Attachment 5.09

Network Asset Management Strategy

(ASM-STG-10002)

May 2014

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Purpose & Scope

The Network Asset Management Strategy provides an overall view of the approach Ausgrid takes to manage its asset portfolio to achieve business objectives. It describes the key business objectives, and relates them to the key target outcomes of the asset management processes. It describes the nature of the Ausgrid asset base at a high level and the policy level approach to asset management. It describes the key processes in the asset management framework by reference to the appropriate policy, standard and procedural documents.

This strategy covers network assets used to deliver electricity services to Ausgrid's customers. It is not intended to include non-system assets.

Business Objectives

Background

Ausgrid is a New South Wales (NSW) State Owned Corporation constituted under the Energy Services Corporations Act 1995. Ausgrid's main business undertakings are subject to the National Electricity Law and the associated National Electricity Rules. The NSW Electricity Supply Act, 1995 governs many aspects of our business and provides the framework for our distribution licence and the conditions attached to it. Commercially, we operate under a revenue determination made by the Australian Energy Regulator (AER) in accordance with the National Electricity Rules.

The objectives for energy distribution business outlined in the Energy Services Corporation Act 1995 are:

a) *to be a successful business and, to this end:*
    i. *operate at least as efficiently as any comparable business*
    ii. *maximise the net worth of the State's investment in the State Owned Corporation; and*
    iii. *exhibit a sense of social responsibility by having regard to the interests of the community in which it operates.*
b) *To protect the environment by conducting its operations in compliance with the principles of economically sustainable development contained in section 6 (2) of the Protection of the Environment Administration Act 1991.*
c) *To exhibit a sense of responsibility towards regional development and decentralisation in the way in which it operates.*
d) *To operate efficient, safe and reliable facilities for the distribution of electricity of other forms of energy.*
e) *To be an efficient and responsible supplier of electricity and other forms of energy and of services relating to the use and conservation of electricity and other forms of energy.*

Our obligations under the National Electricity Law and Rules are designed to align with the National Electricity Objective:

to promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity with respect to:

- *price, quality, safety, reliability, and security of supply of electricity; and*

- *the reliability, safety and security of the national electricity system.*

Our focus, with respect to investment and expenditure on the operations of our business is also guided by the requirements of Chapter 6 of the National Electricity Rules, which define the capital and operating expenditure objectives that the AER uses to determine our allowable revenue. The objectives are to:

- *meet or manage the expected demand;*
- *comply with all applicable regulatory obligations or requirements;*
- *maintain the quality, reliability and security of supply;*
- *maintain the reliability and security of the distribution system; and*
- *maintain the safety of the distribution system.*[1]

Ausgrid has translated these obligations into three core business objectives in our current business plan:

Continuously improving safety performance with respect to our customers, staff and the public. Maintaining the reliability and sustainability of the network. Containing average network tariff increases to CPI for our customers.

Relationship between business objectives and asset management outcomes

Ausgrid's asset management approach is intended to deliver on these key business objectives. The application of our asset management principles and processes deliver the outcomes that ensure the long term safety, reliability and efficiency of our network operations.

The key outcomes of our asset management system are described below. While all outcomes contribute to each of our key business objectives at some level, the table identifies where the most significant contributions lie.

[1] Paraphrased for clarity

Outcome	Safety	Reliability and sustainability	Cost to consumers
Assets added to our network are fit for purpose, the most economical choice on a life-cycle basis, and clearly specified.	✓✓	✓✓	✓✓✓
Assets in service are monitored and maintained in accordance with properly developed maintenance plans.	✓✓	✓✓✓	✓
Asset management plans are regularly reviewed using multi-factor risk assessment including safety, environmental, reliability and financial risks.	✓✓✓	✓✓✓	✓✓✓
Maintenance practices are kept efficient by a review cycle that ensures continuous improvement.	✓	✓	✓✓✓
The effective economic life of assets is maximised by using condition based decision making.	✓	✓	✓✓✓
Performance and condition data is collected and recorded to enable future analysis in support of robust decision making.	✓	✓✓✓	✓✓
Asset disposal is recognised and managed as part of the replacement process.	✓✓	✓✓✓	✓

The Ausgrid Network

In 2012/13, Ausgrid's network supplied more than 26,316GWh of electricity to more than 1.64 million network customers. Our distribution area (Figure 1) covers an area of 22,275 square kilometres and includes some of the most densely populated of NSW. We supply customers from the Upper Hunter Valley in the north, Waterfall in the south, and west in Sydney to Auburn.

Figure 1 – Ausgrid's Distribution Area

Ausgrid's network includes:

- a dual function (transmission) system of 132kV assets;
- a sub-transmission system of 33kV, 66kV and 132kV assets;
- a high voltage distribution system of 5kV, 11kV and some 33kV assets; and
- a low voltage distribution system of 230V and 400V assets.

Ausgrid operates an extensive network of 132kV assets which are directly connected to TransGrid's NSW main transmission network. Where these 132kV assets are operated in parallel and provide transmission services to support TransGrid's network they are defined as dual function assets under the NER. Ausgrid is therefore also registered as a Transmission Network Service Provider. Dual function assets are regulated by the Australian Energy Regulator (AER) as if they were part of the distribution system for the

purposes of revenue and are subject to the economic evaluation, and public notification and consultation requirements of the Regulatory Investment Test for Distribution (RIT-D).

Figure 2 – Typical components of the electricity network

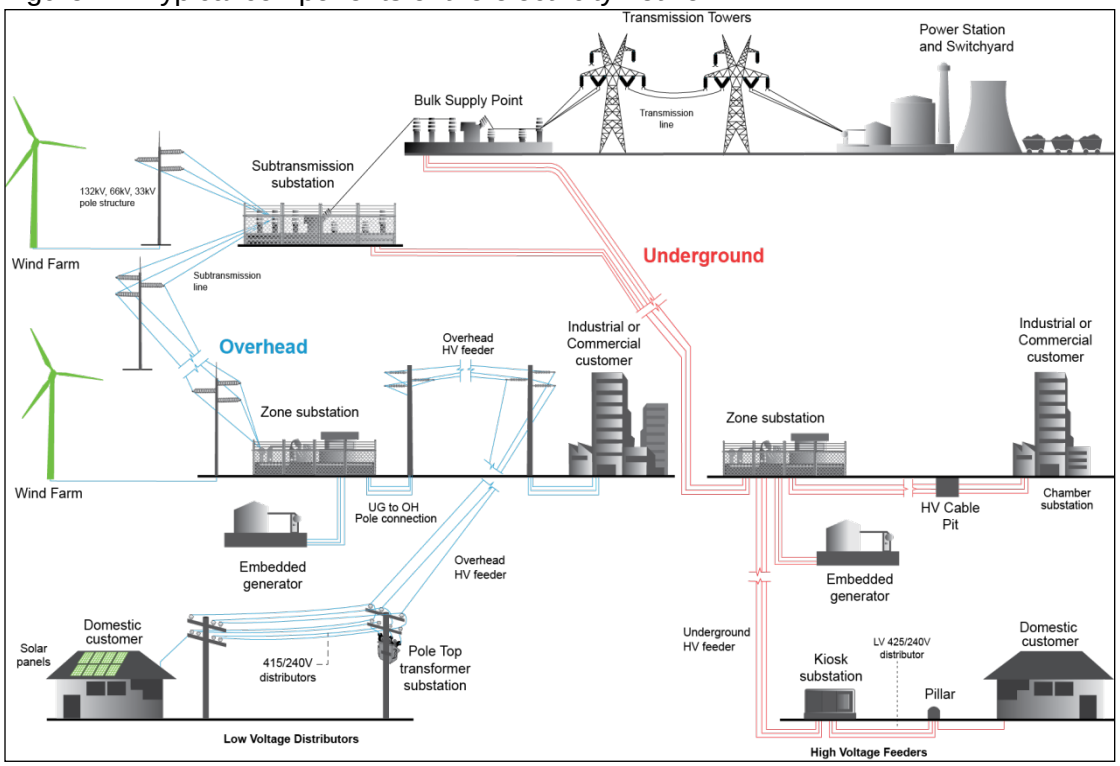


Figure 2 above shows Ausgrid's typical distribution network arrangement. Power is generally supplied through the TransGrid statwide transmission system, and distributed via Bulk Supply Points into the sub-transmission network. Other electricity distributors' networks and some power stations are also connected into our distribution network.

Ausgrid's network has a current day replacement value of approximately $38 billion and has been developed over the past 80 years. The main dimensions of the network are shown in the table below.

Table 1 – Ausgrid network statistics

Distribution Network Assets	2012/13
Dual Function (Transmission) System – 132kV (km)	789
Substations - Sub-transmission	42
Sub-transmission System - 33kV, 66kV and 132kV (km)	3,534
Substations - Zone	192
Substations - Distribution	31,070
High Voltage Overhead - 11 kV and 22 kV (km)	10,117
High Voltage Underground – 11 kV and 22 kV (km)	7,822
Low Voltage Overhead – 400V (km)	13,060
Low Voltage Underground – 400V (km)	5,638
Feeder Numbers CBD	55
Feeder Numbers Urban	1,733
Feeder Numbers Short Rural	287
Feeder Numbers Long Rural	4
Pole (number)	514,190
Streetlights (number)	253,881

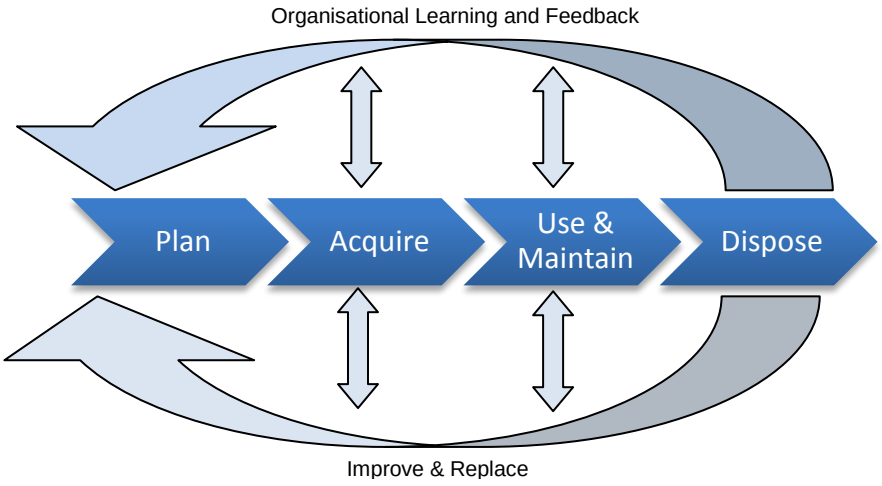
Asset Management Approach

Electricity networks are highly capital intensive businesses and asset management is core to Ausgrid's business. Asset management can be defined as *"The lifecycle management of physical assets to achieve the stated outputs of the enterprise."*[2]

Ausgrid has an organisation-wide focus on asset management, including design, procurement, maintenance activities, asset renewal, capital investment, condition monitoring and continuous improvement. Our asset management approach enables the competing requirements of the network to be optimised through the systematic consideration of risk and is supported by an integrated asset management system.

The Asset Management framework adopted by Ausgrid recognises four distinct but overlapping phases in the asset life cycle, as depicted in the simplified model at Figure 3. This model is similar to that adopted by many other asset intensive businesses and is consistent with the elements of a total asset management system identified in the New South Wales Government's Total Asset Management Policy.

Figure 3 - Asset Management Model



The key phases and major associated processes are:

1) Identification of the need for an asset (Asset Planning - Concept and Specify).

Business planning and analysis leading to a business case are the key processes. These provide the economic justification for the acquisition or improvement of an asset, or in some cases the adoption of another, non-asset solution to meet the business requirement. This phase is substantially embodied in Ausgrid's network investment policy framework.

2) Provision of the asset, including its refurbishment (Acquisition).

This includes the specification of requirements, systems engineering, project management and delivery, and quality assurance. These processes verify and validate the final design / delivered product against the specified requirements. Additional processes ensure that project objectives are achieved with minimum risk.

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[2] Asset Management Council – www.amcouncil.com.au

3) Operation of the asset, including its maintenance (Use and Maintain).

Many of the activities performed within this phase rely directly on the planning and analysis carried out during the acquisition phase, (or equivalent planning for existing assets). These include determining maintenance and support requirements through the application of specialised analysis techniques; and providing documentation, training and facilities to support maintenance and repair actions.

This phase covers all routine and programmed maintenance as well as developing and implementing engineering changes and improvements to either enhance asset performance or to reduce costs, or both. A key element of the asset management task during this phase is engineering management, particularly the documentation of asset configuration and control and approval of engineering changes.

Ausgrid's processes cover a set of systems and procedures for engineering and maintenance management, as well as information support systems, enabling managers to plan and control workload and to evaluate results. Cost information relating to individual assets is a key element in the ongoing analysis of performance and forms an integral part of the organisation-wide continuous improvement process.

4) Disposal, and thus effective removal of the asset from Ausgrid's portfolio.

Requirements for disposal of obsolete or replaced assets are incorporated in the planning for new assets, to ensure that a superseded item and support provisions are removed from service at the earliest possible time, thereby minimising management and storage costs and impact on the value of inventory. The costs of disposal are included in the investment decision.

Disposal activity can have an important bearing on safety and continuing support costs, as well as significant implications for environmental and/or heritage management.

Investment Decision Making

The key asset management processes determining outcomes in the PLAN, ACQUIRE and DISPOSAL phases are described in Ausgrid's network investment policy framework. All assets on the Ausgrid network are initially created through these policies and standards.

Policy or Standard	Scope
Network Investment Policy (INV-POL-10001)	This policy defines the principles by which Ausgrid decides to invest in its electricity system. It covers legislative requirements and investment objectives; decision making processes and criteria; and processes to ensure these decisions are made in a consistent and transparent manner. The policy framework divides investment decision making processes into investment categories that are described more fully in a series of planning standards.
Area Planning (INV-STD-10019)	This standard relates to the development of Ausgrid's Area Plans. Area Plans relate to major investments in the network, and consider Ausgrid's obligations holistically (irrespective of network type, voltage or the investment driver). The majority of investments within the Area Plans are sub-transmission investments due to the greater interconnectivity of the network at this level and because these investments are generally complex and high value. It is common, however, for a major project to include components of distribution work.
Replacement Planning (INV-STD-10035)	This standard relates to investment decisions aimed at managing the risks associated with age and condition of network assets (excluding metering and street lighting), or that would otherwise affect the safe, sustainable and reliable operation of the network, and specifically to decisions to replace or modify existing assets. Where solutions might form part of a strategic investment addressing multiple drivers, especially for subtransmission assets, the investment decision is made within area planning. Replacement planning includes proactive programs of work covering multiple smaller individual investments, and reactive investments resulting from inspection processes or in-service failures.

Policy or Standard	Scope
Distribution Planning (INV-STD-10036)	This standard specifies the requirements when planning investment in the high voltage distribution network, which is typically 11kV (but may also be 33kV and 5kV). It outlines the criteria used to identify needs and compare alternative investment solutions. Investments may be initiated to address general load growth, provide adequate quality of supply or to ensure voltage is within limits.
Low Voltage Planning (INV-STD-10034)	This standard specifies the requirements when planning the low voltage network (i.e. distribution substations and 400V network) to address general load growth, provide adequate quality of supply and ensure voltage is within limits. The low voltage network extends from the high voltage connection at each distribution centre to the point of common coupling with the customer.

Other categories of investment include:

Customer Connections - initiated by an application for a customer connection.

Metering - determined through an annual review of metering, system capabilities and compliance obligations.

Investments focussed on maintaining the reliability of the network are described under a separate policy framework.

Policy or Standard	Scope
Network Reliability Policy (INV-POL-10009)	This policy defines the principles and approach by which Ausgrid decides to invest in projects for improving the reliability of supply. It covers legislative requirements and investment objectives, and describes the constituent components of the Reliability Investment Plan.
Reliability Planning: Feeder Category (INV-STD-10028)	This standard outlines how Ausgrid manages reliability performance at the average feeder category level, in accordance with clauses 15, 18.2, 18.3 and Schedule 2 of the Licence Conditions. It specifies the requirements for establishing targets, and identifying gaps between the forecast performance and the targets to determine when investment is required; documenting the plan and reporting on performance.

Policy or Standard	Scope
Reliability Planning: Individual Feeders (INV-STD-10027)	This standard outlines how Ausgrid manages reliability performance for individual distribution feeders, in accordance with clauses 16, 18.4 and Schedule 3 of the Licence Conditions. It specifies the requirements for investigating and reporting on the reliability performance of individual feeders; determining when investment is required; and documenting the plan.
Reliability Planning: Individual Customers Receiving Poor Reliability (INV-STD-10031)	This standard relates to the management of reliability performance for individual customers. It specifies the requirements for Investigating and reporting on the reliability performance of individual customers at the distribution feeder section level; determining when investment is required; and documenting the plan.
Reliability Planning: Wide Area Outage Management (INV-STD-10030)	This standard outlines how Ausgrid manages the risk of wide area outages based on analysis of major events. These outages have the potential to affect large numbers of customers and/or critical infrastructure. The management of these outages is driven by risk mitigation that considers the broader impacts of such events on the community. This Standard specifies the requirements for assessing the risks; planning mitigating investments; and documenting the plan.
Reliability Planning: STPIS (INV-STD-10029)	This standard specifies the requirements for developing the Service Target Performance Incentive Scheme (STPIS) component of the Reliability Investment Plan, initiating projects that respond to the STPIS incentives and the reporting and target setting requirements for managing the STPIS. It specifies the requirements for establishing STPIS targets and incentive rates; planning investments to respond to the incentive; documenting the plan and reporting on performance.

Asset Support Analysis

Supportability analyses provide the essential linkage between the *ACQUIRE* and the *USE AND MAINTAIN* phases within the asset life cycle.

Supportability analysis forms an integral part of the systems engineering approach to asset development and acquisition. It begins with the specification of key parameters which will influence the operational availability, maintenance and support costs for the asset. At Ausgrid, these requirements are written into tender specifications to ensure suppliers identify the initial requirements for spares, maintenance and support at the outset. Supportability requirements for new assets are described in Network Standard NS212 Integrated Support Requirements for Ausgrid Network Assets.

Design, operational and maintenance standards form part of ongoing asset supportability. These are captured in Network Standards that cover a wide range of technical issues and practices.

Maintenance Planning

The planning and management of maintenance is the key activity in the *USE AND MAINTAIN* phase of the cycle.

Maintenance is an essential element of the asset management process that makes a direct contribution to achieving the business objectives of the organisation. In particular, a cost effective maintenance program is essential to ensure the long term sustainability of the network by preserving the engineering integrity of assets and their continued fitness for use within the electrical system. This in turn supports the reliability performance of the network, directly manages the safety risk profile and minimises long term costs.

Ausgrid utilises a Condition Based Maintenance approach to monitor the condition of assets, determine asset risk, specify the maintenance requirements and ultimately inform the replacement decision at end of life. This process commences when assets are first introduced to the network and continues cyclically over the life of the asset.

Establishing the set of programmed maintenance requirements is a key element of the management process for all assets. This is aimed at establishing what actions must be put in place to maintain the asset in satisfactory condition during its service life. It also provides the basis for determining financial and technical support requirements for the asset in the form of training, spares, tools and support equipment as well as data collection and analysis requirements for managing and monitoring the cost effectiveness of the maintenance program. Maintenance Requirements Analysis is the process Ausgrid applies to maintenance planning.

Maintenance requirements analysis

Maintenance Requirements Analysis provides a systematic method of determining the most appropriate and cost effective maintenance actions for individual assets, based on an assessment of the failure characteristics of the item, past failure history, the effects including costs of individual failures and the potential effectiveness of the maintenance task. The analysis is documented to provide a permanent record of the basis for decisions and to support the requirement for periodic review of the scope and effectiveness of maintenance action. The process is described within the Maintenance Requirements Analysis Manual (ASM STG-10005).

Maintenance requirements cover both short term actions, designed to detect or prevent a specific mode of failure as well as major renewal decision points to counter the effects of long cycle deterioration. Maintenance requirements for an asset may include preventive tasks to be done at some specified frequency or inspection or condition monitoring tasks, designed to establish the condition of the asset and to determine the need for corrective work based on this condition.

Failure Modes, Effects and Criticality Analysis (FMECA) provides a structured method for assessing the likely causes of failure for an asset and the consequences of these failures on safety, asset performance and economics. This information is then used to:

- Provide a basis for the maintenance requirements and expenditure forecasting process.
- Provide an input to the safety analysis and thus to initiate corrective action for failure modes which have an unacceptable impact on safety standards for the asset in use.

The data and information developed in the FMECA process is used to inform a Reliability Centred Maintenance approach to decision making regarding maintenance tasks, periodicity and repair / replace choices.

Manufacturer's recommendations and previous history for the same or similar assets typically set the baseline for maintenance requirements. Once the asset enters service its maintenance requirements are progressively refined and improved using recorded asset performance and actual maintenance costs.

Programmed maintenance requirements are consolidated in Network Technical Maintenance Plans (NTMPs) issued for major assets. These NTMPs document the approved scheduled maintenance program for the asset and represent the basis for maintenance programming and management. NTMPs incorporate service and maintenance standards, which provide more detailed information on the actions to be performed on individual assets.

As assets approach the end of their economic life, maintenance analysis identifies an asset as a candidate for end-of-life replacement, and underpins the risk analysis that informs a decision to invest in replacing or otherwise dealing with the retirement of the asset – returning to the *PLAN* phase of the asset management cycle.

Approved by Pamela Henderson, Chief Engineer

Approved 27 March 2013