Asset Management Plan

CONNECTION ASSETS

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Responsibilities

This document is the responsibility of the Metering Assets Strategy Team, Tasmanian Networks Pty Ltd, ABN 24 167 357 299 (hereafter referred to as "TasNetworks").

Please contact the Metering Asset Strategy Team Leader with any queries or suggestions.

- Implementation All TasNetworks staff and contractors.
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Record of revisions

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1 Purpose

The purpose of this document is to describe for Connection Assets and related assets:

- TasNetworks' approach to asset management, as reflected through its legislative and regulatory obligations and strategic plans;
- The key projects and programs underpinning its activities; and
- Forecast CAPEX and OPEX, including the basis upon which these forecasts are derived.

2 Scope

The scope of this document is to provide relevant background, analysis and justifications behind the connection assets thread programs for the upcoming regulatory period.

The assets covered by the Connection Assets Management Plan are:

- Overhead service conductors to transport the electricity between the distribution network and the customer installation;
- Service fuses to provide protection functions in the case of a fault in the consumer mains and to act as an isolation, connection and disconnection point between the distribution system and the customer installation;
- Fixtures and fittings to connect components together;
- Meter panels to install metering equipment located in the consumer's metering enclosure;
- LV metering current transformers for metering installations with greater than 100 A connected load;
- HV metering voltage transformers for metering installations connected at high voltage; and
- Neutral impedance monitoring devices (CablePI).

This management plan does not cover underground services and other privately owned assets.

3 Strategic Alignment and Objectives

This asset management plan has been developed to align with both TasNetworks' Asset Management Policy and Strategic Objectives.

It is part of a suite of documentation that supports the achievement of TasNetworks strategic performance objectives and, in turn, its mission. The asset management plans identifies the issues and strategies relating to network system assets and detail the specific activities that need to be undertaken to address the identified issues.

Figure 1 represents TasNetworks documents that support the asset management framework. The diagram highlights the existence of, and interdependence between, the Plan, Do, Check, Act components of good asset management practice.

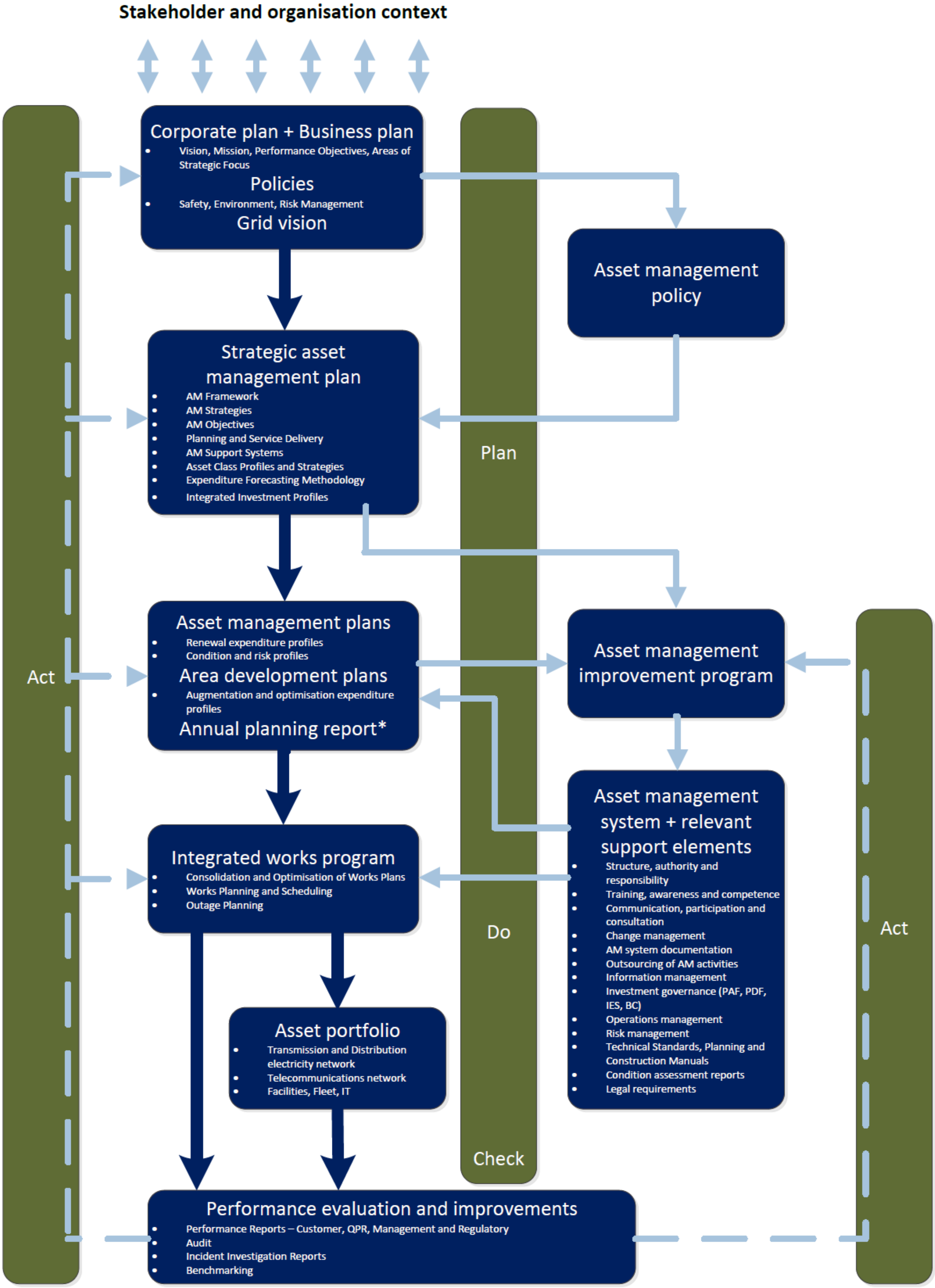
The management objectives for the Connection Assets are to

- Minimise the cost of asset management to a sustainable level;
- Use best endeavours to maintain the asset contribution to state-wide SAIFI to within two standard deviations of the five year average;
- No significant safety or environmental incidents;

- Maintain risk such that the residual risk level for all asset risks is 'As Low As Reasonably Practicable' taking into consideration any expressed or implied duty of care;
- Achieve compliance with relevant legislative, regulatory and statutory requirements;
- Establish performance measures, targets and reporting framework for asset management; and
- Have a formal, documented management framework in place for asset management that includes mechanisms for review and continual improvement.

This asset management plan describes the asset management strategies and programs developed to manage the Connection Assets, with the aim of achieving these objectives.

Figure 1 – TasNetworks Asset Management Documentation Framework



* The Annual Planning Report (APR) is a requirement of sections 5.12.2 and 5.13.2 of the National Electricity Rules (NER) and also satisfies a licence obligation to publish a Tasmanian Annual Planning Statement (TAPS). The APR is a compilation of information from the Area Development Plans and the Asset Management Plans.

4 Asset Support Systems

4.1 Systems

TasNetworks maintains an asset management information system (AMIS) that contains detailed information relating to the connection asset populations. AMIS is a combination of people processes and technology applied to provide the essential outputs for effective asset management.

4.2 Asset Information

The asset information contained on connection assets is stored in the Spatial Data Warehouse (GIS data). TasNetworks is updating its capability to record additional information relating to connections to enable more effective and efficient management of these assets. Additional information to be collected and stored includes:

- NMI/location/geographical details/site/access details/customer;
- Equipment attributes and ratings; and
- Compliance test results.

To determine the boundary between TasNetworks-owned and privately-owned connection assets, TasNetworks uses the Point of Supply as defined in the Tasmanian Electricity Code.

The Tasmanian Electricity Code defines the Point of Supply as:

- In the case of an electrical installation supplied by an underground electric line, the load side terminals of the service protection equipment at the end of the underground electric line; and
- In the case of an electrical installation supplied by an overhead electric line, the first point of connection of that electric line on the land, being:
    a) Where the electric line is carried onto the land by one or more poles, the first pole on the land carrying that electric line;
    b) Where the electric line is connected directly to the premises on that land, that connection to the premises; or
    c) Where it is not possible to determine a point of supply in accordance with (1) or (2) above, the point at which the electric line crosses the boundary of the land.

Any assets on the supply-side of the Point of Supply are considered TasNetworks-owned, any assets on the load-side of the Point of Supply are considered privately-owned.

5 Description of the Assets

The assets covered by the Connection Assets Management Plan are:

- Overhead service conductors to transport the electricity between the distribution network and the customer installation;
- Service fuses to provide protection functions in the case of a fault in the consumer mains and to act as an isolation, connection and disconnection point between the distribution system and the customer installation;
- Fixtures and fittings to connect components together;
- Meter panels to install metering equipment located in the consumer's metering enclosure;

- LV metering current transformers for metering installations with greater than 100 A connected load;
- HV metering voltage transformers for metering installations connected at high voltage; and
- Neutral impedance monitoring devices (CablePI).

5.1 Overhead Service Conductors

Approximately 213,000 installations are connected to the network via overhead service conductors.

A mixture of conductor types is used including:

- 25 mm2 Low Voltage Aerial Bundled Conductor (LV ABC) Aluminium;
- Open wire copper;
- 10 and 16 mm2 twisted Copper;
- Figure 8 Copper; and
- PVC and Twisted Copper PVC.

Aluminium LV ABC is the current standard conductor type used for overhead services and has been used as standard since 2001.

Figure 8 Copper, PVC and Twisted Copper PVC 10 mm2 services have been discontinued for many years and are included on a defects list that will trigger a service replacement when work is required on the asset.

Historically, a run to failure approach has been used to manage the replacement of overhead services due to the large volume of services and low impact of individual failures.

Due to limited information of LV service assets, an audit of 10% of the service population was conducted in 2006 to provide a snapshot of asset condition (LV Service Audit Findings, reference 3). This audit indicated that 13% of installed service wires were in poor condition, resulting in a replacement program being initiated in 2007/08. However, at the time another targeted service replacement program, replacement of Sicame Fuses, was deemed to have higher priority due to their high failure rate and the mode of failure and funds were diverted for this purpose.

TasNetworks currently utilises a risk based approach to replacement of service conductors. A rule base and condition assessment is applied whenever a conductor is worked on and determine of the conductor can be reinstated or requires replacement.

5.2 Service Fuses

Service fuses protect the service wire and distribution network from failures within an installation and are usually located at the point of attachment.

As with service conductors, a mix of service fuses is installed.

Since 2004, the standard fuse type for new and upgraded service installations is the Michaud 100 Amp fuses.

Older types such as Henley, Stanger 55 A and Stanger 30 A are included on a defects list that will trigger a service replacement when work is required on the asset.

Sicame fuses are also included on the defect list for replacement as a high priority due to the high failure rate of this particular fuse type. As there has been a targeted replacement program, their population in the network is very small. Therefore, Sicame fuses are replacement upon discovery during service replacements and upgrades.

5.3 Fixtures and Fittings

Various fixtures and fitting are installed on the network and these are generally replaced when other assets are replaced or repaired.

Since 2001, the standard connector used is an insulated IPC type connector. These connectors are not reusable and must be replaced when other service assets are replaced or repaired.

5.4 Meter Panels

There are approximately 280,000 meter panels are installed in the network.

Panels installed prior to 1984 contain a small amount of asbestos (5-10%). Whilst the advice of independent consultants indicates that the asbestos is safe as long as the particles are not disturbed by drilling or cutting, TasNetworks has made the decision to replace these panels when meters are replaced at an installation with an asbestos panel.

For details on TasNetworks asbestos handling policy see IMS-OPR-00-48 Asbestos Management Plan (reference 4).

5.5 Low Voltage Metering Current Transformers

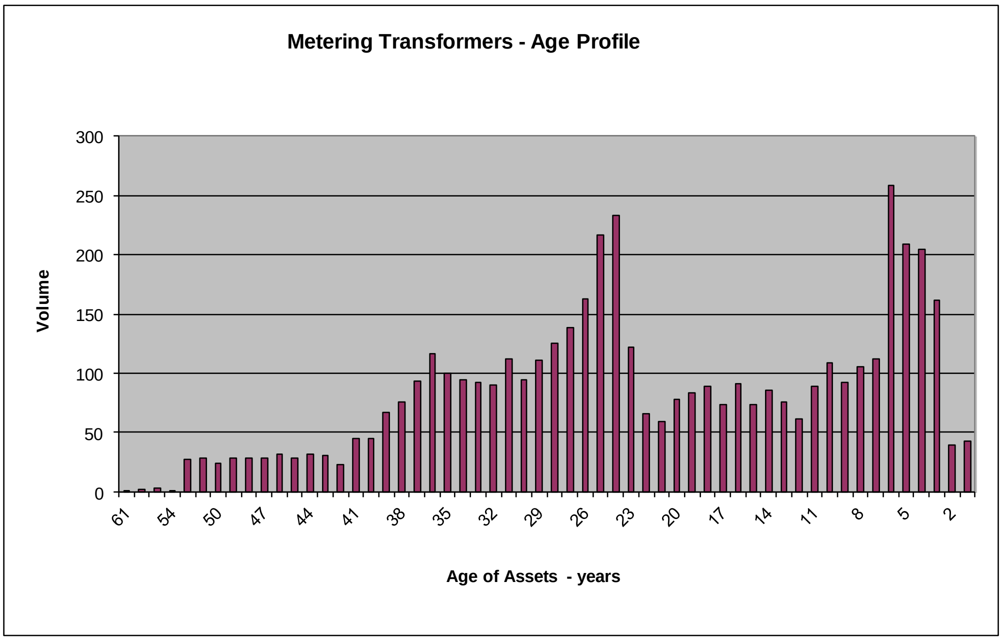
There are approximately 4,600 sets of LV metering current transformers (CTs) installed in the network as at March 2014, with approximately 60 being more than 50 years old.

The age profile of metering CTs is shown in Figure 2.

A set of metering transformers usually consists of three transformers (one for each phase). In order to comply with National Electricity Rules (NER) obligations TasNetworks must test every CT once every 10 years.

TasNetworks is assessing the option to move to a random sample-testing regime as described in the AEMO document Alternative Testing Minimum Requirements. This obligation drives a metering equipment testing program, from which it is expected a certain percentage will not meet the required accuracy and condition standards and will therefore require replacement. Details of this testing program can be found in Appendix B.

Figure 2: Age Profile of installed metering CTs (as at March 2014)



The data held by TasNetworks on each of its LV CT installations presently does not include precise information on the actual CTs fitted. Hence in some cases it is difficult to know whether a given CT is a fixed tap device or a multi tap CT. Fortunately this confusion only relates to 800:5 CTs which may be either Type B or Type T; (there are no Type U CTs used by TasNetworks).

Since 2004 when AS60044.1 came into force, TasNetworks has been installing single tap extended range CTs in new installations, (200:5, 800:5 or 1500:5). This has reduced the range of stock CTs required while catering for a wide range of customer loads.

TasNetworks has determined the number of each Type of CT it has in service from the meter multiplier used. Table 1 shows the breakdown of each CT type in service. There are 15 installations in Tasmania where the CTs do not fall into any of these families, and the CTs at these locations are likely to be very old and will be replaced.

Table 1: Volume of Installed CTs by Type

CT Type	CT Ratio	Number of Installations
A	150/300/600/5	303
B[1]	400/800/1200/5	181
C	1000/2000/3000/5	114
S	200/5	3,175
T	800/5	727
U	2000/5	0
V	4000/5	0
W	1500/5	92
Other	Various	15
Total		**4,607**

5.6 High Voltage Metering Transformers

Approximately 110 HV metering voltage transformers (VTs) are installed on the network as at March 2014.

An audit was conducted in 2006 to check the condition and compliance of all these assets, from which work practices at the time dictated that all substandard VTs be replaced.

This audit has established that most of TasNetworks metering VTs are in good serviceable condition. Compliance with the NER requires that these devices be tested every 10 years, with non-compliant devices being replaced.

5.7 Cable PI

CablePI is a small device that plugs into a domestic power point and monitors the impedance of the neutral. The device acts to alert customers of a potentially hazardous situation before a shock occurs.

[1] The actual number of Type B and T CTs may vary slightly as TasNetworks records do not indicate if a CT is fixed or multi-tap, but the total will remain unchanged.

In 2009, TasNetworks distributed CablePI devices to all households in Tasmania as a strategy to manage the risk associated with broken neutrals.

The TasNetworks asset register does not record each individual CablePI. Each residential installation is provided a device free of charge, so it is assumed that there is one deployed for every tariff 31 and tariff 22 meter (approximately 210,000 devices).

A further 30,000 devices have been delivered to businesses.

Since it was distributed, CablePI has detected more than 3,400 faults, including some that could have resulted in an electric shock.

Of these, 190 were dangerous neutral faults, more than 1,080 were active conductor faults, and more than 789 voltage issues were found on TasNetworks' low voltage network.

6 Associated Risk

TasNetworks is committed to maintaining a risk management system and processes aimed at maximising shareholder value and preventing breaches of statutory and regulatory obligations. It is recognised that there are risks inherent to the activities undertaken by TasNetworks, and therefore it is critical that risk management is an integral part of the day-to-day activities of the business.

The risk assessment is based on:

- Condition
- Criticality
- Probability of failure (not meeting business requirement)
- Consequence of failure
    - Performance
    - Safety
    - Environment
    - Customer

TasNetworks business risks are analysed utilising the 5x5 corporate risk matrixes, as outlined in the TasNetworks Risk Management Framework. Relevant strategic business risk factors that apply to each asset types that are associated with the asset replacement program are detailed in the following sections.

6.1 Overhead Service Conductors and Service Fuses

Failure to replace or install these assets will result in the inability for TasNetworks to restore customer supply and leave the network in a potentially unsafe condition (including potentially hazardous voltages and fire starts) following a fault or asset failure. It will also result in GSL payments for failure to restore supply in required timeframes and expose TasNetworks to negative publicity. Failure to connect customers to the network would contravene the requirements of the NER. It would also lead to power quality issues relating to overloaded connection assets and also has the potential to result in negative publicity from customer complaints and poor customer service.

Relevant strategic business risk factors that apply are follows:

Risk Category	Risk	Likelihood	Consequence	Risk Rating
Financial	Losses associated with damage to customer equipment or fire.	Unlikely	Minor	Low
Customer	Supply interruption to single customer.	Almost certain	Negligible	Medium
Regulatory Compliance	Failure to connect customers to network.	Almost certain	Moderate	High
Network Performance	Power quality issues due to overloaded service assets. Failure to connect customers to GSDs.	Almost certain	Minor	Medium
Reputation	Negative publicity resulting from poor customer service and failure to connect customers to network.	Almost certain	Moderate	High
Environment and Community	Asset failure results in bushfire with some loss to property	Possible	Major	High
	Asset failure results in catastrophic bushfire with widespread loss of property and potential fatality	Unlikely	Severe	High
Safety and People	Risk of shock or electrocution resulting from failed neutral	Likely	Severe	Very High

6.2 Metering Current and Voltage Transformers

Failure to replace or installation of this asset will result in inaccurate network and customer billing, failure to provide a functional metering installation following a fault in contravention of the requirements of the NER and also has the potential to result in negative publicity from customer complaints and poor customer service.

Relevant strategic business risk factors that apply are follows:

Risk Category	Risk	Likelihood	Consequence	Risk Rating
Financial	Failed or inaccurate CTs result in inaccurate network and customer billing.	Possible	Minor	Low
Customer	Supply interruption resulting from failure of CTs.	Possible	Negligible	Low
Regulatory Compliance	Regulatory breach for failure to replace non-compliant CTs.	Almost certain	Moderate	High
Network Performance	Supply interruption resulting from failure of CTs.	Possible	Minor	Low
Reputation	Negative publicity resulting from poor customer service and failure to	Almost certain	Moderate	High

	connect customers to network.			
Environment and Community	Risk of oil spill from failed overhead HV metering unit.	Possible	Minor	Low
Safety and People	Risk of injury from catastrophic failure of asset.	Unlikely	Major	Medium

6.3 Cable PI

Failure to replace or installation of this asset will result in increased public exposure to the risk of electric shock or electrocution and also result in increased power quality issues and supply interruptions from broken neutrals.

Relevant strategic business risk factors that apply are follows:

Risk Category	Risk	Likelihood	Consequence	Risk Rating
Financial	Litigation payments resulting from death or injury.	Unlikely	Moderate	Medium
Customer	Supply interruption to single customer.	Almost certain	Negligible	Medium
Regulatory Compliance				
Network Performance	Broken LV neutral resulting in voltage fluctuations and supply interruptions.	Possible	Minor	low
Reputation				
Environment and Community				
Safety and People	Potential shock resulting in injury or death due to electrocution.	Likely	Severe	Very High

7 Management Plan

7.1 Historical

Due to limited information of LV service assets, an audit of 10% of the service population was conducted in 2006 to provide a snapshot of asset condition (LV Service Audit Findings and Conclusions, reference 3). This audit indicated that 13% of installed service wires were in poor condition, resulting in a replacement program being initiated in 2007/08. However, at the time another targeted service replacement program, replacement of Sicame Fuses, was deemed to have higher priority due to their high failure rate and the mode of failure. The replacement of service conductors and fuses is now managed as a risk managed approach via a defective asset rule base and on site condition assessment made before starting work on a given asset.

The replacement of Sicame fuses as a specific program has ceased with these assets now replaced when they are identified as per other defective connective assets. This is in accordance with the defective service asset rule base. There are currently 11 reported Sicame fuses scheduled for replacement.

Commencement of retail competition in Tasmania in 2005 resulted in the installation of a significant volume of remote read interval meters for contestable customers. Resource constraints in turn resulted in a reduction in LV CT testing and the program is now behind schedule. TasNetworks has increased the volume of testing and is due to regain compliance by the end of 2016/17.

7.2 Strategy

7.2.1 Routine Maintenance

There is a fundamental requirement for TasNetworks to periodically inspect its connection assets to ensure their physical state and condition does not represent a hazard to the public and in the case of metering CTs and VTs to ensure compliance with chapter 7 of the NER. Other than visiting the assets, there is no other economic solution to satisfy this requirement.

7.2.2 Routine Maintenance versus Planned Asset Replacement

It is more economical to replace older metering transformers (that do not comply with current Australian Standards) rather than complete compliance testing.

Sample audits of service conductors and fuses are completed to assess the general condition of types of assets. These condition assessments are used to produce a defective asset rule base that determines when assets require replacement. Service conductors and fuses are also inspected as part of the overhead network asset inspection program.

7.2.3 Refurbishment

A condition assessment is made on metering transformers removed from service to determine which transformers are suitable for refurbishment and returned to service. Transformers deemed unsuitable are written off and disposed.

Service conductors and fuses are not suitable for refurbishment.

7.2.4 Planned Asset Replacement versus Reactive Asset Replacement

Overhead service conductors and service fuses are run to failure or replaced when the asset is worked rather than pro-actively replaced as part of a planned replacement program.

7.2.5 Non Network Solutions

There are currently no non-network solutions available for connection assets.

7.2.6 Network Augmentation Impacts

TasNetworks' requirements for developing the distribution network are principally driven by five elements:

1. Demand forecasts;
2. New customer connection requests;
3. New generation requests;
4. Network performance requirements; and
5. NER compliance.

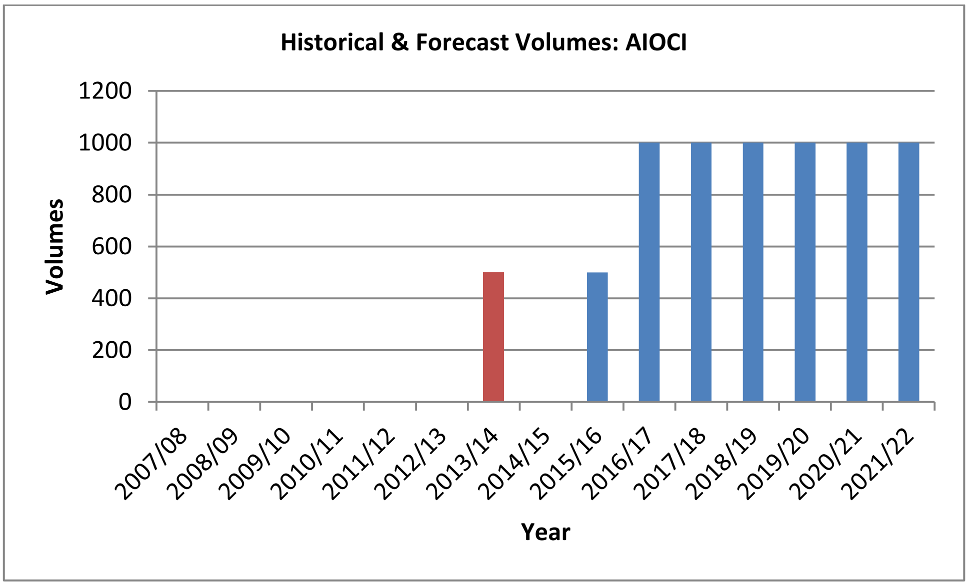
The major influence on the management strategies covered by this AMP is due to customer initiated new connections to the network, and replacement of assets due to performance or compliance issues.

7.3 Routine Maintenance

7.3.1 OH Conductor condition inspection – AIOCI

This inspection program aims to identify defective types of overhead service conductors and service fuses. Assets identified under this program are included in the Overhead Service Replacement Rule Base (refer Appendix C). The forecast volumes are designed to provide a statistically accurate result based on a random sample of assets. Figure 3 below shows historical and forecast volumes of tasks for this work category.

Figure 3: Historical and Forecast Volumes – AIOCI



7.4 Non Routine Maintenance

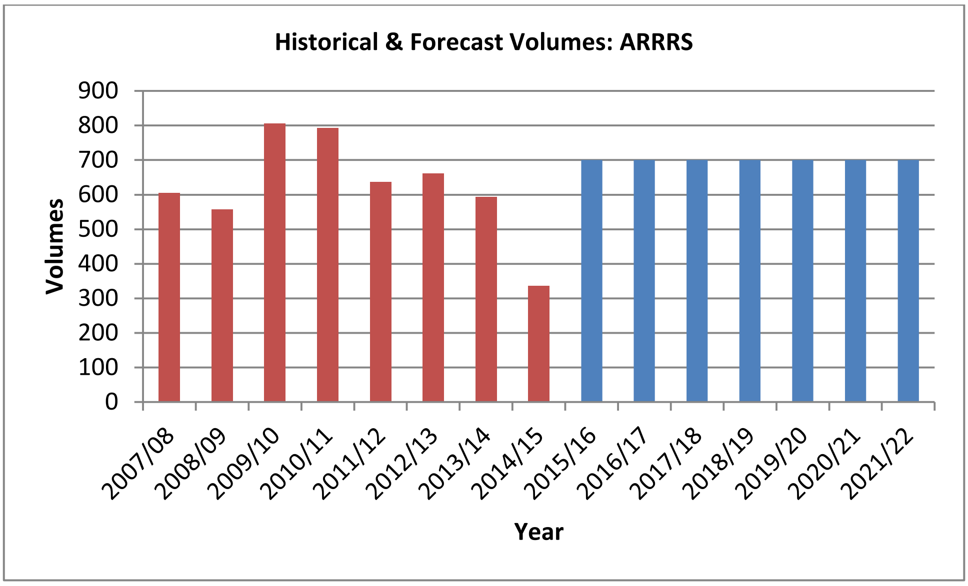
7.4.1 Meter Ancillary Equipment Repair – ARANC

This program is to replace or repair metering ancillary assets under fault, which have failed in service. Forecast volumes for this program are based on historical volumes.

7.4.2 Remove Redundant Services – ARRRS

This allows connection assets to be removed, which are no longer required when a supply to an installation is abolished. Forecast volumes are shown in Figure 4.

Figure 4: Historical and Forecast Volumes – ARRRS



7.4.3 Cable PI services costs - CABPI

To ensure broad coverage with timely and accurate fault response to CablePI alarms TasNetworks Energy use the services of electrical contractors to respond to 'red' alarm calls and Australia Post for the delivery of new/replacement devices.

Australia Post delivers new devices with 48 hours of a customer request being received.

TasNetworks Energy engages the services of AMI electrical contractors for the first response of CablePI high impedance alarms. Historically TasNetworks Energy Compliance Inspectors handled this function. A move to general electrical contractors as first responders has reduced OPEX.

7.4.4 Cable PI marketing costs - CABPI

The success of the CablePI program relies on customers keeping the devices plugged in and turned on. To maximise plug-in rates, TasNetworks conducts marketing campaigns promoting the benefits of plugging in the device. The plug-in rate is tested by market surveys.

To ensure the CablePI is effectively managing the risk of broken neutrals, a plug-in rate of at least 80% is required. After the initial roll-out of the device in 2009 the measured plug in rate was 87%, this had fallen to 66% by June 2011.

To address this decline in plug-in rates, a marketing campaign was been developed for general use across the year. The campaign is designed to be generic therefore able to be used for multiple years with the following aims:

- Provide general awareness of the device;
- Encourage customers to plug the device in;
- Encourage customers to check it is turned on and working, i.e. the green light is on. This is to also help flush the thermal fuse failures out of the network; and
- Encourage customers to contact TasNetworks if you require a new/replacement device.

Plug in rates are monitored twice a year through market surveys to ensure the effectiveness of any marketing.

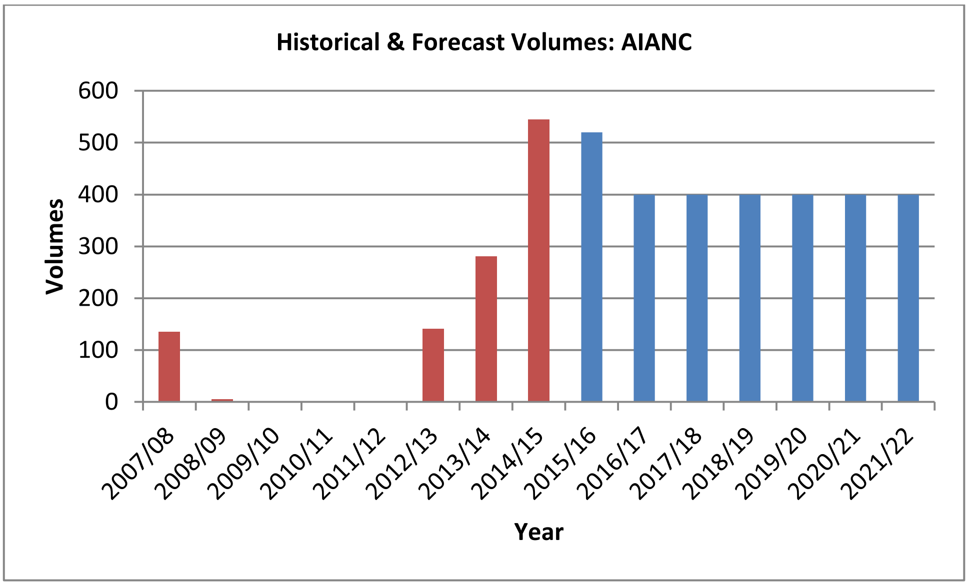
The market surveys currently cost $8.8k per survey with the marketing campaign costing about $160K per year.

7.5 Regulatory Obligations and Requirements

7.5.1 Meter Ancillary Equipment Inspection – AIANC

Compliance with the requirements of Schedule 7.3 of the NER requires that all metering CTs and VTs must be tested every ten years. As a result, TasNetworks has an annual testing program in place. LV CTs have been grouped into families based on type of CT so that the results can be analysed to assess if sample testing is suitable for TasNetworks' metering CTs. Appendix B contains details of the methodology for the transformer compliance testing program and figure 5 below shows historical and projected volumes for this work category.

Figure 5: Historical and Forecast Volumes – AIANC



7.5.2 Install Service Connections (New Installations) – SCNEW

This customer initiated program is for the installation and upgrade of service conductors and fuses required for connection of new and upgraded customer installations.

7.5.3 CT AND VT (New) – SCCVT

This customer initiated program is for the installation of new metering transformers required for new and upgraded customer installations that have maximum demand in excess of 100 amps per phase.

7.6 Replacement

7.6.1 Replace services OH & service fuses – SCSRE

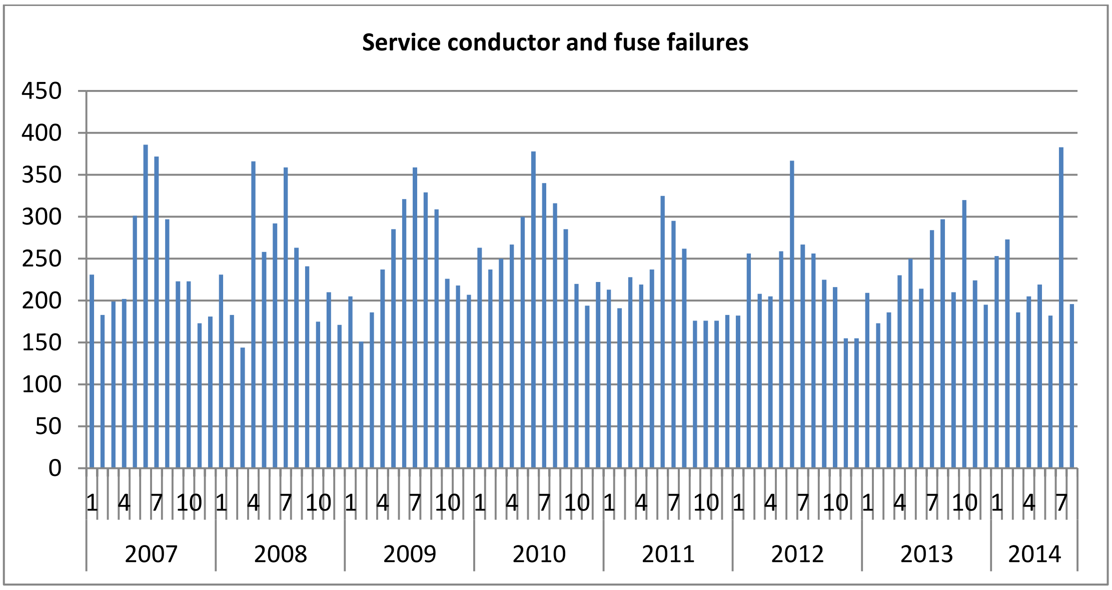
Existing substandard overhead electrical services are required to be replaced to ensure the safety of the property owner, the general public and TasNetworks personnel.

An audit in 2006 identified that approximately 13% of service connection assets, including service wire, fuses and clamps, were in poor condition and required replacement. This audit identified specific asset types that were in poor condition and has resulted in the creation of the Overhead service replacement rule base (Appendix C). The rule base is used to assess the condition and identify assets for replacement whenever crews work on a service asset during other tasks such as pole replacement or staking or LV conductor upgrades.

Volumes are based on expected number of pole replacements/staking and number of spans of LV conductor upgraded. Analysis of assets data indicates that there are approximately 1.6 overhead services per LV pole and this average is used in the estimate of the number of services that will require replacement. It is also assumed that approximately 13% of services will be in poor condition as per the 2006 audit.

This program capitalises the asset replacement required during replacement of service assets that operate or fail in service. Forecasting of this replacement program is based on historical service related outage information, which is shown in Figure 6 and shows a stable trend of service related outages averaging at approximately 2900 faults per year.

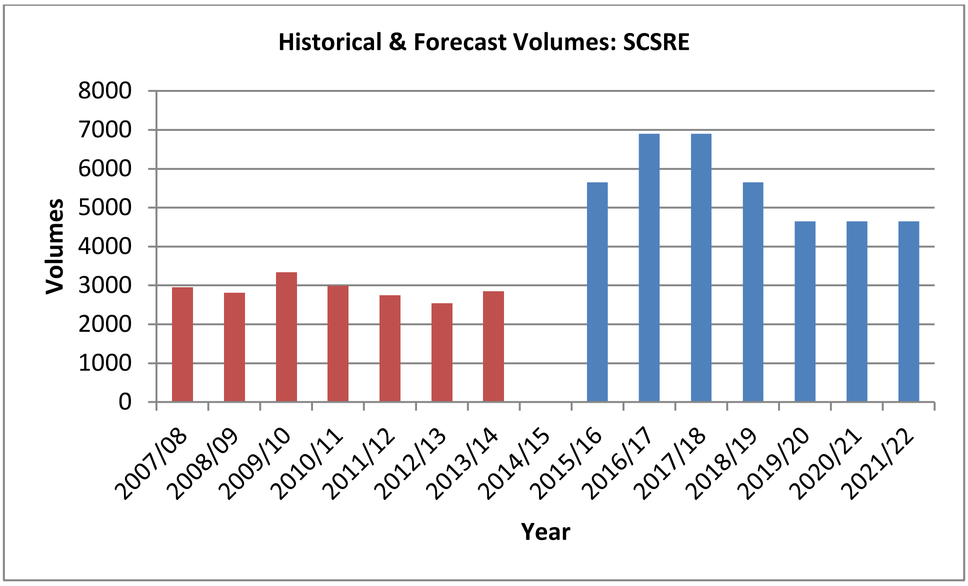
Figure 6: Number of Service Conductor and Fuse failures per Month



This category of work also includes replacement tasks associated with upgrades to public lighting assets and assets replaced according to the Overhead Service Replacement Rule Base. Figure 7 below shows historical[2] and forecast volumes of tasks for this work category.

[2] Historical volumes for SCSRE for 2014/15 were not available when this plan was prepared.

Figure 7: Historical and Forecast Volumes - SCSRE



7.6.2 Replace Meter Panels – SCMPA

This program is required to replace meter panels that contain asbestos or are not compatible with new metering configurations. Panels are replaced when meters are replaced.

7.6.3 CT AND VT Replacement – SCNVT

This program is required for TasNetworks compliance with NER obligations, dictating that any metering equipment that fails testing or is in poor condition must be replaced.

These rules were amended in 2005 requiring mandatory testing of HV CTs and VTs used for metering once every 10 years. Therefore little historical data or trends exist on typical metering transformer failure rates, making it difficult to forecast a replacement program. Based on the standard asset life of a transformer (40 years) and the current metering transformer population, it is expected that on average approximately three HV metering units will fail testing and require replacement per year.

7.6.4 CablePI Purchase new and replacement units – SCMWA

This program is for the purchase of replacement and new Cable PI devices.

These devices cover customer churn, new customer installations and failure of devices.

7.7 Investment Evaluation

Investment evaluation is undertaken using TasNetworks' investment evaluation tool, see Gated Investment Framework (Reference 7). Investment Evaluation Summaries (IES) are used to provide information in support of a project for inclusion in the Capital Works Program. This information provides a record of the project as it progresses from initiation to finalisation and is required to support a request for funding approval. This IES aims to improve the efficiency and delivery of the capital investment justification and approval process and is a requirement for regulatory and governance purposes.

7.8 Spares Management

Spare metering transformers are managed as warehouse stock items procured under period based contracts. Average monthly usage volumes are used to forecast orders from suppliers to maintain minimum / maximum stock holdings. Transformers removed from service and deemed suitable for reuse are returned to stock following refurbishment.

7.9 Disposal Plan

All decommissioned assets are either recovered for re-use or disposed to eliminate any hazard on site which may pose a risk to the community. Redundant Connection Assets are inspected and assessed to determine whether it can be re-used and recovered back to store.

All copper and steel conductors and damaged aluminium conductors are recovered for scrap/recycle.

7.10 Summary of Programs

Table 2 provides a summary of all of the programs described in this management plan.

Table 2: Summary of Connection Assets Programs

Work Program	Work Category	Project/Program
Routine Maintenance	Meter Ancillary Equipment Inspection (AIANC)	Meter Ancillary CT and VT Equipment Inspection and Testing
	OH Conductor Condition Inspection (AIOCI)	Inspection OH – Identification of Substandard Services
Non-routine Maintenance	Remove Redundant Services (ARRRS)	Remove Redundant Services (Customer Connections)
	Meter Ancillary Equipment Repair (ARANC)	Connection Asset Repair
	CablePI services costs (CABPI)	CablePI fault response
	CablePI marketing costs (CABPI)	CablePI marketing
Reliability and Quality Maintained	CT and VT Replacement (SCNVT)	CT and VT Replacement
	Replace services OH & service fuses (SCSRE)	Replace OH LV Services – Basic
		Replace OH LV Services – Complex
		Replace Service Fuses – Fault

Work Program	Work Category	Project/Program
		Replace Service Wires – Fault
		Replace service fuses for Public Lighting
	Cable PI (SCMWA)	CablePI
Customer Initiated	Meter Panels (SCMPA)	Install Meter Panels - New Connections
	Install Service Connections (New Installations) (SCNEW)	Install Service Connections (New Installations)
	CT AND VT - New (SCCVT)	Install CTs and VTs – New Installations

8 Financial Summary

8.1 Proposed OPEX Expenditure Plan

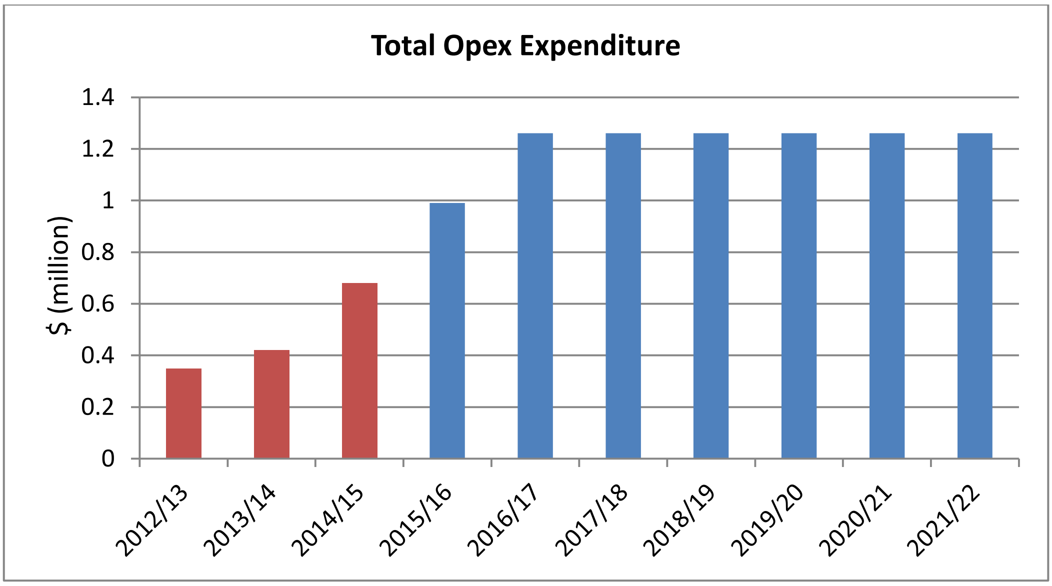
The proposed operational expenditure for the replacement program for various asset types are detailed as below.

The Operational Program is detailed in Table 3 and Figure 8 below.

Table 3: OPEX for period between 2012/13 and 2020/21 financial years (in $M)

	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Budget	$ 0.96	$ 0.88	$ 0.72	$ 0.99	$ 1.26	$ 1.26	$ 1.26	$ 1.26	$ 1.26	$ 1.26
Actual	$ 0.35	$ 0.42	$ 0.68							

Figure 8: OPEX expenditure profile



8.2 Proposed CAPEX Expenditure Plan

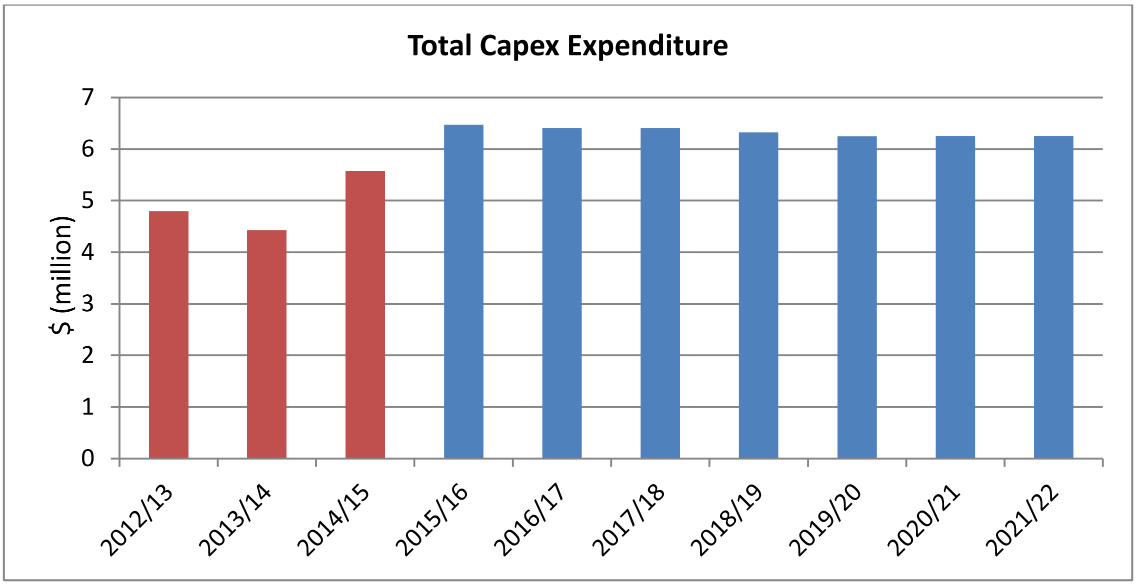
The capital programs and expenditure identified in this management plan are necessary to manage operational and safety risks and maintain network reliably at an acceptable level. All capital expenditure is prioritised expenditure based on current condition data, field failure rates and prudent risk management.

The Capital Program is detailed in Table 4 and Figure 9 below.

Table 4: CAPEX 2012/13 and 2020/21 financial years (in $M)

	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Budget	$ 5.56	$ 6.28	$ 6.49	$ 6.47	$ 6.41	$ 6.41	$ 6.32	$ 6.25	$ 6.25	$ 6.25
Actual	$ 4.79	$ 4.42	$ 5.57							

Figure 9: CAPEX expenditure profile



9 Responsibilities

Maintenance and implementation of this management plan is the responsibility of the Metering Asset Strategy Team Leader.

Approval of this management plan is the responsibility of the Asset Strategy and Performance Leader.

A review of this asset management plan will be conducted every 2.5 years or upon changes to applicable standards, rules, codes or legislation.

10 Related Standards and Documentation

The following documents have been used to either in the development of this management plan, or provide supporting information to it:

1. TasNetworks Asset Management Policy
2. National Electricity Rules (NER) – Chapter 7
3. LV Service Audit Findings and Conclusions (NW10241180)
4. IMS-OPR-00-48 Asbestos Management Plan
5. Defective Servicing Asset Replacement Rule Base (NW30208873)
6. Gated Investment Process – Investment Evaluation Summary

11 Appendix A – Summary of Programs and Risk

Expenditure shown in $M

Description	Work Category	Risk Level	Driver	Expenditure Type	Residual Risk	**15/16**	**16/17**	**17/18**	**18/19**	**19/20**	**20/21**	**21/22**
Meter Ancillary Equipment Inspection	AIANC	High	Compliance	OPEX	Medium	0.62	0.46	0.46	0.46	0.46	0.46	0.46
OH Conductor Condition Inspection	AIOCI	Very High	Safety/ Reliability	OPEX	Medium	0.15	0.40	0.40	0.40	0.40	0.40	0.40
Remove Redundant Services	ARRRS	Medium	Safety	OPEX	Low	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Meter Ancillary Equipment Repair	ARANC	High	Safety/ Reliability	OPEX	Low	0.10	0.09	0.09	0.09	0.09	0.09	0.09
Cable PI marketing and services costs	CABPI	Very High	Safety	OPEX	Medium	0.28	0.28	0.28	0.28	0.28	0.28	0.28
CT and VT Replacement	SCNVT	High	Safety/ Reliability	CAPEX	Low	0.08	0.21	0.21	0.21	0.21	0.21	0.21
Replace services OH & service fuses	SCSRE	Very High	Safety/ Reliability	CAPEX	Medium	3.09	2.98	2.98	2.89	2.82	2.82	2.82
Cable PI	SCMWA	Very High	Safety	CAPEX	Medium	0.58	0.30	0.30	0.30	0.30	0.30	0.30
Meter Panels	SCMPA	Medium	Safety/ Compliance	CAPEX	Low	0.27	0.29	0.29	0.29	0.29	0.29	0.29
Install Service Connections (New Installations)	SCNEW	High	Compliance	CAPEX	Low	2.29	2.40	2.40	2.40	2.40	2.40	2.40
CT AND VT - New	SCCVT	High	Compliance	CAPEX	Low	0.19	0.24	0.24	0.24	0.24	0.24	0.24

12 Appendix B – Metering Transformer Compliance Testing Method

12.1 Introduction

This appendix outlines the approach to be taken in the error testing program of metering transformers. It covers LV CTs, HV CTs and VTs for which TasNetworks is the Responsible Person (RP), or for which TasNetworks has agreed to complete testing on behalf of another RP. It should be read in conjunction with TasNetworks' Metering (Regulated) Type 6 Asset Management Plan and outlines the approach TasNetworks will take in error testing metering transformers and in analysing the results.

12.2 Strategy

TasNetworks intends to test its metering transformers according to the regime prescribed in table S7.3.2 of the NER with the LV CT population divided into eight families (A-W) to enable analysis of the test results to determine if sample testing is an appropriate method of testing in the future. TasNetworks will select 10% of transformers for testing annually.

12.3 Sample Selection

Transformers selected for testing will be selected from sites connected more than 10 years ago or testing has not been completed for over 10 years. Selection will start with the oldest transformers (most likely to fail) and largest ratios (larger energy consumption).

12.4 Test Equipment and Test Points

All current transformer testing will be done in-situ, using the Red Phase 509C Current Transformer Error Tester, which demagnetises each CT before beginning its test procedure. The test points shown in the Table below shall be used. Multi-tap CTs shall be tested on all taps and extended range CTs shall also be tested at the Accuracy Limit current.

The burden used for CT testing shall be 25% of the rated burden of the device in question, and this burden will be resistive.

All CTs present at each selected site shall be error tested. All CT error results obtained will be provided to AEMO.

Any faulty CTs found will be replaced and the faulty items will be retained so that the failure mechanism can be determined.

Table 5 shows the test points for each CT test.

Table 1: CT Test Points

% Rated Current	Magnitude Error Limits	Phase Error limits (Minutes)	Phase Error limits (Crad)
5	±1.5	±90	±2.7
20	±0.75	±45	±1.35
100	±0.5	±30	±0.9
200 or 250 (As appropriate for extended range CTs only)	±0.5	±30	±0.9

12.5 Installation Inspections

As part of the test procedure each selected metering installation shall also undergo an inspection as prescribed in chapter 7 of the NER. Asset nameplate and rating details will be recorded during each site audit.

12.6 HV Metering Installations

TasNetworks' specifies that 100% compliance testing of the CTs, VTs and Meters used in HV installations shall be performed.

13 Appendix C – Overhead Service Replacement Rule Base

Replace all substandard electrical service configurations originating from the pole where the following tasks are undertaken:

- Pole replacements
- LV cross-arm replacements
- LV Conductor replacements/upgrades (Open wire to ABC)

13.1 New Overhead Services

All new overhead services are to be constructed from 25 sq mm Aluminium ABC conductor as minimum.

16mm2 copper cables, with helical terminations and neoprene sleeving in good condition may remain in service provided that the connections to the LV reticulation are via IPC type connections so that no water can enter the cable strands. Ensure that remaining services are continuous conductors and do not have additional joins that have been used to extend length.

13.2 Overhead Services Identified for Replacement

Where a Defective Electrical Installation Notice (DEI) has been issued to rectify an issue with a customer’s installation, the replacement of the substandard overhead service is to be carried out via the normal tee-up processes with the customer’s Electrical Contractor.

13.3 Pre- Installation Audit

Pre-installation audit to be conducted on each pole where substandard service replacement will need to be assessed.

13.4 Roles of Pre-installation Auditor

- Audit of all services originating from a pole identified to be replaced, crossarm replacement or conductor replacement.
- Communication with each property owner to gain permission for access to service, POA, mains box, main switchboard and main earth
- Identification of overhead services required to be replaced as substandard services
- Identification of damaged or unsafe service arrangements and initiate immediate task for rectification. Any faults requiring immediate attention are to be reported directly to the TasNetworks Fault Centre 132004.
- Inspection of POA assessing height of attachment and condition and type of assets installed.
- Inspection of mains box (customer owned), removing mains box cover to determine condition of customer’s mains.
- Visual condition report of main switchboard including main earth conductor.
- Make final determination on ability to replace substandard service based on the condition of customer’s installation.
- Organise for TasNetworks Energy’s Inspection Group to attend site for any items suspected to be defective within the installation that may restrict TasNetworks from upgrading the substandard service.
- Provide data regarding status of each service originating from that pole to TasNetworks Network.

13.5 Point of Attachment (POA)

Existing substandard POAs are to be rectified by the property owner following the issuing of DEI by TasNetworks. This may require the installation of the following by the customer's electrical contractor:

- A new raiser bracket
- Relocation of the POA

13.6 Customer's Mains Box

The mains box is owned by the customer and is the demarcation point between the customer and TasNetworks. At many locations where a substandard service is to be replaced, the mains box may no longer be serviceable due to the age of the installation. Mains box with untinned terminals are deemed to be unserviceable due to potential corrosion issues with 25 sq mm Al ABC service cable.

13.7 Consumers' Mains

Consumers' mains are deemed to be unserviceable if:

- Insulation at mains box is degraded and cannot be re-established by sleeving or stripping back if additional length can be gained
- POA needs relocation and mains are not long enough
- Raiser bracket is required

Where a Defective Electrical Installation Notice (DEI) has been issued to rectify an issue with a customer's installation, the replacement of the substandard overhead service is to be carried out via the normal tee-up processes with the customer's Electrical Contractor.

13.8 Customer's Main Switchboard and Main Earth

Any defective components within the Customers Main Switchboard and Main Earth identified by the Pre-Installation Auditor may result in the issuing of a Defective Electrical Installation (DEI) notice to the customer for rectification. The ultimate responsibility to upgrade any defective aspects of the main switchboard and main earth will be with the property owner and their electrical contractor.

13.9 Additional Criteria for Overhead Service Replacement

13.9.1Connections at pole end

All connections at the pole must be of IPC type. This is to ensure that no water will enter the cable during its life. Therefore any connector that is not insulating piercing is to be replaced.

The service cable at the connector is to be tied to the main conductor with cable ties.

13.9.2Strain Clamps

All Ramp Clamp and Wedges are to be replaced.

All Helical ties without neoprene sleeves are to be replaced

13.9.3 Terminating hooks

Any terminating hook that is located in a position that will cause the cable to rub against the spouting or any other part of the building shall be relocated.

13.9.4 Connections at the House with Mains Connection Box

All connections into and out of the new house service fuse will be either 16mm2 copper or 25mm2 aluminium nothing smaller will be acceptable.

The neutral cable shall be disconnected from the mains connection box and inspected for deterioration. Any Mains Connection Box that is not fit for service is to be replaced.

Where possible Mains Connection Boxes (tinned tunnel connector) should be capable of accepting aluminium cable if the aluminium cable is installed.

The neutral cable is to be tied to the active on both sides of the service fuse. Drip loops are to be installed.

A short length of old 10mm Cu conductor should not be left connected to the mains box with the new 25mm Al service connected to the 10mm Cu. This practice was used to remove the need to replace an imperial mains box for use with aluminium conductor. This practice is no longer allowed.

13.9.5 Connections at the House without Mains Connection Box

All exposed customer mains has to have an UV resistant outer sleeve. Normal internal building wire is not UV resistant and requires additional protection in outdoor situations. The connections between the service fuse and the customer mains will need to be waterproof to prevent moisture entering the service fuse, ie an IPC type connection.

13.9.6 Service Fuse Element Size

The fuse element size shall be 100amps unless the Customer Mains is less than 10mm2 Copper equivalent, in which case the fuse element shall be 60 amps for 7/.036 (4.60mm2) & 7/.048 (6.8mm2) & 7/1.35 (10mm2).

13.10 Substandard Service Configurations

The following overhead electrical service arrangements are identified as substandard:

- Figure 8, 7/044 Copper Parallel Webbed PVC service
- Open wire services whether PVC covered or bare to point of attachment (ie last span only).
- Any service with a ramp and wedge type termination on either the pole or at the P of A.
- Any Henley type fuse fitting (the entire service should be replaced unless the conductor is 16mm2 twisted or LVABC).
- 10mm2 twisted service conductor (7/1.35 copper)
- A service conductor with a helical type termination that does not have a Neoprene insert.
- Sicame PF100 service fuse fitting
- Substandard point of attachment location
    - inaccessible location such as over carports or verandas
    - Service cable is less than 3.0 metres above ground
- Substandard service clearance over public or private land

  - Ground clearances as outlined in TasNetworks Service and Installation Rules and Section 1.6 of the OH Construction Manual. In general, 5.8 metres kerb to kerb, 4.6 metres over driveways and 3.0 metres for areas where vehicles cannot traverse.
- Substandard service clearance over buildings or structures

13.11 Safety Imperatives – Immediate Action Required

Any service identified as unsafe or damaged shall be assessed and either repaired or replaced immediately upon identification.

Ensure that Sicame PF100 service fuses that are not replaced when work is carried out on site are reported for prioritised replacement. This can be done by reporting calling TasNetworks Fault Centre on 132004.