the Power System Controller and the Network Operator; relevant System Participants will also be consulted.
(d) If there is conflict in relation to market operational issues and procedures between this Code and the Ring Fencing Code, the requirements of the Ring Fencing Code shall prevail. All such conflicts will be dealt with by the Power System Controller and the Utilities Commission; relevant System Participants will also be consulted.
1.5 DISPUTE RESOLUTION

(a) Should a dispute arise between a System Participant and the Power System Controller concerning this 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.

1.6 CONFIDENTIALITY

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

1.7 OBLIGATIONS

1.7.1 Obligations of System Participants

(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.

1.7.2 Obligations of the Network Operator

(a) Network Technical Code outlines the obligations of the Network Operator.

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

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

(2) in accordance with access agreements with another System 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.

1.7.3 Obligations of Generators

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

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

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

(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.

1.7.4 Obligations of the Power System Controller

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

(2) Without limiting paragraph (1), 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, the Electricity Reform Act, the Electricity Reform (Administration) Regulations, 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 customers 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 Participants’ 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.

1.7.5 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.

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

1.8.1 Variations and exemptions to the Code

Various clauses throughout this 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.

1.8.2 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.

1.9 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 voltages 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 networks 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 networks 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 generating unit;

(2) a small generator; or

(3) a small inverter energy system.
(b) Each *generating unit* shall be further classified by the *Power System Controller* as:

1. a scheduled generating unit; or
2. a semi-scheduled generating unit; or
3. a non-scheduled generating unit.

(c) The classification under clause 3.2.3(b) will be informed by the output capability 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.

*Note:* A generating unit that achieves the capabilities specified in Version 4 of the Network Technical Code clauses 3.3.5.14 and 3.3.5.17 would have the capability referenced in clause 3.2.3(c) of this code (SCTC) requiring the generating unit to be classified as a scheduled generating unit in accordance with 3.2.3(b).

(d) Small generators and small inverter energy systems shall be classified as a non-scheduled or semi-scheduled generating unit.

(e) The classification of a generating unit under clause 3.2.3(b) may change from time to time if there is a change in the capability of the relevant generating unit.

*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.

(f) 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 customers 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 events.

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

(a) sufficient supply options available and in service to meet the forecast instantaneous customer demand for electricity;
(b) sufficient fast response supply reserves available either as unused generating plant actually in service (spinning/reducing 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 events

(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 events 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 events 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 events

(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.
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.

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 voltages** remain stable in the disruptions likely under the most *credible contingency scenarios*.

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

(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:

- involuntary load shedding is not occurring;
- involuntary load shedding will not occur if a credible contingency event occurs; and
- 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:

- maintain power system security;
- monitor the operating status of a power system;
- coordinate Network operational personnel in undertaking certain activities and operations and monitoring activities of a power system;
- ensure that High Voltage switching procedures and arrangements are utilised by System Participants to provide adequate protection of a power system;
- assess potential infringement of Power System Operating Procedures which could affect the security of a power system;
- 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;
- assess the impacts of technical and any operational plant on the operation of a power system;
- 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;
- 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;
- 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 events 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 Participants, 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 coordinate 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;

(t) 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. coordinate and direct any rotation of widespread interruption of demand in the event of a major supply shortfall or disruption;

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

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

(1) power system frequencies outside those specified in the definition of satisfactory operating state;
(2) power system voltages outside those specified in the definition of satisfactory operating state;
(3) actual or potential power system instability;
(4) unplanned/unexpected operation of major power system equipment; and

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

3.3.2 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 voltages within the declared standards and limits;
(c) maintaining the stability of a power system;
(d) ensuring that under credible contingency events, 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.
(b) the Network Operator is to ensure that it has the rights prescribed in its access agreements with all un-licenced Network Users that permit the provisions in 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 that Network User.
(d) The Network Operator, in its role as System Participant, shall pass on to un-licenced Network Users relevant information or reports on power system matters that it receives from time to time from 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 access agreements, shall oblige relevant un-licenced Network Users to comply with any operating protocol and arrangements determined from time to time by the Power System Controller in accordance with clause 1.7.4.

(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 compensators, automatic generation control, synchronous condensers, etc.).

(d) Any situation which is not corrected quickly will normally result in automatic operation of generating or transmission equipment protection in an attempt to isolate the problem, but may also require intervention by 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.
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 compensators);
2. AVRs (Automatic Voltage Control systems, 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).

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.

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

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.

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 networks;

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

(e) whether 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 networks.

(b) Threat to secure system

If there is a threat to a secure system, threat to safety of persons or hazard to equipment, then 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 systems 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 systems 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
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 outages 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 stations falls below the alert level.

3.8.3 Definition of alert level

The alert level in respect of a power station is such fuel as would enable all the generating units in the relevant power station to continue to generate at the generated output required in the currently applicable schedule instruction for the next 8 hours (or such shorter time period as is advised by 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 outages affecting the primary fuel supply to a power station, 14 days advanced notice is required.

3.9 SYSTEM CONSTRAINT

3.9.1 Generic system constraint

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

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

(c) To avoid a generic system constraint, 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 networks.

(b) The majority of temporary network constraints 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 customers.

(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 outages

(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 outages 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 FORECASTS

3.11.1 System Participants/Customer 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

(b) electricity generation or load.

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 regions.

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 loading behaviour, immediately such changes become apparent.
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 units.
(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 stations.

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); and
   (6)(7) where practicable, in normal operation, scheduling ancillary services from generating systems operated by Generators (other than Territory Generation) that pay for ancillary services under A6.11 should result in an equivalent or increased dispatch level (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 outages;
   (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;
   (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.
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.

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.

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

(c) 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.

(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 reconnection 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

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 Networks through:
   (1) obligations on the part of Network Users; or under their access agreements; and
   (2) the provision of such facilities by the Network Operator.

(f) Without limitation, such reactive power facilities may include:
   (1) synchronous Generator voltage controls usually associated with tap-changing transformers; or Generator AVR set point control (rotor current adjustment);
   (2) synchronous condensers (compensators);
   (3) static VAR compensators (SVC);
   (4) shunt capacitors;
   (5) shunt reactors; 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 voltages 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 voltages 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 units reactive power output

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

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

(c) Leading power factor capability shall be no less than the limit specified in the Network Technical Code or as specified in the relevant access agreement.
(d) Generators are required to comply with 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 changes voltage regulation mode, such as from ‘automatic’ to ‘manual’ control or an alternate AVR is brought into service; or if any over-excitation limiter or under-excitation limiter has operated, the Generator shall immediately inform 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, coordinate and supervise the conduct of appropriate tests to assess the availability and adequacy of the provision of reactive power devices to control and maintain power system voltages under both satisfactory operating state and contingency event conditions.

5.3 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 customers.
(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 LOADING 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 networks due to excessive network usage.

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

(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 stations that have black start capacity as black start power stations.

(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 days of receiving the amendment notice from the Power System Controller.

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

(h) A Generator may propose changes to Black System Procedures for one or more of its power stations by notice in writing to 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 *networks* or between transmission and distribution systems within an electricity *network*, is a factor determined by the *network provider* for specific transfer locations.

(b) The *Network Operator* shall determine the *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

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 changes.

6.4 APPROVAL OF PERSONNEL

6.4.1 Authorised officers:

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

6.4.2 Electricity officers

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

6.4.3 Registered operators

(a) A System Participant shall maintain a register of individuals authorised to undertake electrical operations at the interface with a High Voltage network or on a High Voltage network, and provide this maintained list to 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).

(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 times:

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

(b) Time of plant outages
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 outages.

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:

   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 logbook 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 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), the standards approved by the Network Operator and endorsed by the Power System Controller relating to numbering, terminology and abbreviations used for information transfer by 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.

(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.

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 customers.

(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 CUSTOMERS**

Embedded customers 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 five working 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 DISCONNECTION FROM THE SYSTEM

6.21.1 Voluntary disconnection

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

(b) A System Participant shall provide a minimum of 30 days’ notice of intention to permanently disconnect a facility unless a shorter period is specified in an access agreement.
(c) A System Participant is entitled, subject to the terms of the relevant access agreement, to require voluntary permanent disconnection of its equipment from 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 Disconnection 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 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

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 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 Participants.
(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 networks 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 six hours affecting more than 200 customers 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 customers 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 six hours affecting more than 200 customers 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 customers 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 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 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.

(b) The Power System Controller shall include in the Incident Reporting Guidelines provisions for advising un-licenced Network Users of power system emergency conditions 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.*
SECTION 8

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 mail 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
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 meters of customers and is as approved by the Utilities Commission.
(d) The charge shall be paid monthly.
**ATTACHMENT 1 GLOSSARY OF TERMS OF THE CODE**

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

<table>
<thead>
<tr>
<th><strong>Access agreement</strong></th>
<th>Means an agreement for the provision of <em>network</em> access services entered into between a <em>Network Operator</em> and a <em>Network User</em> whether under the <em>NT NER</em> or the former Network Access Code or otherwise.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alice Springs power system</strong></td>
<td>The <em>power system</em> located in the <em>region</em> of Alice Springs operated pursuant to licences issued by the Utilities Commission pursuant to Part 3 of the Electricity Reform Act.</td>
</tr>
<tr>
<td><strong>Ancillary services</strong></td>
<td>Refers to the following services provided by <em>Generators</em> or other <em>System Participants</em>: voltage control, reactive power control, frequency control, and <em>black start</em> capability.</td>
</tr>
<tr>
<td><strong>Automatic generation control, generation control, AGC</strong></td>
<td>A <em>generating unit</em> which responds to the regulating signals from the <em>Power System Controller</em> SCADA computing system.</td>
</tr>
<tr>
<td><strong>Automatic reclose equipment</strong></td>
<td>In relation to a power line, the <em>equipment</em> 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.</td>
</tr>
<tr>
<td><strong>Black start capacity</strong></td>
<td>In relation to a <em>generating unit</em>, the ability to start and <em>synchronise</em> without using <em>supply</em> from a <em>power system</em>.</td>
</tr>
<tr>
<td><strong>Black system</strong></td>
<td>The absence of <em>voltage</em> on all or a significant part of the <em>network</em> following a major <em>supply</em> disruption, affecting one or more <em>power stations</em> and a significant number of <em>customers</em>.</td>
</tr>
<tr>
<td><strong>Black System Procedures</strong></td>
<td>The procedures, described under clause 5.7.2 applicable to a <em>Network User</em> or a <em>Generator</em> as procedures approved by the <em>Power System Controller</em> from time to time.</td>
</tr>
<tr>
<td><strong>Black System Restart Procedures</strong></td>
<td>The procedures described in clause 5.7.3 developed by the <em>Power System Controller</em> for the restart of a <em>power system</em> following a <em>black system</em>.</td>
</tr>
<tr>
<td><strong>Busbar</strong></td>
<td>A common <em>connection point</em> in a <em>power station substation</em> or a <em>transmission network substation</em>.</td>
</tr>
<tr>
<td><strong>Business day</strong></td>
<td>Any <em>day</em> other than a Saturday, Sunday, or <em>day</em> that is a public holiday in the City of Darwin.</td>
</tr>
<tr>
<td><strong>Capacitor bank</strong></td>
<td>A type of static electrical <em>equipment</em> used to generate <em>reactive power</em> and therefore support <em>voltage</em> levels on <em>network</em> elements.</td>
</tr>
<tr>
<td><strong>Change</strong></td>
<td>Includes amendment, alteration, addition or deletion.</td>
</tr>
<tr>
<td><strong>Code</strong></td>
<td>This System Control Technical Code, prepared under clause 38(1) of the Electricity Reform Act.</td>
</tr>
<tr>
<td><strong>Commitment and dispatch submission</strong></td>
<td>A notice submitted by a <em>Generator</em> to the <em>Power System Controller</em> relating to the dispatch of a <em>scheduled generating unit</em> in accordance with the requirements of clause4.4B.</td>
</tr>
<tr>
<td><strong>Confidential information</strong></td>
<td>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.</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Connect, connected, connection</strong></td>
<td>Means to establish an effective link via installation of the necessary connection equipment.</td>
</tr>
<tr>
<td><strong>connection point</strong></td>
<td>The point of supply between a Network Operator and a Network User.</td>
</tr>
<tr>
<td><strong>Constraint, constrained</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Contingency</strong></td>
<td>Disconnection or separation, planned or forced, of one or more components from the power system.</td>
</tr>
<tr>
<td><strong>Contingency event</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Control system</strong></td>
<td>Means of monitoring and controlling the operation of the power system or equipment including generating units connected to a network.</td>
</tr>
<tr>
<td><strong>Credible contingency event</strong></td>
<td>A contingency event, the occurrence of which the Power System Controller considers to be reasonably possible as defined in clause 3.2.7.</td>
</tr>
<tr>
<td><strong>Current rating</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Customer</strong></td>
<td>A person who purchases electricity supplied through a network.</td>
</tr>
<tr>
<td><strong>Darwin-Katherine power system</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Day</strong></td>
<td>Unless otherwise specified, the 24 hour period beginning and ending at midnight Australian Central Standard Time.</td>
</tr>
<tr>
<td><strong>Decommission</strong></td>
<td>In respect of a generating unit, ceasing to generate and disconnecting from a network.</td>
</tr>
<tr>
<td><strong>Direction</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Disconnection, disconnect</strong></td>
<td>In respect of a <em>connection point</em>, means to operate switching <em>equipment</em> so as to prevent the transfer of electricity through the <em>connection point</em>.</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Dispatch cost</strong></td>
<td>The cost to the relevant <em>Generator</em> associated with fuel, start-up and variable operation, maintenance and other items of the same nature calculated on the basis that the relevant <em>generating unit</em> will be dispatched during the <em>trading day</em> in accordance with the <em>Generator's</em> expectation.</td>
</tr>
<tr>
<td><strong>Dispatch instruction</strong></td>
<td>An instruction given to a <em>Generator</em> pursuant to clause 4.7 to <em>synchronise</em>, desynchronise, <em>supply ancillary services</em> including <em>spinning reserve</em> or <em>supply energy</em>.</td>
</tr>
<tr>
<td><strong>Distribution system</strong></td>
<td>That part or those parts of the electricity <em>network</em> used for transporting electricity at nominal <em>voltages</em> of less than 66kV and at a nominal <em>frequency</em> of 50Hz.</td>
</tr>
<tr>
<td><strong>Economic dispatch</strong></td>
<td>The dispatch of <em>generating units</em> that minimises production cost, given <em>generating unit</em> and <em>network constraints</em>.</td>
</tr>
<tr>
<td><strong>Electricity market</strong></td>
<td>The <em>electricity market</em> in its various stages (such as the <em>I-NTEM</em>).</td>
</tr>
<tr>
<td><strong>Electricity Reform Act</strong></td>
<td>The <em>Electricity Reform Act 2000</em> (NT)</td>
</tr>
<tr>
<td><strong>Embedded generator</strong></td>
<td>A generator which supplies on-site <em>loads</em> or distribution <em>network loads</em> and is <em>connected</em> either indirectly (i.e. via the distribution network) or directly to the <em>transmission network</em>.</td>
</tr>
<tr>
<td><strong>Emergency</strong></td>
<td>Any abnormal system condition which required immediate manual or automatic action to prevent loss of <em>load</em>, <em>equipment</em> damage, or tripping of system elements which might result in cascading and to restore the system to a <em>satisfactory operating state</em>.</td>
</tr>
<tr>
<td><strong>Emergency ratings</strong></td>
<td>In respect of a <em>transmission</em> line, <em>transformer</em> or other element of <em>equipment</em> on a <em>power system</em>, a rating in excess of the continuous capacity of the <em>equipment</em> which may be safely used for limited periods or in specified weather conditions. <em>Emergency ratings</em> are advised by the <em>Network Operator</em> in accordance with clause 5.6(c).</td>
</tr>
<tr>
<td><strong>Energise, energisation</strong></td>
<td>The act of operation of switching <em>equipment</em> or the start-up of a <em>generating unit</em>, which results in there being a non-zero <em>voltage</em> beyond a <em>connection point</em> or part of the <em>network</em>.</td>
</tr>
<tr>
<td><strong>Energy</strong></td>
<td>Active <em>energy</em> and/or reactive <em>energy</em>.</td>
</tr>
<tr>
<td><strong>Energy balancing</strong></td>
<td>In respect of operation in the <em>Tennant Creek power system</em> and the <em>Alice Springs power system</em>, reconciliation of metered electricity provided to the <em>power system</em> by a <em>Generator</em> and the metered take of its contracted <em>customers</em> adjusted for <em>network energy losses</em>.</td>
</tr>
<tr>
<td><strong>Energy loss factor</strong></td>
<td>The amount determined in accordance with clause A6.3.</td>
</tr>
<tr>
<td><strong>Energy Loss Factor Code</strong></td>
<td>The most recently published version of the document entitled <em>Northern Territory Energy Loss Factor Code</em> prepared and published by the <em>Utilities Commission</em>.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Energy usage period</strong></td>
<td>A time interval defined for reconciliation of energy usage, e.g. 15 minutes.</td>
</tr>
<tr>
<td><strong>Entry point</strong></td>
<td>A connection point at which electricity is more likely to be transferred to the electricity network than to be transferred from the electricity network.</td>
</tr>
<tr>
<td><strong>Exit point</strong></td>
<td>A connection point at which electricity is more likely to be transferred from the electricity network than to be transferred to the electricity network.</td>
</tr>
<tr>
<td><strong>Facility</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Fast start</strong></td>
<td>Generating units for which the Power System Controller determines whether to synchronise (or de-synchronise) the unit to a power system.</td>
</tr>
<tr>
<td><strong>Fault level</strong></td>
<td>The current that will flow to a fault on an item of plant when maximum system conditions prevail.</td>
</tr>
<tr>
<td><strong>Financial year</strong></td>
<td>A period commencing on 1 July in one calendar year and terminating on 30 June in the following calendar year.</td>
</tr>
<tr>
<td><strong>Forced outage</strong></td>
<td>System element not in operation due to breakdowns, storms or other unplanned occurrences.</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>For alternating current electricity, the number of cycles occurring in each second. The term Hertz (Hz) corresponds to cycles per second.</td>
</tr>
<tr>
<td><strong>Frequency operation standards</strong></td>
<td>The frequency standards set out in clause 5.3.1.</td>
</tr>
<tr>
<td><strong>Generated</strong></td>
<td>In relation to a generating unit, the amount of electrical energy produced by the generating unit as measured at its terminals.</td>
</tr>
<tr>
<td><strong>Generating plant</strong></td>
<td>In relation to a connection point, includes all equipment involved in generating electrical energy.</td>
</tr>
<tr>
<td><strong>Generating system</strong></td>
<td>A system comprising one or more generating units connected to a Network at a single connection point. A system comprising one or more generating units and that includes auxiliary or reactive plant that is located on the Generator’s side of the connection point and is necessary for the generating system to meet its performance standards.</td>
</tr>
<tr>
<td><strong>Generating unit</strong></td>
<td>The actual Generator plant used in the production of electricity and all the related equipment essential to the generating unit’s operation and its functioning as a single entity.</td>
</tr>
<tr>
<td><strong>Generator</strong></td>
<td>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-</td>
</tr>
</tbody>
</table>
**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 lines* 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*, 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 networks* in adjacent regions.

**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 events* or shortages of *supply*.

**Load**

The amount of electrical *energy* delivered at a defined instant at a connection point or aggregated over a group of connection points.

**Load 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.
<table>
<thead>
<tr>
<th><strong>Market Participant</strong></th>
<th>A <em>Generator</em> or <em>Market Customer</em> who registers for participation in the <em>electricity market</em>.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Market Price</strong></td>
<td>The price determined for each <em>trading interval</em> in accordance with clause 4.8 and the methodology provided in Attachment 5.</td>
</tr>
<tr>
<td><strong>Market Price Principle</strong></td>
<td>The principle set out in clause 4.8(b).</td>
</tr>
<tr>
<td><strong>Minor reportable incident</strong></td>
<td>Unless otherwise specified, the period beginning at 12.00 am on the &quot;relevant commencement date&quot; and ending at 12.00 am on the date in the &quot;next calendar month&quot; corresponding to the commencement date of the period. If the &quot;relevant commencement date&quot; is the 29th, 30th or 31st and this date does not exist in the &quot;next calendar month&quot;, then the end date in the &quot;next calendar month&quot; shall be taken as the last day of that month.</td>
</tr>
<tr>
<td><strong>Month</strong></td>
<td>The <em>connection</em> assets and <em>network system assets</em> which together are operated by the <em>network provider</em> for the purposes of transporting electricity from <em>Generators of electricity</em> to a transfer point or to consumers of electricity.</td>
</tr>
<tr>
<td><strong>Network energy losses</strong></td>
<td>The energy loss incurred in the transportation of electricity from an <em>entry point</em> or transfer point to an <em>exit point</em> or another transfer point on a network.</td>
</tr>
<tr>
<td><strong>Network Operator</strong></td>
<td>A <em>person</em> defined as a &quot;network provider&quot; under section 4(1) of the <em>Electricity Reform Act</em> as in force at 1 June 2019.</td>
</tr>
<tr>
<td><strong>Network Technical Code</strong></td>
<td>The Code specified in the <em>Electricity Reform Act</em> and prepared by Power and Water under its <em>Network Licence</em> in accordance with the <em>Electricity Reform (Administration) Regulations</em>.</td>
</tr>
<tr>
<td><strong>Network User</strong></td>
<td>Any person or body that has entered into an <em>access connection agreement</em> with the <em>Network Operator</em> to convey electricity from an <em>entry point</em> to an <em>exit point</em>.</td>
</tr>
<tr>
<td><strong>Nomenclature, nomenclature standards</strong></td>
<td>The principles relating to numbering, terminology and abbreviations used for information transfer by <em>System Participants</em> and <em>Network Users</em> in accordance with clause 6.14.</td>
</tr>
<tr>
<td><strong>Non-scheduled generating unit</strong></td>
<td>A <em>generating unit</em> which is classified by the <em>Power System Controller</em> as non-scheduled in accordance with clause 3.2.3(b) or as defined in clause 3.2.3(ed).</td>
</tr>
<tr>
<td><strong>Non-credible contingency event</strong></td>
<td>A <em>contingency event</em> other than a <em>credible contingency event</em> as defined in clause 3.2.7.</td>
</tr>
<tr>
<td><strong>Normal operating frequency band</strong></td>
<td>In relation to the <em>frequency</em> of the <em>power system</em>, means the range specified in clause 5.3.1(a).</td>
</tr>
<tr>
<td><strong>NT NER</strong></td>
<td>The <em>National Electricity Rules</em> as applicable in the <em>Northern Territory</em>.</td>
</tr>
<tr>
<td><strong>Off-peak period</strong></td>
<td>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...</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Operating protocol</td>
<td>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.</td>
</tr>
<tr>
<td>Operational communication</td>
<td>A communication concerning the arrangements for or actual operation of a power system in accordance with the Code.</td>
</tr>
<tr>
<td>Out of balance energy</td>
<td>The difference between the metered electricity provided by a Generator and the metered consumption of electricity by its contracted customers adjusted for network energy losses. Out of balance energy can be in surplus or deficit.</td>
</tr>
<tr>
<td>Outage</td>
<td>Any planned or unplanned full or partial unavailability of plant or equipment, inclusive of performance issue outages.</td>
</tr>
<tr>
<td>Over supplied market</td>
<td>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.</td>
</tr>
<tr>
<td>Peak period</td>
<td>The 12 hour period ending at 1800 hours on a weekday (note that a public holiday is classified as a weekday for this definition).</td>
</tr>
<tr>
<td>Performance issue outages</td>
<td>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.</td>
</tr>
<tr>
<td>Planned outage</td>
<td>System elements not in operation due to planned maintenance or other planned occurrences</td>
</tr>
<tr>
<td>Plant, equipment</td>
<td>Includes all equipment involved in generating, utilising or transmitting electrical energy.</td>
</tr>
<tr>
<td>Post-trip management</td>
<td>The maintenance of system security in the aftermath of trips.</td>
</tr>
<tr>
<td>Power and Water Corporation</td>
<td>The body corporate established under the Government Owned Corporations Act.</td>
</tr>
<tr>
<td>Power factor</td>
<td>The ratio of the active power to the apparent power at a point.</td>
</tr>
<tr>
<td>Power flow</td>
<td>A generic term used to describe the type, direction, and magnitude of actual or simulated electrical power flows on electrical systems.</td>
</tr>
<tr>
<td>Power station</td>
<td>In relation to a Generator, a facility in which any of that Generator's generating units are located.</td>
</tr>
<tr>
<td>Power system</td>
<td>The generation facilities and electricity network facilities which together are integral to the supply of electricity, operated as an integrated arrangement.</td>
</tr>
<tr>
<td>Power System Controller</td>
<td>The entity licenced by the Utilities Commission pursuant to section 30 of the Electricity Reform Act.</td>
</tr>
</tbody>
</table>
| 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
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>a power system or connection points</td>
<td>as described in clause 6.1.</td>
</tr>
<tr>
<td><strong>Power system security</strong></td>
<td>The safe scheduling, operation and control of a power system on a continuous basis in accordance with the principles set out in clause 3.3</td>
</tr>
<tr>
<td><strong>Power system stabiliser</strong></td>
<td>An auxiliary control device connected to an excitation control system to provide additional feedback signals to reduce power system oscillations.</td>
</tr>
<tr>
<td><strong>Power transfer</strong></td>
<td>The instantaneous rate at which active energy is transferred between connection points.</td>
</tr>
<tr>
<td><strong>Pre-dispatch schedule</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Protection system</strong></td>
<td>A system which includes all the protection schemes applied to the system.</td>
</tr>
<tr>
<td><strong>Publish, publishing, publication</strong></td>
<td>The provision of a document in the public domain that can be readily accessed by the general public.</td>
</tr>
<tr>
<td><strong>Quality of supply</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Reactive plant</strong></td>
<td>Plant which is normally specifically provided to be capable of providing and/or absorbing reactive power.</td>
</tr>
<tr>
<td><strong>Reactive power</strong></td>
<td>The rate at which reactive energy is transferred.</td>
</tr>
<tr>
<td><strong>Reactive power</strong></td>
<td>Reactive power is a necessary component of alternating current electrical power which is separate from active power and is predominantly consumed in the creation of magnetic fields in motors and transformers and produced by plant such as:</td>
</tr>
<tr>
<td></td>
<td>(a) alternating current Generators;</td>
</tr>
<tr>
<td></td>
<td>(b) capacitors, including the capacitive effect of power lines; or</td>
</tr>
<tr>
<td></td>
<td>(c) synchronous condensers.</td>
</tr>
<tr>
<td><strong>Reactive power capability</strong></td>
<td>The maximum rate at which reactive energy may be transferred from a generating unit to a connection point as specified in an access agreement.</td>
</tr>
<tr>
<td><strong>Reactive power reserve</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Reactor</strong></td>
<td>A device, similar to a transformer, specifically arranged to be connected into the network during periods of low load demand or low reactive power demand to counteract the natural capacitive effects of long transmission lines in generating excess reactive power and so correct any voltage effects during these periods.</td>
</tr>
<tr>
<td><strong>Recall time</strong></td>
<td>The lead-time specified on an outage request that the plant can be restored to service.</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td>An area determined by the <strong>Network Operator</strong>, being an area served by a particular part of the <strong>transmission network</strong> containing one or more major <strong>load centres or generation centres or both.</strong></td>
</tr>
<tr>
<td><strong>Registered operator</strong></td>
<td>A person approved by the <strong>Power System Controller</strong> to operate <strong>power system equipment.</strong></td>
</tr>
<tr>
<td><strong>Regulating reserve</strong></td>
<td>The capability of a <strong>Generator or Generators</strong> to provide the marginal increase or decrease of <strong>power system demand.</strong></td>
</tr>
<tr>
<td><strong>Regulating unit</strong></td>
<td><strong>Generating plant</strong> arranged by the <strong>Power System Controller</strong> and specifically allocated to <strong>frequency regulating duty.</strong> Such <strong>plant</strong> can be automatically controlled or directed by the <strong>Power System Controller</strong> to ensure that all normal <strong>load</strong> variations do not result in <strong>frequency</strong> deviations outside designated limits as specified in the System Control Technical Code.</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>The probability of a system, device, <strong>plant or equipment</strong> performing its function adequately for the period of <strong>time</strong> intended, under the operating conditions encountered.</td>
</tr>
<tr>
<td><strong>Reliable</strong></td>
<td>The expression of a recognised degree of confidence in the certainty of an event or action occurring when expected.</td>
</tr>
<tr>
<td><strong>Reliable operating state</strong></td>
<td>In relation to a <strong>power system</strong>, has the meaning given in clause 3.2.11.</td>
</tr>
<tr>
<td><strong>Remote monitoring facilities</strong></td>
<td><strong>Equipment</strong> installed to enable monitoring of a <strong>facility</strong> from a control centre, including a remote terminal unit (RTU).</td>
</tr>
<tr>
<td><strong>Reportable incident</strong></td>
<td>A <strong>power system</strong> event that had, or could have had, a significant effect on the security or <strong>reliability of supply</strong>, as defined in clause 7.3.1.</td>
</tr>
<tr>
<td><strong>Reserve, reserves</strong></td>
<td>The active power and <strong>reactive power</strong> available to a <strong>power system</strong> at a nominated <strong>time</strong> but not currently utilised.</td>
</tr>
<tr>
<td><strong>Revenue energy meter</strong></td>
<td>A device complying with Australian Standards which measures and records the production or consumption of electrical <strong>energy</strong> that is used for obtaining the primary source of revenue metering data.</td>
</tr>
<tr>
<td><strong>Ring Fencing Code</strong></td>
<td>The Northern Territory Electricity Ring-Fencing Code made by the <strong>Utilities Commission</strong> pursuant to section 24 of the <strong>Utilities Commission Act.</strong></td>
</tr>
<tr>
<td><strong>Satisfactory operating state</strong></td>
<td>In relation to a <strong>power system</strong>, has the meaning given in clause 3.2.6.</td>
</tr>
<tr>
<td><strong>SCADA system</strong></td>
<td><strong>Supervisory control and data acquisition equipment</strong> which enables the <strong>Power System Controller</strong> to continuously and remotely monitor, and to a limited extent control, the import or export of electricity from or to a <strong>power system.</strong></td>
</tr>
<tr>
<td><strong>Scheduled generating unit</strong></td>
<td>A <strong>generating unit</strong> which is dispatched/classified by the <strong>Power System Controller</strong>; as scheduled in accordance with clause 3.2.3(b).</td>
</tr>
<tr>
<td><strong>Secure system, secure</strong></td>
<td>In relation to a <strong>power system</strong> has the meaning given in clause</td>
</tr>
<tr>
<td><strong>operating state</strong></td>
<td>3.2.9.</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>Secure System Guidelines</strong></td>
<td>The guidelines prepared by the <em>Power System Controller</em> which contains the principles specified in clause 3.5.1.</td>
</tr>
<tr>
<td><strong>Security Constrained Economic Dispatch</strong></td>
<td><em>Economic Dispatch</em> which achieves a <em>secure operating state</em>.</td>
</tr>
<tr>
<td><strong>Self-commitment, Self-committed</strong></td>
<td><em>Generating units</em> for which the <em>Generator</em> makes the (primary) decision to <em>synchronise</em> (or de-<em>synchronise</em>) the unit to a power system (subject to permission to proceed from the <em>Power System Controller</em>).</td>
</tr>
<tr>
<td><strong>Semi-scheduled generating unit</strong></td>
<td>A <em>generating unit</em> which is classified by the <em>Power System Controller</em> as semi-scheduled in accordance with 3.2.3(b).</td>
</tr>
<tr>
<td><strong>Settlements</strong></td>
<td>The activity of producing virtual invoices and virtual credit notes for <em>Market Participants</em>.</td>
</tr>
<tr>
<td><strong>Settlements period</strong></td>
<td>For the <em>I-NTEM</em>, a period of one calendar <em>month</em>.</td>
</tr>
<tr>
<td><strong>Single credible fault</strong></td>
<td>A <em>single credible fault</em> considered by the <em>Power System Controller</em>, in particular circumstances, to have the potential for the most significant impact on a <em>power system</em> at that <em>time</em>. This would generally be the instantaneous loss of the largest <em>generating unit</em> or a fault on a major <em>network</em> element on a <em>power system</em>. Under normal conditions, the design or operation of the relevant part of a <em>power system</em> would adequately cater for a <em>single credible fault</em>, so as to avoid significant disruption to <em>power system security</em>.</td>
</tr>
<tr>
<td><strong>Spinning reserve</strong></td>
<td>The ability to immediately and automatically increase <em>generation</em> or reduce demand in response to a fall in <em>frequency</em>.</td>
</tr>
<tr>
<td><strong>SPRINT</strong></td>
<td><em>SPRay INTercooling</em>, a technique used in turbine engines to enhance the efficiency and output of the engine.</td>
</tr>
<tr>
<td><strong>Stand-by power, generation</strong></td>
<td>The amount of electrical <em>energy</em> which could be supplied to a <em>load</em> user in accordance with the terms of a <em>stand-by generation</em> agreement.</td>
</tr>
<tr>
<td><strong>Statement of Calculation</strong></td>
<td>A document of 1 page or more that carries the information specified in clauses A6.10 and A6.11 applicable to the relevant <em>Market Participant</em>.</td>
</tr>
<tr>
<td><strong>Static VAR compensator</strong></td>
<td>A device specifically provided on a <em>network</em> to provide the ability to generate and absorb <em>reactive power</em> and to respond automatically and rapidly to <em>voltage</em> fluctuations or <em>voltage instability</em> arising from a disturbance or disruption on the <em>network</em>.</td>
</tr>
<tr>
<td><strong>Substation</strong></td>
<td>A <em>facility</em> at which lines are switched for operational purposes. May include one or more <em>transformers</em> so that some <em>connected</em> lines operate at different nominal <em>voltages</em> to others.</td>
</tr>
<tr>
<td><strong>Supply</strong></td>
<td>The delivery of electricity.</td>
</tr>
<tr>
<td><strong>Synchronise</strong></td>
<td>The act of <em>synchronising</em> a <em>generating unit</em> to a <em>power system</em>.</td>
</tr>
<tr>
<td><strong>Synchronising, synchronisation</strong></td>
<td>To electrically <em>connect</em> a <em>generating unit</em> to a <em>power system</em>.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Synchronous condensers</strong></td>
<td>Plant, similar in construction to a <em>generating unit</em> of the synchronous <em>Generator</em> category, which operates at the equivalent speed of the <em>frequency</em> of a <em>power system</em>, specifically provided to generate or absorb <em>reactive power</em> through the adjustment of excitation current.</td>
</tr>
<tr>
<td><strong>Synchronous Generator voltage control</strong></td>
<td>The automatic <em>voltage control system</em> of a <em>generating unit</em> of the synchronous <em>Generator</em> category which <em>changes</em> the output <em>voltage</em> of the <em>generating unit</em> through the adjustment of the <em>Generator</em> excitation current and effectively <em>changes</em> the <em>reactive power</em> output from that <em>generating unit</em>.</td>
</tr>
<tr>
<td><strong>Synchronous Generator</strong></td>
<td>The alternating current <em>Generators</em> which operate at the equivalent of the <em>frequency</em> of a <em>power system</em> in its <em>satisfactory operating state</em>.</td>
</tr>
<tr>
<td><strong>System Participant</strong></td>
<td>A person or body, licensed by the Utilities Commission, who inputs, transports, controls, operates or takes electricity from any part of a <em>power system</em>.</td>
</tr>
<tr>
<td><strong>Tap-changing transformer</strong></td>
<td>A <em>transformer</em> with the capability to allow internal adjustment of output <em>voltages</em> which can be automatically or manually initiated and which is used as a major component in the control of the <em>voltage</em> of the <em>networks</em> in conjunction with the operation of <em>reactive plant</em>.</td>
</tr>
<tr>
<td><strong>Tennant Creek Power System</strong></td>
<td>The <em>power system</em> located in the <em>region</em> of Tennant Creek operated pursuant to licences issued by the Utilities Commission pursuant to Part 3 of the Electricity Reform Act.</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>Central Australian Standard Time, as defined by the <em>National Measurement Act</em>.</td>
</tr>
<tr>
<td><strong>Transformer</strong></td>
<td>A <em>plant</em> or device that reduces or increases the <em>voltage</em> of alternating current.</td>
</tr>
<tr>
<td><strong>Trading interval</strong></td>
<td>A 30 minute period ending on the hour (Australian Central Standard Time) or on the half hour and, where identified by a <em>time</em>, means the 30 minute period ending at that <em>time</em>.</td>
</tr>
<tr>
<td><strong>Trading day</strong></td>
<td>The 24 hour period ending at 0400 hours on a calendar <em>day</em>.</td>
</tr>
<tr>
<td><strong>Transaction Reference Point</strong></td>
<td>The <em>connection point</em> on the <em>Power and Water Corporation</em>’s <em>electricity network</em> that relates to a <em>Market Customer</em>’s <em>supply</em> of electricity.</td>
</tr>
<tr>
<td><strong>Transmission, transmission system</strong></td>
<td>Activities pertaining to a <em>transmission network</em> including the conveyance of electrical <em>energy</em>.</td>
</tr>
<tr>
<td><strong>Transmission capacity</strong></td>
<td>The capacity of the <em>transmission network</em> to transmit power between two or more points under the full range of operating conditions likely to be experienced in service.</td>
</tr>
<tr>
<td><strong>Transmission line</strong></td>
<td>A power line that is part of a <em>transmission network</em>.</td>
</tr>
<tr>
<td><strong>Transmission network</strong></td>
<td>That part or those parts of the electricity <em>network</em> used for transmitting electricity at nominal <em>voltages</em> of 66kV or higher and at a nominal <em>frequency</em> of 50Hz.</td>
</tr>
<tr>
<td><strong>Under supplied market</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Unit commitment</strong></td>
<td>Contained in the definition of Dispatch Instruction, as part of the synchronisation process.</td>
</tr>
<tr>
<td><strong>Unit de-commitment</strong></td>
<td>Contained in the definition of Dispatch Instruction, as part of the de-synchronisation process.</td>
</tr>
<tr>
<td><strong>Unit protection</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Unplanned outage</strong></td>
<td>Outages of system element not notified in advance to the Power System Controller.</td>
</tr>
<tr>
<td><strong>Virtual Settlements Statement</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>The electronic force or electric potential between two points that gives rise to the flow of electrical energy.</td>
</tr>
<tr>
<td><strong>Voltage control</strong></td>
<td>Keeping network voltages within operational limits in normal operation and in the aftermath of trips by automatic regulation of generation MVAr output or by voltage control equipment such as capacitor banks and automatic tap-changers.</td>
</tr>
<tr>
<td><strong>Wet Mode</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>
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-NTM*.

**Version 6 Consultation Draft December 2018 [To be completed when changes approved]**

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. 2.3(b): Restructuring for clarity.
- 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. Various changes to better align with NTC and NT NER definitions.
  - Changes to: Code, dispatch instruction, embedded generator, nomenclature, network energy losses, Network User.
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).

<table>
<thead>
<tr>
<th>Primary order index</th>
<th>Standard Unit ID</th>
<th>Self-commitment units</th>
<th>Fast start units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Number of units</td>
<td>Time of start (off-line)</td>
<td>T1: Time to start</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time of stop (on-line)</td>
<td>T2: Time to reform load</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B1: minimum stable load</td>
<td>T3: Minimum run time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B2: incremental capacity</td>
<td>T4: Time to reduce to zero</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B2 OFFER</td>
<td>B3 OFFER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B3 OFFER</td>
<td>Total offered capacity (check)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>hh:mm</th>
<th>MW/$/MWh</th>
<th>MW</th>
<th>MW/$/MWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>00</td>
<td>0</td>
<td>0</td>
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<td>2</td>
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<td>23</td>
<td>00</td>
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<tr>
<td>24</td>
<td>00</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Band totals: 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:
\[ GP = MP \times MSO \times LF(G) \]

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:
\[ MCP = MP \times MCM \times LF(C) \]

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:

\[
\text{Generator revenue} = \text{Pool price} \times \text{Generator sent out volume} = \text{Pool price} \times \text{customer meter vol} / (1 - \text{Loss factor})
\]

AND

Referring meter volumes to the Transaction reference point

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

\[
\text{JACint} = \text{Jacana customers supplied under contestable contracts i.e excluding Jacana customers with interval meters remaining on franchise tariff (x200)}
\]

\[
\text{JACint meter vol} = \text{sum of } \sim 200 \text{ interval meters (split into (the four) loss factor regions)}
\]

The only unknown volume is J+IES and it must be calculated by difference

\[
\text{J+IES meter vol at Transaction ref pt} = [\text{Total generators sent out (SCADA data) vol} - \text{JACint(D-HV) meter vol}/(1-\text{Loss(D-HV)}) - \text{JACint(D-LV) meter vol}/(1-\text{Loss(D-LV)}) - \text{JACint(K-HV) meter vol}/(1-\text{Loss(K-HV)}) - \text{JACint(K-LV) meter vol}/(1-\text{Loss(K-LV)}) - \text{R(D-HV) meter vol}/(1-\text{Loss(D-HV)}) - \text{R(D-LV) meter vol}/(1-\text{Loss(D-LV)}) - \text{R(K-HV) meter vol}/(1-\text{Loss(K-HV)}) - \text{R(K-LV) meter vol}/(1-\text{Loss(K-LV)})] \times 1 - \text{Loss(Jav)}
\]

THEREFORE

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

Where Jav is the average weighted loss factor of the non-accumulation meters (assumed at LV only)

for Darwin and Katherine systems

\[
\text{Retailer payments} = \text{Sum}[\text{R(D-HV) meter vol} \times \text{Pool price}/(1-\text{Loss(D-HV)}) + \text{R(D-LV) meter vol} \times \text{Pool price}/(1-\text{Loss(D-LV)}) + \text{R(K-HV) meter vol} \times \text{Pool price}/(1-\text{Loss(K-HV)}) + \text{R(K-LV) meter vol} \times \text{Pool price}/(1-\text{Loss(K-LV)})]
\]

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:

\[
\text{Figure A6.2 – second part of the calculations for Jacana Energy consumption data}
\]
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:

\[
\text{Payment} = \text{ASQuantity} \times \text{ASPrice}
\]

Where:

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

\[
\text{ASPrice} = \$5.40/\text{MWh (sent out)} \text{ unless the Market Operator publishes a notice amending this price}
\]

(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.