

D11/88008
Network Management Plan

March 2011



Document History

Issue No.	Date	Approved By	Summary of Changes
1*	Feb 2009	EGM – System Planning & Regulation	New combined Network Management Plan updated as required under Electricity Supply (Safety and Network Management) Regulation 2008
2	Feb 2011	EGM – System Planning & Regulation	Updated and revised in line with requirement for biennial review under Electricity Supply (Safety and Network Management) Regulation 2008
3	Mar 2011	EGM – System Planning & Regulation	Prior to 1 March 2011 Ausgrid was named EnergyAustralia. The document was amended to reflect the name change.

* NB. Prior to February 2009, the four chapters of this Network Management Plan were contained in four separate documents: the Network Management Plan; the Customer Installation Safety, the Public Electrical Safety Awareness Plan and the Bush Fire Risk Management Plan. Chapter one: network safety and reliability was previously called the Network Management Plan. All four documents have been brought together as required by the Electricity Supply (Safety and Network Management) Regulation 2008.

Warning

It is illegal for persons other than licensed electricians, or persons authorised by legislation, to work on the fixed wiring of any electrical installation. Penalties for conviction are severe.

Ausgrid may amend this document at any time. It is the responsibility of the user of this document to ensure that only the current version is being used

Duration and Availability of this Plan

This Plan covers the period from 2009 to 2014, to align with the regulatory period. This Plan will be regularly reviewed against legislation and regulations applicable to distribution and transmission network service providers, industry standards, Ausgrid's strategic plans and relevant internal policies, procedures and standards and our regulatory determination.

In accordance with the NSW Electricity Supply (Safety and Network Management) Regulation 2008, this Plan will be made available to all stakeholders who are likely to be involved in its implementation.

This Network Management Plan is available on Ausgrid's website (www.ausgrid.com.au). Printed copies of this Plan are available at Ausgrid's principal office – 570 George Street, Sydney NSW 2000.

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Published and printed by Ausgrid

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Introduction to Ausgrid's Network Management Plan

Under the Electricity Supply (Safety and Network Management) Regulation 2008 (the Regulation) Ausgrid must, if required to do so by the Director-General of NSW Industry and Investment (the Director-General) prepare, lodge and implement a Network Management Plan consisting of the following four chapters:

1. Network safety and reliability;
2. Customer installation safety;
3. Public electrical safety awareness; and
4. Bush fire risk management

In December 2010, the Director-General notified Ausgrid that it should review and if necessary revise its Network Management Plan and lodge it in the first half of 2011. This Plan, which comprises the four chapters stipulated in the Regulation, has been prepared accordingly.

The Director-General's requirements

Among his specific requirements, the Director-General indicated that in developing and implementing its revised Network Management Plan, Ausgrid should incorporate the most recent version of particular codes, standards or guidelines. This has been done and those codes, standards or guidelines are included (among other documents also incorporated in the Plan) in Section 10 of Chapter 1, Section 9 of Chapter 2 and Section 10 of Chapter 4.

The Director-General also stipulated that in describing its asset management strategies as required by clause 9(2)(d) of the Regulation, the Network Management Plan should address the level to which its asset management strategies conform with the principles of Total Asset Management set out in the Premier's Memorandum No 2002 – 10. . This is addressed in section 5.1 which includes mapping of Ausgrid's Asset Management documents to the requirements of the NSW Total Asset Management (TAM) Manual

The Director-General also referred to the provisions of clause 14(1)(a) of the Regulation, which requires that the Network Management Plan be reviewed and revised after any significant change occurs. He drew particular attention to the relevant provisions of the National Electricity Law covering Demand Management, stating that he expects that they will be adopted when they are issued in lieu of the NSW Code of Practice. Demand Management is addressed in Chapter 1 of the Network Management Plan.

From 1 March 2011, EnergyAustralia's network business was named Ausgrid; this Plan has been updated to reflect this new brand.

Significant changes since the last Network Management Plan

There have been no 'significant changes' that have occurred since Ausgrid last revised its Network Management Plan in 2009. The Network Management Plan 2011 has been revised and updated where appropriate in line with the requirements under the Electricity Supply (Safety and Network Management) Regulation 2008.

In 2010, the Electricity Supply Act was amended to make it mandatory for network operators to belong to "Dial Before You Dig", a community service which provides information on the location of underground assets. Ausgrid has been a member of Dial Before You Dig since 1996. It is now one of the conditions of Ausgrid's network licence that it is a member of Dial Before You Dig" and complies with its membership obligations relating to the provision of information to the public. Before the relevant legislative amendments commenced, Ausgrid reviewed its "Dial Before you Dig" procedures and made some revisions to its excavation guidelines.

In 2010, in connection with the commencement of the Australian Consumer Law, Ausgrid's Standard Form Customer Connection Contract was reviewed and amended to ensure compliance. During the currency of this Network Management Plan, extensive work will be undertaken to develop a connection contract or contracts that will comply with the provisions of the new National Electricity Retail Law.

Model national work safe laws are expected to be in operation by December 2011, when each jurisdiction will have enacted their own laws that mirror the national model laws. Before its next Network Management Plan is prepared, Ausgrid will review its current workplace procedures for compliance with the new legislation.

Ausgrid's commitment to safety

Ausgrid is committed to ensuring the safe operation of its network and to providing a reliable and safe supply of electricity to all its customers. It gives the highest priority to safety issues, including network safety and security, environmental, workplace and public safety, bushfire risk and the safety of the customer installations connected to the Ausgrid network.

Subject always to its paramount commitment to safety, Ausgrid's network planning objective is to comply with the many legislative and regulatory obligations that apply to infrastructure development and maintenance while at the same time efficiently managing the financial performance of its business as a network operator.

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Chapter 1 Network Safety and Reliability Plan

March 2011



1 Overview of chapter 1

1.1 Network management objectives

The purpose of chapter 1 of the Network Management Plan (Plan) is to provide a network management framework for ensuring Ausgrid's network provides an adequate, reliable and safe supply of electricity of appropriate quality.

Ausgrid is committed to ensuring the safe operation of its network and gives priority to safety issues, including workplace and public safety, over all other aspects of network management.

Ausgrid's network planning balances the need to meet applicable legislative and regulatory requirements with our wider organisational objectives and business responsibilities, including meeting customer expectations of a reliable and safe supply of electricity, managing safety, environmental and security risks associated with our network infrastructure, and managing the financial performance of the business.

To deliver these objectives, Ausgrid's network plan focuses on two key areas. These are:

1. Maintaining compliant infrastructure – Achieving this objective involves management of safety, environmental and infrastructure security risk in relation to Ausgrid's network. The various environmental, safety and asset security obligations applicable to Ausgrid's network, and to the services Ausgrid provides as an electricity distributor, have been taken into account in developing Ausgrid's network management strategies. These include obligations under regulatory instruments including the Electricity Supply (Safety and Network Management) Regulation 2008.
2. Network performance – Overall network performance is impacted by the performance of individual assets, the number of new customer connections required, and the extent of any imbalance between demand for electricity and supply.

In meeting these two objectives, Ausgrid targets its investment expenditure to ensure that network performance and compliance outcomes are achieved in a manner that is efficient and prudent, and in accordance with this Plan and all regulatory and other obligations applicable to Ausgrid as an electricity distributor. Ausgrid's network planning processes and asset management strategies reflect and support these objectives.

1.2 Scope of this chapter

This Chapter has been prepared in accordance with the requirements of the Electricity Supply (Safety and Network Management) Regulation 2008. It documents Ausgrid's objectives for managing its network, Ausgrid's network planning processes and the asset investment and management strategies and initiatives developed for meeting network management objectives.

This Chapter also sets out:

- Ausgrid's sub-transmission and distribution systems, including a description of those systems and their design, construction, operation and maintenance;
- the network planning processes employed for the purpose of assessing the adequacy of the network and the need for development of the network including demand management methodologies and system reliability planning standards;
- asset management strategies employed for the purposes of the design, construction, operation and maintenance of the network including risk management and public liability insurance arrangements and customer technical service standards;
- safety management strategies and procedures in relation to the safe operation of the network;
- the schedule of reports to be made to the Director General in relation to management and performance of the network;
- Ausgrid's strategic and operational risk management procedures;

- the governance framework under which network investment decisions are made;
- a description of relevant codes, standards and guidelines Ausgrid follows in the design, installation, operation and maintenance of the network, and a description of any departures from those codes, standards and guidelines, including information on arrangements in place to ensure an equal or better outcome; and
- information on how Ausgrid complies with the various codes, standards and guidelines nominated by Industry & Investment NSW.

Ausgrid recognises that this Chapter is relevant to a number of stakeholders, including Ausgrid staff, Ausgrid's shareholders, contractors and others who undertake work on or near Ausgrid's assets, and members of the public generally in the context of public safety.

2 Ausgrid's network

Ausgrid operates one of the largest electricity networks in Australia (ranked by size of asset base) with more than 100 years experience in delivering a safe and reliable power supply. It is a major New South Wales government state-owned corporation.

Ausgrid services a community of more than three million people with a broad-ranging customer base covering rural, urban, residential and commercial customers, including mining, manufacturing and agricultural industries. Our distribution area (Figure 1) covers an area of 22,275 square kilometres and includes some of the most densely populated and fastest growing areas of NSW.

Figure 1 – Ausgrid's distribution area



Ausgrid operates both a transmission and distribution network.

Our transmission network comprises:

- 132kV lines that are operated in parallel to and in support of TransGrid’s transmission network.
- Substations which are connected to these lines

While these assets are operated as part of the distribution system for the purposes of the Electricity Supply Act 1995 (NSW), they fall within the definition of a transmission network under the National Electricity Rules. These assets are presently regulated by the Australian Energy Regulator (AER) as if they were part of the distribution system for the purposes of revenue, although transmission pricing rules continue to apply.

Ausgrid’s distribution network includes the following network elements:

- a sub-transmission system of 33kV, 66kV and 132kV assets;
- a high voltage (HV) distribution system of 5kV, 11kV and 22kV assets; and
- a low voltage (LV) distribution system of 415V and 240 V assets.

These network elements (both transmission and distribution) in combination are referred to throughout this Plan as “the network”. Ausgrid’s network is planned in accordance with the National Electricity Rules and the requirements of the Design, Reliability and Performance Licence Conditions.

Figure 2 – Typical components of the electricity network

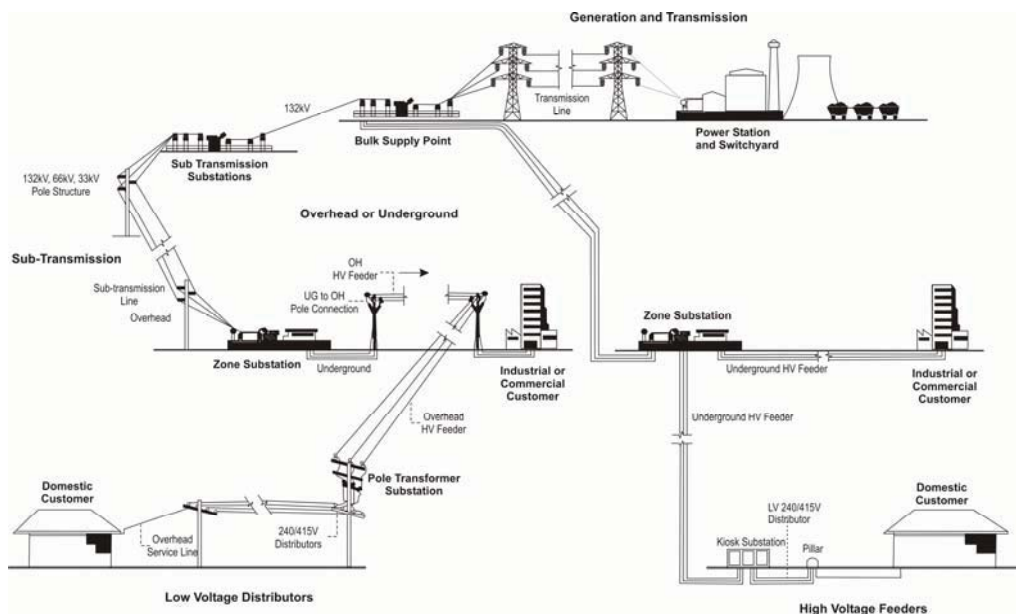


Figure 2 above shows Ausgrid’s typical distribution network arrangement. Power is supplied by TransGrid, and distributed via Bulk Supply Points into the sub-transmission network. Other electricity distributors’ networks and some power stations also provide supply into our distribution network.

Ausgrid maintains comprehensive engineering records, drawings and maps showing the location of network assets. A number of systems, software & databases are used to ensure this information is available to effectively design, construct and maintain our network. These systems include:

- Geographic Information System (GIS)
- Technical Document Management System (TDMS)

- Project Tracker (PrjTrak)
- Asset databases - SAP
- Engineering intranet (Balin)
- Ausgrid's Policy and Procedures database.
- Website (www.ausgrid.com.au)
- Automated "One-Call" system for "Dial before You Dig" enquiries.

All Ausgrid staff and contractors obtain access to relevant Ausgrid systems and databases as required by their work scopes. Accredited Service Providers are provided with access to all technical information reasonably necessary to perform or design Contestable Works.

Persons requiring maps for carrying out work such as excavation or construction not related to the network may obtain maps of asset locations with "Dial Before You Dig" by submitting a request via the web. Information may also be obtained under the Government Information (Public Access) Act 2009.

The design of new customer connections and associated network extensions are generally funded by customers, who may use external accredited service providers to carry out design and construction work. Design work for customer connections is carried out in accordance with guidelines nominated by Industry & Investment NSW, Ausgrid's own Network Standards and other relevant regulatory instruments, standards and codes.

Design and construction work on other shared parts of the network may be managed by Ausgrid, its alliance partners or contractors.

Many routine inspection services (which are part of Ausgrid's maintenance regime), such as pole inspection, are provided under contract by specialist external service providers.

Ausgrid's network is controlled via two control rooms, one in Sydney and the other in Newcastle. These two control rooms operate independently and cover different network areas. The Sydney control centre controls the network for the Sydney CBD and Sydney East, Sydney South, Sydney North, and the Central Coast network areas. The Newcastle control centre controls the network for the Newcastle, Lower Hunter and Upper Hunter network areas.

Ausgrid's contact centre is located at two sites, one in Sydney and the other in Newcastle. Using the contact centre, customers and the public can quickly contact Ausgrid regarding network-related matters. The Sydney control room is able to monitor and control the entire Newcastle network area and the Newcastle control room is able to monitor and control part of the Sydney area network. The Newcastle control room will be able to monitor and control the entire Sydney network upon completion of the Distribution Monitoring System is complete.

3 Network Development Process

This section describes the network planning processes that inform Ausgrid's capital and operating expenditure programs.

3.1 Meeting our obligations

Compliance with applicable regulatory obligations and requirements is a primary consideration in all Ausgrid's network planning activities.

There are three main drivers of investment in Ausgrid's network: network performance; customer connections and meeting modern infrastructure needs. These categories are discussed in further detail below.

3.1.1 Network performance

Network performance relates to the performance of the supply network. Ausgrid's capability to provide network services in a manner consistent with our obligations will be compromised unless the three drivers of network performance are appropriately managed:

Demand capacity imbalance

Network performance can be compromised where demand exceeds capacity. Insufficient network capacity may result in load shedding to protect equipment against thermal damage and will result in non-compliance with Ausgrid's licence conditions. Provision of sufficient network capacity in combination with management of demand where appropriate, addresses this risk to performance.

Ausgrid is required to provide sufficient network capacity to supply all connected customers. Ausgrid's network capacity is limited by the equipment installed, the rating of this equipment and the mandated limit for load at risk. Growth in the demand for electricity, or more specifically, the demand for electricity distribution capacity during peak periods, drives investment.

Ausgrid forecasts demand through two well-developed forecasting processes¹. These are:

- **'Network Substation Spatial Demand Forecasts Processes'**. These processes result in spatial forecasts for zone and sub-transmission substations and are key inputs in forecasting the extent and timing of future demand-capacity imbalances on the sub-transmission and 11kV distribution systems; and
- **'Global Energy and Peak Demand Forecast Processes'**. These processes are primarily used to forecast energy usage and the associated revenue stream, but also result in corresponding forecasts of overall network summer and winter peak demand.

Both of these processes are documented and located in Ausgrid's procedures database.

Demand on Ausgrid's low voltage network has been historically provided through periodic load surveys or from maximum demand indicators installed at distribution centres. Ausgrid is presently implementing a Distribution Monitoring & Control program at its larger distribution systems, which will provide more comprehensive loading information for the low voltage distribution system. Where growth in demand reaches the trigger point, Ausgrid is obliged to invest in either additional network capacity, transfer load to better utilise existing capacity or invest in programs that manage demand in that location.

The key trigger of growth-related investment is defined by the Design, Reliability and Performance licence conditions imposed on Distribution Network Service providers by the (NSW) Minister for Energy (Licence Conditions)². Schedule 1 of the Design Planning Criteria has the most significant impact on Ausgrid's network.

¹ These are internal documents that are generally not publicly available.

² The Design, Reliability and Performance Licence Conditions came into effect on 1 August 2005 and were amended with effect from 1 December 2007.

The Design Planning Criteria mandates minimum levels of network redundancy and specifies permissible load at risk (i.e. the level/time during which load can exceed the secure rating of particular groups of network elements).³

Asset condition

Network performance is influenced by the condition of individual assets. Assets that are in poor condition cannot be relied upon to continue to function in a manner consistent with their intended design. Ausgrid uses a sophisticated condition based maintenance regime that monitors asset condition to enable investment managers to balance risks and costs of ongoing service of these assets. Poor asset performance limits Ausgrid's ability to maintain the quality and reliability of supply and the safety of the network.

In general, asset failure rates increase as assets age. Although asset age is not a driver of asset replacement per se, asset age, and particularly the age of the population of assets, can indicate increased levels of risk of asset failure.

The identification and prioritisation of replacement requirements is a risk management exercise for an asset management business such as Ausgrid, and is based on assessment of the likelihood and consequences of asset failure. Risk assessment and replacement of assets is a key mechanism through which Ausgrid ensures it is able to deliver a safe and reliable supply of Electricity to its customers and is able to effectively maintain its network.

Network reliability

Network reliability, or lack of reliability, can be caused by poor network design, poor asset performance; environmental factors e.g. interference from wildlife and vegetation, and lack of in-built redundancy. These factors can drive an investment response where the reliability impact is significant, or where performance of a single asset is unacceptable.

Historically, Ausgrid has managed reliability performance through compliance with planning standards, an asset management approach focused on reducing asset failures, and projects targeting poorly performing feeders.

The Design, Reliability and Performance licence conditions, particularly the Schedule 2 SAIDI and SAIFI reliability standards⁴, has introduced a new set of reliability drivers to the portfolio. Reliability can no longer be managed solely at an asset management level, but requires a holistic approach to ensure compliance with mandated performance targets.

Ausgrid's ability to meet our specific performance targets (SAIDI and SAIFI) can be compromised if the above three drivers (demand capacity imbalance, asset condition and network reliability) are not managed through appropriate investment.

3.1.2 Customer connections

Ausgrid has clear obligations to provide access to its network services under the National Electricity Rules & Electricity Supply Act 1995 (NSW). Investment is driven by the number and type of customers seeking new or modified connections to the network.

3.1.3 Meeting modern infrastructure standards

Ausgrid is required to comply with various legislative and regulatory obligations to provide distribution services and maintain electrical infrastructure in a manner that is safe for its workers, the general public and the environment. The obligation to maintain compliant infrastructure stands separately from the network performance driver as it does not contribute to network performance per se. However, it is critical to delivering Ausgrid's number one priority of a safe electrical network.

³ The Design, Reliability and Performance Licence Conditions do not specify performance requirements for the low voltage network. Ausgrid have established internal utilisation targets for low voltage distributors of 95% of fuse rating.

⁴ The SAIDI and SAIFI Reliability Standards are set out in Schedule 2 of the Licence Conditions.

3.2 Supply quality

The National Electricity Rules (Schedules 5.1, 5.1a and 5.3) describe the planning, design and operating criteria which must be applied to transmission and distribution networks. A network service provider must describe the quality of the network services it agrees to provide and ensure that the quality of these services are not less than that required by Schedule 5.1.

Ausgrid's Electricity Network Operation Standards (ENOS), which is available on our website, provides details of the objectives that Ausgrid has adopted in relation to supply quality. Objectives documented in ENOS include:

- supply voltage;
- frequency departures;
- voltage disturbances;
- voltage dips; and
- distortion disturbances, including:
 - transients;
 - waveform and harmonic distortion; and
 - voltage and current differences between neutral and earth.

The ENOS explains why electrical supply quality and reliability may vary and provides steps for customers to follow if performance is considered unsatisfactory.

3.3 Ausgrid's planning process

Ausgrid carries out network development planning at both a strategic and project level. The processes used for each of these levels of network planning are set out in the "Network Investment Governance" process document stored on Ausgrid's Policy & Procedures database. Our investment governance process provides continuous review and assurance that capital prudence and efficiency are being achieved, as well as consistency with longer term strategic planning.

Ausgrid's planning process is designed to identify the most efficient ways of ensuring the network business meets its network performance obligations. We place great emphasis on the planning and project identification stage, assessing customer needs and then identifying and selecting the best option to meet those needs and provide the best outcome for customers. All relevant options are considered in deciding how to meet the performance obligations, including non-network and non-capital alternatives. There is a robust selection process that explicitly trades off alternative expenditure options using quantified estimates of project costs and benefits (against the business performance targets), to identify the portfolio of projects that minimises the cost of achieving desired performance.

In accordance with NER obligations network augmentation and demand management options are assessed impartially, using a consistent cost effectiveness review process. Demand management options are evaluated on the extent to which they can avoid or defer the need for network augmentation. This allows various combinations of demand management and deferred augmentation projects to be assessed.

The first stage of the planning process involves the gathering of all data required to inform the investment process. This includes current demand, the preparation of demand forecasts, examining network capacity limits, assessing asset condition, forecasting new customer connections and taking into account duty of care obligations e.g. resulting from modern infrastructure standards.

The forecast adequacy of the network is assessed against key criteria which include:

- Meeting Modern Infrastructure Standards, (including safety and environmental compliance);

- Addressing demand – capacity imbalance (to achieve compliance with the Design Planning Criteria of the DR&P licence condition);
- Reliability performance;
- Asset condition; and
- Customer connection requirements.

When emerging inadequacies are identified, a range of feasible options is developed to address the identified issues and to ensure continuing compliance. Options include both system and demand management alternatives. A review then selects the most economic option (or options). Each major investment is required to be consistent with longer term network plans and network standards.

The planning and development process is carried out in accordance with the National Electricity Rules (5.6 Planning and Development Requirements). Ausgrid has developed and regularly reviews a “Guide to Network Planning and Development under the National Electricity Rules”. This Guide is available on Ausgrid’s Policy and Procedures database to all network planning and investment analyst staff. It outlines the planning and development obligations to be performed by Ausgrid as both a DNSP and TNSP, covers the obligations which arise in relation to augmentations of networks, including non-network alternatives to augmentations, and highlights where planning and development obligations are to be performed jointly by DNSPs and TNSPs.

A key output of the planning process is the annual Electricity System Development Review (ESDR) and the Transmission Annual Planning Report (TAPR) which are published on our website.

3.3.1 Investment governance

Ausgrid’s Investment Governance Framework sets out the process by which decisions on network capital investments are made and implemented within Ausgrid. There are two main processes associated with the framework. These are:

- strategic planning processes; and
- project planning processes.

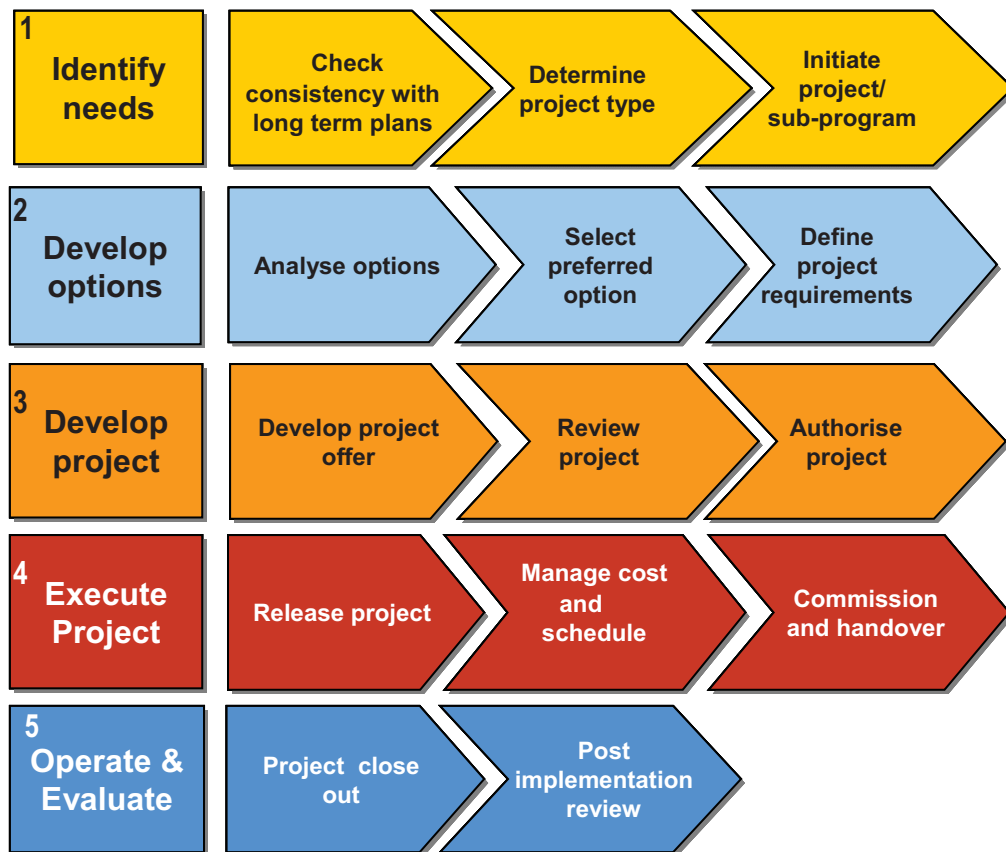
The strategic planning process covers the development of a strategic view of network investments in the longer term and provides an overall portfolio of network investments.

The project planning process sets out the steps required to develop, design and deliver an individual capital project or a program of related network projects. Individual projects/programs are required to be consistent with the Ausgrid’s strategic plans.

The process for assessing augmentation projects involves identifying and assessing alternatives to network augmentation, such as demand management and other non-network alternatives. This approach provides greater scope in terms of the availability of potential cost effective solutions and increased assurance of regulatory compliance.

The investment governance process involves five key steps. These are set out in Figure 3 below. All capital investments go through a process that follows the investment governance principles. However, the size, type and driver of a project will determine the particular governance process and investment gateways that apply. Where a project option has an augmentation component of more than \$1 million, demand management alternatives are considered as an alternative to supply side options.

Figure 3 - Project governance process



The governance process ensures that projects planned through the strategic network development process maintain their optimality throughout the project development phase. Not only are projects assessed for consistency against long term plans, they are reviewed and checked at various points in the process to ensure they continue to represent an optimal investment solution.

3.3.2 Strategic planning approach

Ausgrid's approach to strategic planning varies over the three distinct categories of network, the transmission, sub-transmission and distribution networks.

Transmission network

The transmission network operates in support of TransGrid's 330kV system. Ausgrid's transmission network comprises the overhead and underground 132kV feeders which link TransGrid's Bulk Supply Points to major substations.

Sub-transmission substations and 132kV feeders which supply multiple areas are considered in the transmission planning process. Investment in this level of the network is made up of small numbers of projects which are generally high cost investments and have long development times.

In many cases, Ausgrid's and TransGrid's transmission networks are interdependent and joint planning between Ausgrid and TransGrid is a key part of the transmission planning process. Each investment is agreed jointly and documented in a Memorandum of Understanding between TransGrid and Ausgrid.

Efficient development of this part of the network requires long term strategic planning and is centred on three transmission plans, each covering a different region of Ausgrid's franchise area. These plans have been developed to map out future investment requirements in Ausgrid's and TransGrid's joint transmission network.

Sub-transmission network

The sub-transmission network links sub-transmission substations to zone substations. It is made up of overhead and underground feeders that operate at 132kV, 66kV and 33kV, and associated major substations. Major projects at this level are generally high cost investments and have long development times.

Efficient development of this part of the network requires long term strategic planning, and centres around 25 area plans developed by Ausgrid, each covering a different network area within Ausgrid's distribution area.

Distribution network

The distribution network is made up of the medium voltage network (primarily 11kV) and the low voltage network (415V) which distributes energy from zone substations mainly via distribution substations and kiosks to customers. Investment at this level is made up of large quantities of assets at relatively small cost. Generally, individual projects have a medium to short lead time.

The planning horizon for individual customer connection and small capacity driven projects is generally less than two years as development is driven by the requirements of individual or small groups of customers. From an asset performance, network performance and compliant infrastructure perspective, it is necessary to consider the performance and compliance of the overall population of assets. This is done through Ausgrid's Replacement Plan, Reliability Investment Plan and Duty of Care Plan which look at network investment requirements over the short, medium and long term.

3.3.3 Strategic plans

Ausgrid has a suite of plans that set out the medium to long term strategy of capital investment and asset replacement needs:

- Area and Transmission Plans;
- Replacement Plans;
- Duty of Care Plan (to meet modern infrastructure standards) ; and
- Reliability Investment Plan.

Area and transmission plans

To ensure that all drivers are considered in a holistic manner, Ausgrid has developed a suite of area plans that encompass all strategic network investment drivers at the transmission and sub-transmission levels of the network respectively.

The sub-transmission area plans are focussed on specific geographic locations within Ausgrid's network and represent a long term plan for each area. There are 25 sub-transmission area plans.

There are also three strategic transmission plans that focus on investment requirements in the transmission network, which cross multiple geographic network areas across the Sydney Inner Metropolitan, Hunter and Central Coast regions.

The area plans contain all strategic growth, reliability, customer connection and replacement driven investments for the sub-transmission network within each area.⁵

The area planning process involves:

- Identification of needs and risks
- Identification of alternative options at both project and strategic level

⁵ Where replacement of equipment components is required, this is not considered strategic and therefore, has not been included in the area plans.

- Review of option feasibility
- Economic evaluation of alternatives and
- Documentation of outcomes.

The key inputs to each plan include:

- spatial forecasts for each zone and sub-transmission substation within the area which drive future capacity constraints;
- prioritised, condition-based replacement needs for strategic assets within the area;
- infrastructure standards issues within the area;
- known large customer connections; and
- a list of locations where reliability and/or quality criteria are not being met.

Each published plan contains a summary of relevant network needs for the area and outlines alternative investment strategies developed to address the long term network needs. Ausgrid develops and assesses multiple strategies for each network area to ensure that the strategy Ausgrid elects to implement for each area represents the most efficient cost of meeting the network needs in that area over time.

Replacement plans

Ausgrid's Replacement Plans contain a consolidated long term view of all system asset replacement requirements throughout Ausgrid's transmission, sub-transmission and distribution networks. The Replacement Plan describes the programs of work that have been developed, are currently being implemented, or are planned to address the asset condition issues identified by Ausgrid. The current version of the Replacement Plan contains all known replacement requirements as at February 2008.

Ausgrid uses the following processes in asset assessment and replacement:

- a "condition assessment criterion" (based on condition monitoring surveys) to determine when an individual asset needs to be replaced;
- use of age as a replacement consideration when data on the condition of the asset is not available (this is only a secondary consideration when determining the priorities on projects);
- evaluation and formal approval of individual replacement works (involving factors such as equipment condition, reliability and maintenance and repair costs); and
- design and construction of replacement assets.

This process is described in our "Refurbishment/Replacement Strategies and Policies" which are located on Ausgrid's procedures database. After this detailed condition assessment is completed, assets identified for replacement are prioritised based on the risk assessment outcomes. The prioritised replacement lists developed by asset managers are critical inputs to system planning processes underpinning the development of the transmission and sub-transmission area plans. These replacement lists are continuously evolving as the operations investment managers identify both additional assets with emerging condition issues indicating end of life, the results of subsequent condition assessments and the effectiveness of complete replacement programs.

Duty of care plan

Ausgrid's Duty of Care Plan contains a consolidated view of upgrades necessary to existing infrastructure so that Ausgrid continues to comply with its legislative and regulatory obligations to provide distribution services and maintain electrical infrastructure in a manner that is safe for its workers, the general public and the environment. In particular the Duty of Care Plan proactively responds to any increasing obligations or contemporary knowledge and expectations.

The Duty of Care Plan covers the following three key areas of risk:

- Safety – covering both public and workplace safety risks, including fire prevention and risk mitigation strategies in relation to Ausgrid assets;
- Environmental – covering environmental compliance requirements including obligations in respect of waste disposal, pollution, contamination of land, remediation and environmentally hazardous chemicals; and
- Infrastructure risk – covering security and compliance risks relevant to Ausgrid’s network assets.

The Duty of Care Plan is a critical input to the system planning processes used in developing the transmission and sub-transmission area plans.

Reliability planning

The Industry & Investment NSW Licence Conditions, particularly Schedule 2 SAIDI and SAIFI reliability standards, have introduced a new set of reliability drivers to Ausgrid’s investment portfolio. Reliability can no longer be managed solely at an asset management level, but requires a holistic approach to ensure compliance with mandated performance targets.

Ausgrid’s Reliability Investment Plan⁶ outlines investments required to bridge the gap between network performance that will result from implementation of the maintenance and capital investment programs identified by Ausgrid, and the reliability output criteria performance requirements under the Licence Conditions. Implementation of the capital investment programs provides some reliability benefits through network augmentation benefits, improved security, reduced fault rates, and improved restoration times. After assessment of the reliability benefits there are performance gaps, identified through statistical analysis of past performance and predictions of future performance, taking into account these proposed investment programs.

Therefore, specific reliability capital investments are required to bridge those gaps.

The performance gap is then translated into a quantum of work required which is prioritised on the basis of individual feeder performance. . . Ausgrid’s Reliability Investment Plan contains the work required to bridge those gaps and include:-

- Individual feeder reliability performance improvements
- Average feeder category reliability improvements; and
- Individual customer “black spot” reliability improvements.

3.3.4 Project planning

The implementation of Ausgrid’ strategic objectives, (as defined through its strategic plans) are implemented by individual projects or sub-programs of work which are individually planned.

The project planning process follows the previously described governance process. Ausgrid adopts a level of analysis which is commensurate with the costs and risk of each individual project.

Sub-transmission developments

At a sub-transmission level, the continued compliance of the network with the Design, Reliability and Performance licence conditions are checked annually following completion of the spatial forecasts. This review also considers other changing requires such as new customer connections, and replacement needs. Where emerging issues are identified, individual projects are initiated to meet the identified needs.

⁶ Ausgrid’s “Reliability Investment Plan – Proposed Expenditure 2009-14”, is published as an attachment to Ausgrid’s Regulatory Proposal, June 2008 and is located in Ausgrid’s Reliability Manual Library (Network Reliability corporate drive).

Prior to initiation, individual projects are checked for consistency with existing sub-transmission and area plans. Where network needs cannot be efficiently met within the existing strategy, a Strategic Planning Option Study is completed. These studies are considered in or may initiate area plan reviews.

11kV distribution development

Emerging capacity issues on the 11kV distribution network are identified by

- Regular (2-3 yearly) reviews of the entire network using a 6 year demand forecast and
- Reviews of individual network elements impacted by events such as customer load applications, load transfer requests or changes to the sub-transmission network

Emerging needs identified by the above processes together with reliability, and asset condition issues are inputs to the project planning process described above (Investment Governance)

Low voltage distribution development

The project planning for the low voltage network considers the overall needs of a locality. These needs include capacity, requirements (arising from reviews of distribution centre and distributor loading), customer connection requirements, asset condition and reliability. Consideration of the overall need at the planning stage, provides for efficient outcomes by maximising the synergies between individual projects and identified needs.

3.4 Demand Management

Ausgrid's objective is to use demand management to cost effectively defer or avoid the need to augment the network. Demand management options are considered in the development of strategies to address network drivers in the sub-transmission area plan process, as well as at an individual project basis.

3.4.1 Demand management strategies

Efficient and effective consideration of demand management is an important part of delivering cost effective network services to customers. Ausgrid's demand management process has been progressively developed and implemented as an integral part of the Network Investment Governance process to improve the effectiveness and efficiency of demand management investigations.

Ausgrid's demand management process also enables us to meet our demand management obligations under the Distribution Network Services Provider Licence imposed by the Electricity Supply Act 1995 (NSW) and the network planning obligations under the National Electricity Rules. In developing this process, Ausgrid has considered the requirements embodied in the revised "Demand Management for Electricity Distributors: NSW Code of Practice" published by Industry & Investment NSW, which provides guidance on complying with the licence obligations.

The principles of the Demand Management Code may be summarised as:

- transparency of network planning processes and data on network needs;
- use of formal processes for determination of the need for demand management investigations;
- effective demand management investigations, including public participation;
- transparent and equitable treatment in comparing augmentation and DM options;
- implementation of cost effective demand management options; and
- public reporting of these activities.

The demand management process and Network Investment Governance framework Ausgrid has developed are strongly aligned with these principles.

The Australian Energy Market Commission published a draft National Electricity Rule change in September 2009 following direction from the Ministerial Council on Energy for a review of the current distribution network

planning and expansion arrangements. Draft Rule 5.6.2AA Distribution Annual Planning Review and Report sets out proposed obligations for a Distribution Annual Planning Review, including a Distribution Annual Planning Report, and a Demand Side Engagement Strategy. Ausgrid is presently considering the changes to its process which will be required to comply with the draft rules. This will ensure a smooth transition to the new requirements.

3.4.2 Demand management processes

Emerging constraints on the electricity distribution network are identified through the planning process, and published in the Annual Electricity System Development Review (AESDR). Ausgrid maintains a demand management register of interested parties who are notified of the publication of the AESDR as well as the release of demand management public consultation papers relating to specific projects, as well as any other related reports.

Each identified network constraint is assessed to determine whether it is reasonable to expect that demand management might be a cost effective solution. Emerging constraints identified in the planning process that have network augmentation solutions involving a capital cost of less than \$1 million are not normally considered material. Demand management investigations are not normally pursued for these constraints.

All material constraints identified are subject to a demand management screening test, which is the first step in the demand management process. It consists of an analysis of the drivers behind the emerging constraint, determination of the extent to which demand is driving investment and the demand management requirement. This requirement is described as the approximate size, cost per kVA and nature (for example time of day, seasonality) of the demand management options that would be required to defer the proposed investment for at least one year.

The screening test report provides the basis for a decision regarding whether it would be reasonable to expect that it would be cost effective to avoid or postpone the expansion by implementing demand management strategies, and therefore to proceed with a detailed demand management investigation.

Based on the demand management requirements identified in the screening test, the demand management investigation identifies the possible demand management options that might exist in the study area and determines the approximate amount available and likely cost to Ausgrid of each of the identified options. Options are identified based on existing knowledge, field visits, public consultation via an advertised "Demand Management Options Consultation Paper", seeking proposals from interested parties and discussions with specific customers.

The public consultation is focused on identifying potential options and uncovering information that is otherwise unavailable to Ausgrid. The information is analysed using a standard approach that compares the net present value of costs for the demand management alternative and the net present value of saving in costs due to the deferral of the network expansion option. The demand management investigation report identifies and describes any feasible demand management options to be considered for development alongside network augmentation options.

If a demand management option identified as feasible in the investigation is determined to be the most economical solution, it is developed into a demand management project proposal. This consists of a business case and implementation plan with clear deliverables in terms of demand reduction, timing and cost. Once authorised, a demand management project is implemented.

The demand management implementation strategy may include a range of implementation options, including Requests For Proposals, standard offers, marketing programs and direct customer negotiations depending on the demand management options being implemented.

The demand management process and methodologies Ausgrid uses are described in detail in Ausgrid's "Demand Management Guidelines" which is an internal Ausgrid document. A summary of Ausgrid's processes for investigating, developing and implementing demand management is described on our website (www.ausgrid.com.au).

3.4.3 Other demand management initiatives

In addition to investigating demand management alternatives to specific network investment requirements, Ausgrid is continuing to develop and market new products and tariffs aimed at supporting longer term and system wide changes in demand.

Ausgrid's current network pricing initiatives are described in our "Annual Network Prices Report", published on Ausgrid's web site.

3.5 Network innovation

Ausgrid is committed to implementing new technology into its network to ensure the network operates efficiently and is capable of delivering a reliable distribution services to customers both now and in an increasingly, digital and connected world. Improvements in the performance and cost of new communications, monitoring and control technologies are making it possible to build greater intelligence into the network. Ausgrid believes that taking advantage of these innovative technology opportunities is an essential part of its strategy to deliver efficient network services.

During the 2004-09 regulatory period, Ausgrid invested in replacement telecommunications infrastructure between major substations. This strategic investment has connected more than 200 key substations and depots and rolled out in excess of 800 kilometres of new fibre optic cable, providing a robust means of transferring critical data from the field, and a foundation for making Ausgrid's electricity network more intelligent and capable in the future. Ausgrid intends to expand upon this investment during the 2009-14 period by installing additional sensors and IT applications to improve efficiency across the business.

Ausgrid is rolling out 12,000 monitoring devices across the electricity distribution network which will support earlier fault detection and restoration. At the customer level, smart meters and time-based pricing will be the gateway for managing energy use and carbon in the home.

A smart grid needs a communications platform to bring all the real time data from substations and field devices back so IT systems can turn that data into useful information for planners, field staff and consumers. Ausgrid is building a 4G wireless telecommunication network to allow crucial two-way communication between new devices on the electricity grid.

Ausgrid's proven track record in innovation projects and already delivered intelligent network infrastructure helped in winning the Federal Government's *Smart Grid, Smart City* project in 2010. This Federal Government funded project will support building a commercial-scale smart grid to be rolled out across five sites in Sydney and the Hunter.

As part of the *Smart Grid, Smart City* project new generation smart meters will be rolled out to up to 50,000 homes and around 15,000 households will become 'smart homes' to trial a new breed of in-house displays and websites that track electricity and water use, costs and CO2 emissions.

Renewable energy and battery storage trials will see power generated locally and a fleet of electric vehicles will test mobile battery storage and smart charging.

Ausgrid has also invested in research of demand management initiatives, including strategic pricing studies and metering technology, as well as the implementation of advanced metering trials.

In developing and deploying innovation Ausgrid uses an approach that seeks to ensure demonstrated, transferable and ongoing benefits are delivered. This involves working with leading industry and academic partners including establishing a Centre of Excellence in Intelligent Networks in partnership with the University of Sydney and the University of Newcastle, specifically focused on smart grids.

In assessing innovations Ausgrid looks beyond stand-alone incremental changes available through individual "leading edge" technologies and physical products. By deliberately taking a forward looking approach to innovation across the business, Ausgrid is able to build service delivery capabilities through individual innovations that support each other and future development. Substantial business change can then be driven from a platform of prudent investment in individual elements of the network. This reduces risk and is done without creating islands of innovation isolated from the mainstream business.

Ausgrid's approach to innovation seeks to ensure interoperability and develop open industry standards to gain the benefits of competition between vendors.

4 Design, reliability and performance criteria

The National Electricity Rules (Schedule 5.1) sets out the minimum standards for network performance within a region. The NER requires that the amount of redundancy provided by a network must consider a number of factors which include the size and importance of customer groups.

The NSW Minister for Energy has imposed Design, Reliability and Performance Licence Conditions on NSW distributors which mandate a range of network performance requirements for different locations and magnitudes of load. These requirements clarify how the requirements of the NER should be applied within NSW.

The purpose of the Design, Reliability and Performance (DRP) Licence Conditions is to facilitate the delivery of a safe and reliable supply of electricity. To achieve this purpose the Licence Conditions:

- set planning and design criteria for each distribution network service provider in NSW;
- set target reliability standards for the overall network and for individual feeders;
- set specific customer service standards for interruption duration and interruption frequency and provide for financial recognition to eligible customers where reliability falls short of the relevant standards; and
- specify performance, auditing and reporting requirements regarding compliance.

Ausgrid reports performance against, and compliance with, these Licence Conditions to the Minister for Energy.

The Licence Conditions are, in the most part, consistent with Ausgrid's historical network planning philosophy and outcomes. However, the Licence Conditions establish specific limits of risk that Ausgrid is able to accept when planning the network (input criteria), and specific targets for performance (output criteria).

Ausgrid's strategies for ensuring compliance with the Design Planning Criteria of the Licence Conditions for the sub-transmission network are described in our 28 Area and Sub-transmission Plans. At a distribution level, Ausgrid's capital works plan is targeted at achieving compliance (as far as reasonably practical) from June 2014.

The criteria adopted in Ausgrid's planning process to achieve compliance are described in the following.

4.1 Design planning criteria

Schedule 1 of the Licence Conditions contains the design planning criteria, which outline the level of redundancy that must be provided in the network. These are the standards which Ausgrid applies when planning the augmentation of our network. The Licence Conditions require that Ausgrid plan all new network elements in accordance with these standards. In addition, all existing network elements must be as compliant as reasonably practicable with the standards by 1 July 2014 and fully compliant by 1 July 2019.

Schedule 1 – Design planning criteria

Network Element	Load Type	Forecast Demand or Expected Demand	Security Standard	Customer Interruption Time
Sub Transmission Line	CBD	Any	N-2 ⁶	Nil for 1 st credible contingency < 1hr for 2 nd credible contingency
	Urban & Non-Urban	≥ 10MVA	N-1 ¹	< 1 minute
	Urban & Non-Urban	< 10MVA	N ²	Best practice repair time
Sub Transmission Substation	CBD	Any	N-2 ⁶	Nil for 1 st credible contingency < 1hr for 2 nd credible contingency
	Urban & Non-Urban	Any	N-1	< 1 minute
Zone Substation	CBD	Any	N-2 ⁶	Nil for 1 st credible contingency < 1hr for 2 nd credible contingency
	Urban & Non-Urban	≥ 10MVA	N-1 ¹	< 1 minute
	Urban & Non-Urban	< 10MVA	N ²	Best practice repair time
Distribution Feeder	CBD	Any	N-1 ³	Nil
	Urban	Any	N-1 ⁴	< 4 hours
	Non-Urban	Any	N	Best practice repair time
Distribution Substation	CBD	Any	N-1 ³	Nil
	Urban & Non-Urban	Any	N ⁷	Best practice repair time

1. For a Sub Transmission line – Overhead and a Zone Substation:
 - a. under N-1 conditions, the forecast demand is not to exceed the thermal capacity for more than 1% of the time i.e. a total aggregate time of 88 hours per annum, up to a maximum of 20% above the thermal capacity under N-1 conditions.
 - b. under N conditions, a further criterion is that the thermal capacity is required to meet at least 115% of forecast demand.
2. For a Sub Transmission line – Underground, any overhead section may be designed as if it was a Sub Transmission line – Overhead, providing the forecast demand does not exceed the thermal capacity of the underground section at any time under N-1 conditions. Under N conditions, thermal capacity is to be provided for greater than 115% of forecast demand.
3. The actual Security Standard is an enhanced N-1. For a second coincident credible contingency on the CBD triplex system, restricted load can still be supplied.
4. By 30 June 2014, expected demand is to be no more than 80% of feeder thermal capacity (under normal operating conditions) with switchable interconnection to adjacent feeders enabling restoration for an unplanned network element failure. By 30 June 2019, expected demand is to be no more than 75% of feeder thermal capacity. In order to achieve compliance, feeder reinforcement projects may need to be undertaken over more than one regulatory period. In those cases where a number of feeders form an interrelated system (such as a meshed network); the limits apply to the average loading of the feeders within the one system.
5. The timeframe is expected only, and is based on the need to carry out the isolation and restoration switching referred to in note 4. This standard does not apply to interim/staged supplies, i.e. prior to completion of the entire development or to excluded interruptions outside the control of the licence holder.
6. In the CBD area, N-2 equivalent is achieved by the network being normally configured on the basis of N-1 with no interruption of supply when any one line or item of electrical apparatus within a substation is out of service. The licence holder must plan the CBD network to cater for two credible contingencies involving the loss of multiple lines or items of electrical apparatus within a substation, by being able to restore supply within 1 hour. Restoration may be via alternative arrangements (e.g. 11kV interconnections).
7. Urban Distributions substations shared, or available to be shared, by multiple customers are generally expected to have some level of redundancy for an unplanned contingency, e.g. via low voltage manual interconnection to adjacent substations enabling at least partial restoration.

4.1.1 Sub-transmission substations and line criteria

Central business district

The planning criteria in Schedule 1 are a deterministic N-2 criteria for 132kV lines and sub-transmission (132/66kV or 132/33kV) substation transformers supplying the CBD. This means that a forced or planned outage will result in:

- no interruption to customers following the first contingency event;
- an interruption to customers of not more than one hour following the second contingency event;
- acceptable voltage levels being maintained on the secondary busbars of transformers; and
- loading of the remaining in service network elements remaining within accepted thermal limits.

Where 132kV lines and sub-transmission substations provide supply to both CBD and urban areas, Ausgrid will provide sufficient redundancy to supply peak CBD (but not urban load) during second contingency events.

Urban/non-urban areas

The planning criteria for sub-transmission elements that supply urban and rural areas require a deterministic N-1 level of redundancy. Following a first contingency outage, the system must be designed to recover supply within one minute in those areas with demand of >10MVA, and otherwise, within best practice repair times.

To account for the low probability that outages will occur at times of peak load, the N-1 rating of overhead sub-transmission lines can be exceeded for 1% of the year, and up to a maximum of 120% of N-1 rating.

4.1.2 Zone substation criteria

CBD zone substations

The planning criterion used for CBD zone substations is an N-2 criteria for substation transformers (132/11kV or 33/11kV). This means that a forced or planned outage will result in:

- no interruption to customers following first contingency;
- an interruption to customers of not more than one hour following the second contingency event;
- acceptable voltage levels being maintained on the secondary busbars of transformers; and
- loading of the remaining in service network elements remaining within accepted limits.

To achieve N-2, the network can be designed to recover supply following a second contingency via interconnection at the 11kV level in the CBD.

Urban zone substations / Non-Urban >10MVA

The planning criteria for zone elements that supply urban and non-urban areas with demand >10MVA is a deterministic N-1 level of redundancy. Following a first contingency outage, the system must be designed to recover supply within 1 minute.

To account for the low probability that outages will occur at times of peak load, the N-1 rating of urban zone substation lines can be exceeded for 1% of the year, and up to a maximum of 120% of N-1 rating.

There is also a requirement that thermal capacity is to be provided for greater than 115% of forecast demand. This provides:

- a margin to ensure that equipment is not overloaded during normal operation when peaks loads will exceed forecast, (which will occur 50% of time)

- provides a sensible limit on loading in substation where there are large numbers of transformers (e.g. in a six transformer substation, loading to 120% of capacity would require each transformer to be loaded to 100% of its rating)

Urban/ Non-urban zones <10MVA

Zone substations that supply loads of <10MVA are not required to incorporate redundancy in their design (i.e. are able to be supplied by an N network). However, following an outage of a single element, the network must be brought back to service within best practice repair times. To account for the 50% probability that peaks loads will exceed forecast thermal capacity is to be provided for greater than 115% of forecast demand.

4.1.3 Distribution feeder criteria

CBD

The planning criteria for all feeders that supply the Sydney CBD is a deterministic N-1 level of redundancy with no outages to be experienced following a first contingency outage.

Urban areas

The planning criteria used for all distribution feeders that supply urban areas, is a deterministic (N-1) level of redundancy. Following a first contingency outage, supply must be restored within four hours for customers within these areas.

The four hour restoration timeframe is an expected timeframe only, and is based on the need to carry out manual isolation and switching operations to restore supply. This timeframe does not apply to networks that are in the process of development, or to the network in cases of severe storms or traffic gridlock.

The Licence Conditions require Ausgrid to ensure that feeder utilisation is not more than 80% under system normal conditions, taking account of the extent of interconnection of the local feeder network and its ability to pick up load following a contingent event. This utilisation generally provides for the pickup of all load in four switching operations.

Due to the magnitude of demand at some distribution substations (2-3MVA) it may be necessary to reduce feeder utilisation within a group of feeders to below 80%. For example, a feeder with a 7MVA rating would have a utilisation of 57% if it supplied 2 x 2MVA substations. Utilisation would increase to 86% if it supplied 3 x 2MVA substations. This level of utilisation would only be considered satisfactory if there was adequate spare capacity in interconnecting feeders to enable supply to be restored following an outage. Adjoining feeders would need to be restricted to less than 71% utilisation to allow the pickup of a single 2MVA load.

Where a single feeder supplies a single substation via a tee, the teed part is not considered. In these situations a single distribution substation is expected to have a level of redundancy available via the low voltage network, just as it does for a distribution substation outage.

Non-urban areas

The criteria are relaxed for non-urban areas. In such locations, distribution feeders are designed to supply load at N. Repair times are based on best practice repair times for an asset in that location.

4.1.4 Distribution substation criteria

The design planning criteria include redundancy criteria for all distribution substations. This requires N-1 redundancy in the CBD and N at other locations. Urban distribution substations generally have some level of redundancy provided by LV interconnection.

Distribution centre loading has historically been determined in the Sydney area by maximum demand indicators (MDI) which capture peak load relatively accurately and are read regularly. Ausgrid is presently installing a distribution monitoring system into the larger distribution substations in both Sydney and the Hunter which will provide more detailed loading information. There will continue to be a number of small distribution centres in the Hunter area where permanent load monitoring is not installed. Determining loading at these locations requires the temporary installation of load recording equipment. As this survey work covers only a proportion of distributors and Hunter distribution centres each year, the data lag is generally two to three years.

In planning the development of distribution substations, it is necessary to determine the level of loading which triggers the need for augmentation. These targets are driven by the need to avoid thermal damage to the network from prolonged operation above the cyclic rating of equipment and must allow for inaccuracies in data. Ausgrid has set the maximum utilisation target for distribution substations of:

- 100% of cyclic rating where loads are determined by permanent meters
- 95% of cyclic rating where loads are determined by intermittent surveys

4.1.5 Low voltage network criteria

The licence conditions do not specify performance for low voltage network design. It is Ausgrid's and general industry practice in Australia that the low voltage network be planned on the basis of deterministic (N) level of redundancy.

Measurement of low voltage distributor loads throughout Ausgrid and distribution centre load in the Hunter area has historically required the temporary installation of load recording equipment for a period of approximately one week. As this survey work covers only a proportion of distributors and Hunter distribution centres each year, data are generally at least two to three years out of date. Ausgrid is presently installing a distribution monitoring system into the larger distribution substations in both Sydney and the Hunter which will provide more detailed loading information.

In planning the development of the LV system, it is necessary to determine the level of loading which triggers the need for augmentation. These targets are driven by the need to avoid thermal damage to the network from prolonged operation above the cyclic rating of equipment and must allow for inaccuracies in data. Ausgrid has set the maximum utilisation target for distribution substations at 95% of the LV fuse rating.

It should be noted that as in many cases the fuse rating may exceed the distributor rating the present targets will not entirely address loading issues on the LV network. Ausgrid will extend the functionality of its ratings systems in the near future to include primary LV distributors. This will allow LV utilisation targets to be reviewed prior to 2014.

4.1.6 Customer criteria

The redundancy provided for customer connections is in accordance with customer requirements. However, provision of redundancy above standard levels is subject to a negotiation framework where customers pay for enhanced levels of service.

4.1.7 Load at risk

The design planning criteria allows peak demand to exceed N-1 capacity in some circumstances to account for the low probability that outages will occur at times of peak load.

The load at risk criteria applies to non-CBD zone substations and sub-transmission overhead feeders only. For this infrastructure under N-1 conditions, the forecast demand is not to exceed the thermal capacity for more than one percent of the time (i.e. a total aggregate of 88 hours per year) up to a maximum of 20% above the thermal capacity (i.e. a zone may be loaded to 120% of its firm rating for periods that total <88hours per year).

No load at risk is allowed in the sub-transmission system supplying the CBD or for underground sub-transmission cables or for sub-transmission substations.

There may be circumstances where load at risk criteria cannot be applied due to the network characteristics or configuration. These include:

- Where a feeder is comprised of part underground cable and part overhead construction, risk is applied to the overhead section of line, but the underground section of line will not be operated above its N-1 rating. (i.e. the rating shall be limited by the lesser of 100% of the limiting underground rating or 120% of the limiting overhead rating).
- Where zone substations are supplied by dedicated groups of underground feeders the capacity available from the substation is often limited by the underground feeder capacity. This limits substation capacity to the N-1 feeder capacity.

- Some system configurations rely on unloaded standby feeders or transformers which automatically close to restore supply following outages. Where system configurations do not allow the load to be supplied from standby plant, the need to maintain loading within the thermal rating of plant under normal operating conditions prevents load at risk criteria being applied.

The determination of the load corresponding to a 1% time above firm rating is based on the load duration characteristics of standard load cycles.

4.1.8 Licence compliance reporting

Reporting on Ausgrid's compliance with its licence conditions is provided in the annual Network Performance Report.

4.2 Credible contingency

A credible contingency is defined in the Licence Conditions as meaning:

an outage on one line or item of electrical apparatus, or a coincident outage on more than one line and/or items of electrical apparatus that a licence holder, acting reasonably, could expect to arise as a result of a single electrical failure or mechanical event affecting those lines or items. Credible contingencies are generally limited to major items of equipment with significant probabilities of failure or outage.

Electrical Apparatus is defined as "a transformer within a substation".

The Licence Conditions apply a reasonableness test which requires Ausgrid to establish its own list of credible contingencies. This list is informed by the content of Schedule 5.1 of the National Electricity Rules and by Ausgrid's own experience of coincident outages.

4.2.1 Credible contingency - distribution

Credible contingencies within the distribution system involve the simultaneous outages of single assets.

Busbars

Busbar outages are not considered to be credible contingencies under either the Licence Conditions or the National Electricity Rules. However, Ausgrid's current design standards use multiple sections of busbar, to allow maintenance and to minimise the risk of losing supply to an entire busbar at a zone substation.

Double circuit tower and trenches

Within urban areas, substantial loads are supplied from double circuit overhead lines or from double circuit cable banks. A double circuit tower outage is not considered to be a credible contingency in Schedule 5.1 of the National Electricity Rules. Although rare, tower failures and trench outages do occur and may result in wide area outages until repairs are carried out.

Ausgrid mitigates against such risks for underground circuits in its design and construction practices by locating cables in roadways rather than footways, providing separation for cables sharing a common trench and providing mechanical protection. Where competing area strategies have equivalent cost, preference is given to those strategies which mitigate against double circuit outages.

4.2.2 Credible contingency - transmission

In planning its transmission network Ausgrid generally uses the same principles as for the distribution system, with the exception of the inner metropolitan transmission system, where specific criteria have been adopted.

TransGrid is the main provider of transmission services within New South Wales. However, TransGrid is not subject to the planning standards and reliability conditions applicable to Ausgrid under its distribution licence.

Ausgrid plans its transmission network jointly with TransGrid. Due to the critical nature of the network and the number of elements required to deliver supply, particularly after a first contingency outage, TransGrid and Ausgrid have agreed to expand the security criteria used in planning the supply to the CBD and inner suburbs to be more in line with international practice.

The joint reliability standard for the inner metropolitan transmission system, as agreed in a Memorandum of Understanding between TransGrid and Ausgrid, is that the system will be capable of supplying peak load under the following contingencies:

- a coincident outage of TransGrid's 330kV cable 41 or 330kV cable 42 and any 132kV feeder or 330/132kV transformer; and
- an outage of any section of 132kV busbar.

Ausgrid and TransGrid have also jointly planned and agreed, through a Memorandum of Understanding, reliability criteria for the Hunter and Central Coast regions. The criterion applied for these areas are largely consistent with that applied throughout the National Electricity Market.

4.3 System voltage levels

Voltage limits used at different levels of the system are intended to ensure that the supply provided to low voltage customers is within nominal limits specified in the Electricity Network Operating Standard. To achieve this objective, performance based limits are used at different levels of the system, with the lower limit of performance for 132kV systems being based on the requirements of the National Electricity Rules.

4.3.1 132kV networks

The upper voltage level on the underground 132kV system is restricted to 1.05 per unit. Marginally higher voltages may be possible in some areas with overhead supply. The lower voltage limit is determined by the requirement during first contingency outages for:

- transformers in sub-transmission substations to maintain regulation;
- 11kV busbar voltages in 132/11kV zone substations to be less than 4% below their set voltage level (allowing for effects of line drop compensation); and
- voltage levels on the 132kV system should not fall below 0.9 per unit.

4.3.2 33kV and 66kV networks

The regulation range of the 33kV and 66kV system is determined by the requirement for zone transformers to:

- maintain regulation under normal system conditions; and
- be less than 4% below their set voltage level (allowing for line drop compensation) during first contingency outages.

4.3.3 11kV networks

Voltage drops of up to 5% are regarded as satisfactory. Higher voltage drops are permissible only where investigations confirm that the supply provided to low voltage customers is within the limits.

4.4 Reliability output criteria – reliability standards

The purpose of the Reliability Standards required by Ausgrid's licence conditions is to:

- define minimum average reliability performance, by feeder type, across our distribution network; and
- provide a basis against which Ausgrid's reliability performance can be assessed.

The Reliability Standards are measured in terms of average SAIDI standards, the average time off supply an average customer experiences per year, and average SAIFI standards, the average number of sustained interruptions an average customer experiences per year. Ausgrid's average SAIDI and SAIFI standards are set out in Schedule 2 of the Licence Conditions. Schedule 2 is reproduced below.

Schedule 2 – Reliability standards

SAIDI – Average Reliability Duration Standards (Minutes per customer)

Feeder Type	2005/06	2006/07	2007/08	2008/09	2009/10	From 2010/11
CDB	60	57	54	51	48	45
Urban	90	88	86	84	82	80
Short-rural	400	380	360	340	320	300
Long-rural	900	860	820	780	740	700

SAIFI – Average Reliability Frequency Standards (Number per customer)

Feeder Type	2005/06	2006/07	2007/08	2008/09	2009/10	From 2010/11
CDB	0.35	0.34	0.33	0.32	0.31	0.3
Urban	1.3	1.28	1.26	1.24	1.22	1.2
Short-rural	4.4	4.2	3.9	3.7	3.4	3.2
Long-rural	8.5	8	7.5	7	6.5	6

Ausgrid publishes its performance against these standards in our annual Electricity Network Performance Report, which is available on Ausgrid's website.

The Reliability Standards are a set of minimum service standards which reflect the minimum average performance for different feeder categories. Due to the random nature of events that affect the network (for example, weather, animal and third party events), Ausgrid has established a set of internal management reliability performance targets that aim for only a 5% risk of exceeding each reliability standard.

Ausgrid calculates the gap between network performance that will result from the capital investment programs, and its internal reliability performance targets. The gap is determined through statistical analysis of past performance and predictions of future network performance. The performance gap is translated into a quantum of work required which is prioritised on the basis of improving the worst performing parts of the network first, referencing the Individual Feeder Standards, as described in the following section.

Ausgrid has implemented a new Outage Management System (OMS) to more accurately record our reliability performance and better understand the causes of poor reliability of supply. The new OMS implementation also entails significant work on developing improved procedures for asset and outage event data collection, and outage management.

4.5 Reliability output criteria - individual feeder standards

The purpose of the Individual Feeder Standards required by Ausgrid's Licence Conditions is to:

- specify Ausgrid's minimum standards of reliability performance for individual feeders;
- require Ausgrid to focus continually on improving the reliability of its feeders; and
- enable reliability performance of feeders to be monitored over time.

Ausgrid's Individual Feeder Standards for SAIDI and SAIFI feeder standards are set out in Schedule 3 of the Licence Conditions. Schedule 3 is reproduced below.

Schedule 3 – Individual feeder standards

Feeder Type	SAIDI (Minutes per customer)	SAIFI (Number per customer)
CDB	100	1.4
Urban	350	4
Short-rural	1000	8
Long-rural	1400	10

Ausgrid publishes its performance against these standards in the annual Electricity Network Performance Report, which is available on Ausgrid's website.

The Individual Feeder Standards are a set of minimum service standards to trigger network improvements if the average performance to the customers on the feeder is worse than the Standard. Due to the random nature of events that affect the network (for example, weather, animal, and third party events) the 12 month performance of a feeder may or may not represent its true underlying performance. Therefore, Ausgrid not only investigates feeders with 12 month performance that exceed the Individual Feeder Standard it also investigates and improves feeders that have performance approaching the Individual Feeder Standard.

This approach is expected to reduce the number of feeders which (randomly) exceed the set standard, as well as provide the improvements necessary to meet the Reliability Standards in each feeder category.

Typical feeder improvement initiatives include ensuring vegetation, asset condition and feeder loading standards are met, sectionalising the feeder into smaller segments so that fewer customers are affected should a fault occur, and improving outage restoration times by establishing remote network supply monitoring and remote controlled switching devices.

4.6 Reliability output criteria - customer service standards

Ausgrid has an obligation under the Electricity Supply Act 1995 (NSW) to comply with all guaranteed customer service standards. Our guaranteed customer service standards, quality and reliability of connection services is included in Ausgrid's standard form customer connection contract which is available on our website. This sets out guaranteed customer service standards and minimum service standards. This is underpinned by the customer service standards contained within the Design, Reliability and Performance Licence Conditions. These conditions specify the level of service that Ausgrid, and other electricity businesses, are expected to meet. The purpose of these conditions is to provide financial recognition to eligible customers who have experienced poor reliability of supply.

Guaranteed customer service standards and the applicable compensation are available on the Customer Service Standards page on Ausgrid's website (www.ausgrid.com.au).

4.7 Individual customer and wide area reliability performance

Ausgrid's Licence Conditions set minimum average reliability⁷ performance standards for feeder types⁸ and minimum reliability performance standards for individual feeders.

Ausgrid has identified two facets of customer reliability of supply performance where it is necessary to provide specific reliability programs that are not covered under the Licence Conditions. These areas are:

- Individual customer reliability; and
- Wide area outage risk.

⁷ The reliability standards are measured as SAIDI, minutes per customer, and SAIFI, number per customer.

⁸ The feeder types are CBD, long rural, short rural and urban types of distribution feeder.

4.7.1 Individual customer reliability

The Licence Conditions set reliability standards in terms of reliability performance as an average for all customers. These averaged reliability performance metrics may not adequately reflect the experience of customers on an individual basis who are experiencing poor reliability in certain pockets, or “black spots”, of the network.

Ausgrid’s “black spot” reliability program⁹ focuses on delivering an acceptable standard of reliability performance for individual customers, which is not necessarily achieved by the reliability performance standards in the Licence Conditions.

Ausgrid has filled the gap in the Licence Conditions through the development of a black spot reliability program for individual customers. Reliability black spots are identified through “Individual Customer Reliability Thresholds” which are internal thresholds defining a level of poor individual customer performance at the tail end of the range of customer experience in any given customer category.

Ausgrid is committed to a reliability black spot program over the period to 2014 to address individual customer performance not covered by the averaged performance metrics in the Licence Conditions. This program allows Ausgrid to meet one of its core functions – to provide a safe and reliable electricity supply to all its customers.

4.7.2 Wide area outage risk

The design planning criteria specify minimum standards of system redundancy required to provide acceptable network performance. Ausgrid has recognised several areas where extended wide area outages may occur for some system failures. Ausgrid considers that as a prudent network service provider it should mitigate against the risk of low probability but high consequence events. The Reliability Standards mandated in the Licence Conditions also do not provide the investment driver to mitigate these wide area outage risks, particularly in relation to:

- Inner metropolitan transmission system design;
- Double circuit towers; and
- Suburban four transformer 132/11kV substations.

Inner metropolitan transmission system design

The Inner Metropolitan transmission system is comprised of TransGrid’s 330kV cables 41 and 42, the 330/132kV substations at Beaconsfield, Haymarket, Sydney North and Sydney South and future 330kV cables and associated 330/132kV substations, together with Ausgrid’s 132kV transmission network that links these supply points.

The decision to adopt a reliability criterion for the transmission network overall that is more onerous than ‘N-1’ was made jointly by TransGrid and Ausgrid, and is reflected in a Memorandum of Understanding, after taking into account:

- the importance and commercial sensitivity of the Sydney area load to supply interruptions;
- the high cost applying a strict ‘N-2’ criterion to the 330kV cable network;
- the large number of network elements in the 132kV network supplying the area;
- the past performance of the cable system; and
- long repair times for cables that fail.

⁹ “Black Spot” Individual Customer Reliability Thresholds document is published as an attachment to Ausgrid’s Regulatory Proposal, June 2008. The document is located in the Reliability Manual library (in the Network Reliability corporate drive).

The jointly developed target design planning standards for the transmission system are that the system will be capable of meeting peak load under the following contingencies:

- simultaneous outage of a single 330kV cable, and any 132kV feeder or 330/132kV transformer; or
- an outage of any section of 132kV busbar.

Double circuit tower

Double circuit tower and double circuit¹⁰ cable outages are not considered within the design planning criteria as they are not regarded as credible contingencies. However double circuit outages have occurred in the past and will continue to occur, either as a result of mechanical damage (cable circuits) or tower failure.

Ausgrid has mitigated against double circuit cable failures through design and construction practices discussed in this Plan. Ausgrid has also developed recovery strategies for tower failures, however extended outages are still likely, particularly where access to tower lines is limited by terrain or development along the route of the tower line.

Risk of outages arising from suburban 4 transformer 132/11kV substations

Ausgrid's first generation of suburban 132/11kV zone substations used a four transformer design. This type of substation lacked 132kV circuit breakers and was fitted with only two groups of 11kV switchgear. Two substations with a combined capacity of more than 200MVA were typically supplied by a pair of 132kV cables sharing a common trench.

The design of these substations has resulted in a number of wide area outages. As there is limited scope to modify these substations to provide improved reliability, Ausgrid intends to mitigate against the risk of wide area outages from this type of substation by reducing the load supplied from these substations to a level which is equivalent to the firm (N-1) rating of a three, rather than four, transformer substation. This rating reduction will be carried out progressively between now and 2019.

¹⁰ Double circuit cable outages most commonly arise when two or more cable circuits sharing a common trench are mechanically damaged by excavation or boring.

5 Asset management

Ausgrid's organisational focus is asset management. Ausgrid manages its network in order to supply customers with a high quality and reliable supply while maintaining its network in a safe and reliable manner at the lowest efficient cost. Ausgrid's asset management philosophy enables the competing requirements of the network to be optimised through the mature consideration of risk.

Ausgrid's practices relating to the Management of Assets, as defined in documents including, but and not limited to, Network Standards, Plans, Guidelines, Procedures and Work Instructions etc, is compliant with the Electricity Transmission and Distribution Asset Management: Code of Practice.

5.1 Asset management strategy

Ausgrid's Asset Management Strategy (AM002) provides a high level link between the NSW Total Asset Management (TAM) Policy and the asset management approach adopted by Ausgrid. It identifies the four key stages in the asset lifecycle (Asset planning, Asset Acquisition, Use & Maintain and Asset Disposal), and identifies asset management practices and issues that must be addressed during these phases.

The titles of Ausgrid's asset management processes and document sets are not directly aligned with the titles of strategy documents used in the current published version of the TAM Manual. The documents which Ausgrid has in place provide a more direct alignment with the asset planning and delivery over a number of geographic load areas, particularly in the area of capital investment strategies. The Ausgrid processes and documents set provide alignment with the TAM Manual requirements, in a different document structure and has been in continual evolution since Ausgrid's adoption of this asset management approach in 2000. Conformity of Ausgrid's asset related plans and strategies with the TAM Manual strategy documents and tools are mapped in Table 1 below. It is not intended to alter this asset management documentation structure until the release of the ISO Standard on Asset Management which is currently in development.

Ausgrid's compliance with these procedures is undertaken by internal and external audit.

Table 1 - Mapping of Ausgrid Procedures and Plans to NSW TAM manual

TAM Manual Requirements		Ausgrid Documents
Asset Strategy		
• Can service delivery be made less asset-dependent?		• INV-POL-10003 System Planning-Planning the Network. Published on Sharepoint – Enterprise Documentation
• Are existing assets fully used in service delivery?		• INV-PCD-10024 Managing Strategic Sub-Transmission Planning. Published on Sharepoint – Enterprise Documentation
• Are existing assets appropriately located for effective service delivery?		• INV-PCD-10010 Spatial Demand Forecasting - Perform Spatial Demand Zone Forecast. Published on Sharepoint – Enterprise Documentation
• Is the capacity of existing assets sufficient to provide the required services?		• INV-PCD-10002 Annual Development Load and Sub-transmission Feeder Forecast Review. Published on Sharepoint – Enterprise Documentation
• Are assets suitable for the effective delivery of the services they are intended to support?		• ASM-PCD-10005 Review and Update Feeder Loads and Ratings. Published on Sharepoint – Enterprise Documentation
		• ASM-PCD-10015 Reviewing and Reporting Bushfire Risk Management Performance. Published on Sharepoint – Enterprise Documentation
		• AM 002 Asset Management Strategy. Published in Ausgrid Procedures Database.
		• Area and Transmission Plans. Published on Ausgrid Intranet (Balin)
Office Accommodation Strategic Plan		
• Can service delivery be made less dependent on accommodation assets?		• Corporate Property Strategy 2008-2014
• Are accommodation assets fully used in service delivery?		• PROP004 Sustainable Building Guide. Published in Ausgrid Procedures Database.
• Are accommodation assets appropriately located for effective service delivery?		
• Have the accommodation assets sufficient capacity to provide the required services?		
• Are accommodation assets suitable for the optimal delivery of the services they are intended to support?		
Capital Investment Strategic Plan		
A Capital Investment Strategic plan aims to provide efficient and effective planning of limited government capital resources by ensuring that there are clear and detailed links between assets and the service delivery outcomes they support. It applies where the need for investment in new assets or significant improvement or upgrading of existing assets.		• INV-PCD-10024 Managing Strategic Sub-Transmission Planning. Published on Sharepoint – Enterprise Documentation
		• INV-PCD-10022 Network Investment Review of Area Plan. Published on Sharepoint – Enterprise Documentation
		• Area and Transmission Plans, Replacement Plan. Published on Ausgrid Intranet (Balin).
		• Duty of Care Plan. Published on Ausgrid Procedures
		• Refer also to Chapter 1 section 3.3.3 above.
Asset Maintenance Strategic Plan		
		• AM005 - Maintenance Requirements Analysis Manual. Published in Ausgrid Procedures Database.

TAM Manual Requirements	Ausgrid Documents
<ul style="list-style-type: none"> • Define and segment assets to meet service strategy • Determine required asset performance • Define maintenance resources and overall strategies • Assess condition of assets and recommend maintenance • Prepare Maintenance Cost Plan • Implement Maintenance Plan and programs • Monitor and review Maintenance Plan 	<ul style="list-style-type: none"> • ASM-PCD-10001 Creating and Reviewing Maintenance Plans. Published on Sharepoint – Enterprise Documentation • Network Technical Maintenance Plan (and associated Maintenance Standards). Published on Ausgrid Intranet (Balin)
Asset Disposal Strategic Plan	<ul style="list-style-type: none"> • Network assets identified for disposal are identified as part of the capital investment processes described above, and integrated into the respective geographically based Area and Transmission Plans
Sustainable Development	<ul style="list-style-type: none"> • Ausgrid's Regulatory Submission to the Australia Energy Regulator for 2009-10
Heritage Asset Management	<ul style="list-style-type: none"> • Heritage and Conservation Register –located on Balin, Sharepoint and the internal.
Demand Management	<ul style="list-style-type: none"> • GEN-004 Demand Management Process Guidelines. Published in Ausgrid Procedures Database. Outputs of the DM process are included under INV-PCD-10022 Network Investment Review of Area Plan. Published on Sharepoint – Enterprise Documentation
Life-Cycle Costing	<ul style="list-style-type: none"> • INV-POL-10001 - Network Investment Management Policy. . Published on Sharepoint – Enterprise Documentation
Economic/Financial Appraisal	<ul style="list-style-type: none"> • INV-WI-10048 Conduct Economic and Project Appraisal. Published on Sharepoint – Enterprise Documentation
Value Management	<ul style="list-style-type: none"> • PMPG 01 Project Management Practitioners Guide (Project Manager's Manual V2). Published in Ausgrid Procedures Database
Risk Management	<ul style="list-style-type: none"> • BRM 01 Business Risk Management Policy & Procedure. Published in Ausgrid Procedures Database. • Corporate Risk Register • Bushfire Risk Management Plan. Published in Ausgrid Internet • MRP14 Duty of Care Plan. Published on Ausgrid Procedures • AM005 - Maintenance Requirements Analysis Manual (section 6.4). Published in Ausgrid Procedures Database. • ENI 002 Environmental Aspects and Improvement.). Published in Ausgrid Procedures Database.
Post Implementation Review	<ul style="list-style-type: none"> • A&M 001 Network Investment Governance Framework. Published in Ausgrid Procedures Database • PMPG 01 Project Management Practitioners Guide (Project Manager's Manual V2). Published in Ausgrid Procedures Database
Asset Information	<ul style="list-style-type: none"> • ASM-PCD-10011 Collect and Record Network Asset Statistics. Published on Sharepoint – Enterprise Documentation

5.2 Maintenance Management

Ausgrid's network assets are managed during the "useful life" phase of the asset lifecycle using a maintenance strategy and associated maintenance standards which are developed from the analysis of failure modes, failure rates and consequences of asset failure. This analysis provides a valuable insight into the behaviour of the assets, which also provides input into the decision to refurbish, retire or replace assets.

5.3 Maintenance requirements analysis (MRA)

Ausgrid's Maintenance Requirements Analysis Manual (MRAM) supports Ausgrid's Asset Management Strategy with detailed procedures for implementing a significant element of Logistic Support Analysis (LSA). This element includes the determination of preventative maintenance requirements of both "in service" and new assets. This process, along with the identification of all corrective maintenance needs of the network, is termed "Maintenance Planning" in the LSA task list.

The determination of maintenance requirements (both inspection and corrective), is a significant part of the LSA process. Maintenance procedures relate to both the physical and functional configurations of items comprising a system, and recognise that the operating context and the environment in which equipment is installed contributes significantly to system maintenance needs.

The MRAM is primarily directed at engineers responsible for establishing and implementing maintenance policies contained in Ausgrid's Network Technical Maintenance Plans (NTMP).

Ausgrid applies a failure mode effect and criticality analysis (FMECA) and reliability-centred maintenance (RCM) analysis for the development of system preventative maintenance requirements. This is a "world class" standardised Maintenance Requirements Analysis (MRA) process, which is currently accepted and applied across Network assets. The FMECA/RCM process also recognises that preventative and corrective maintenance can only, at best, enable assets to achieve their inherent levels of safety and reliability, and the process aims to active this at an efficient cost.

RCM programs require the selection of preventive maintenance tasks on the basis of the:

- reliability characteristics of the equipment;
- operating context of the equipment (i.e. its environment);
- logical analysis of the failure consequences, and
- the applicability and effectiveness of the proposed maintenance task.

The FMECA/RCM approach adopted by Ausgrid produces a schedule of preventive maintenance activities which include an assessment of risk. The RCM also identifies the most cost effective corrective maintenance strategy for failed items, which is either to maintain (repair) or to dispose of failed items and, if the strategy is to maintain, the organisational level at which that maintenance strategy will be applied. FMECA and RCM combined provide a comprehensive set of analysis tools to determine, either at the design stage or during the service life, equipment's complete set of inspection and corrective maintenance requirements and the organisational level at which that maintenance will be done.

Ausgrid's maintenance standards and procedures comprise three key elements:

- inspection;
- corrective maintenance; and
- breakdown repair activities (both asset related and nature induced).

5.3.1 Inspection

Ausgrid has undertaken a network asset evaluation for all network assets using RCM principles and FMECA techniques. This has been used to develop the NTMP which specifies the type and frequency of inspection maintenance activities required for different assets. Inspection maintenance activities (which include condition

monitoring) are set out in associated Maintenance Standards. Ausgrid's inspection maintenance procedures are documented on Ausgrid's procedures database.

Condition monitoring and assessment of assets is used to determine the need for corrective maintenance. Completion of the inspection work is recorded in the SAP Plant Maintenance (PM) module. Completed and pending corrective maintenance for all Network assets is recorded in SAP. All such corrective maintenance requirements are prioritised on a risk basis.

Where the inspection reveals:

- a need for immediate repairs (corrective maintenance) due to a safety or environmental protection issue; or,
- the potential for an imminent equipment breakdown or failure, repairs are carried out as part of the inspection work and recorded in SAP for future action.

5.3.2 Corrective maintenance

Corrective maintenance results from inspection activities. Corrective maintenance requirements are prioritised by review of condition assessment details entered into the SAP PM module.

Typically, these are addressed in order of risk priority based on safety, environmental protection and network security. These procedures are documented on Ausgrid's Procedures database.

5.3.3 Breakdown repair activities

Asset related breakdowns are asset failures due solely to the asset and its condition. Nature induced breakdowns are the result of events that are due to influences outside the design function of the asset.

Both asset related and nature induced breakdown repair activities are typically urgent in nature and are prioritised in order of safety, environmental protection, network security and expected duration of incident recovery. These are distinguished to enable equipment conditional and functional failure data to be identified and utilised in the FMECA/RCM process when reviewing the current asset maintenance standards. These procedures are documented on Ausgrid's Procedures database.

6 Risk management

Ausgrid's risk management approach is to identify risks associated with running a network business and ensure that these are managed appropriately, either by elimination (where this is possible and practicable) or by implementing targeted risk mitigation strategies.

6.1 Nature of key risks

Ausgrid's key risks in relation to its network are:

- (a) Risks relating to compliant infrastructure. Ausgrid has identified three key areas of risk relating to its infrastructure. These are:
 - Safety – covering both public and workplace safety risks, including fire prevention, and safety risks relating to Ausgrid's infrastructure;
 - Environmental risk – covering environmental compliance requirements including obligations in respect of waste disposal, pollution, contamination of land, remediation and environmentally hazardous chemicals; and
 - Infrastructure security risk – covering security and compliance risks relating to Ausgrid's assets.
- (b) Risks relating to network performance. The key areas of risk relating to network performance are:
 - Failure to provide sufficient network capacity to supply all connected customers;
 - Poor performance or failure of specific assets;
 - Failure to provide a reliable, secure supply of electricity of sufficient quality; and
 - Failure to meet customer connection obligations.

Where risks are asset or location specific, they may present as risks to be managed at a network operational or business level. Other risks affecting the network more broadly or with greater potential safety, environmental, asset security or cost impacts, present as strategic or organisational risk, and are addressed at the executive level in the organisation.

6.2 Managing compliant infrastructure risks

In order to manage its infrastructure related risks, Ausgrid has developed a strategic program called its Duty of Care program. Under this program, Ausgrid identifies specific strategic, safety, environmental and infrastructure security risks, and implements targeted projects and programs to address these risks. The Duty of Care program is documented in Ausgrid's Duty of Care Plan.

The Duty of Care Plan identifies programs by asset type and sets out the scope of work required to appropriately manage each identified risk to ensure compliance. The types of programs included in our Duty of Care Plan include programs to address:

- safety risks, including a program to enhance public safety by improving fencing, doors, windows and signage around substations to impede unauthorised entry and various programs to mitigate asbestos and fire risks;
- environmental risk, including programs to manage risks relating to oil leakages; and
- infrastructure security risk, including programs to increase electronic and other security measures at and around Ausgrid sites.

6.3 Other programs to manage safety risk

Other programs implemented by Ausgrid at an operational level to manage workplace and public safety risks in relation to our network include:

- training and authorisation procedures targeted at people who will work on or near Ausgrid's assets to ensure persons working on or near the system's electricity works have the competencies required to undertake the work safely and to adhere to safe working procedures;
- procedures for notifying workers around Ausgrid's electrical assets of relevant procedures and standards, including compliance with Ausgrid's Electrical Safety Rules;
- education programs to communicate to the public safety hazards associated with electricity (as outlined in chapter three: the Public Electrical Safety Awareness Plan);
- availability of the "Dial Before You Dig Service" which provides information on the location of underground assets;
- compliance inspections of customer installations in accordance with chapter two of this Plan: the Customer Installation Safety Plan to ensure they are safe for the occupier and safe to connect to the network;
- the development of a Bushfire Risk Management Plan, (chapter four of this Plan) and implementation of the initiatives set out in that plan; and
- availability of various risk assessment guides on Ausgrid's website (for example, the "Building Site Risk Assessment" guide).

These programs are a sample of Ausgrid's initiatives in the area of public and workplace safety.

6.4 Managing environmental risks

Ausgrid's Environmental Management System (EMS) consists of a combination of procedures and processes aimed at developing, implementing and reviewing Ausgrid's environmental policy. Ausgrid's operational EMS is externally certified to AS/NZS ISO14001:2004.

The environmental planning process involves a risk assessment approach to effectively comply with our policy. At an organisation level, the results from facilitating risk reviews for Ausgrid's approximately 30 key environmental functional areas are collated and analysed, identifying those aspects of the business which can have significant impacts. The risk reviews provide a means to systematically assess Ausgrid's environmental risk exposure and determine appropriate management strategies. On a project level, environmental impact assessments (EIA) are prepared for individual projects in accordance with legislative requirements and Ausgrid procedures which are based on an approach consistent with Department of Planning guidelines.

Examples of programs implemented by Ausgrid to manage environmental risks in relation to our network include:

- Environmental strategies for the management of Oil Filled Equipment, Oil Filled Cables, Polychlorinated Biphenyls (PCBs), Heritage Assets, Water Discharge, Contaminated Land, Environmental GIS, Waste, Pesticide Use, Tree Safety and Sulphur Hexafluoride (SF6).
- Environmental Civil Works Program to provide infrastructure (e.g. washbays, oil storage, material bays, equipment storage etc.) to support Ausgrid's network.
- Noise Assessment Program to manage the generation of noise and vibration associated with the use of assets and the carrying out of certain activities.
- Electric and magnetic fields (EMF) Program includes monitoring, an advisory service and a measurement service within our network area.
- Appropriate environmental training for any person(s) performing tasks on behalf of Ausgrid that have potential to cause significant environmental impacts. Training is provided through the compulsory Environmental Awareness Induction Program and Ausgrid's Environmental Training Program.
- Procedures, documents and technical support to assist staff in undertaking their activities with minimal environmental impact and in accordance with relevant legislative requirements.

- Environmental emergency response management to provide the necessary support within Ausgrid to address the needs of staff, facilities and equipment in the event of unplanned emergency situations should they occur.
- Environmental legislation monitoring, interpretation, dissemination and regulator negotiation.
- Environmental auditing programs (internal and external) to monitor compliance and performance of our network and activities.
- Communication (internal and external) of up-to-date environmental information to employees via a range of channels.

6.5 Insurance

Ausgrid uses insurance as another tool for managing network infrastructure related risk in addition to the strategies and processes for managing infrastructure and network performance risks. Ausgrid maintains a comprehensive insurance program which includes, among other things, public and products liability and property insurances. The levels of insurance coverage and risk retention of the various insurance policies are reviewed annually in consultation with Ausgrid's insurance broker. New insurance coverage requirements are also reviewed as required on an ongoing basis. Ausgrid also require contractors engaged by Ausgrid to have appropriate insurances in place.

6.6 Managing network performance risks

Ausgrid's network performance obligations include obligations to:

- connect and provide ongoing access to the network, as required by the National Electricity Law and the Electricity Supply Act 1995 (NSW);
- provide a reliable and secure supply of electricity to our customers. The Licence Conditions are relevant to this obligation. These Licence Conditions set the requirements for Ausgrid's installed network capacity and targets for network performance;
- appropriately manage asset performance. Poorly performing assets, and asset failure, are a key driver of poor network performance and may result in negative customer reliability outcomes and public and workforce safety being compromised; and
- provide sufficient network capacity to supply all of Ausgrid's connected customers. Ausgrid's network capacity is limited by the equipment installed, the rating of this equipment and the mandated limit for load at risk imposed by the Licence Conditions. Growth in demand for electricity distribution capacity during peak periods can cause a demand/capacity imbalance where network capacity cannot meet peak demand.

In order to manage its network performance risks, Ausgrid:

- has analysed equipment failure modes and rates to establish a risk based maintenance plan to achieve the inherent levels of safety and reliability of the network assets;
- has implemented a condition-based monitoring approach to asset management;
- has implemented a risk assessment process to identify and prioritise asset replacement requirements, based on the application of specific risk criteria;
- has identified the specific projects and programs of work required to address asset condition and performance issues across Ausgrid's network. These projects and programs are documented in Ausgrid's "Replacement Plan" which contains a consolidated view of known asset performance and replacement requirements throughout the network;
- identifies those areas of the network that exhibit, or will be likely to exhibit, poor reliability performance outcomes, when measured against reliability requirements under the Licence Conditions. Ausgrid has identified a program of work required to specifically address reliability issues

additional to those addressed by Ausgrid's other programs of work. This program is documented in Ausgrid's "Reliability Investment Plan";

- forecasts customer connection volumes to identify numbers of new customer connections and implements processes and plans to meet those connections requirements;
- undertakes strategic reviews of network performance requirements across the transmission and sub-transmission networks, focussing on discrete, geographic network areas. At this level, Ausgrid's strategic planning takes into account multiple network performance drivers on an area by area basis. The outcomes of this strategic planning process are documented in a suite of documents called "Area Plans";
- regularly reviews the utilisation of the sub-transmission and distribution system for compliance with the Design Planning Criteria of the Design, Reliability and Performance licence conditions and carries out works to address emerging non-compliances.
- periodically reviews the utilisation of the low voltage distributors and when utilisation exceeds established limits, carries out works to address low voltage capacity issues.
- has adopted a 24 hour recovery time target for major equipment failures. This is supported by the implementation of a range of mobile substation recovery strategies, which provide for recovery from catastrophic substation asset failure, and a spare equipment strategy that provides a risk based framework for the acquisition, maintenance and storage of critical spare assets; and
- tracks the output of its capital works program against the requirements of the various plans.

6.7 Strategic risk management processes

Strategic risk management applies to risk identified which impacts upon the organisation's ability to meet its objectives, and putting in place strategies that will manage these risks.

In addition, broad areas of operational risk are identified and monitored at a business unit level. Each business unit is responsible for the detailed assessment of their risks and the management and control of these risks.

As part of the organisation's strategic planning process, Ausgrid's internal audit branch facilitates an annual workshop involving the executive team to identify key strategic risks to be addressed by the organisation. Risks identified through this process are assigned ownership for the management and control of these risks.

A review process is undertaken quarterly and annually to monitor compliance with outcomes of the planning process and ensure appropriate management of strategic risk.

7 Safety and emergency management

Ausgrid is committed to workplace and public safety. To meet our objectives in this regard as well as relevant legislative and regulatory compliance requirements, we have implemented a number of safety programs and initiatives, both in relation to the safe operation of the network and workplace safety. These programs are summarised below.

7.1 Safe operation of the network

As discussed in Section 6 of this Plan (Risk Management), Ausgrid has identified safety as a key network risk. To manage this risk, Ausgrid has undertaken strategic risk analysis of the types of hazardous events that may occur.

Ausgrid has identified various broad categories of risk relating to the safe operation of the network. At a strategic level, these are addressed in our Duty of Care Plan. The planned programs of work documented in our Duty of Care Plan and Replacement Plan are a key organisational safeguard against network safety risk.

In addition to these planned asset-related programs of work, Ausgrid has implemented various procedures and processes at an operational level for enhancing network safety, including:

- an Incident Management System for managing network incidents and network emergencies that enable rapid response to hazardous situations; and
- formal safety procedures and systems applicable when working on or near the network. This has both network safety and workplace safety implications. Our procedures for working on or near the network are discussed in more detail in Section 8 below.

7.2 Emergencies

The Ausgrid Emergency Management Plan was endorsed by the Executive in June 2008. The Emergency Management Plan outlines the framework for Emergency Management within Ausgrid, including exercising. Exercises are run from time to time in collaboration with EUSFAC and other utilities. They may be cancelled should a real incident precede the exercise.

The Incident Management System is the operational procedures for the preparation and response to incidents within Ausgrid. The Incident Management System is applicable to all Ausgrid divisions, applies to all incidents and is produced and maintained by System Control - Strategic & Emergency Network Operations, in consultation with the relevant stakeholders. The Incident Management System is regularly reviewed and distributed to all who may be called upon to form part of the Incident Management Team, and is available electronically on the Ausgrid Procedures Database.

The Incident Management Steering Committee provides guidance and support for the continual improvement of Emergency Management arrangements within Ausgrid.

7.3 Workplace safety

Ausgrid has workplace safety obligations to its staff and contractors under the Occupational Health and Safety Act 2000 (NSW) (NSW OH&S Act) and the Occupation Health and Safety Regulation 2001 (NSW) (OH&S Regulation). Successful implementation of workplace safety processes and procedures also impacts more generally on network safety and contributes to the safe operation of the network.

Model national work safe laws are expected to be in operation by December 2011, when each jurisdiction will have enacted their own laws that mirror the national model laws. Before its next Network Management Plan is prepared, Ausgrid will review its current workplace procedures for compliance with the new legislation.

Ausgrid has numerous policies and procedures in place to ensure safe work practices. Ausgrid conducts programs to identify workplace safety risks and implements initiatives to address these risks to ensure ongoing compliance with its workplace safety obligations, and consistent application of its commitment to safety.

One of Ausgrid's initiatives is the "BeSafe" workplace program. This program has two key objectives:

- the health, safety and welfare of all staff while they are at work; and
- ensuring that people other than our staff are not exposed to unacceptable risks to their health and safety in connection with Ausgrid’s network operations.

Our “BeSafe” policy is based on:

- eliminating or controlling any reasonably foreseeable occupational health and safety risks;
- a commitment to consultation with staff to enable them to contribute to decisions affecting their health, safety and welfare at work;
- ensuring the design, supply and use of plant and substances at work is safe and without risks to health when used properly;
- education and training programs to ensure staff and contractors are equipped with sufficient information to ensure their health and safety;
- preventing occupational injury and illness by all reasonable, practicable means;
- providing timely and cost effective injury management to promote early return to duties;
- maintaining a workers' compensation self-insurer licence;
- complying with the OH&S Act and OH&S Regulation, and maintaining an OH&S system that complies with Australian Standard AS/NZS 4801;
- adopting best practice standards where legislation or mandatory standards do not exist; and
- promoting community awareness of safety issues, through public education campaigns.

7.4 Working on or near the network

Ausgrid’s safety objectives are to ensure:

- that those working on or near the network are competent to do so, and can do so in the intended safe manner; and
- compliance with the OH&S Act and OH&S Regulation, which require employers such as Ausgrid to identify foreseeable hazards, assess the risks of these hazards and eliminate or control these risks and review these controls.

Ausgrid’s Public Electrical Safety Awareness Plan (chapter three of this Plan) educates the general public, the construction industry and emergency services of the risks of working near network assets and the requirement for people working near those assets to be appropriately qualified and authorised (where required). Ausgrid has the following processes in place to meet these objectives:

- Hazard assessment forms and safe work method statements have been developed in consultation with staff. External parties (such as Accredited Service Providers and contractors) are required to develop their own procedures and forms to submit to Ausgrid;
- Competency-based training (based on relevant national training packages and in accordance with the principle outlined in Section 8 of the National Electricity Network Safety Code “ENA Doc 01-2008”);
- Induction training for all new employees (both employees and contractors) is carried out in accordance with our Quality, Safety, Health and Environmental Management System;
- Accreditation of service providers undertaking contestable work meets Contestable Works: Code of Practice standards (and other applicable schemes) administered by NSW Fair Trading;
- Audit inspection of works in progress to monitor ASP compliance with Ausgrid's Electrical Safety Rules;

- Report accidents and incidents, as specified by Industry & Investment NSW under the Significant Electrical Network Incidents reporting system (including those required under the Electricity (Consumer Safety) Regulation 2006); and
- Report customer installation incidents to the NSW Fair Trading (in accordance with the Electricity (Consumer Safety) Act 2004).

In addition to the activities listed above, Ausgrid has a number of procedures, standards and requirements that help to ensure everyone working on or near our network is competent and remains safe. These include:

- Training and competency requirements;
- Training records management;
- Procedures and training for working on live electricity assets;
- Safety equipment design, use and maintenance standards;
- Provision of recorded asset information (maps and drawings) for underground assets via the Dial Before You Dig Service, including general safety precautions via reference to Network Standard NS156; and
- Provision of risk assessment guides via the Ausgrid procedures database.

7.5 Training and competency requirements

It is the responsibility of individual employees, contractors and Accredited Service Providers to only undertake work for which they have been formally trained and demonstrated competence. It is essential that all authorised work be performed safely in accordance with this Plan, Electrical Safety Rules, and Network Standards and in compliance with applicable legislative and regulatory obligations.

Ausgrid staff – Ausgrid must ensure that staff are trained to a level where they are competent to perform their duties. Managers must ensure that appropriate training is made available to employees. Employees must undertake training and understand their responsibilities.

Contractors – Contractors and their staff must be correctly trained for the type of work they perform. This requirement is outlined in their contract with us. In addition, as a condition of contract, all contractors must receive induction training from Ausgrid prior to commencing their work on site. Ausgrid manages and audits contractors as required.

Accredited service providers – Accredited Service Providers and their staff must be correctly trained for the type of work they perform. They are responsible for ensuring the safety of their employees and the public in general while carrying out contestable work.

7.6 Training records management

These records form part of Ausgrid's safety management system and alert management when refresher training is required.

Ausgrid staff – Ausgrid maintains training records for all employees.

Contractors – Contractors are required to maintain systems that document the training requirements and status of training for their personnel. These records may be reviewed during audits conducted by Ausgrid.

Accredited service providers – Accredited Service Providers are required to maintain systems that document the training requirements and status of training for their personnel. The statutory safety training requirements are detailed in the accreditation schemes for ASPs administered by Industry & Investment NSW. These records are reviewed as part of Ausgrid's initial authorisation process that assesses both statutory training and trade-based competencies. Statutory safety training records are reviewed annually as part of the re-authorisation process.

Personal training records (such as network passports) – Authorised persons when working on or near the network are required to carry documentation of their personal training records. The personal training record must be presented on request to any officer representing Ausgrid, Industry & Investment NSW or WorkCover. The Ausgrid Network Passport or the Australian Electricity Supply Industry Skills Passport is used to record personal training for all authorised persons employed or contracted by Ausgrid and by authorised persons working for Accredited Service Providers.

7.7 Procedures for working on de-energised electricity assets

Persons who undertake work on energised electricity assets must be trained and demonstrate the required competency to carry out this work. This training is encompassed in the National Electricity Supply Industry Transmission and Distribution Training package. Our staff who carry out this type of work have either:

- attained these skills and knowledge by undertaking the National Electricity Supply Industry Transmission and Distribution Training package;
- are apprentices who are currently attaining the skills and knowledge under a formal training contract and have appropriate supervision; or
- were assessed as having the equivalent skills and knowledge by the Vocational Education and Training Advisory Board at the time the package was introduced.

7.8 Procedures and training for working on live electricity assets

Electrical work on energised (“live”) high voltage and low voltage network equipment is carried out under this plan.¹¹ In addition to the training delivered outlined in section 7.7 persons who undertake this live electrical work must be supervised and follow Ausgrid’s documented processes, in particular:

- **Live High Voltage** – Ausgrid has safety procedures that document the requirements for working with live electricity. In addition, live electrical work is carried out in accordance with the Australian Standards AS 5804.1 High voltage live working – general, AS5804.2 High voltage live working – glove and barrier work and AS5804.3 High voltage live working – stick work.
- **Live Low Voltage** – encompassed in the national training package. We also utilise training courses based on our Electrical Safety Rules (e.g. for work performed by electrically qualified staff in substations on live low voltage panels and switchboards).

Both Live Low Voltage and Live High Voltage work must be performed in accordance with the requirements of the Electrical Safety Rules.

7.9 Analysis of hazardous events

Hazardous situations exist from day to day in the energy industry, exposing employees, contractors, the public and the environment to some level of risk.

These dangers can be systematically identified and controlled, through the adoption of appropriate control mechanisms.

Analysis of Hazardous Events (Appendix B) set out the types of hazardous events that may be reasonably expected to occur in the course of the construction, maintenance and operation of the network and outlines how Ausgrid aims to manage these events. Appendix B provides a comprehensive checklist to ensure that appropriate safeguards are in place in relation to foreseeable risks.

Appendix B sets out:

¹¹ It should be noted that clause 207 of the Occupational Health and Safety Regulation 2001 prohibits work on energised electrical circuits and apparatus. However clause 207 does not apply electrical work carried out under a Network Management Plan, such as this one, required to be lodged under the Electricity Supply (Safety and Network Management) Regulation 2002.

- hazardous events that can occur during construction, maintenance or operation of the network;
- the potential causes of the hazardous event; and
- the safeguards intended to prevent (where possible) the events from occurring, or should they occur, intended to protect construction, maintenance and operating personnel, plant, equipment, the community and the environment.

In addition to this analysis of generic hazardous events, Ausgrid utilises the 'CHAIR' process ('Construction Hazard Assessment and Implication Review') as documented in WorkCover's 'Safety in Design Tool' to identify specific hazardous events that may occur during construction, operation, maintenance and retirement of network assets. Ausgrid uses this process when there are unusual designs or where there are sufficient inherent safety hazards. The CHAIR process will identify risks, consider ways of eliminating or reducing such risks and document results. These are then reflected in the asset design and used to complement Ausgrid's existing safety procedures.

7.10 Safety management compliance

Ausgrid's objective in relation to Safety Management Compliance is to ensure staff, contractors and Accredited Service Providers follow safe work procedures. Ausgrid has in place the following compliance procedures and activities:

Ausgrid staff

- conduct targeted, unannounced audits of field staff and work sites;
- report results of audits to senior management and business unit safety managers;
- identify and implement any corrective action procedures required (confirming that the supervisor is satisfied with the action); and
- prepare timeframes for corrective action in cases where a response cannot occur immediately.

Contractors

- conduct unannounced audits (appropriate to the nature of the work);
- document results of audits and provide to the appropriate contract management staff;
- formally notify the contractor of any non-compliance and request rectification;
- provide incentives to encourage adherence to safety (e.g. recovering any additional costs incurred by Ausgrid as a result of non-compliance); and
- record the results of audits for large contracts in databases that are used to monitor performance.

Accredited service providers (ASP)

- Level 1 (ASPs working on the network)
 - inspect all work for Level 1 ASPs at relevant stages specified in the contract;
 - notify the contractor of any safety breaches and request rectification (prior to work recommencing);
 - advise appropriate Ausgrid staff of all Level 1 breaches; and
 - if required, recommend action to Industry & Investment NSW.
- Level 2 (ASPs working on customer installations)

- conduct a baseline audit of their safety equipment (to assess their capability for meeting safety requirements);
- conduct a pre-arranged field safety audit of the ASPs' work (at least six months prior to re-authorisation); and
- investigate appropriate corrective action as a result of accidents or incidents arising from their work.

ASPs are accredited to undertake contestable work on the New South Wales network through a scheme administered by Industry & Investment NSW. Individual electrical contractors or electrical contracting/consulting companies may become ASPs and perform contestable work. Individuals may also obtain authorisation from Ausgrid, or work on or near our existing network distribution assets.

7.11 Safety equipment design, use and maintenance

Ausgrid purchases safety equipment that has been manufactured in accordance with the requirements of the relevant Australian or IEC Standards.

Where any design of safety equipment is undertaken, Ausgrid ensures it is designed to the relevant Australian or IEC Standards and thoroughly tested before it is commissioned for use.

Safety equipment is used and maintained according to Ausgrid's Electrical Safety Rules clause 4.1 "Safety Equipment and other tools" and clause 4.2 "Checking Safety and Operating Equipment" and applicable Technical Standards and Guidelines. These outline the instances when safety equipment and clothing should be used and the requirements for testing and maintenance.

Wherever possible, a Registered Training Organisation (RTO) will conduct mandatory training (i.e. primary and secondary) and specialist training. Where training services are not available from an RTO, or the training is not encompassed in a national training package, non-RTOs may be engaged. That organisation must meet Ausgrid's Quality, Safety, Health and Environmental Management System requirements. Ausgrid also needs to approve course content for non RTOs. Where such training is provided internally by Ausgrid¹², this will conform to national training package standards.

All RTOs must be able to demonstrate that they have factored in the requirements outlined in clause 8.3 of the Network Safety Code "ENA Doc 01-2008" in all their training courses.

Ausgrid recognises the following training courses:

- Ausgrid courses (e.g. Electrical Safety Rules, Substation Entry, Environmental Awareness);
- Industry courses (e.g. the NSW WorkCover approved Overhead Power line Electrical Safety Course, NSW TAFE Bonded Asbestos Removal Course, NSW TAFE Accredited Service Providers Level 2 training course);
- National Training Package qualifications delivered within the scope of Registered Training Organisations
- Refresher training delivered under the Memorandum of Understanding between members of the Energy Networks Association and evidenced through the Australian ESI Skills Passport
- Courses related to the needs of the Electricity Supply Industry as determined by the Learning & Development Branch (e.g. St John Ambulance First Aid Courses, CPR, Fall Arrest).

Persons must not undertake work unless they are trained in accordance with the requirements of Appendix A.

¹² Ausgrid is a Registered Training Organisation

8 Standards and procedures

8.1 Design and Construction Standards and Procedures

Ausgrid's objective is to design and construct the electricity network so that it can be maintained and operated safely while delivering an adequate, reliable and cost effective electricity supply of appropriate quality.

The approach taken to network asset design by Ausgrid is based on the principles outlined in the National Electricity Network Safety Code published by the Energy Networks Association (ENA) in particular ENA Doc 01-2008 – Section 6 Design and Construction.

The primary reference sources for development and amendment of a Network Standard are the applicable Ausgrid plans under the Electricity Supply (Safety and Network Management) Regulation 2008, particularly the Network Management Plan and the Bush Fire Risk Management Plan, and the NENS Codes and Guidelines. Other sources for development include relevant ENA Guidelines, National and International design standards.

The following matters are considered as being of primary importance when considering the content of a network standard:

- safety, environmental and infrastructure security risk;
- quality of supply; and
- reliability.

Ausgrid's procedure for "Preparation of Network Standards", available on Ausgrid Procedures database, incorporates the process Ausgrid uses to set design standards that are to be included in Network Standards.

Under Network Standard NS104 Network Project Design Plans, which applies to all electrical works involving Ausgrid's network, designers are required to:

- adhere to relevant legislation, standards and codes of practice;
- consider safety and environmental aspects of the works; and
- declare that the design, as submitted, is fit for its intended purpose.

Ausgrid uses a certification/verification process to manage compliance with its design standards.

Ausgrid's Electrical Safety Rules are the principal procedures that Ausgrid requires all persons to follow when undertaking construction work on or near the network or on sections of the network that are out-of-service or under construction. Ausgrid uses audit inspection and quality procedures to manage compliance with its construction standards.

A list of Ausgrid's design and construction standards and procedures is included in Appendix A. Design and construction standards are available to appropriate employees, contractors and service providers.

8.2 Maintenance standards and procedures

Ausgrid is continuing the implementation of a less intrusive maintenance program with targeted condition-based testing and asset analysis. These techniques allow us to repair or replace only those assets that require attention, delivering an improved maintenance outcome.

Ausgrid's maintenance documentation is aligned to the requirements of ENA Doc 01-2008 – Section 7 Maintenance with the exception of EMF which is considered to be a design issue, not a maintenance issue.

The principal documents underpinning our maintenance process are the Maintenance Requirements Analysis Manual (MRAM) and the Network Technical Maintenance Plan (NTMP), both of which are available to Ausgrid staff on the Engineering Intranet Balin. The required Maintenance Standards, by major asset class, are accessed via the NTMP web pages on Balin.

Ausgrid uses the inspection, corrective and breakdown maintenance procedures to manage the implementation of the NTMP and associated Maintenance Standards. A list of maintenance standards and procedures applied by Ausgrid is included on the Ausgrid website (www.ausgrid.com.au) and Balin.

8.3 Operation and safe work standards and procedures

Ausgrid performs all work on or near the distribution network in a manner that ensures safety has the highest priority. The operating procedures for such work are based on the Electrical Safety Rules. Ausgrid's Electrical Safety Rules and companion handbook are available to all Ausgrid staff on the Ausgrid website, the Engineering Intranet Balin or as hard copy, and as hard copy to all authorised ASPs and contractors.

The Electrical Safety Rules provide detailed procedures for operational activities, with the following being particularly relevant:

- Training and Authorisation
- Safety Equipment, Clothing and Material;
- Safe Working Distances;
- General Provisions;
- Low Voltage Work;
- High Voltage Work;
- Red and White Striped Tape;
- Disconnection and Reconnection;
- Permits and Folders;
- Operating and other Authorities;
- Access on Ausgrid Mains and Apparatus in the Vicinity of Other Organisation's Mains;
- Access on Ausgrid Mains and Apparatus that Interconnect with Others;
- Electrical Stations Controlled by Other Organisations;
- Isolation of Ausgrid's Mains and Apparatus for other Organisations; and
- Mains and Apparatus Owned by Others.

The above procedures provide the means for persons to carry out operational and work activities, on or near both live and de-energised electricity assets, in a safe manner. These procedures include:

- the need for all persons to complete a specific hazard assessment with reference to Safe Work Method Statements where relevant;
- the detailed requirements for training and authorisation to carry out various operational activities; and
- the provision of general procedures for a wide range of common events, practices and activities such as the identification of dangers in various circumstances, entering different locations where network assets are located and warning systems.

Further procedures on specific technical matters are provided to district operators via "Advice (notices) to District Operators" which are available to Ausgrid staff on the Engineering Intranet Balin.

For control room staff located in Ausgrid's Sydney and Wallsend control rooms, further procedures on specific technical matters are provided via "Control Centre Advices" (notices) for control centre operators which are maintained in the control room as controlled hard copy documents. For staff in the Wallsend control room,

further procedures on specific technical matters are also provided via "Network Memorandums" which are also maintained as controlled hard copy documents in the control room.

Core documentation (such as the Electrical Safety Rules, Network Standards and Electrical Standards) and associated processes have been reviewed and are compliant with the detailed requirements of the ENA Doc 01-2008.

8.3.1 Safe work method statements (SWMS) and hazard assessment checklists (HAC)

Ausgrid has a safe system of work that includes a comprehensive database of safe work method statements for use by relevant employees, as well as a defined hazard assessment check [HAC] process, for the identification of site based hazards before commencing work.

All authorised accredited service providers and contractors are required to have their own Safe Work Method Statements as part of their authorisation.

8.4 Managing & complying with network operating procedures and standards

The network operating procedures used by Ausgrid address the requirements of the National Electricity Network Safety Code "ENA Doc 01-2008" - in particular Section 8 Work on or Near Electricity Networks.

A periodic review of the Electrical Safety Rules is conducted by a committee including Ausgrid management and staff representatives. This is the principal process used by Ausgrid to set network operating standards and procedures.

The Electrical Safety Rules were last reviewed in August 2010. All changes to the Electrical Safety Rules are reviewed by senior management for compliance with this Plan, relevant legislation, codes and guidelines before issue of the Rules under the authority of the Executive General Manager, Engineering Transmission & Technology. Ausgrid's strategies to deliver compliance with the network operating standards and procedures are detailed in the Safety Management section of this Plan.

8.5 Incident management procedures

Ausgrid's emergency procedures (for managing emergencies, including fires, explosions, storms, natural disasters, civil disturbances or anything else that may effect the distribution network or critical business processes) are defined in the "Incident Management System" (IMS) that is available to all staff on Ausgrid's procedures database. The IMS enacts the direction set out in the "Ausgrid - Emergency Management Plan", which complies with NSW arrangements.

Ausgrid's response to emergencies centres around three key priorities:

- safety (people and property);
- the environment; and
- restoring the network.

Ausgrid's IMS is tested (via simulation) on an annual basis as a minimum – unless there has been a declared incident requiring the use of the IMS during that period. After each incident or simulation, a debrief is held with any resulting alteration or improvement to the system being overseen by the Incident Management Steering Committee and implemented accordingly.

8.6 Engineering records, drawings and spatial Information

Ausgrid maintains comprehensive engineering records, drawings & spatial information showing the location of network assets. We use a number of systems, software & databases to ensure this information is available to effectively design, construct and maintain our network:

- **Geographic Information System (GIS)** – stores various forms of network asset spatial information and delivers essential data updates to Ausgrid's related network asset management business systems (iAMS, OMS, DM&C, RIC etc). The GIS also provides periodic updates of geographic maps, geo-schematic plans and "as-built" recordings as stored in the TDMS. Ausgrid staff have "read only" access to the entire GIS database through the "Scout" software application, providing the capability to

query, view and trace connectivity of Ausgrid's network assets. Scout can also be used to extract spatial information on Ausgrid's network assets for use in CAD software as part of the network planning design cycle.

- **Technical Document Management System (TDMS)** – a database providing access to engineering, architectural, and survey drawings, field recordings and maps for the network.
- **Project Tracker (PrjTrak)** – ensures all network project design plans, network upgrades and connections are tracked and recorded in the GIS. Allocation of a unique PrjTrak number facilitates notification, tracking and status of network changes with GIS updates in the GIS.
- **Asset databases SAP**– Ausgrid has implemented an integrated asset management system using SAP. This system, captures network asset technical details, history, plant ratings, maintenance and modification status and performance (such as outages and loads), for substations, poles, pillars, street lighting, associated pole attachments (such as cross arms, mains and insulators) and load control points. SAP contains some technical details on conductors and cables. This system captures inspection, corrective and breakdown tasks required to be done and those completed, including failure and cost details.
- **Engineering intranet (Balin)** – BALIN is an intranet service containing technical standards, procedures, manuals and instructions. It also provides access (via other systems) to system diagrams, an environmental index, the ChemAlert database, ION Smart Grid Monitoring, the Technical Document Management System and Network project databases.
- **Ausgrid's procedures database** – accessed via Lotus Notes, this service provides information on general business procedures and includes safety and environmental procedures for all staff.
- **Website (www.ausgrid.com.au)** – access for ASPs and the public to network standards and information on company policy, standards and electrical safety.
- **Automated "One-Call" system** – responds to 1100 "Dial before You Dig" enquiries and provides relevant plans and standards to the caller.

Procedures for gaining access to information concerning Network Assets:

Ausgrid staff – All Ausgrid staff and contractors obtain access to all relevant Ausgrid listed systems as required by their work scopes. In general, such access is obtained by submitting an application request that is registered via Lotus Notes in a database "Directory & Application Access Requests" and is subject to approval by the staff nominated as responsible for the directory or application.

Accredited service providers (ASP) – ASPs can access Ausgrid Network Standards and Electricity Supply Standards via Ausgrid's website www.ausgrid.com.au

ASPs will be provided with access to such technical information as is reasonably necessary to perform or design Contestable Works.

Other parties requiring access to information concerning network assets – For parties that may require technical information for purposes other than network asset design and construction, the provision of such information is through the Shared Service Subsidiary of Ausgrid. The process for the provision of such information is defined in the internal Customer Installations Advice 74B "Provision of Information to Network Access Seekers".

For persons carrying out work that is not related to the network, provision of information such as maps of asset locations required prior to spot excavation or construction is facilitated by the "Dial before You Dig" system. This access is detailed in Electricity Supply Standard ES1 Part A Section 15 "Cable Locations". "Dial Before You Dig" enquiries can now be submitted via the web.

8.7 Government Information (Public Access) Act 2009 ("GIPA Act")

The Government Information (Public Access) Act 2009 (NSW) (GIPA Act) is a new piece of legislation, which governs how Ausgrid releases information. On 1 July 2010, the GIPA Act replaced the Freedom of Information

Act 1989 (NSW) (FOI Act), creating a new 'right to information' regime aimed at making more information publicly available.

Under the GIPA Act Ausgrid must now release information about its operations and activities unless there is an overriding public interest against disclosure or, if the information falls within an exempt category of information under the Act.

The GIPA Act establishes four ways in which Ausgrid information is to be made available to the public.

1. **Mandatory disclosure of open access information** – Ausgrid must make the following information available on its website free of charge: contract register; disclosure log; policy documents and reports; documents tabled in parliament; current publication guide
2. **Proactive release** – Ausgrid may decide to make certain information regarding its activities, which is of interest to the public readily available.
3. **Informal release** – Requests for specific information which Ausgrid is able to release without the need for a formal application. It is Ausgrid's preference to deal with requests informally where suitable as it more often quicker and less costly.
4. **Formal access application** – In limited circumstances, access to information will require a formal access application. People have a right to access information in this way unless the GIPA Act provides a reason to withhold the information.

9 Network performance and licence compliance

9.1 Performance indicators

The Network Management Plan contains the high level design, construction, operation and maintenance principles used to manage the network assets, and incorporates the principles being applied to asset utilisation in the areas of safety, reliability, quality of supply and risk management. Ausgrid's annual Electricity Network Performance Report then reports on the performance indicators highlighted in the Network Management Plan.

The performance indicators relevant to the management and operation of the network are specifically nominated in the report outline for the annual Electricity Network Performance Report, issued by Industry & Investment NSW.

Ausgrid reports annually against the Industry and Investment outline and publishes the results in the annual Electricity Network Performance Report on our website (www.ausgrid.com.au). The report provides details of performance in the following areas:

- Network Management, including complaints and customer service standards;
- Network Planning and Demand Management;
- Asset Management including technical service standards, quality and reliability of supply;
- Network Safety - accidents and incidents involving the network;
- Accredited Service Provider Scheme including the number of notifications, inspections and defects;
- Bushfire Risk Management;
- Public Electrical Safety Awareness; and
- Compliance with the NSW Maritime electricity industry code "Crossings of NSW Navigable Waters".

9.2 Schedule of reports to Industry & Investment NSW

Ausgrid submits the following reports to Industry & Investment NSW:

- Annual Electricity Network Performance Report (based on the report outline provided by Industry & Investment NSW each year);
- Quarterly Performance Report (based on the report outline provided by Industry & Investment NSW) in accordance with the reporting requirements of the Design, Reliability and Performance Licence Conditions;
- Reports of accidents and incidents – as specified by Industry & Investment NSW under the Significant Electricity Network Incidents (SENI) reporting system (including those required under the Electricity (Consumer Safety) Regulation 2006); and
- Any other reports that the Director General may require under Clause 17 of the Electricity Supply (Safety and Network Management) Regulation 2008.

9.3 Compliance with distribution network service provider's licence.

In NSW, the Electricity Supply Act 1995 (ESA), Electricity Supply (General) Regulations 2001, the Market Operations Rules, and Ministerially Imposed Licence Conditions clearly define the suite of DNSP Licence obligations applicable to Ausgrid as a network operator. Nationally, Ausgrid is also subject to the National Electricity Regime, which includes the National Electricity Law (NEL) and National Electricity Rules (NER).

At all times during the term of its Licence, Ausgrid must hold and comply with its NSW Licence authorisation and with the NEL and NER.

Licence Condition 7 states that Ausgrid must “prepare and submit reports in accordance with the applicable Reporting Manual issued by IPART” and condition 8 states “The Licence Holder must develop and maintain internal systems capable of effectively managing compliance with its Licence.”

In accordance with these conditions, Ausgrid is required to submit an annual compliance report to IPART by 31 August each year detailing its compliance with both the NSW and National Regime (NER and NEL). To compile this report and to manage its compliance obligations, Ausgrid maintains a comprehensive Licence and NER compliance management system. The system contains every obligation (relevant to a distribution network service provider) imposed by each of the regulatory instruments referred to in the first paragraph above. The Ministerially-imposed Licence Conditions are those pursuant to item 6(1)(b) of Schedule 2 of the Electricity Supply Act 1995 and are split into two groups: conditions 1-13 in one group, and 14-19 which are additional conditions imposing design, reliability and performance standards on distribution network service providers.

The Licence and NER compliance management system reflects the characteristics of a robust compliance program as defined by the Australian Standard AS3806 "Compliance Programs" and is reviewed regularly.

10 Codes, standards and guidelines

10.1 Relevant codes, standards and guidelines

Ausgrid adheres to the following codes, standards and guidelines in the design, installation, operation and maintenance of our network:

- ENA Doc 01-2008 National Electricity Network Safety Code;
- Electricity Transmission and Distribution Asset Management: Code of Practice;
- Contestable Works: Code of Practice
- NSW Code of Practice Electricity Service Standards
- NSW Code of Practice Installation Safety Management;
- NSW Code of Practice Demand Management for Electricity Distributors 2004;
- NSW Code of Practice Contestable Works;
- NSW Code of Practice Electrical Workers Safety Equipment;
- NSW Code of Practice Distribution Risk Management;
- NSW Code of Practice Service and Installation Rules (updated Jan 2009);
- ISSC 3 – Guide to Tree Planting and Maintaining Safety Clearances Near Powerlines;
- ISSC 14 – Guide to electrical workers’ safety equipment
- ISSC 28 – Guideline for Enclosed Spaces in NSW Electricity Networks;
- ISSC 29 – Guideline for Pre-Climbing and Climbing Assessment of Poles;
- ISSC 31 – Guideline for the Management of Private Overhead Lines;
- ISSC 32 – Guide for Network Operators to Provide Information to the Construction Industry for the Use of Cable Covers;
- ISSC 33 – Guideline for network configuration during high bush fire risk days;
- AS 5804 (including: Guidelines for: Live Line Bare Hand Work, Live Line Stick Work and Live Line Glove and Barrier Work);
- National Guidelines for Protecting Critical Infrastructure from Terrorism;
- Service and Installation Rules of NSW; and
- NSW Maritime Crossings of NSW Navigable Waters: Electricity Industry Code.

Ausgrid also references additional guidelines, standards and other documents used in electricity networks nominated in relevant Network Standards. These are available on the ENA website (www.ena.asn.au).

10.2 Departures from codes, standards and guidelines

The following exceptions are made to ENA Doc 01- 2008:

- In accordance with the written direction of 13 May 2003 from the Director General of Industry & Investment NSW, clause 6.4.1 of ENA Doc 01 is not applied to overhead services and other cable systems as defined in AS 7000 “Overhead Line Design – Detailed Procedures”. For these clearances, clause 5.3.5.2 of the Electricity Association of NSW Code of Practice for Electricity

Transmission and Distribution Asset Management, November 1997 will apply, to maintain existing higher clearances.

- Clause 8.4.3 Of ENA Doc 01, including ENA NENS 04-2006 “National guidelines for safe approach distances to electrical and mechanical apparatus” is not applied for safe approach distances. The safe working distances nominated in Ausgrid’s Electrical Safety Rules will apply. The WorkCover - Work Near Overhead Power Lines - Code of Practice will be utilised for safe approach distances for operating equipment near overhead network assets.

The Demand Management for Electricity Distributors - NSW Code of Practice (2004) has been taken into account in the formulation and implementation of this Plan. While Ausgrid's processes depart from the detailed provisions of the Code in several respects, they equal or exceed the objectives and outcomes of the Code.

There are seven stated objectives of the Code:

1. To publish information that makes transparent the underlying assumptions and decision making processes relating to investments that expand distribution networks;
2. To publish detailed information regarding the need for network expansion in a way that enables interested parties to identify likely locations of forthcoming constraint.

Ausgrid publishes an annual Electricity Distribution System Review (ESDR). This document provides detailed information about forecasts and system capacity at each major substation in Ausgrid’s franchise area; descriptions of the decision making processes and investment criteria; descriptions and estimated costs of all proposed and potential expansion projects; and details of investment timeframes. A DM register of interested parties is maintained and all registered parties are informed of the availability of all publicly available documents relevant to DM as they become available;

3. To use a formal process to determine whether demand management investigations are warranted for identified emerging constraints, and publish the results.

Ausgrid undertakes formal DM screening tests for each identified constraint, as described in section 2.2. The results of these tests are published on the Ausgrid web site. The screening test is carried out to determine whether it is reasonable to expect that demand management may be an option. The considerations of the screening test are more comprehensive than the Reasonableness Test provided for in the Code. Tests are carried out promptly according to priority of need and when necessary information becomes available;

4. To carry out demand management investigations that provides opportunities for market participation.

Where a screening test indicates that demand management may be a reasonable alternative, Ausgrid's processes include a formal DM investigation stage, during which a specific and targeted public consultation is normally undertaken. The public documentation includes much more detailed information about the region under investigation and the nature of the constraint than is available in the ESDR. All responses received as a result of public consultation regarding a particular constraint are considered and formally addressed in the demand management investigation report. In addition to consultation, Ausgrid undertakes direct investigation of DM opportunities. If, as a result of the demand management investigation process, Ausgrid determines that demand management is likely to be feasible, Ausgrid procures the relevant DM services.

5. To analyse demand management and network expansion options on an equal basis according to the published methodology and assumptions and publish the results of those determinations;
6. To implement demand management options where they are determined to be cost-effective.

Ausgrid's processes equal or exceed Code recommendations in respect of these two objectives;

7. Prepare and publish reports on these activities annually.

Ausgrid submits annual reports to Industry & Investment NSW in accordance with the Reporting Guidelines published by the Minister. Details of all investigations and DM projects undertaken during the year are also published in Ausgrid's annual report, and individual reports are published from time to time and publicised via the DM Register of interested parties and Ausgrid website.

10.3 Code clarifications

The following clarifications are made to ENA DOC 001-2008:

- In clause 3 (Scope), it is Ausgrid's understanding that "out-of-service" refers to de-commissioned assets. Ausgrid maintains such assets as is necessary to assure public safety, the safety of employees and to protect the environment. Should such de-commissioned assets be returned to service, Ausgrid would at that time, carry out any necessary work(s) to meet the full provisions required by ENA DOC 001-2008 for these assets.
- In Clause 4.1 of ENA DOC 001-2008, Ausgrid is responsible for ensuring that current relevant Australian Standards and ENA documents are referenced. When formulating policies, Ausgrid takes these documents into consideration, and incorporates the appropriate procedures into its own documentation. However, there may be minor differences between Ausgrid's practices and the reference documents while maintaining an equivalent safety outcome.
- In clause 8.3.1 (Qualifications and Training - General Requirements), the relevance of the training listed to the work being undertaken will be determined by Ausgrid.

Appendix A Training and Competency Requirements

Class of Work	Type of Work	Mandatory Primary Training	Mandatory Secondary Training (see NOTE 1)	Optional Training Extended (see NOTE 2)
Construction and maintenance of the Distribution Network - involving energised and de-energised apparatus up to and including 132 kV (includes contestable construction work by Level 1 ASPs)	Network construction and maintenance tasks requiring electrical trade (Electrician) skills and covering the following work categories: Substation Construction, Protection, Voltage Regulation, Tele-control, LV & HV Metering, Installation Inspection	Electrical trade apprenticeship as a minimum. Specialist training (as required by the type of work to be undertaken)	Safety training and refresher training as required by Clause 8.3 of ENA Doc 01-2008. Code with the interpretations listed in Section 4.3 of this Plan. This may include, but is not limited to, the following: Electrical Safety Rules, Access Permit Procedures, Entry to Substations, Oil containment, Traffic Control, Asbestos Awareness, Environmental Awareness, Confined Spaces Training and Fall Arrest Training. For Level 1 ASPs refer also to ES4 Section 5 Table 1.	Limited Operating (see NOTE 3) Plant Operating Certificates (various).
Operation of the Distribution/Network	Operation of the network - involving electrical trade (Electrician) skills in performing field switching to energise and de-energise apparatus at voltages up to and including 132 kV	Electrical trade apprenticeship as a minimum. Specialist training in system operation. (see NOTE 3)	Safety training and refresher training as required by Clause 8.3 of ENA Doc 01-2008. Code with the interpretations listed in Section 4.3 of this Plan. This may include, but is not limited to, the following: Overhead Power line Electrical Safety Electrical Safety Rules, Access Permit Procedures, Entry to Substations, Oil containment, Asbestos Awareness, Environmental Awareness, Confined Spaces Training and Fall Arrest Training.	EWP and Plant Operating Certificates (various)
Construction and maintenance of the Distribution Network - involving energised and de-energised apparatus up to and including 132 kV (includes contestable construction work by Level 1 ASPs)	Network construction and maintenance tasks requiring electrical trade (Line worker) skills and covering the following work categories: LV overhead mains, HV overhead mains and Sub-Transmission Overhead Mains	Electrical Trade (Line Work) apprenticeship or equivalent line work trade qualification. Specialist training as required by the type of line work to be performed	Safety training and refresher training as required by Clause 8.3 of ENA Doc 01-2008. Code with the interpretations listed in Section 4.3 of this Plan. This may include, but is not limited to, the following: Electrical Safety Rules, Access Permit Procedures, Entry to Substations, EWP rescue and CDD training, Oil containment, Traffic Control, Asbestos Awareness, Environmental Awareness, Fall Arrest Training and Climbing attached training. For Level 1 ASPs refer also to ES4 Section 5 Table 1.	Limited Operating, Live Line working, driving heavy vehicles. EWP and Plant Operating Certificates (various)

Class of Work	Type of Work	Mandatory Primary Training	Mandatory Secondary Training (see NOTE 1)	Optional Training Extended (see NOTE 2)
Construction and maintenance of the Distribution Network - involving energised and de-energised apparatus up to and including 132 kV (includes contestable construction work by Level 1 ASPs)	Network construction and maintenance tasks requiring electrical trade (Cable Joiner) skills on one or more of the following categories of cable: Distribution (e.g. Polymeric & Paper lead), Sub-Transmission (e.g. Paper lead, Oil filled, Gas Filled & Polymeric)	Electrical Trade (Cable Joiner) apprenticeship or equivalent cable joiner trade qualification. Specialist training as required by the type of cable being jointed.	Safety training and refresher training as required by Clause 8.3 of ENA Doc 01-2008. Code with the interpretations listed in Section 4.3 of this Plan. This may include but is not limited to the following: Electrical Safety Rules, Access Permit Procedures, Entry to Substations, Oil containment, Traffic Control, Asbestos Awareness, Environmental Awareness, Fall Arrest Training and Confined Spaces Training. For Level 1 ASPs refer also to ES4 Section 5 Table 1.	Limited Operating, Plant Operating Certificates (various) Driving heavy vehicles, Overhead Power line Electrical Safety
Working on the Distribution Network (up to and including 132 kV) and ancillary maintenance work (includes assisting the classes of work above in carrying out Level 1 contestable construction work)	Training in one or more of the following work categories: Cable installation only, Safety Observer, Trade Assistant, Bulk Street Lamp Replacement, Vegetation Management, Trade Assistant, Pole and Line inspection, Ancillary Substation work (cleaning, painting & structural repairs), Telecommunications and installation/maintenance. Engineering design and/or supervision of construction and maintenance.	Training as required by the type of work to be undertaken (as indicated in the 'Type of Work' column)	Safety training and refresher training as required by Clause 8.3 of ENA Doc 01-2008. Code with the interpretations listed in Section 4.3 of this Plan. This may include, but is not limited to, the following: Electrical Safety Rules, Access Permit Procedures, Entry to Substations, Oil containment, Overhead Power line Electrical Safety, Traffic Control, Asbestos Removal, Fall Arrest Training, Confined Spaces Training and Environmental Awareness.	Other training as required.
Interface works between the Electricity Distribution System and the Customer Terminals (Level 2 Accreditation - per Industry & Investment NSW Accreditation of Service Providers)	Contestable Work: Level 2 Category 1 (per Industry & Investment NSW Accreditation of Service Providers Scheme)	Electrical trade (Electrician) apprenticeship as a minimum, Category 1 Training Course by Ausgrid or other training provider approved by Ausgrid.	Safety training and refresher training as set out in E S 4 Section 5 Table 2. Additional training may include, but is not limited to, the following: Asbestos Removal.	Other training as required.

Class of Work	Type of Work	Mandatory Primary Training	Mandatory Secondary Training (see NOTE 1)	Optional Training Extended (see NOTE 2)
Interface works between the Electricity Distribution System and the Customer Terminals (Level 2 Accreditation - per Industry & Investment NSW Accreditation of Service Providers)	Contestable Work: Level 2 Category 2 (per Industry & Investment NSW Accreditation of Service Providers Scheme)	Electrical trade (Electrician or Cable Joiner) apprenticeship as a minimum, Category 2 Training Course by Ausgrid, other training provider approved by Ausgrid or equivalent cable joiner trade qualification.	Safety training as set out in E S 4 Section 5 Table 2. This may include, but is not limited to, the following: Asbestos Awareness, Traffic Control, Asbestos Removal Confined Spaces Training and Environmental Awareness	Other training as required.
Interface works between the Electricity Distribution System and the Customer Terminals (Level 2 Accreditation -Reference Industry & Investment NSW Accreditation of Service Providers)	Contestable Work: Level 2 Category 3 (per Industry & Investment NSW Accreditation of Service Providers Scheme)	Electrical trade (Electrician or Line Worker) apprenticeship as a minimum, Category 3 Training Course by Ausgrid, other training provider approved by Ausgrid or equivalent line work trade qualification.	Safety training as set out in E S 4 Section 5 Table 2. This may include, but is not limited to, the following: Asbestos Awareness, Asbestos Removal and Traffic Control.	Other training as required.
Interface works between the Electricity Distribution System and the Customer Terminals (Level 2 Accreditation - per Industry & Investment NSW Accreditation of Service Providers)	Contestable Work: Level 2 Category 4 (per Industry & Investment NSW Accreditation of Service Providers Scheme)	Electrical trade (Electrician) apprenticeship as a minimum, Category 4 Training Course by Ausgrid or other training provider approved by Ausgrid.	Safety training as set out in E S 4 Section 5 Table 2. This may include, but is not limited to, the following: Asbestos Awareness and Asbestos Removal.	Other training as required.

1. The scope of secondary training will be determined by the employer following consultation with the employee/s - taking into account the specific nature of the work undertaken. In cases where the relevance of secondary training is in doubt, Ausgrid (as the network owner) will make the final determination.

2. Further training of electrical trades personnel may also be appropriate in line with workplace agreements covering multi-skilling, flexible work arrangements. This may include training for electrician-line workers, line worker cable joiners, electrician-cable joiners and electrical trades personnel with additional skills (such as limited operating activities).

3. Authority to perform the full range of operating tasks on the Distribution Network may reside with dedicated network operators or suitably trained multi-skilled workers. There are some workers who have been trained to perform only a selection of network operating tasks as defined for various operating authorities. These operating authorities are detailed in Section 13 of our Electrical Safety Rules.

Hazardous Event: Contact with live Electrical Conductors (including hazardous events occurring during construction)		Possible Consequences: Death, injury or trauma	
Immediate causes of the hazardous event	Safeguards intended to protect Construction, Maintenance and Operating Personnel	Safeguards intended to protect Plant and Equipment	Safeguards intended to protect the Community
<p>Conductor in its normal position</p> <p>Unauthorised entry to substations/equipment</p> <p>Substation unsecured</p> <p>Ready access to live mains (eg from tree, during building construction, aircraft, boating, off parked vehicles)</p> <p>Lack of temporary insulation (LV)</p> <p>Lack of temporary isolation (HV and above)</p> <p>Lack of training/qualifications/ authorisation</p> <p>Following the wrong work procedures</p> <p>Lack of adequate supervision</p> <p>Inadequate protective equipment (eg worn out, not issued, incorrectly selected)</p> <p>Medical condition (eg heart attack etc)</p>	<p>Ausgrid's Electrical Safety Rules, Advice notices to Ausgrid's control room and district operating staff</p> <p>Technical Maintenance Programs (eg for lines, poles, substations, protection etc)</p> <p>Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems</p> <p>Vegetation Management Programs (including Bush Fire Risk Management Plan)</p> <p>Danger and warning indicators (eg signs, marker balls, barriers, tape etc)</p> <p>Personal protective equipment</p> <p>Protective clothing</p> <p>Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems</p> <p>Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System</p> <p>Safety training</p> <p>Competency (craft-based) training - (see Appendix A)</p> <p>Protection Systems - (see relevant Network Standards for the asset class in question)</p> <p>Hazard Assessments</p> <p>Worksite Audits</p> <p>Plant and equipment routine testing/inspections (eg EWP's, live line tools etc)</p> <p>Network Design to ENA Doc 01-2008</p>	<p>Protection Systems - (see relevant Network Standards for the asset class in question)</p>	<p>Ausgrid's Public Electrical Safety Awareness Plan</p> <p>Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems</p> <p>Vegetation Management Programs (including Bush Fire Risk Management Plan)</p> <p>Danger and warning indicators (eg signs, marker balls, barriers, tape etc)</p> <p>Protection Systems - (see relevant Network Standards for the asset class in question)</p> <p>Network Design to ENA Doc 01-2008</p> <p>Locking devices and/or security services</p> <p>Implementation and compliance with NSW Maritime Crossing of NSW Navigable Waters: Electricity Industry Code</p>
			<p>Safeguards intended to protect the Environment</p> <p>Certified operational Environmental Management System</p> <p>Vegetation Management Programs (including Bush Fire Risk Management Plan)</p> <p>Environmental refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System</p> <p>Protection Systems - (see relevant Network Standards for the asset class in question)</p>

Hazardous Event: Contact with live Electrical Conductors (including hazardous events occurring during construction)		Possible Consequences: Death, injury or trauma		
Immediate causes of the hazardous event	Potential root causes	Safeguards intended to protect Construction, Maintenance and Operating Personnel	Safeguards intended to protect the Community	
Underground Cable Damage	<p>Failure to investigate the presence of UG construction (eg through plans, locating devices etc)</p> <p>Failure to observe precautions to avoid known underground construction</p> <p>Lack of accurate information on plans</p> <p>Lack of training/qualifications/authorisations</p> <p>Following the wrong work procedures</p> <p>Lack of adequate supervision</p> <p>Vandalism</p>	<p>Ausgrid's Electrical Safety Rules, Advice notices to Ausgrid's control room and district operating staff.</p> <p>Personal protective equipment</p> <p>Protective clothing</p> <p>Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems</p> <p>Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System</p> <p>Safety training</p> <p>Competency (craft-based) training</p> <p>Network Passports detailing qualifications/authorisations</p> <p>Work procedures (Safe Work Method Statements, Technical Procedures)</p> <p>Protection Systems - (see relevant Network Standards for the asset class in question)</p> <p>Hazard Assessments</p> <p>Worksite Audits</p> <p>Mapping Systems that detail equipment locations</p>	<p>Ausgrid's Public Electrical Safety Awareness Plan</p> <p>Mapping Systems that detail equipment locations</p>	<p>Certified operational Environmental Management System</p> <p>Environmental refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System</p> <p>Underground Transmission Cables Environmental Management Strategy</p> <p>Contaminated Land Environmental Management Strategy</p> <p>Oil Handling Guidelines</p> <p>Waste Guidelines</p> <p>Environmental Geographic Information System</p> <p>Ausgrid's Environmental Handbook for Construction and Maintenance</p>
		Safeguards intended to protect Plant and Equipment		
		Protection Systems - (see relevant Network Standards for the asset class in question)		

Hazardous Event: Contact with live Electrical Conductors (including hazardous events occurring during construction)

Possible Consequences: Death, injury or trauma

Immediate causes of the hazardous event	Safeguards intended to protect Construction, Maintenance and Operating Personnel	Safeguards intended to protect Plant and Equipment	Safeguards intended to protect the Community	Safeguards intended to protect the Environment
<p>Potential root causes</p> <p>Electrical equipment failure (eg cross arm, insulator, transformer, switch etc) - Excluding poles</p> <p>Leakage from defective insulators (in poles)</p> <p>Insulation breakdown and associated defective earthing</p> <p>Protection malfunction</p>	<p>Ausgrid's Electrical Safety Rules, Advice notices to Ausgrid's control room and district operating staff.</p> <p>Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems</p> <p>Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems</p> <p>Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System</p> <p>Safety training</p> <p>Protection Systems - (see relevant Network Standards for the asset class in question)</p> <p>Network Design to ENA Doc 01-2008</p>	<p>Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems</p> <p>Protection Systems - (see relevant Network Standards for the asset class in question)</p>	<p>Ausgrid's Public Electrical Safety Awareness Plan</p> <p>Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems</p> <p>Protection Systems - (see relevant Network Standards for the asset class in question)</p> <p>Network Design to ENA Doc 01-2008</p>	<p>Certified operational Environmental Management System</p> <p>Environmental refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System</p>

Hazardous Event: Flashover (including hazardous events occurring during construction)		Safeguards intended to protect the Environment	
Potential Consequences: Death, physical injury, trauma, property damage, environmental damage		Safeguards intended to protect the Community	
Immediate causes of the hazardous event		Safeguards intended to protect the Environment	
Potential root causes		Safeguards intended to protect the Community	
Personnel		Safeguards intended to protect the Environment	
Insulation deterioration (failure or breakdown)	Leakage from defective insulators (in poles) Insulation breakdown and associated defective earthing Low insulation resistance on electrical equipment	Ausgrid's Electrical Safety Rules, Advice notices to Ausgrid's control room and district operating staff. Personal protective equipment Protective clothing Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Plant and equipment routine testing/inspections (eg EWP's, live line tools, etc)	Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems Protection Systems - (see relevant Network Standards for the asset class in question)
Insulation shorted out (manual intervention) includes close proximity to mains	Not observing safe working procedures (employees, contractors and service providers) Unauthorised entry to substations/ equipment Substation unsecured Ready access to live mains (eg from tree, during building construction, aircraft, boating, off parked vehicles) Lack of temporary insulation (LV) Incorrect operation of electrical equipment (eg machinery, Network equipment etc) Medical condition (eg heart attack etc)	Ausgrid's Electrical Safety Rules, Advice notices to Ausgrid's control room and district operating staff Personal protective equipment Protective clothing Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments Worksite Audits Plant and equipment routine testing/inspections (eg EWP's, live line tools etc) Network Design to ENA Doc 01-2008	Ausgrid's Public Electrical Safety Awareness Plan Network Design to ENA Doc 01-2008 Locking devices and/or security services Implementation and compliance with NSW Maritime Crossing of NSW Navigable Waters: Electricity Industry Code

Hazardous Event: Step and touch and transferred earth potential electric shock (including hazardous events occurring during construction)

Potential Consequences: Death, physical injury, trauma

Immediate causes of the hazardous event	Potential root causes	Safeguards intended to protect Operating Personnel	Safeguards intended to protect Plant and Equipment	Safeguards intended to protect the Community	Safeguards intended to protect the Environment
System faults	Electrical equipment failure (eg cross arm, insulator, transformer, switch etc) - Excluding poles Wet conditions	Ausgrid's Electrical Safety Rules, Advice notices to Ausgrid's control room and district operating staff Protection Systems - (see relevant Network Standards for the asset class in question) Network Design to ENA Doc 01-2008	Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems Protection Systems - (see relevant Network Standards for the asset class in question) Network Design to ENA Doc 01-2008	Protection Systems - (see relevant Network Standards for the asset class in question) Network Design to ENA Doc 01-2008	Certified operational Environmental Management System
Stray currents to earth	Electrical equipment failure (eg cross arm, insulator, transformer, switch etc) - Excluding poles Leakage from defective insulators (in poles) Wet conditions	Ausgrid's Electrical Safety Rules, Advice notices to Ausgrid's control room and district operating staff Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems Competency (craft-based) training Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments	Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems Protection Systems - (see relevant Network Standards for the asset class in question) Network Design to ENA Doc 01-2008	Ausgrid's Public Electrical Safety Awareness Plan. Network Design to ENA Doc 01-2008	Certified operational Environmental Management System

Hazardous Event: Step and touch and transferred earth potential electric shock (including hazardous events occurring during construction)					
Potential Consequences: Death, physical injury, trauma					
Immediate causes of the hazardous event	Potential root causes	Safeguards intended to protect Operating Personnel	Safeguards intended to protect Plant and Equipment	Safeguards intended to protect the Community	Safeguards intended to protect the Environment
Lightning strike	Storms (eg wind, rain, lightning etc) Leakage from defective insulators (in poles) Low insulation resistance on electrical equipment Wet conditions	Surge Protection design features of the Network (eg overhead earth wires, lightning masts, surge diverters, etc) - (see the relevant Network Standards for the asset class in question.) Competency (craft-based) Protection Systems - (see relevant Network Standards for the asset class in question) Network Design to ENA Doc 01-2008	Surge Protection design features of the Network (eg overhead earth wires, lightning masts, surge diverters, etc) - (see the relevant Network Standards for the asset class in question.) Protection Systems - (see relevant Network Standards for the asset class in question) Network Design to ENA Doc 01-2008	Ausgrid's Public Electrical Safety Awareness Plan. Surge Protection design features of the Network (eg overhead earth wires, lightning masts, surge diverters, etc) - (see the relevant Network Standards for the asset class in question) Protection Systems - (see relevant Network Standards for the asset class in question) Network Design to ENA Doc 01-2008	Certified operational Environmental Management System Environmental Incident Response Procedure Contaminated Land Environmental Management Strategy Oil Handling Guidelines
Induced voltages	Not observing safe working procedures (employees, contractors and service providers) Lack of training/qualification s/ authorisation Inadequate protective equipment (eg worn out, not issued, incorrectly selected)	Ausgrid's Electrical Safety Rules, Advice notices to Ausgrid's control room and district operating staff Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety training Competency (craft-based) training Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments Worksite Audits	Surge Protection design features of the Network (e.g. overhead earth wires, lightning masts, surge diverters, etc) - (see the relevant Network Standards for the asset class in question.) Protection Systems - (see relevant Network Standards for the asset class in question) Network Design to ENA Doc 01-2008	Ausgrid's Public Electrical Safety Awareness Plan Hazard Assessments Protection Systems - (see relevant Network Standards for the asset class in question) Worksite Audits Network Design to ENA Doc 01-2008	

Hazardous Event: Explosions/fires (including hazardous events occurring during construction)		Potential Consequences: Death, physical injury, trauma, property damage, and environmental damage	
Immediate causes of the hazardous event	Potential root causes	Safeguards intended to protect Operating Personnel	Safeguards intended to protect Plant and Equipment
Insulation deterioration (under oil)	Electrical equipment failure (eg cross arm, insulator, transformer, switch etc) - Excluding poles Protection malfunction Low insulation resistance on electrical equipment	Ausgrid's Electrical Safety Rules, Advice notices to Ausgrid's control room and district operating staff Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems Ausgrid's Incident Management System Personal protective equipment Protective clothing Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments Network Design to ENA Doc 01-2008	Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Surge Protection design features of the Network (eg overhead earth wires, lightning masts, surge diverters, etc) - (see the relevant Network Standards for the asset class in question) Protection Systems - (see relevant Network Standards for the asset class in question) Network Design to ENA Doc 01-2008
		Ausgrid's Public Electrical Safety Awareness Plan Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems Ausgrid's Network Incident Management System Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Network Design to ENA Doc 01-2008	Certified operational Environmental Management System Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Environmental refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Network Design to ENA Doc 01-2008 Environmental Incident Response Procedure Oil Handling Guidelines

Hazardous Event: Explosions/fires (including hazardous events occurring during construction)		Potential Consequences: Death, physical injury, trauma, property damage, and environmental damage	
Immediate causes of the hazardous event	Potential root causes	Safeguards intended to protect Operating Personnel	Safeguards intended to protect Plant and Equipment
System fault	Electrical equipment failure (eg cross arm, insulator, transformer, switch etc) - Excluding poles Clashing conductors Storms (eg wind, rain, lightning etc) Protection malfunction Low insulation resistance on electrical equipment	Ausgrid's Electrical Safety Rules, Advice notices to Ausgrid's control room and district operating staff. Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Ausgrid's Incident Management System Personal protective equipment Protective clothing Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Work procedures (Safe Work Method Statements, Technical Procedures) Network Design to ENA Doc 01-2008	Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Surge Protection design features of the Network (eg overhead earth wires, lightning masts, surge diverters, etc) - (see the relevant Network Standards for the asset class in question) Protection Systems - (see relevant Network Standards for the asset class in question) Network Design to ENA Doc 01-2008
		Ausgrid's Public Electrical Safety Awareness Plan. Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability) Information Systems Ausgrid's Incident Management System Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Network Design to ENA Doc 01-2008	Certified operational Environmental Management System Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Environmental refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Network Design to ENA Doc 01-2008

Hazardous Event: Potential Consequences: Immediate causes of the hazardous event	Explosions/fires (including hazardous events occurring during construction) Death, physical injury, trauma, property damage, and environmental damage	Safeguards intended to protect Plant and Equipment	Safeguards intended to protect the Community	Safeguards intended to protect the Environment
Pressure vessel failure Not observing safe working procedures (employees, contractors and service providers) Pressure vessel failure Incorrect storage of equipment	Potential root causes Safeguards intended to protect Operating Personnel	Safeguards intended to protect Plant and Equipment	Safeguards intended to protect the Community	Safeguards intended to protect the Environment
	Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Environmental refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System	Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Plant and equipment routine testing/inspections (eg EWP's, live line tools etc)	Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Work procedures (Safe Work Method Statements, Technical Procedures) Plant and equipment routine testing/inspections (eg EWP's, live line tools etc)	Certified operational Environmental Management System Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Environmental refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Environmental Incident Response Procedure Oil Handling Guidelines Oil Filled Equipment Environmental Management Strategy PCB Environmental Management Strategy Waste Guidelines

Hazardous Event: Explosions/fires (including hazardous events occurring during construction)		Potential Consequences: Death, physical injury, trauma, property damage, and environmental damage	
Immediate causes of the hazardous event	Potential root causes	Safeguards intended to protect Operating Personnel	Safeguards intended to protect Plant and Equipment
Accumulated gases	Not observing safe working procedures (employees, contractors and service providers) Pressure vessel failure Lack of training/qualifications/authorisation Equipment Failure (ventilation)	Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Competency (craft-based) training Network Passports detailing qualifications/authorisations Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments Worksite Audits Plant and equipment routine testing/inspections (eg EWPs, live line tools etc)	Work procedures (Safe Work Method Statements, Technical Procedures)
		Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Competency (craft-based) training Network Passports detailing qualifications/authorisations Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments Worksite Audits Plant and equipment routine testing/inspections (eg EWPs, live line tools etc)	Safeguards intended to protect the Community
		Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management System Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management System Environmental refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Environmental Incident Response Procedure SF6 Environmental Management Strategy	Safeguards intended to protect the Environment

Hazardous Event: Impact with Equipment (including hazardous events occurring during construction)

Potential Consequences: Death, physical injury, trauma, property damage, and environmental damage

Immediate causes of the hazardous event	Potential root causes	Safeguards intended to protect Operating Personnel	Safeguards intended to protect Plant and Equipment	Safeguards intended to protect the Community	Safeguards intended to protect the Environment
Falling debris	Electrical equipment failure (eg cross arm, insulator, transformer, switch etc) - Excluding poles	Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability)	Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability)	Technical Maintenance Programs (eg for lines, poles, substations, protection etc) Capital Expenditure Program (Asset replacement, Compliance works, Reliability)	Certified operational Environmental Management System
	Clashing conductors	Information Systems	Information Systems	Information Systems	Environmental refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System
	Pole failure	Personal protective equipment	Personal protective equipment	Personal protective equipment	Environmental Incident Response Procedure
	Storms (eg wind, rain, lightning etc)	Protective clothing	Protective clothing	Protective Systems - (see relevant Network Standards for the asset class in question)	Waste Guidelines
	Veicular impact	Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems	Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems	Vegetation Management Programs (including Bush Fire Risk Management Plan)	
	Not observing safe working procedures (employees, contractors and service providers)	Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System	Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System	Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System	
	Inadequately secured equipment	Safety training	Safety training	Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System	
	Incorrect storage of equipment	Work procedures (Safe Work Method Statements, Technical Procedures)	Work procedures (Safe Work Method Statements, Technical Procedures)	Work procedures (Safe Work Method Statements, Technical Procedures)	
	Medical condition (eg heart attack etc)	Hazard Assessments	Hazard Assessments	Hazard Assessments	
		Worksite Audits	Worksite Audits	Worksite Audits	
		Network Design to ENA Doc 01-2008	Network Design to ENA Doc 01-2008	Network Design to ENA Doc 01-2008	
				Locking devices and/or security services	

Hazardous Event: Impact with Equipment (including hazardous events occurring during construction)		Safeguards intended to protect the Environment	
Potential Consequences: Death, physical injury, trauma, property damage, and environmental damage		Safeguards intended to protect the Community	
Immediate causes of the hazardous event	Potential root causes	Safeguards intended to protect Plant and Equipment	Safeguards intended to protect the Environment
Dislodged equipment during transportation	Not observing safe working procedures (employees, contractors and service providers) Inadequately secured equipment Mechanical equipment failure (eg slings, body belts etc) Incorrect storage of equipment	Personal protective equipment Protective clothing Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety training Competency (craft-based) training Work procedures (Safe Work Method Statements, Technical Procedures)	Certified operational Environmental Management System Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Environmental refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments Worksite Audits Plant and equipment routine testing/inspections (eg EWPs, live line tools, etc)
		Operating Personnel Personal protective equipment Protective clothing Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety training Competency (craft-based) training Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments Worksite Audits Plant and equipment routine testing/inspections (eg EWPs, live line tools etc)	Environmental Incident Response Procedure Oil Handling Guidelines PCB Environmental Management Strategy

Hazardous Event: Impact with Equipment (including hazardous events occurring during construction)		Safeguards intended to protect the Environment	
Potential Consequences: Death, physical injury, trauma, property damage, and environmental damage			
Immediate causes of the hazardous event	Potential root causes	Safeguards intended to protect the Community	Safeguards intended to protect the Environment
Equipment positioning (locating) eg poles	<p>Vehicular impact</p> <p>Medical condition (eg heart attack etc)</p>	<p>Work procedures (Safe Work Method Statements, Technical Procedures)</p> <p>Hazard Assessments</p> <p>Worksite Audits</p>	<p>Certified operational Environmental Management System</p> <p>Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems</p> <p>Environmental refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System</p> <p>Work procedures (Safe Work Method Statements, Technical Procedures)</p> <p>Environmental Impact Assessment Guidelines</p>

Hazardous Event: Non-electrical accidents (death, physical injury or trauma) (including hazardous events occurring during construction)

Potential Consequences: Death, physical injury, trauma

Immediate causes of the hazardous event Potential root causes

Safeguards intended to protect Operating Personnel

Safeguards intended to protect Plant and Equipment

Safeguards intended to protect the Community

Safeguards intended to protect the Environment

Falling from heights (eg pole, structure etc)
 Pole failure
 Vehicular impact
 Mechanical equipment failure (eg slings, body belts etc)
 Following the wrong work procedures
 Inadequate protective equipment (eg worn out, not issued, incorrectly selected)
 Medical condition (eg heart attack etc)

Personal protective equipment
 Protective clothing
 Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems
 Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System
 Safety training
 Competency (craft-based) training
 Work procedures (Safe Work Method Statements, Technical Procedures)
 Hazard Assessments
 Worksite Audits

Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems
 Safety training
 Competency (craft-based) training
 Work procedures (Safe Work Method Statements, Technical Procedures)
 Hazard Assessments
 Worksite Audits

Hazardous Event: Non-electrical accidents (death, physical injury or trauma) (including hazardous events occurring during construction)		Potential Consequences: Death, physical injury, trauma	
Immediate causes of the hazardous event	Potential root causes	Safeguards intended to protect Operating Personnel	Safeguards intended to protect the Plant and Equipment
Falling into holes (eg trenches, pits)	Not observing safe working procedures (employees, contractors and service providers) Following the wrong work procedures Medical condition (eg heart attack etc)	Personal protective equipment Protective clothing Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Competency (craft-based) training	Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety training Competency (craft-based) training Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments Worksite Audits
		Safeguards intended to protect the Community	Safeguards intended to protect the Environment

Hazardous Event: Non-electrical accidents (death, physical injury or trauma) (including hazardous events occurring during construction)		Potential Consequences: Death, physical injury, trauma	
Immediate causes of the hazardous event	Potential root causes	Safeguards intended to protect Operating Personnel	Safeguards intended to protect Plant and Equipment
Trapped in a confined space	Electrical equipment failure (eg cross arm, insulator, transformer, switch etc) - Excluding poles Not observing safe working procedures (employees, contractors and service providers) Unauthorised entry to substations/equipment Pressure vessel failure Lack of training/qualifications/authorisation Following the wrong work procedures Medical condition (eg heart attack etc)	Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Competency (craft-based) training Network Passports detailing qualifications/authorisations Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments Worksite Audits Plant and equipment routine testing/inspections	Work procedures (Safe Work Method Statements, Technical Procedures) Plant and equipment routine testing/inspections
		Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management Systems Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Competency (craft-based) training Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments Worksite Audits Plant and equipment routine testing/inspections	Quality refer to Ausgrid's Quality, Safety, Health and Environmental Management System Safety refer to Ausgrid's Service Division's Quality, Safety, Health and Environmental Management System Safety training Competency (craft-based) training Work procedures (Safe Work Method Statements, Technical Procedures) Hazard Assessments Worksite Audits Plant and equipment routine testing/inspections

D11/88008

Chapter 2 Customer Installation Safety Plan

March 2011



1 Overview

Each year work is undertaken on electrical installations at thousands of customer properties throughout the Ausgrid distribution area.

While it is our responsibility to maintain the electricity distribution network, including the poles and wires which are identified as our assets required for the connection of customer installations, all new and existing electrical work within a customer's electrical installation remains the responsibility of the customer and their electrical Contractor.

We aim to protect people in customers' premises by:

- supporting the scheme of licensing electrical contractors; and
- enforcing compliance with the relevant requirements, codes and regulations.

Customers are responsible for the maintenance of their installation including all private poles and wires, to ensure the safety of persons and property and the prevention of bushfires.

Customers are also responsible for ensuring that any contractor or trades person they engage are appropriately licensed.

Our Customer Installation Safety Plan addresses the management of safety from within a customer's premises to the customer's terminals (the point of connection between the customer's electrical installation and the Ausgrid network). It only applies to installations operating below 132kV (including customer owned and operated substations and high voltage installations).

The Electricity Supply (Safety and Network Management) Regulation 2008, requires us to develop, publish, implement and report under this Plan.

The Customer Installation Safety Plan draws on the vast experience of Ausgrid and the industry in managing the compliance and safety of our network customer's electrical installations.

In preparation we have taken into account the following NSW Codes of Practice:

- **NSW Code of Practice, Service and Installation Rules** – specifies the technical requirements necessary for electrical installations to be safely, reliably and efficiently connected to the electricity network and associated obligations and procedures for customers and network operators.
- **NSW Code of Practice, Installation Safety Management** – outlines the minimum practices required by electricity network operators in managing the safety of customers' electrical installations. The intent of the Code is that safety standards will be maintained or improved.

There are no departures from these Codes unless to adopt a higher safety standard. As required by the Code, we also advise that customers operating electrical installations (including those above 11kV) are also subject to the requirements of the Service and Installation Rules of NSW and Ausgrid's local requirements.

The installing electrical contractor (contractor) is responsible for testing and verifying that their work complies with all relevant requirements and standards and is safe. Ausgrid conducts a documented risk based inspection program to verify compliance by the contractor by selecting a sample of notified works once a suitable standard of compliance has been achieved.

The Customer Installation Safety Plan aims to ensure customers and Contractors are aware of their rights and responsibilities. It is up to customers and their electrical or installing Contractors to ensure that all work is performed safely and meets current industry Rules and Standards for installation.

Customers need to employ licensed Contractors for any new or modified electrical work. Contractors are required to meet industry Rules and Standards. Accredited Service Providers (ASP) connecting customer installations to our electricity network need to be authorised by Ausgrid.

Ausgrid undertakes to monitor and audit Contractor and ASP performance (using a qualified inspection team). If we identify any existing work as hazardous or unsafe we will ensure the problem is rectified and/or take appropriate action, such as disconnection and/or disciplinary measures.

We contribute to the development and maintenance of the various rules, codes and standards, further enabling us to promote safety as a priority.

2 Our approach to safety

The safety and well being of our staff, contractors and the community is promoted by having the appropriate procedures in place and by effectively communicating the important role safety plays in running our network.

While the potential hazards associated with electricity are widely known, we can never assume that everyone is aware of all the dangers.

Our safety message is targeted and ongoing, and supported by our staff, Contractors and industry colleagues.

It is part of our commitment to provide a safe and reliable electricity supply to all of our customers.

This Customer Installation Safety Plan addresses safe wiring installation and its safe connection to our electrical network. Our approach to the safety of new connections and electrical installation work includes:

- design, construction and maintenance standards (required by customers and Contractors)
- testing, connection and notification criteria (required by Contractors)
- inspection regime and procedures (to identify faulty work)
- corrective action procedures (to remedy faulty work and apply penalties or disciplinary action as appropriate)
- management and reporting (to manage and report plan outcomes)

Figure 1 - Installation inspector tests a distribution sub board



Owners of electrical installations are required by law to maintain their installation to ensure it remains safe. Ausgrid encourages customers to arrange regular safety checks of their electrical installation. Of particular concern is old wiring that has deteriorated and become unsafe. We also recommend that customers purchasing new or existing premises request an electrical safety check to ensure that there is no faulty wiring due to deterioration or defective workmanship. Our Electricity Supply Document ES 1 - Customer Connection Information provides further information.

Ausgrid also designs and operates our electricity network to include a number of electrical protection systems to protect our customers, the community, their installations and our network assets to minimise and localise the impact of any unsafe or hazardous event.

3 Design, construction and maintenance standards

Under the NSW Codes of Practice, Ausgrid's installation work is required to comply with the appropriate Rules and Standards.

The Codes provide guidance, and establishes minimum requirements for the provision of customer connection services. The Codes, Rules and Standards also help enforce the Electricity Supply Act 1995 and associated regulations.

Ausgrid requires all electrical and installing Contractors in our network area to meet the Rules and Standards. Exceptions are considered, but only if the agreed alternative achieves an outcome which matches or exceeds the minimum standard.

The Electricity (Consumer Safety) Act requires customers to maintain their electrical installation ensuring the safe and satisfactory operation of the installation is not impaired by interference, damage, ageing or wear and the installation does not become a significant potential cause of fire for the environment surrounding the installation.

Electrical installation work must only be undertaken by a licensed electrical Contractor. Contractors must ensure that we are notified of certain types of work (including work which results in a change to the electricity service connection) as specified in the Electricity (Consumer Safety) Regulation. Customers are advised that contractors are required by law to provide you with a Certificate of Compliance (CCEW) for all work they carry out on your electrical installation. The certificate covers the work carried out, the tests performed, and certification that the work is compliant with the appropriate standards and rules (see Section 4). The CCEW form is also to be used by electrical contractors when they are required to notify Ausgrid of their work as stipulated in the Electricity (Consumer Safety) Regulation.

3.1 What we aim to achieve

Customers, electrical and installing contractors understand their rights and responsibilities in the provision of safe electrical customer installations (new and existing) for connection to Ausgrid's transmission and/or distribution system (our network).

3.2 How we plan to achieve it

- promoting the need to use appropriately licensed Contractors as required by law
- informing customers who may have special requirements for their electrical installation (e.g., the need for a safety management plan for high voltage installations, arc fault minimisation at large electrical load installations, equipment and maintenance dossiers at installations with hazardous zones, etc)
- maintaining systems to keep Contractors up to date with industry developments (to ensure their methods are current and effective)
- providing customers and contractors with reasonable access to our policies, rules, standards and procedures. This includes notification via Customer Installation Advices to registered Contractors. The Electricity Supply (ES) series of policy documents assists customers and Contractors with this
- ensuring our inspection staff are promptly briefed on any changes to the standards and other documentation applicable
- promoting (wherever possible) uniform documentation across the industry
- participating in updating and/or development of appropriate Rules and Standards through representation on committees and working groups associated with Industry and Investment NSW, Standards Australia, NSW Fair Trading, Electricity Networks Association (ENA) and the National Electrical and Communications Association (NECA)

- continually undertaking and analysing investigation reports of electricity shock incidents to identify problems with assets, equipment, locations, installation work etc, and taking the appropriate action.

3.3 How we will communicate it

- providing customers, Contractors and other key stakeholders with general information to assist them in recognising, understanding and fulfilling their responsibilities, as well as outlining the penalties for non-compliance
- highlighting the necessity to employ only licensed electrical Contractors - to minimise the dangers inherent in electrical installations and the threat to life and property in unsafe situations (see chapter three - Public Electrical Safety Awareness)
- informing high voltage customers of the requirement to prepare an integrated Installation Safety Management Plan and lodge this with Ausgrid for acknowledgement. The Plan should be based on appropriate risk analysis techniques (and include non compliant equipment, upgrade and refurbishment programs, site hazards, etc)
- encouraging large non-domestic customers (i.e. with loads in excess of 1 MVA or with installations in hazardous locations) to produce and implement an integrated Installation Safety Management Plan (similar to that required by high voltage customers)
- alerting customers who live in bush fire prone areas of the need to minimise bush fire risks as part of their condition of supply (see chapter four - Bush Fire Risk Management).

3.4 How we will measure it

Effectiveness will be assessed by:

- shock rates and fatalities (shocks per thousand customers)
- categories of shocks analysed.

4 Testing, connection and notification criteria

Under the Rules and Standards, installation work by Contractors must be tested and verified that it is safe and it complies with AS/NZS 3000 – Wiring Rules and related Standards. A Certificate of Compliance for Electrical Work (CCEW) must be completed detailing the work.

Testing must be carried out by one or more of the following:

- the licensed electrical Contractor who completed the work
- another licensed electrical Contractor
- a person authorised for testing by the electricity network operator
- a suitably authorised Accredited Service Provider undertaking pre-energising checks (refer Ausgrid publication ES 4 Section 9).

The Electricity (Consumer Safety) Regulation requires Contractors to provide their customers with a Certificate of Compliance for Electrical Work (CCEW) covering their electrical work carried out on an installation. The Contractor is also required to notify Ausgrid of certain types of electrical work as detailed in the Regulation.

Contractors will be required to provide written notification and test reports in a format specified by Ausgrid and NSW Fair Trading. We use these reports to update our installation data system, create new customer accounts and better plan system augmentation. These reports also are essential to the establishment of our audit responsibilities under this Plan.

4.1 What we aim to achieve

That all installations connected to our network are safe.

4.2 How we plan to achieve it

- Monitoring electrical installation work to ensure that it is only carried out by licensed and competent persons.
- Requiring tests to be performed that confirm work complies with the Rules and Standards (in particular Australian Standard AS/NZS 3000 Wiring Rules and the Service and Installation Rules of NSW).
- Managing a system for Contractors to notify us of the required types of installation work and tests using the Certificate of Compliance: Electrical Work (CCEW) form. Note this form was previously called the Notification of Electrical Work (NOEW form).
- Working with the NSW Fair Trading to enforce the requirements of the Electricity (Consumer Safety) Act
- Managing a system for all Accredited Service Providers, authorised by Ausgrid, to provide written notification and test reports in a specified format using a Notification of Service Work (NOSW) form.

4.3 How we will communicate it

- Highlighting to industry bodies such as the National Electrical and Communications Association (NECA), the importance of the notification and testing process (as specified by the Regulation) and the consequences if their members fail to undertake these.
- Providing information on the inherent dangers and consequences (e.g. reverse polarity connections, ineffective earthing).
- Targeting Contractors and Accredited Service Providers (Level 2) with information specific to their responsibilities.

- Providing information on industry guidelines and procedures relating to working safely with asbestos (a copy is published on WorkCover's website (www.workcover.nsw.gov.au)).
- Meeting with customers and Contractor representatives to discuss testing, connection and notification criteria.

4.4 How we will measure it

- Number of notifications received
- Certificate of Compliance: Electrical Work notifications
- Notification of Service Work (NOSW)
- Contractor compliance performance
- Defective work trends.

5 Inspection regime and procedures

Ausgrid operates an audit inspection regime aimed at securing compliance by both the individual Contractor and the contracting company with requirements to maintain an acceptable standard for each category and type of installation work.

Notified installation work by a particular Contractor will be inspected until an appropriate standard of work has been demonstrated. A sample of works of all Contractors will generally be inspected on a risk basis.

All inspections by Ausgrid are intended to verify aspects of the work to assist in its regulatory responsibilities.

It is the responsibility of the customer to employ a licensed Electrical Contractor. The Contractor must ensure that the completed work complies with the Rules and Standards and provide their customer with a certificate of compliance.

The number of notifications submitted will be considered when assessing the Contractor's overall performance. The sample of work inspected on an audit basis will be determined for each category of installation work (e.g. domestic, commercial). All work notified as high voltage, hazardous area, large load, permanent un-metered supply and grid connected embedded generation will be inspected.

The audit program is reviewed regularly.

A similar program operates for contestable connection work performed by Accredited Service Providers who connect the installation to our electricity distribution network.

Unsafe or defective installations, identified during routine or emergency inspections or other work, will be notified to the customer and immediate action will be taken to make the installation safe including disconnection if necessary.

If major safety defects are detected on notified work (i.e. dangerous to life, health or property – refer to Ausgrid publication ES1 for more details) all future work by that Contractor is inspected until the required standard of work has once again been demonstrated.

Ausgrid may also disconnect customers' installations or parts of a installation for safety reasons as permitted under the Electricity Supply Act and in accordance with the Electricity Supply (Safety and Network Management) Regulation. Ausgrid Standard Form Customer Connection Contract lists other reasons for disconnection such as; when a premise is vacated for a long period, or for non-payment of accounts. Ausgrid will aim to ensure those who carry out the disconnection work are appropriately trained and competent.

5.1 What we aim to achieve

The detection, rectification or disconnection of unsafe installation work and taking corrective action as appropriate.

5.2 How we plan to achieve it

- Maintaining and monitoring records of work performed by Contractors.
- Maintaining a risk based inspection process and adequate samples to secure compliance by Contractors with requirements.
- Carrying out unannounced audits of electrical installation work at major commercial development sites to monitor compliance with the Electricity (Consumer Safety) Regulation.
- When inspections are undertaken, confirming that workmanship has been sound (and specific obligations met) with particular attention paid to work involving:
 - consumer's mains;

- main switchboards;
 - high voltage installations;
 - installations in environments classified as hazardous (by relevant Australian Standards);
 - permanent un-metered supply connections; or
 - embedded grid connected generation.
- Using only trained staff and documented procedures in the audit inspection program.
 - Carrying out inspections within the time required by the Code.
 - Conducting reviews of internal inspection processes to check for adequacy and compliance with the objectives of this Plan.
 - Carrying out disconnection work in accordance with statutory requirements using appropriately trained and competent staff.

5.3 How we will communicate it

- Liaising directly with individual Contractors and industry bodies such as the National Electrical and Communications Association (NECA), the NSW Fair Trading and other network operators to improve procedures
- providing general information updates via our Customer Installation Advices (CIAs) and other communication channels.
- maintaining and updating related reference standards and policy documents

5.4 How we will measure it

- Number of inspections performed
- number and details of audits performed
- defect rates for major defects
- corrective and disciplinary action taken.

6 Corrective action procedures

Ausgrid will seek corrective or disciplinary action to remedy non-compliance with the Rules and Standards. This may include action against owners of electrical installations, Contractors, employees or individuals - in the form of warnings, retraining or disciplinary measures or referral to NSW Fair Trading.

NSW Fair Trading is responsible for the register of Electrical contractors, including licence type and status, and can remove a contractor's licence or impose penalties under the Electricity (Consumer Safety) Act. Industry and Investment NSW is responsible for the accreditation of service providers and maintains a register of all NSW Accredited Service Providers (ASPs) and nominates the grade of accreditation established through performance.

6.1 We will take action relating to

- Defective or unsafe installation work ('major' and 'minor' safety defects)
- unsafe work practices when performing installation work
- failure of Contractors to notify Ausgrid of work performed
- unauthorised connections to the supply network
- failure by Contractors to carry out required tests and correct any defects
- work performed by unqualified persons
- failure of an owner of an electrical installation to maintain the installation so it remains safe.

Where work is dangerous to life, health or property, we will act immediately to prevent an accident by making the installation safe either by disconnecting the entire installation or part thereof.

6.2 Disciplinary action may include

- A verbal or written advice or warning
- a re-assessment of the audit program for the offending Contractor (e.g., more frequent inspections)
- recommendations for additional training
- a formal interview or counselling session, possibly involving NSW Fair Trading

The disciplinary action taken will depend on the seriousness of the non-compliance and/or the number or frequency of non-compliance cases.

- suspension or cancellation of network connection authorisations granted to accredited service providers by Ausgrid
- reporting the offending Contractor to other NSW network operators and the licensing section of Fair Trading NSW.
- recommending to Industry and Investment NSW the re-grading, suspension or cancellation of the offender's accreditation or licence
- reporting unlicensed persons performing electrical contracting work and recommending the issuing of Penalty notices for breaches of the Electricity Consumer Safety) Act to NSW Fair Trading
- increasing the flow of information, alerting Contractors and customers to their obligations and responsibilities (and any specific issues) as appropriate.

Ausgrid will continue to liaise with NSW Fair Trading and Industry and Investment NSW (as the compliance regulators) to encourage 100% compliance by Contractors and Accredited Services Providers with the Rules and Standards.

We will also endeavour to ensure the network customer is kept informed at all times of any disciplinary action being undertaken.

6.3 Right of reply

Before any disciplinary action is taken, the person subject to the action has the right of reply. Where appropriate, the customer concerned will also be advised on the action taken.

7 Management and reporting

Ausgrid operates a due diligence framework aims to ensure that all risks are identified and that there is an appropriate system for compliance, proper supervision and facilitating compliance.

This Customer Installation Safety Plan and supporting internal documents, policies and procedures are managed in accordance with Ausgrid's quality management system.

We monitor performance against the Customer Installation Safety Plan and publish the results annually as part of our Electricity Network Performance Report (available on our website www.ausgrid.com.au).

Activities related to the management and reporting of this Plan include:

- monitoring Contractor performance, defects and other parameters to allow proper inspection programs to be established and corrective action initiated;
- developing and maintaining a database of regulatory and other relevant information;
- maintaining a Risk Management Plan that includes, but is not limited to, identifying risks and implementing cost effective management actions;
- assessing data from an effective safety monitoring system;
- assessing the consequences of failures of the system;
- periodic reviews; and
- plans for improvement and corrective action.

8 Definitions

Accredited Service Provider (ASP)

Refers to companies/sole traders who have gained accreditation from Industry and Investment NSW (who manage the accreditation schemes) allowing them to perform contestable work in accordance with the Electricity Supply Act 1995.

Contractors

Includes both Electrical, Installing Contractors or ASPs.

Codes of Practice

This refers to the:

- NSW Code of Practice – Installation Safety Management
- NSW Code of Practice –Service and Installation Rules of NSW.

Electrical Contractor (Contractor)

A firm or person who holds an electrical contractor's licence, issued by NSW Fair Trading.

Electrical Installation

Fixed electrical wiring and associated equipment including the Customers private poles and overhead wires, but not Ausgrid's assets such as service lines and metering, or electrical appliances, flexible leads, or anything connected beyond an electrical socket outlet.

Installing Contractor

An electrical contractor who carries out installation work or tests (whether themselves or through any partner, sub-contractor or employee) whether or not for fee, gain or reward.

Rules and Standards

These are key documents for the Customer Installation Safety Plan and are listed in the next section.

Other descriptions and terminologies used have been drawn from:

- AS/NZS 3000 Wiring Rules (and other relevant Australian Standards)
- Service and Installation Rules of NSW
- AS4741 Testing of connections to low voltage networks

9 Reference documents

Key reference documents of the Rules and Standards include:

- AS/NZS 3000 Wiring Rules and other relevant standards produced by Standards Australia
- AS 2067 – Substations and High Voltage Installations Exceeding 1 kV a.c.
- AS 2467 - Maintenance of Electrical Switchgear
- AS/NZS 3017 - Electrical installations - Verification Guidelines
- AS/NZS 3019 – Electrical Installations – Periodic Verification
- NSW Code of Practice – Installation Safety Management
- The Service and Installation Rules of NSW and Ausgrid’s Network Standards (collectively known as the Service Rules)
- Ausgrid’s Electrical Safety Rules
- Ausgrid’s Electricity Supply (ES) series of policy documents and Customer Installation Advice (CIA) documents for ongoing advice on policy and practices on customer supply matters
- ES1 - Customer Connection Information
- ES4 - Service Provider Authorisation
- Ausgrid’s Standard Form Customer Connection Contract
- Certificate of Compliance: Electrical Work (CCEW) (Previously called the NOEW form) administered by NSW Fair Trading
- Notification of Service Work form (NOSW)
- NSW Occupational Health and Safety Regulation under the NSW Occupational Health and Safety Act
- Relevant WorkCover safety guidelines, model procedures listed on their website (www.workcover.nsw.gov.au) from time to time.

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Chapter 3 Public Electrical Safety Awareness Plan

March 2011



1 Public electrical safety awareness

1.1 Overview

The Public Electrical Safety Awareness Plan outlines Ausgrid's commitment to safety and our responsibilities under the Electricity Supply (Safety and Network Management) Regulation 2008.

This plan details Ausgrid's approach to safety and potential hazards associated with the transmission and distribution of electricity, how "at risk" groups are identified and provides precautions to avoid electricity incidents.

Programs are designed to create greater awareness of electrical safety amongst the general public and targeted groups based on an analysis of safety incidents involving Ausgrid's network and relevant data sources.

To communicate our safety message we use a number of communication tools and media to reach the "at risk" groups including TV, radio and print advertisements, sponsorships, education kits, personal presentations, bill inserts, printed material and the web.

1.2 Our approach to safety

Ausgrid seeks to be a leader in safety in all aspects of its business. Our annual report plus the Network Management Plan illustrate our commitment to safety as the number one driver in how we run our business.

We have over 100 years of experience identifying and creating awareness amongst the public of the risks associated with the distribution and use of electricity and ways the public can mitigate these risks.

The Public Electrical Safety Awareness Plan focuses primarily on creating awareness of the potential hazards associated with our network through education and communication.

1.3 PESAP objectives

The objectives of the Public Electrical Safety Awareness Plan are to:

- Raise awareness of electrical safety and the hazards related to Ausgrid's network assets and the distribution of electricity;
- Raise awareness of electrical safety amongst "at risk" groups;
- Raise awareness of the safe use of electrical equipment; and
- Remind the public of hazardous situations involving electricity.

1.4 Risk analysis

Risk areas are identified through analysis of declared network incidents and accidents which have potential to impact public safety. Other data sources we review annually to identify "at risk" groups include the Australian Bureau of Statistics, NSW Fair Trading, Australian Institute of Health and Welfare. In addition, Ausgrid conducts an annual Electrical Safety Study to inform our plan by obtaining insight into the general public's awareness and knowledge of electrical hazards in the home and in the community.

Programs are developed and implemented to address the risks that have been, or have the potential to be, hazardous to the public. Our existing programs are reviewed and updated to align with new information and research outcomes, while new campaigns and programs are developed and implemented where a gap is identified.

1.5 Identified "at risk" groups

Identified "At Risk" groups are separated into three categories:

- High Risk - Death or near miss on network assets and customer installations
- Moderate risk – Identified through other sources and market research

- Compulsory – required under regulation / legislation

Current “At Risk” groups identified are:

- Tradespeople/Outdoor Workers (high risk)
- Children (high risk)
- Do-it-Yourself (DIY) home renovators and home maintenance (moderate risk)
- General community (moderate risk)
- Private Pole owners – bushfire management (compulsory)
- Boat operators – waterway crossings (compulsory)

1.6 Program development and evaluation

This section provides an overview of the identified safety hazards, identifies the “At Risk” group, and provides precautions to avoid electricity incidents.

1.6.1 Overhead power line safety

A common public perception that overhead powerlines are only a hazard if they are touched or connected with is incorrect. Electricity can jump from powerlines to metal objects like ladders or boat masts in an instant.

Many outdoor activities can be hazardous around powerlines including boating, hot air ballooning, construction work, parachuting, kite flying and playing in the street or park.

Target groups:	Precautions:
<ul style="list-style-type: none"> • Tradespeople • Outdoor workers • General community • Boat operators 	<ul style="list-style-type: none"> • Keep a safe distance or clearance from overhead powerlines. • Consider appropriate clearance when working around powerlines as the safe distance can vary according to the size and voltage of the power line. • Look up to check the location and distance of powerlines before beginning any outdoor activity. • Set-up or build structures well away from powerlines. • Set up plant, equipment and vehicles for safe distance or clearance from powerlines during operation (eg. Work platforms, cranes, cement trucks, tip trucks, etc). • Know your mast height (boat operators only).

1.6.2 Underground cable safety

Ausgrid has a large network of underground cables. For safety reasons, it is extremely important that you check the location of these and other utility cables (including gas, water and sewerage) before you start to dig or excavate.

Dial Before You Dig is a community service organisation supported by Ausgrid. Membership of this group is a licence condition of Distribution Network Service Providers. Dial Before You Dig provides plans of where electricity, water, gas and telecommunications cables and pipes are located.

NSW legislation now requires people who are planning to do excavation work to obtain copies of underground electricity cable plans through Dial Before You Dig and to make sure that the plans are no more than 30 days old when excavation commences. This requirement applies to any excavation, including on private land, in connection with any development for which development consent is required.

If an electricity cable is damaged during excavation, Ausgrid must be immediately notified on 13 13 88. The person who damaged the electricity cable is liable for the cost of repair and may also be liable for a penalty.

If you are digging without the use of machinery or powered tools to a depth of less than 300mm you still need to follow precautions detailed below.

Target groups:	Precautions:
<ul style="list-style-type: none"> • Tradespeople • Outdoor workers • General community • DIYs 	<ul style="list-style-type: none"> • Always dial 1100 before you dig and stay well clear of underground powerlines. • Always follow the safe work guidelines provided by utilities when working around underground cables. • The Dial Before You Dig service may not have details of any private underground mains on individual properties. In this instance, a licensed electrician should be contracted to provide a sketch of private properties to identify private underground mains. Refer Clause 2.4.4.1 of the 'Service & Installation Rules of NSW'¹³.

1.6.3 Electricity safety for school students

Ausgrid is working closely with schools to educate children on electricity, the way it is generated and travels. Part of this education process includes highlighting the dangers of electricity.

Target groups:	Precautions:
<ul style="list-style-type: none"> • Children 	<ul style="list-style-type: none"> • Play in open spaces away from electricity poles and powerlines. • Stay away from electricity substations and power equipment. • Never put a metal object in a toaster or power point. • Keep water away from electrical appliances and power cords. • If you see a dangerous situation, tell an adult.

1.6.4 Substation and school holiday safety

Substations are confined within a fenced area which has signage communicating the 'Danger. Keep Out'. However, this needs to be complemented with communication ensuring an increase in the awareness of the dangers of substations. This is a priority particularly during the school holiday period.

Target groups:	Precautions:
<ul style="list-style-type: none"> • Children • General community 	<ul style="list-style-type: none"> • Don't enter a substation • Don't try to retrieve anything that has gone over a substation fence – call Ausgrid and we'll get it for you. • Call Ausgrid if you see anyone climbing over fences. • Obey substation warning signs.

¹³ A sketch of the underground service/consumers mains route must be clearly marked on the inside of the meter enclosure or on the meter panel. Alternatively, a suitable sketch placed in a clear plastic envelope must be permanently attached either within the main switchboard enclosure or on the meter panel and be actioned prior to any digging or excavation.

1.6.5 DIY electricity safety

The influx of DIY home shows has seen a growth of DIY homemakers. The main messages are ‘Do-it-yourself electrical work is not only dangerous, it’s illegal’ and ‘Always use a licensed electrician’. Ausgrid has identified a list of dangerous actions and items associated with DIY work.

Target groups:	Precautions:
<ul style="list-style-type: none"> • Home renovators • Home maintenance • Men aged 18-55 years 	<p>Avoidable danger.</p> <ul style="list-style-type: none"> • Use an extension lead that is appropriate for the power loading you need. Check that it has three prongs and is approved to Australian Standards. • Fully unwind extension leads before you use them so that they don’t run the risk of overheating. • Never use more than one double adaptor in a single power point. • When painting around light fittings, don’t remove the light plate as this will expose live wires even when the light is switched off. Mask around it instead. • When tiling around light fittings, switches or power points, get a licensed electrician to remove the light plates and deactivate any exposed wires before you begin. • Safety switches need to be checked regularly to ensure that all power and lighting circuits are protected. • Stay well away from your service line. Your service line is the overhead or underground mains and wires which are located on your (private) property. <p>Extreme danger</p> <ul style="list-style-type: none"> • Wiring any part of a home. • Installing lighting or switches. • Installing or moving power points. • Rearranging electrical wires. • Carrying out electrical maintenance. • Replacing frayed cords on appliances. <p>Hidden danger.</p> <ul style="list-style-type: none"> • Check for wires before drilling into walls, floors and ceilings. Look up and around you. When using ladders or carrying other tall objects, always look out for powerlines and take care to avoid them. • Avoid contact with underground cables. • When painting eaves, replacing or cleaning gutters, avoid getting close to the electrical wires that connect your home to the power poles. • When changing a blown light bulb, make sure the power is off to avoid being harmed by exposed filaments.

1.6.6 Storm and major incident safety

Storms can cause considerable damage to buildings, trees and infrastructure, creating dangerous conditions and situations. Ausgrid has identified a list of actions to be undertaken before, during and after a storm.

Target groups:	Precautions:
<ul style="list-style-type: none"> General community 	<p>Be prepared for a storm by:</p> <ul style="list-style-type: none"> Tidying up loose items and trimming trees, but do not attempt to trim trees near powerlines. Keep a battery-operated torch and radio handy with spare batteries nearby. Keeping your house weatherproof. Always replace broken roof tiles, keep gutters clean and fix leaks to ensure water cannot access electrical systems or appliances. Being sure you know the location of your mains switch, or switches that turn off the electricity supply <p>During a storm:</p> <ul style="list-style-type: none"> Stay away from fallen powerlines and service wires or anything touching them. Report any fallen powerlines or service wires, trees or branches in contact with powerlines, fires or property damage to your local electricity distributor as soon as possible. Play it safe by unplugging sensitive appliances such as computers, video recorders and televisions. <p>After a storm:</p> <ul style="list-style-type: none"> Stay away from powerlines or service wires or any debris that may have come into contact with them. It is recommended that you keep a six metre distance from any fallen powerlines or any items such as trees, that may have come into contact with the live wires. Get appliances checked by a professional before you plug them back in.

1.6.7 Safety around fallen power lines

Powerlines can be damaged by fallen trees, flying debris during high winds, lightning strikes, car accidents, vandalism, fires, and birds or other animals. Fallen powerlines are very dangerous.

Target groups:	Precautions:
<ul style="list-style-type: none"> General community 	<ul style="list-style-type: none"> Stay away from fallen powerlines or any debris that may have come into contact with them. They may still be live. It is recommended that you keep a six metre distance from any fallen powerlines or any items such as trees, which may have come into contact with the live wires. Always assume fallen powerlines are live. You do not have to touch a “live” object to get an electric shock; simply approaching a fallen power line puts you at risk.

1.6.8 Electrical safety at Christmas

Caution should be taken during the decorative Christmas period where Christmas lights play a major role. Communicating safe practices is critical in the general community avoiding electrical accidents.

Target groups:	Precautions:
<ul style="list-style-type: none">• General community	<ul style="list-style-type: none">• Check your lights when you take them out of storage.• Don't overload power points or power boards.• Only use lights and extension cords outside that are designed for outdoor use.• Turn lights off before leaving home or going to bed.

1.6.9 Bushfire risk

Bushfires pose a risk to life, property and the environment in rural and urban areas throughout NSW. They can be caused by incidents like lightning strikes, sparks from farm machinery and electrical incidents such as fallen powerlines.

Overhead powerlines can clash together or be brought down by strong winds, falling trees and branches. Poles and their fittings, for example cross-arms, can fail due to these reasons also, as well as through lack of maintenance. Both of these conditions can create a serious safety and bushfire risk. Just as Ausgrid maintains the powerlines and poles that it owns, customers with privately-owned powerlines are required to do the same.

Network customers have a legal obligation under the Electricity (Consumer Safety) Act 2004 to maintain their electrical installation, which may include powerlines and poles, to ensure that they are free from any defects that may cause a fire or any other safety hazard. This may include deteriorated or overloaded wires, damaged poles and fittings or trees too close to powerlines. If powerlines or poles cause injury or damage to property, they may be held legally responsible. If you are uncertain whether the powerlines and poles on your property are part of your electrical installation, please contact Ausgrid on the following numbers:

Newcastle and Lower Hunter – 4951 0102

Upper Hunter – 6542 9017

Central Coast – 4399 8088

Sydney North – 9477 8201

Target groups:	Precautions:
<ul style="list-style-type: none"> Private Pole Owners 	<ul style="list-style-type: none"> Clashing wires – Avoid uninsulated wires clashing in windy weather. Fitting low voltage 'spreaders' (which keep the lines separated) is one solution. Ensure only a licensed electrical contractor undertakes this work. Slack wires – If one wire hangs lower than others or wires are slack they are more likely to clash. You will need to engage a licensed electrical contractor to repair these wires. Damaged wires – If the insulation which protects some wires is missing or damaged the exposed wire may be live. Contact with this could be fatal, and vegetation touching the wire in this area is more likely to start a fire. Insulated wires should be replaced, not repaired, and only by a licensed electrical contractor. Trees near powerlines – Trees and other vegetation too close to powerlines may cause fires or other safety risks such as fallen live wires. Trees need to be trimmed to provide a safety clearance from powerlines (in bush fire prone areas, 2.5 metres around uninsulated low voltage wires and one metre around insulated low voltage wires), as well as allowing for regrowth. All overhanging limbs and branches should also be removed in bush fire prone areas. Tree trimming near live powerlines must only be done by an authorised tree trimmer. Termites or wood rot – Termites and wood rot can cause serious structural damage to your private poles and fittings. All termite infested poles and fittings must be treated by a registered pest controller. Unsafe poles and fittings must be replaced by a licensed electrical contractor.

1.6.10 Graffiti on electrical infrastructure

Build awareness of the risk involved with cleaning graffiti off street side electrical equipment and promote reporting of graffiti on electrical infrastructure to the Ausgrid Graffiti Hotline.

Target groups:	Precautions:
<ul style="list-style-type: none"> General community 	<ul style="list-style-type: none"> It is dangerous for anyone to remove graffiti on electrical equipment such as pillar boxes, kiosk subs etc. Report graffiti on electrical equipment via Ausgrid's Graffiti hotline

Ausgrid evaluates the PESAP programs and reports on this evaluation in the annual Electricity Network Performance Report. The Electricity Network Performance Report can be found on the Ausgrid website (www.ausgrid.com.au). The programs are evaluated against the objectives of the PESAP and their effectiveness in reaching "at risk" groups.

1.7 Communication channels

Ausgrid engages a range of communication media and channels to reach "at risk" groups for each program.

The selected channel will vary with each program and may include radio and print advertisements, sponsorships, education kits, personal presentations, bill inserts, printed material, press releases and the web.

The specific channel selected is based on an analysis of the "at risk" group and the safety message/s being communicated.

D11/88008

Chapter 4 Bushfire Risk Management Plan

March 2011



1 Overview

Bushfires pose an ever present risk to life, property and the environment throughout rural and urban areas in New South Wales.

Bushfires can be caused by a variety of factors, including lightning strikes, sparks from farm machinery and incinerators, vehicle crashes, and electrical incidents such as fallen powerlines.

Ausgrid has an obligation to manage bushfire risks as they relate to our network. We do this by adopting a risk management approach attempting to ensure our assets and our customers' private powerlines are safe and are properly designed, constructed and maintained, by the responsible party.

This Plan is a management plan and outlines the procedures, standards, codes and guidelines that Ausgrid applies to construction, operation and management of our network. The Plan also provides an overview of Ausgrid's bushfire risk management strategies in relation to key stakeholders including:

- Landowners and Occupiers;
- Local Government;
- Government Agencies; and
- Emergency Services.

The objective of Ausgrid's Bushfire Risk Management Plan is to devise a management framework that when used correctly will:

- attempt to ensure public safety;
- establish standards for vegetation management near electricity lines (particularly in bushfire prone areas);
- reduce interruptions to electricity supply that are related to vegetation; and
- minimise the possibility of fire ignition by electricity lines and associated equipment.

The Bushfire Risk Management Plan outlines how we inform our customers of their obligation to share bushfire prevention responsibilities with us to ensure that privately owned overhead powerlines are kept free of vegetation and are inspected, tested and maintained at regular intervals.

The Bushfire Risk Management Plan has been prepared in accordance with the Electricity Supply (Safety and Network Management) Regulation 2008, which requires Ausgrid to develop, publish, implement and report against our bushfire risk management strategy. As required by the Director-General, we have incorporated the provisions of ISSC 31 Guideline for the Management of Private Lines and ISSC 33 Guideline for Network Configuration during High Bushfire Risk Days into this Plan.

The Executive Manager, Maintenance & Replacement Planning will revise this Plan in line with the review of the entire Network Management Plan and the finalisation of our annual Electricity Network Performance Report.

2 Our commitment

Ausgrid is committed to managing bushfire risks associated with electrical assets to attempt to ensure the safety of our customers and the wider community.

Ausgrid aims to fulfil its responsibilities under the Bushfire Risk Management Plan by using the following strategies:

- identification of bushfire risks;
- improving standards for electricity assets;
- effective maintenance of our assets;
- specific operational procedures for times of very high fire danger;
- management of safe vegetation clearances;
- communication of bushfire risks and shared responsibilities to our customers and the wider community;
- effective management of enquiries and complaints relating to mitigation of bushfire risks; and
- working with other agencies to ensure a coordinated approach to bushfire risk management.

These strategies allow Ausgrid to fulfil its obligations under the Regulation as directed by Industry and Investment NSW (I &I) and to comply with its duty as a public authority under the Rural Fires Act 1997 to take whatever measures are reasonably practicable to prevent the occurrence of bush fires or minimise the danger of bush fires.

3 Identifying bushfire risks

Our Bushfire Hazard Potential Maps and integrated Asset Management System help us identify bushfire prone areas and assets that may represent a bushfire risk.

Bushfire hazards vary from season to season and are dependent on weather conditions and fuel loads.

Recognising this, we have a process in place to identify bushfire prone areas and network assets capable of starting bushfires. We also have systems to ensure that this information is kept up-to-date.

3.1 Identifying bushfire prone areas

To identify the bushfire prone areas in our distribution area, we use the “bushfire prone” land maps prepared by local councils in accordance with the requirements of section 146 of the Environmental Planning and Assessment Act 1979.

Ausgrid overlays the council maps with our own geospatial asset information to identify assets located in bushfire prone areas. Since September 2005, Ausgrid has had access to a complete set of bushfire prone land maps from councils within our network area.

The maps prepared by local councils are reviewed by the Rural Fire Service prior to being formally certified by the Commissioner for the NSW Rural Fire Service (RFS). Ausgrid has a formal agreement with the RFS regarding use of the certified maps for management of bushfire risks in our network area and load the latest version of these certified maps into our Geospatial Information System (GIS) annually prior to the bushfire season.

We encourage our customers to access these maps from their local council so that they can identify whether their assets lie within areas that are bushfire prone.

3.2 Identifying network assets that could start bushfires

Ausgrid applies a reliability-centred maintenance (RCM) analysis for the development of preventative maintenance requirements. As part of this, a failure modes, effects and criticality analysis (FMECA) has been undertaken on all network assets and included identification of failure modes that potentially could cause bushfires. These failure modes are included in our integrated Asset Management System. The outcome of the RCM/FMECA process is in the form of maintenance standards which are available to all staff via our Technical Maintenance Plan (TMP) on Balin.

We periodically review our Network Standards (where we specify the construction methods for building network assets) to ensure the standards comply with the ENA Doc 01 -2008 Clause 6.3.2. This is of particular relevance to this Plan as it specifically requires the design and construction of electrical apparatus to take account of issues such as bushfire mitigation.

Investigations of actionable incidents under the Significant Electricity Network Incidents scheme (as administered by Industry & Investment NSW) are used by Ausgrid to review all significant incidents involving bushfires and network assets. We use this information to systematically update our RCM/FMECA for the failed equipment if the failure modes have not already been identified as potentially initiating bushfires and this information is then included in our integrated Asset Management System. Replacement or Duty of Care programmes are established for the type of asset that has failed if warranted or else corrective maintenance actions are undertaken to mitigate the risk.

Our integrated Asset Management System is our asset register for network assets. It is used to record inspection activity requirements on our network assets as well as other corrective and breakdown maintenance required on those assets. The integrated Asset Management System is updated to reflect the asset status when:

- an asset is changed or replaced;
- a new asset is installed; or

- the risk status of an existing asset changes when defects are found during inspection and when the defect has been repaired.

The relevant Network Standards or maintenance standards are also updated if required to reflect new information.

4 Designing and maintaining electrical assets

Our asset design and maintenance standards help us minimise the risk of bushfires being started by powerlines and/or electrical equipment.

Ausgrid manages bushfire risks by adopting a risk management approach to ensuring that our assets and our customers' private powerlines are properly designed, equipped and maintained, by the responsible party.

To meet our obligations we periodically review our design, inspection, testing, maintenance and operational procedures (often in consultation with New South Wales and Australian electricity distributors and other industry forums).

We also provide information to help our customers meet their obligations to maintain safe private powerlines. The information includes details on how best to keep private overhead powerlines free of vegetation. It also outlines obligations customers have to inspect, test and maintain their private powerlines at regular intervals to ensure their safety.

4.1 Our assets

Ausgrid operates an extensive network of high voltage and low voltage electrical wires, poles and substations supplied from the TransGrid transmission network. Our network is further described in section two of chapter one (network safety and reliability). We have an obligation to take all reasonably practicable measures to ensure our network does not cause a bushfire.

4.1.1 Design

The design of our network assets is critical to reducing the risk of bushfires. All new and replacement assets must feature appropriate technology in order to limit bushfire risks.

Our network assets are designed in accordance with the requirements of Section 8.1 of chapter one (network safety and reliability). New and revised design standards include a compliance check and signoff to ensure the design standard meets the objectives of our Bushfire Risk Management Plan.

In recent years we have identified aspects of our existing assets base that, if left without mitigation, would have the potential to ignite bushfires and we have mitigated that potential by:

- fitting low voltage spreaders to mitigate potential deficiencies in existing low voltage bare overhead constructions in bushfire prone areas; and
- installation of high voltage substation/control point equipment designed to minimise emission of hot particles that could initiate a bushfire for example, air break switches with arc containment.

4.1.2 Inspection and testing

Our inspection and testing program is ongoing and allows us to identify defects in our network assets that have the potential to start a bushfire and prioritise their repair. Our inspection and testing regime is set out in Section 5.2 of chapter one (network safety and reliability) and is based on Reliability Centred Maintenance/Failure Mode Effect and Criticality Analysis processes (including bushfire mitigation).¹⁴

Our inspection and testing activities are described in Section 8.2 of chapter one (network safety and reliability) and detailed in the Technical Maintenance Plan (TMP) on Balin. These activities include:

- Conducting periodic audits of as-built network infrastructure;

¹⁴ The Reliability Centred Maintenance approach forms part of an overall asset management framework that aims to minimise asset life cycle costs whilst maintaining acceptable reliability and risk levels. The Failure Mode Effect and Criticality Analysis approach proves a structured method for assessing the likely cause of an asset's failure and the consequences of these failures on safety, asset performance and economics.

- Conducting annual pre-bushfire season patrols of assets in all areas certified by the RFS as 'bushfire prone';
- Conducting detailed overhead power line inspections every four years (followed two years later by ground line pole inspection and treatment) to identify any defects that could affect our overhead network and to prioritise their repair;
- Recording network pole and line inspections and corrective work in our Integrated Asset Management System; and
- Recording substation equipment inspections and corrective maintenance in our Integrated Asset Management System.

We use our integrated Asset Management System to enable tracking and management of corrective maintenance for all poles and overhead powerlines in bushfire prone areas identified during the pre-bushfire danger season patrols. Corrective maintenance tasks are completed on a prioritised basis, according to the nature and type of defect.

4.1.3 Operation

Ausgrid has several operational procedures in place that effectively reduce the risk of a bushfire starting during the normal operation of our network or when work is taking place.

These include:

- On total fire ban days, Ausgrid's Network Control Room is notified by the NSW Rural Fire Service of total fire ban conditions and our Network Control Room notifies staff via SMS of the heightened conditions;
- Changing the protection settings on certain equipment during conditions of very high fire danger, by switching the re-close¹⁵ function on nominated high voltage distribution and sub transmission feeders from automatic to manual¹⁶ in high risk bushfire prone areas. Other protection settings such as over-current, earth fault and sensitive earth fault settings are already optimised and do not need to be changed during conditions of very high fire danger;
- Our staff and contractors adopt special work procedures and precautions during the bushfire danger season and total fire bans. Notification of total fire ban days is via SMS messaging from our Network Control Room. Risk mitigation procedures are used during construction and maintenance activities to ensure we do not start a bushfire (per Distribution Guideline DG-33 Hot Work During Total Fire Bans);
- Response to minor individual fire instances is prioritised and co-ordinated by our Network Control Room in a similar manner that responds to other network disruptions;
- When bushfires cause widespread impacts to Ausgrid's electricity network, the incident severity is assessed by our Network Control Room after which our Emergency Management Plan and Incident Management System are implemented. The level of response is in accordance with the level of response required by the Incident Management System;

¹⁵ High voltage powerlines are protected by automatic equipment, which shuts down the power when a fault is detected. Because most faults on high voltage overhead powerlines are temporary (such as those caused by lightning strikes or tree branches falling on to powerlines) the power is usually turned back on automatically (re-closed) after a delay of a few seconds. However, during times when the conditions are especially risky, such as on total fire ban days, we may turn the automatic re-close function off.

¹⁶ Our procedures for manual re-closing after faults are based on the requirements of ISSC 33 Guideline for network configuration during high bushfire risk days and section 7.3.6 of the ENA NENS 01 – 2001 National Electricity Network Safety Code.

- We support and assist other distributors (DNSPs) by sharing resources and equipment during emergencies, to ensure supply is restored safely and as quickly as possible;
- We liaise with NSW Fire Brigade, NSW Rural Fire Service, Local Councils and other authorities during Regional Bushfire Risk Management planning; and
- We participate in electricity industry debriefs following major bushfire incidents and implement improvements identified in these sessions.

4.2 Our customers' assets

Bushfire risk management for electrical equipment is a shared responsibility between Ausgrid and all landowners/occupiers who are customers in our distribution area.

Ausgrid inspects, tests and maintains the assets we own. However, it is the responsibility of landowners/occupiers to ensure their electrical installations¹⁷ are free from defects that could cause fire or other hazards.

Customers are responsible for keeping private overhead powerlines free of vegetation, and must ensure appropriate trees are planted in areas that are close to powerlines. Customers are also responsible for inspecting, testing and maintaining their powerlines and poles at regular intervals – the same way we do.

To assist our customers to meet these requirements we aim to:

- clearly communicate to customers their obligations in our publications ES1 Customer Connection Information;
- provide customers with detailed safety information (via brochures, account inserts and website); and
- advise customers of any defects observed on their private powerlines and poles (by members of the public or our staff) by issuing notices and following up actions where appropriate.¹⁸

In cases where private mains are not being used or customers have not rectified safety defects that have been identified, it may be necessary for us to disconnect these mains. This may include removing any overhead service line to the customer's installation.

Where a customer no longer requires supply and a final account is issued, and assuming there are no defects, new customers have six months to request supply before any disconnections occur. Even when a service has been disconnected, the landowner/occupier remains responsible for maintaining the customer installation in a safe condition.

Ausgrid has a review process consistent with the Network Operator Review outlined in the Industry Safety Steering Committee ISSC 31 document (Management of Private Overhead Lines: NSW Guideline). We also have a process for the disconnection of unused private mains in rural bushfire prone areas. We have incorporated customers' obligations regarding maintenance of their installation into our Standard Form Customer Connection Contract.

¹⁷ Ausgrid uses the Service & Installation Rules of NSW to determine the delineation of private electrical installations from network assets. Our requirements for the inspection and maintenance of private aerial mains are detailed in our publication ES1 Customer Connection Information, our Standard Form Customer Connection Contract and the Network Standards referenced in ES1. Under the Electricity Supply (Safety and Network Management) Regulation 2008, we have taken into account the Industry & Investment NSW Code of Practice (Electricity) – Service & Installation Rules of NSW, October 2006. The Service and Installation Rules of NSW are prepared in accordance with the Code of Practice.

¹⁸ Ausgrid's process for the management of bushfire risk safety defects in customers' installations is detailed in our internal company procedure CS WI 30/03 Processing Bushfire Related Defects Following a Line Patrol Report, available to relevant staff on Ausgrid Procedures on Lotus Notes or in hard copy.

5 Managing vegetation

Our Vegetation Management Program helps to prevent bushfires and reduce supply interruptions caused by vegetation.

Trees near powerlines can start bushfires. Falling branches can bring live wires to the ground. Swaying branches can push overhead lines together, causing the wires to short out, burn through and fall to the ground. Shorted wires can start bushfires, even if the wires don't fall down.

Guidelines on vegetation safety management issues are given in our Tree Safety Management Plan. This plan was developed after an extensive public consultation process involving the community, local councils and organisations such as the NSW National Parks and Wildlife Service. The Tree Safety Management Plan aims to:

- reduce the risk of fires and power interruptions caused by branches touching overhead wires;
- minimise the possibility of electrocution; and
- ensure safe clearances are achieved and maintained while protecting the health of each tree.

The Tree Safety Management Plan also provides advice on the most appropriate trees to plant near powerlines and highlights the importance of engaging only qualified tree trimmers to conduct any trimming work required.

5.1 Safe clearances

To help prevent the possibility of trees causing bushfires or outages, we manage vegetation safety clearances on or near our network using the Tree Safety Management Plan and Network Standard NS 179 Vegetation Safety Clearances. We provide for additional vegetation safety clearances in bushfire prone areas.

Our document ES1 – Customer Connection Information, sets out similar requirements for our customers who must maintain the safety clearances between trees and their private overhead powerlines in a manner consistent with the NS 179. The standard sets out minimum clearance distances and specifies that vegetation management work must only be performed by qualified and authorised persons working in accordance with Ausgrid's Electrical Safety Rules when vegetation is being trimmed near energised powerlines. It should be noted that NS 179 requires larger safety clearances to be established and maintained in bushfire prone areas.

6 Communicating risks and responsibilities

Our Communications Program informs our customers of their obligations in bushfire risk mitigation

We communicate bushfire and other safety messages to our customers and the wider community in the following ways:

- We provide detailed information on customer obligations relating to private powerlines and poles, as well as information about bushfire risks using account inserts, mail outs and our website (www.ausgrid.com.au);
- We provide general information on the dangers of bushfires including links to the NSW Rural Fire Service website (www.rfs.nsw.gov.au);
- We issue Customer Installation Advices (CIAs) and Network Standards Advices (NSAs) to ensure current design standards are communicated to all staff, contractors and Accredited Service Providers. These are published on our website along with Electricity Supply Standards and Network Standards;
- We provide specific information to customers about private overhead lines advising them of the hazards and the safety precautions to be followed;
- We use media releases to provide information to the general public about the fire hazards associated with overhead powerlines and vegetation; and
- We use radio ads and other mediums to provide information to the general public about the fire hazards associated with overhead powerlines and vegetation, particularly during the bushfire season.

7 Handling inquiries and complaints

Our Customer Care System helps us effectively manage all inquiries and complaints.

Ausgrid strives to respond to customer inquiries and complaints in a timely and efficient manner.

Phone calls to our 13 15 35 inquiry line and emails to our website are managed by our Contact Centre and are referred to specific business areas when appropriate.

Complaints relating to safety issues including bushfire risks always receive priority.

Ausgrid uses an Outage Management System (OMS) to record and track outages on its electrical network. This includes reports of hazards such as 'wires down' or 'wires arcing' and other safety related incidents, as well as general 'no supply' issues.

Ausgrid uses OMS in identifying network issues, classifying jobs, managing its response and recording job completions. Calls received via OMS can be tagged as bushfire related and this information is considered when assessing jobs and setting priorities.

8 Building relationships with relevant agencies

We are committed to building and maintaining relationships with all agencies involved in bushfire risk mitigation.

In addition to maintaining ongoing communication with our customers, staff and contractors, Ausgrid also spends time building relationships with emergency services, government agencies and the industry as a whole.

We have developed strong associations with the NSW Rural Fire Service, the New South Wales Fire Brigade, local councils and the State Government. We also work alongside other electricity distributors and industry colleagues to effectively manage bushfire mitigation at a state-wide level.

These liaisons include:

- participation in Regional Bushfire Risk Management forums;
- participation in industry debriefs following bushfires;
- providing 'hands-on' assistance during bushfires (e.g. assisting ActewAGL to restore power during the January 2003 bushfires in Canberra and offered assistance during the February 2009 Victorian bushfires);
- information sharing with the NSW Rural Fire Service to ensure accurate bushfire prone land maps are used and RFS staff have sufficient training when fighting fires around network assets; and
- working with the other electricity distributors, Industry & Investment NSW, and NSW Fair Trading, to develop Industry Safety Steering Committee (ISSC) and other relevant Guidelines.

9 Management and reporting

Our management and reporting framework helps us comply with the requirements of the Regulation and Industry and Investment NSW.

Ausgrid operates under a due diligence framework which ensures that all risks are identified and that an appropriate system of compliance is in place.

This Bushfire Risk Management Plan and the entire Network Management Plan together with supporting documents, policies and procedures are managed in accordance with Ausgrid's quality management system (certified to AS/NZS ISO 9000:2000).

This Plan incorporates management of inspection, preventative and corrective maintenance of our network assets under the provisions of outlined in chapter one (Network Safety & Reliability) of the Network Management Plan.

- We record all network pole and line inspections and corrective work in our integrated Asset Management System. Post fault patrols are conducted on a high voltage feeder or low voltage distributor basis, with all known causes documented in our Outage Management System, and any required corrective work recorded in our Integrated Asset Management System; and
- We track and analyse inspection and corrective work records in the integrated Asset Management System.

9.1 Schedule of reports to Industry and Investment NSW

We monitor our performance against this Plan and report to Industry and Investment NSW annually in our Electricity Network Performance Report, available on our website (www.ausgrid.com.au).

We advise Industry and Investment NSW of any serious electricity network accidents or actionable incidents relating to bushfire risk management (under the Significant Electricity Network Incidents reporting framework detailed in chapter one of the Network Management Plan).

10 Reference documents

- The Service and Installation Rules for NSW are available from:
www.industry.nsw.gov.au/energy/electricity/network-connections/rules

The documents listed below are available on Ausgrid's website www.ausgrid.com.au

- Your Powerlines: Safety and Bushfire Prevention (Customer Information Brochure)
- Tree Safety Management Plan
- Network Maintenance Plan
- ES1 Customer Connection Information
- ES10 Requirements for Electricity Supply to Developments
- Network Standards:
 - NS 145 Pole Inspection and Treatment Procedures
 - NS 166 Line Inspection
 - NS 179 Vegetation Safety Clearances

Copies of the Electricity Networks Association publication listed below can be obtained from: www.ena.asn.au

- ENA Doc 01-2008
- ENA NENS 07 National Guidelines for Manual Reclosing of High Voltage Electrical Apparatus Following a Fault Operation (available from the Energy Network Association).

Copies of the Industry Safety Steering Committee publications listed below are available from:
www.industry.nsw.gov.au/energy/electricity/networks/safety

- Industry Safety Steering Committee publication ISSC 31 Management of Private Overhead Lines: NSW Guideline (published in July 2004).
- Industry Safety Steering Committee publication ISSC 33 Guideline for network configuration during high bushfire risk days (published in February 2008).