Asset Management Plan

Metering (Regulated) - Type 6

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Authorisations

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Review cycle	2.5 Years	

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.
- Compliance All group managers.

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Record of revisions

Section number	Details
	New Document

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1 Purpose

The purpose of this document is to describe for metering 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

This document covers type 6 (accumulation) regulated metering assets only. It excludes type 1-4 interval meters as these are not part of the regulated asset base and are managed under the Metering (Unregulated) Type 1-4 Asset Management Plan, and excludes metering ancillary equipment such as metering transformers and panels, which are managed under the Connection Assets Asset Management Plan. An excerpt from the Connection Assets Asset Management Plan detailing the metering transformer compliance testing program is attached to this document as Appendix E.

The meter testing program (AIMET) includes a line item for compliance testing of type 7 meters (unmetered supplies) as required under the NER and AEMO Metrology Procedures. Type 7 meters (public lighting assets) are managed under the Public Lighting Asset Management Plan.

3 Strategic Alignment and Objectives

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

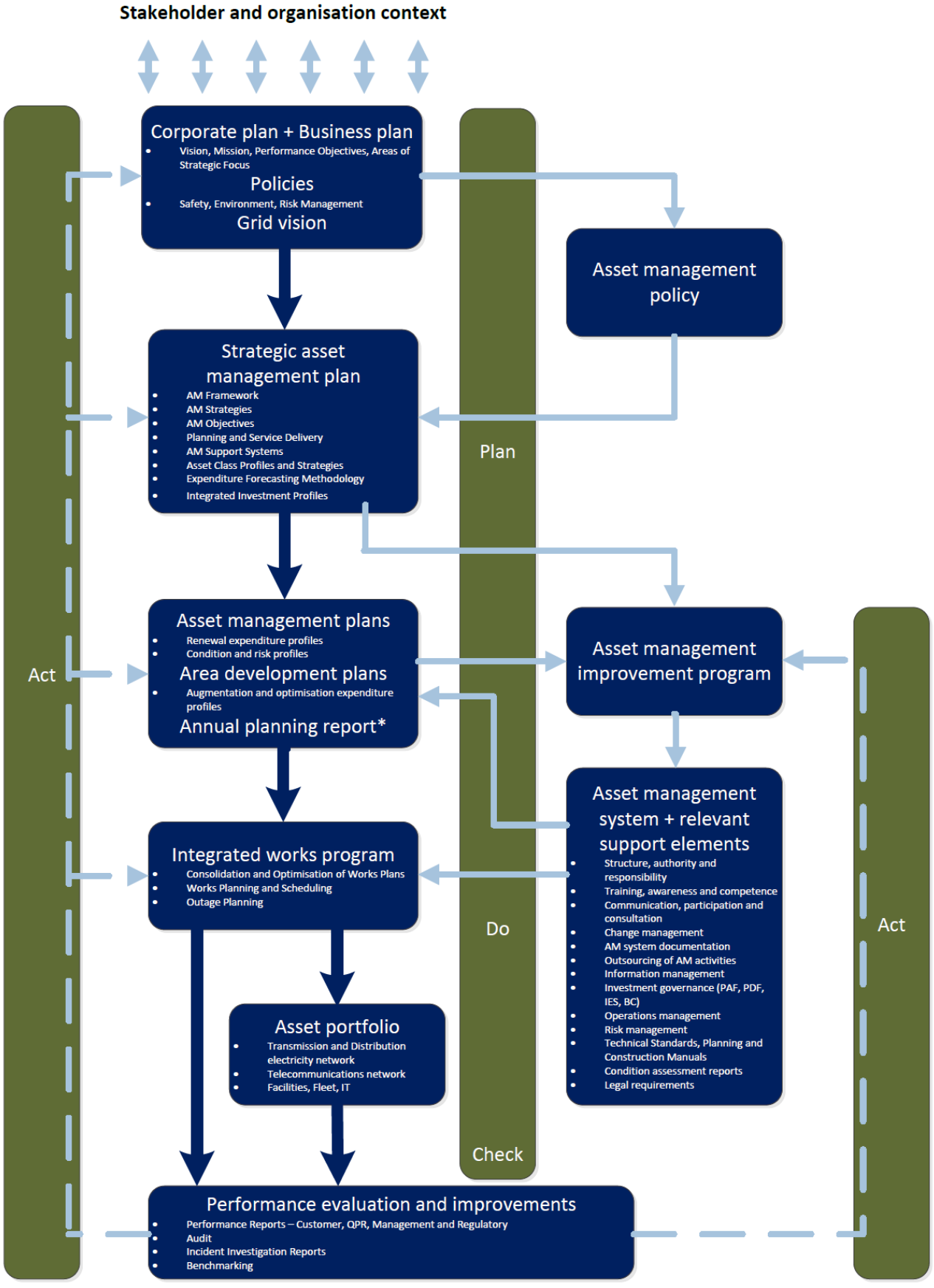
It is part of a suite of documentation that supports the achievement of TasNetworks strategic performance objectives and, in turn, its mission. The asset management plans identifies the issues and strategies relating to network system assets and detail the specific activities that need to be undertaken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

- Manage our assets to meet the strategic goals, measures and initiatives outlined in the Corporate Plan;
- Adopt the lowest whole-of-life cost solutions for investment in asset creation, replacement or refurbishment projects;
- Apply contemporary condition assessment and risk management techniques to identify and effectively manage risks and opportunities; and
- Comply with relevant legislation, licenses, code of practice and industry standards.

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.

TasNetworks maintains records of metering assets through the information received from completed service orders to install, read, alter and remove metering equipment and also from periodic routine testing and inspection programs. The equipment details and attributes are recorded within the Market Data Management System (MDMS), Spatial Data Warehouse and the Assets Zone within TasNetworks document management system.

Recorded information includes:

- Identification number (unique identifier)
- NMI/location/geographical details/site/access details/customer
- Equipment attributes and ratings
- Meter family test results and management program
- Age of asset and components, installed/removed date
- Billing data (consumption/reading dates)

A number of systems are used to support regulated metering services:

- Market Data Management System - Gentrack
- Service Order management - Brave suite
- Task scheduler - TVD
- Meter reading system (basic reading) – MVRS
- Spatial Data Warehouse

TasNetworks will implement a project in 2015/16 to transition inventory management of metering assets into the general inventory management system used for all assets stored and issued by the warehouse. This will include a move to using barcode scanning of meters into and out of the warehouse inventory system and also scanning meters onto to service orders to improve data quality for metering assets.

4.2 Asset Information

The metering data used for this asset management plan supports the TasNetworks billing processes and is considered accurate and complete. TasNetworks completes data validation checks to identify and resolve asset data errors as part of its continual improvement processes.

4.3 Quality Management System

TasNetworks maintains a quality management system for all metering processes, procedures and work instructions with ISO 9001:2008 accreditation. A copy of the current certificate of registration is included as Appendix D to this document.

TasNetworks is currently conducting a full end-to-end review of all metering processes to ensure compliance and alignment with legislative and regulatory requirements. This review is due for completion by 31 December 2015.

5 Description of the Assets

The metering asset family consists of various combinations of equipment to record energy consumed and to control when some tariffs are available such as off peak and multi rates products.

The main categories are:

- Single phase electronic meter
- Single phase electro-mechanical meter
- Multi-phase electronic meter
- Multi-phase electro-mechanical meter
- Low Voltage Current transformer - with electronic meter
- Low Voltage Current transformer - with electro-mechanical meter
- Pay-As-You-Go (PAYG) meter

Single phase electromechanical and electronic meters are used in domestic and small commercial applications. This is the largest category of meters currently used by TasNetworks.

Three phase electromechanical and electronic meters are installed where customers load requirements are slightly larger than the single phase or there is a need to operate three-phase equipment.

LV current transformer electromechanical and electronic meters are installed in commercial applications where the maximum demand is greater than 100 Amps per phase.

The standard meters currently purchased by TasNetworks are:

- Single phase direct connect meter - EDMI Mk 7A
- Multi-phase direct connect meter - EDMI Mk 10D
- LV Current transformer connect meter - EDMI Mk 10E

The number of installed metering assets as at July 2015 is shown in Table 1 and illustrated in Figure 2.

Table 1: Number of installed metering assets (as at July 2015)

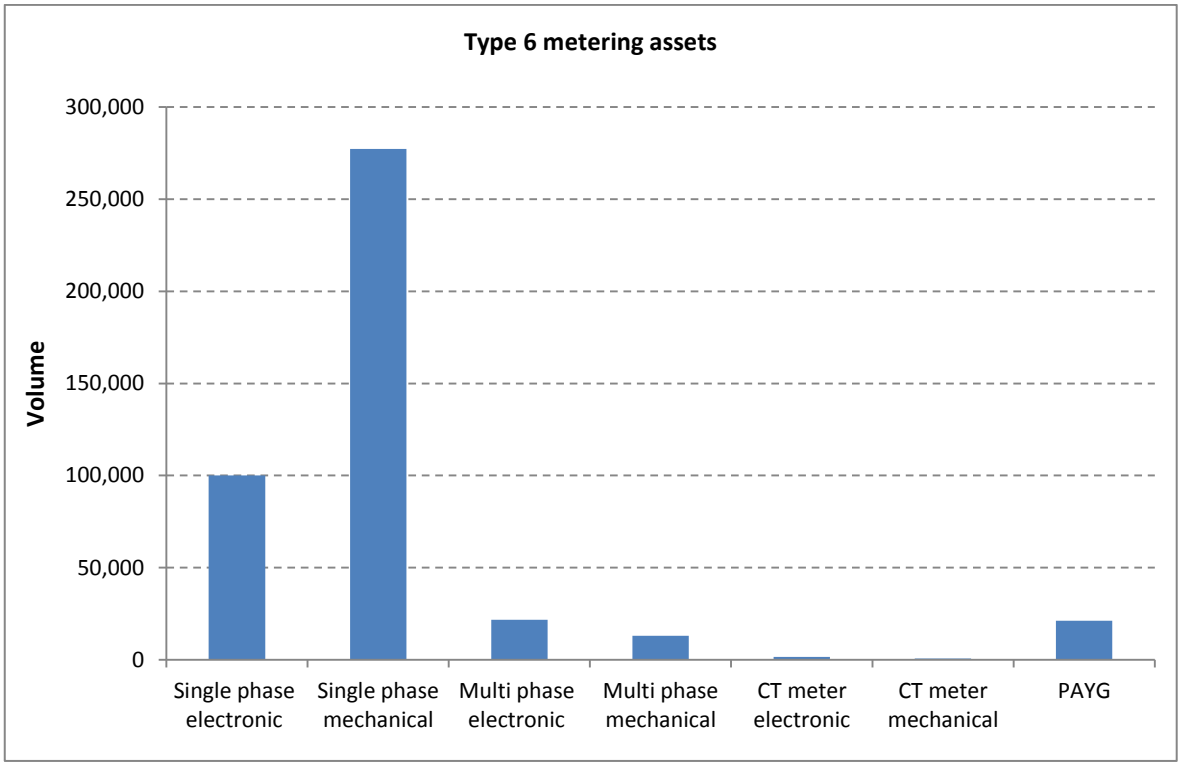
Description	Number Installed
Single phase electronic meter	99,984
Single phase electro-mechanical meter	277,320
Multi-phase electronic meter	21,748
Multi-phase electro-mechanical meter	13,001
Low Voltage Current transformer - with electronic meter	1,627
Low Voltage Current transformer - with electro-mechanical meter	683

Description	Number Installed
Pay-As-You-Go (PAYG) meter	21,275
Total	**435,638**

Meters that are removed from service are refurbished and returned to service if they are deemed suitable. Full details of the meter types that are suitable to returning to service are included in the Metering Technical Specification MM-TS-09-00 (reference 3).

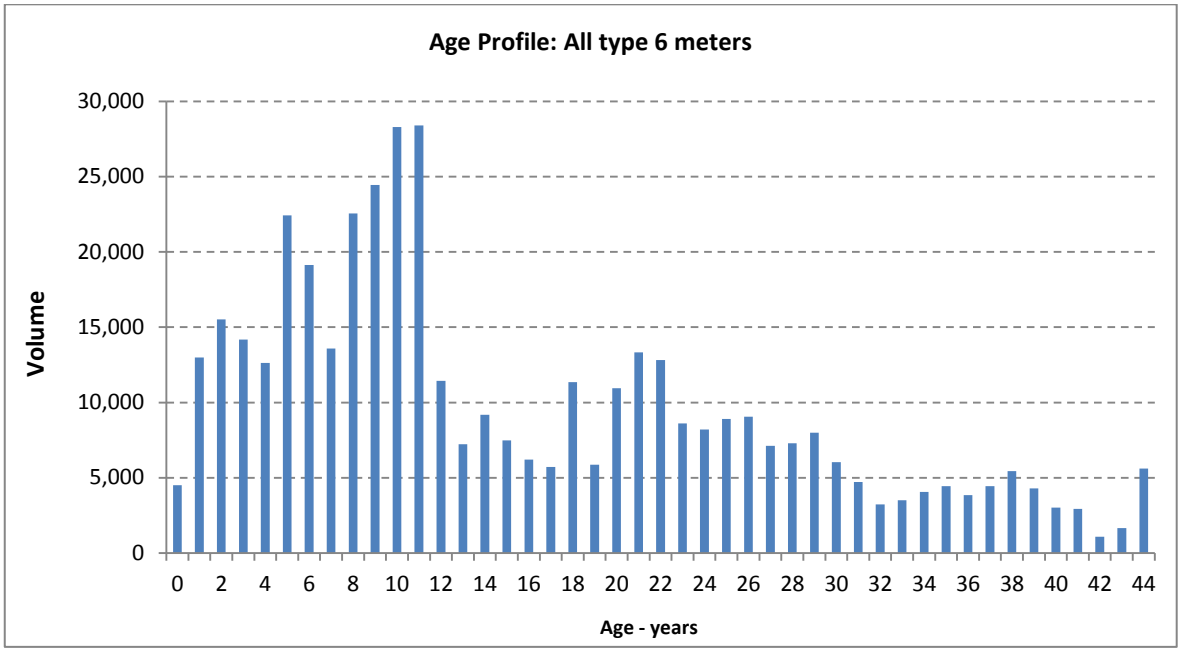
Meter families are tested in accordance with the requirements of Chapter 7 of the National Electricity Rules (NER), with those families that fail being replaced in accordance with this asset management plan. Table 9 contains details of the reasons for why each family is being replaced.

Figure 2: Type 6 metering asset volumes



The age profile of the total population of the metering assets is shown in Figure 3.

Figure 3: Type 6 metering asset age profile

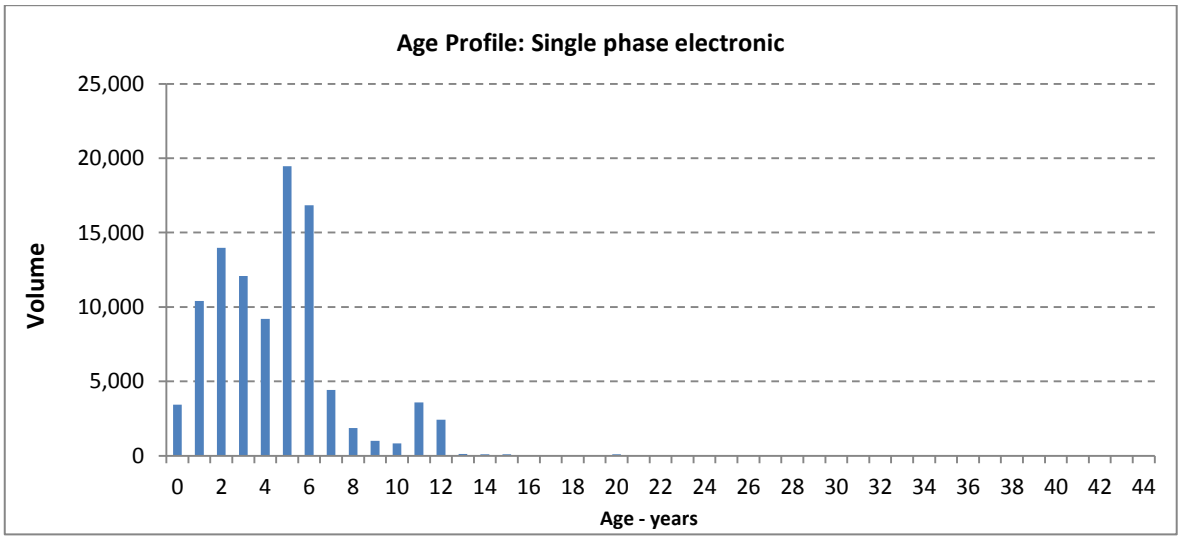


The asset life applied by TasNetworks to type 6 meters is 15 years for electronic meters and 30 years for electro-mechanical units. As of July 2015, only approximately 200 or 0.2% of the electronic meters (excluding PAYG meters) have been in-service beyond the nominal asset life, whilst approximately 52,000 or 18% of the electromechanical meters are more than 30 years old. Also, for electro-mechanical meters, approximately 11,000 or 4% of the population have been in-service for more than the industry typical maximum service life of 40 years.

5.1 Single phase electronic meters

Figure 4 shows the age profile for single phase electronic meters.

Figure 4: Single phase electronic meter age profile

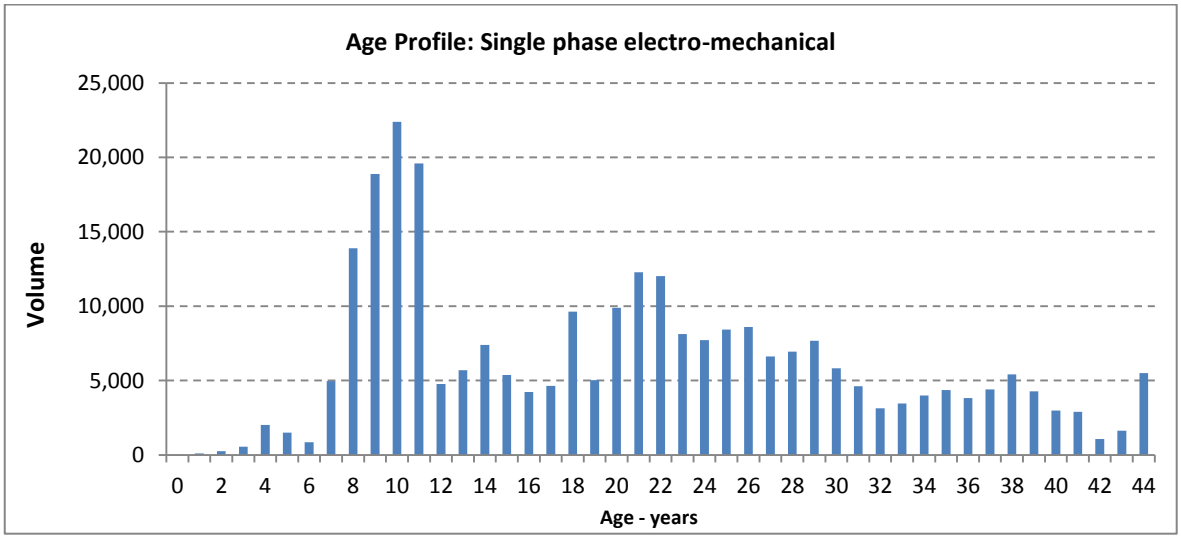


Only 0.2% or approximately 160 units have been in-service beyond the 15-year asset life, with an average age for the population of 4.5 years.

5.2 Single phase electro-mechanical meters

The age profile for the single phase electromechanical meters is shown in Figure 5.

Figure 5: Single phase electro-mechanical meter age profile

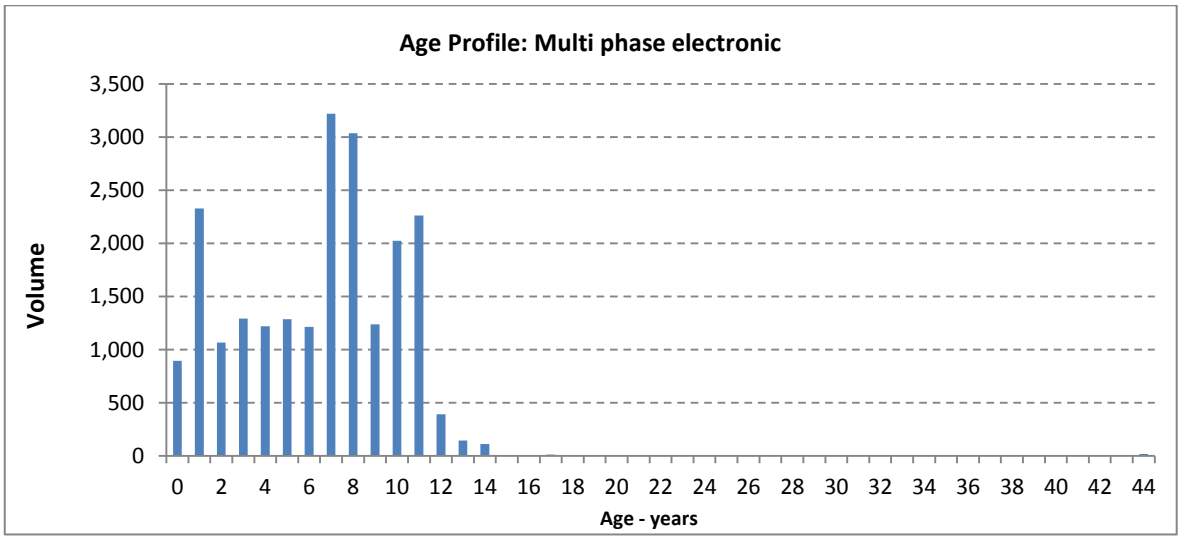


This type of meter is the most common type used by TasNetworks and has a significant 19% of the population or approximately 51,500 units in-service beyond the nominal asset life of 30 years. The average age for this type of meter is 20.6 years. There are approximately 11,000 units, or 4% of the total population that have exceeded the industry typical maximum in-service life of 40 years for this type of meter.

5.3 Multi-phase electronic meters

Figure 6 shows the age profile for the multi-phase electronic meter population.

Figure 6: Multi-phase electronic meter age profile

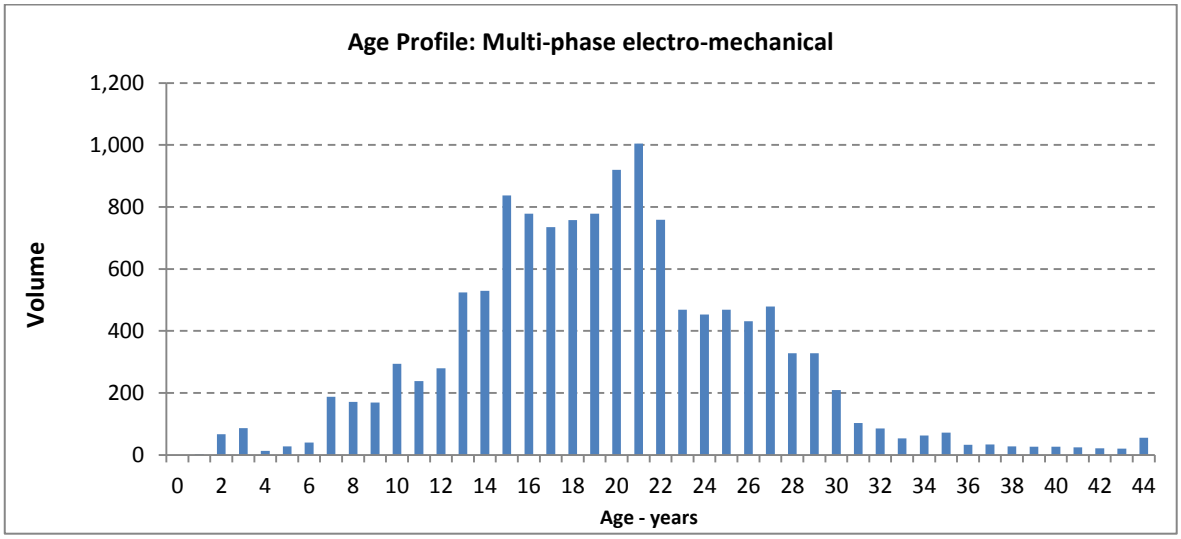


Similar to the single phase electronic units, there is only 0.2% of the population, or 35 units, in-service beyond the asset life of 15 years. The average age is 6.4 years.

5.4 Multi-phase electro-mechanical meters

The age profile for the multi-phase electromechanical meters is shown in Figure 7.

Figure 7: Multi-phase electro-mechanical meter age profile

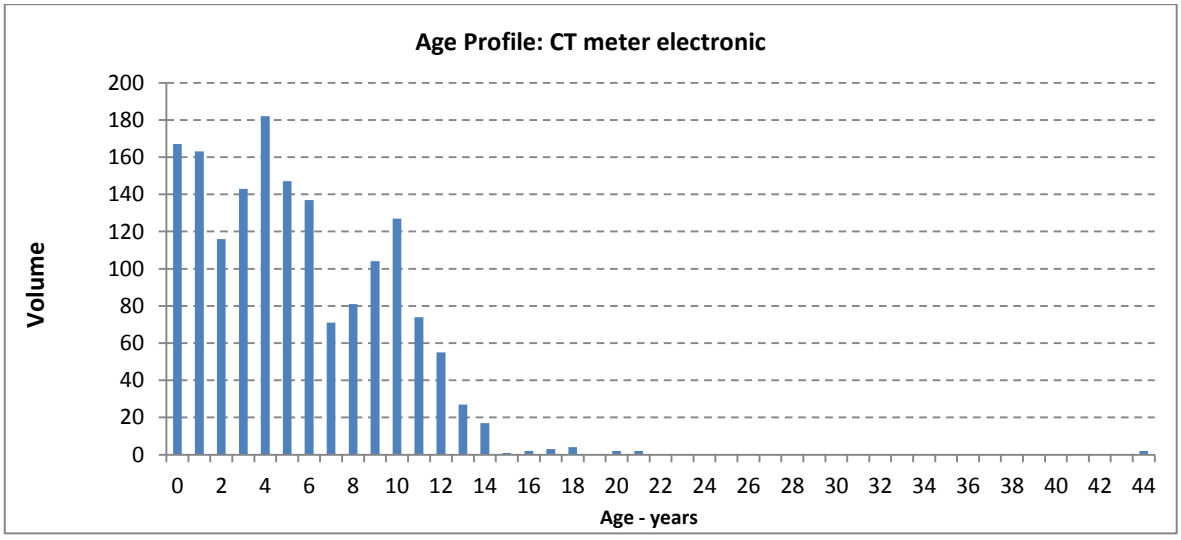


There have been few 3-phase electro-mechanical installations in the past 5 years, with the average of the population being 19.7 years. There are 642 units, or approximately 5% of the population, have been in-service beyond the asset life of 30 years. Only 120 units or approximately 1% have exceeded the maximum in-service life.

5.5 CT electronic meters

Figure 8 shows the age profile for low voltage current transformer connected electronic meters.

Figure 8: CT electronic meter age profile

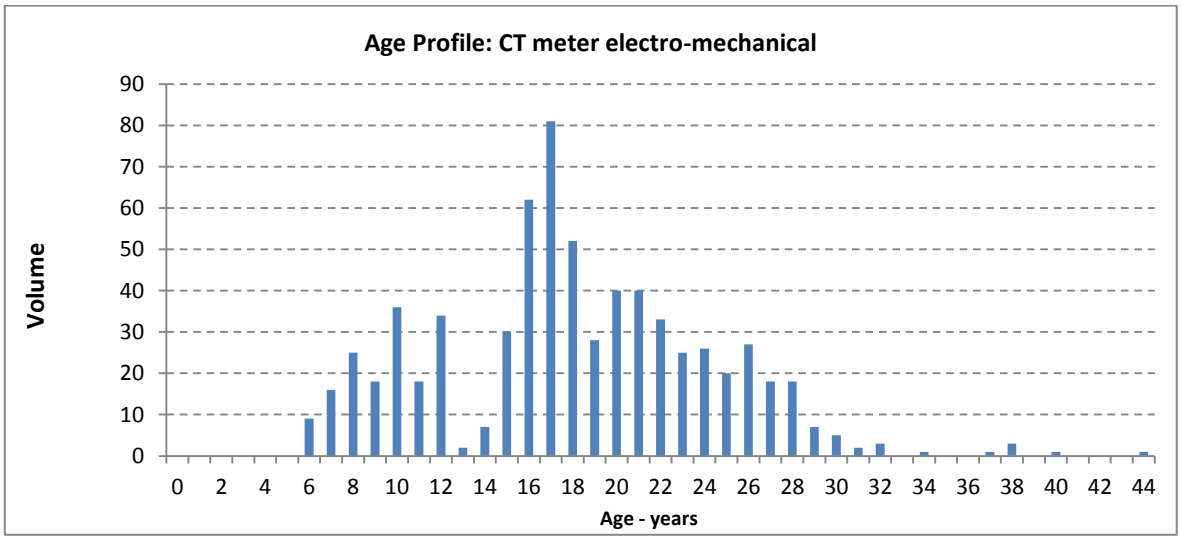


This asset type represents a small proportion of the total metering asset population, and has only 15 units or approximately 1%, in service beyond the nominal asset life of 15 years. The average age is 5.4 years.

5.6 CT electro-mechanical meters

The age profile for the low voltage current transformer connected electro-mechanical meter population is shown in Figure 9.

Figure 9: CT electro-mechanical meter age profile

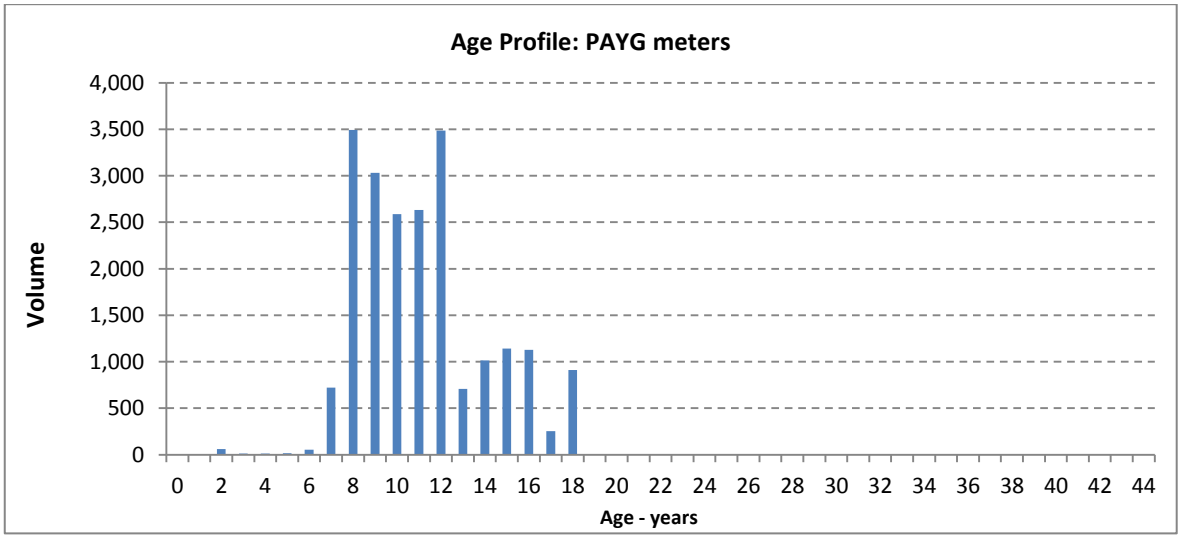


As for the CT electronic meters, there have been no new installations within the past 5 years, and the average age of the population is 18.1 years. There are 12 units, or approximately 2% of the population, remaining in-service beyond the nominal asset life of 30 years.

5.7 PAYG meters

Figure 10 shows the age profile for the PAYG meters.

Figure 10: PAYG meter age profile



There have been few PAYG meter installations in the past 5 years, with the average of the population being 11.1 years. There are approximately 2,300 units, or 11% of the population, have been in-service beyond the asset life of 15 years.

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

Meters are designed to have a high level of service availability. Type 6 metering should always be available for service.

Very high levels of service reliability are demanded from metering assets. Meters operate continuously without being taken out of service and do not require any maintenance. Sample testing of meter populations are routinely undertaken to determine that the metering installation accuracy complies with the relevant Australian Standards for measurement devices.

The consequences of a failed meter are low as this will only result in a loss of revenue; with estimation and substitution of consumption data completed by the Meter Data Provider in accordance with AEMO Metrology Procedures (Part B) to recover lost revenue. Typically, any loss of revenue would be isolated to a single customer.

6.1 Single phase electronic & PAYG meters

There is one identified issue with single phase electronic meters with the majority of these meters being less than 15 years old. This issue relates to one particular type of pre-payment meters (Siemens S_PAYG) and a family of regular meters (Ampy AP) that are showing signs of premature failure of the display.

6.2 Single phase electro-mechanical meters

The majority of these types of meters passed compliance testing in 2007 and was due for next round of testing in 2014. Delays in completing compliance testing have resulted in these meters being overdue and will be tested during 2015/16 to restore compliance.

6.3 Multi-phase electronic meters

The multi-phase electronic meter population has a relatively young average age of 6.4 years, with the majority being less than the nominal asset life of 15 years. There is one identified issue with

one particular family of meters that are showing signs of premature failure of the display (Ampy 5192B).

6.4 Multi-phase electro-mechanical meters

Routine testing has identified that the Email family of SD type meters have failed the light load test. As a consequence 2%, or approximately 210 units, of this meter type have been included in the replacement program for 2015/16. The remainder of the multi-phase electro-mechanical meter population will be monitored in the meter testing program.

6.5 CT electronic meters

These meters are individually inspected and tested or replaced every 5 years and are replaced in instances where they fail testing. No particular or generic issues have been identified with this meter type.

6.6 CT electro-mechanical meters

These meters are no longer economic to test and will all be replaced during 2015/16.

6.7 Draft rule for provision of metering services

In March 2015, the Australian Energy Market Commission (AEMC) published a draft rule and determination regarding proposed changes to the provision of metering services. It is intended to address issues identified by the Council of Australian Government (COAG) Energy Council that limit competition and potentially investment in the provision of advanced metering services.

Most meters currently in use at premises of small customers in the NEM are accumulation meters which only measure total energy consumed over a period of time and require manual reading at the premises. Advanced meters provide data on both the quantity of energy consumed and the pattern of use, together with remote reading and disconnect/reconnect capabilities. As such, advanced meters may offer benefits to all parties, including customers, retailers, distribution electricity utilities and energy services companies.

The rule change proposes a new role known as a Metering Co-ordinator who will have overall responsibility for metering services, and assume management of security of, and access to, advanced meters and the services they provide. The new rule also specifies the minimum services that a new or replacement meter installed at a small customer premises must be capable of providing, and sets out the circumstances in which a small customer may opt out of having a new meter installed at their premises. The Metering Co-ordinator may be requested by a retailer to remotely disconnect or reconnect a small customer premises in specified circumstances.

The new arrangements will commence on 1 December 2017. TasNetworks considers the rule change will mean all new meters should have advanced metering capability, but there is no business case in place to drive a planned meter replacement program based solely on this additional functionality. Meter replacement will be limited to the replacement of non-compliant meters to December 2017 until the implementation of the AEMC rule change.

7 Management Plan

7.1 Historical

TasNetworks makes a concerted effort to prepare a considered deliverability strategy based on the planned operational and capital programs of work for distribution network assets. A number of factors contribute to the successful delivery of the program of work. These factors are utilised as inputs to prioritise and optimise the program of work and to ensure sustainable and efficient delivery is maintained. This program of work prioritisation and optimisation can impact delivery of individual work programs in favour of delivery of other programs. Factors considered include:

- Customer-driven work we must address under the National Electricity Customer Framework (NECF).
- Priority defects identified through inspection and routine maintenance activities.
- Identified asset risks as they relate to safety, the environment and the reliability of the electrical system.
- Adverse impacts of severe storms and bushfire events.
- Changes to individual project or program delivery strategy.
- Size and capability of its workforce
- Use of external contract resources and supplementary service provision to provide support to internal workforce.
- Access issues.

Specific to this asset management plan, these factors have resulted in the delayed delivery of the compliance testing program of work. As a result of these delays and following an internal audit of metering processes, TasNetworks has initiated an end-to-end process review project of all metering processes. This project will define clear accountabilities for tasks and improved processes to improve the delivery of the program of work and ensure compliance with regulatory and legal obligations. It is anticipated that full compliance will be regained by the end of the 2016/17 financial year.

7.1.1 Encoder Receiver Transmitter (ERT) metering replacement program

7,300 Encoder Receiver Transmitter (ERT) meters were originally due for replacement during the period 2012/2013 to 2016/2017 as the vendor no longer supported the meter reading hardware required to read these meters. In 2013 the vendor subsequently provided a solution to enable ERT meters to remain in service for another five to seven years. Replacement of ERT meters has therefore been deferred to 2017/2018 when an assessment will be made on the condition of the meter reading hardware.

7.1.2 PAYG metering compliance program

Pre-Payment metering (PAYG) transferred ownership to the Distribution Business of Aurora Energy (now TasNetworks) from the Energy Business during 2013. These meters have been included in this management plan from 2013. A data capture project was completed during 2013 to assess asset condition and implement meter reading of PAYG meters for the first time since they were installed. Analysis of the data obtained showed high failure rates of displays in one of the meter families. Approximately 5,000 meters were replaced during 2013/2014 and 2014/15 to resolve this issue.

7.2 Strategy

The principal factors in influencing asset management strategies are classified as per objectives set out in section 3.

- Manage our assets to meet the strategic goals, measures and initiatives outlined in the Corporate Plan
    - Maintain a continuous improvement focus on metering assets and procedures; and
    - Ensuring planned maintenance and replacement activities are completed efficiently to minimise the frequency of the supply outages required to complete the work.
- Adopt the lowest whole-of-life cost solutions for investment in asset creation, replacement or refurbishment projects
    - Meter selection ensures a least cost option over the service life of the asset;
    - Ensure replacement activities are only performed when required; and
    - Ensure replacement activities achieve lower cost to serve by installing new technologies and implementing more efficient processes.
- Apply contemporary condition assessment and risk management techniques to identify and effectively manage risks and opportunities
    - Ensuring all risks are identified and have adequate management plans integrated into the business' practices;
    - Ensure loss of revenue due to non-compliant or faulty meters is minimised; and
    - Ensure replacement activities align with specific business needs such as access, obsolete technologies and safety issues.
- Comply with relevant legislation, licenses, code of practice and industry standards
    - Ensure adequate monitoring and inspection activities cover legislative compliance obligations; and
    - The testing program is designed to comply with:
        - National Electricity Rules (NER) – Section 7.6
        - AS 1284.13: 2002 Electricity Metering In-Service Compliance Testing

7.2.1 Routine Maintenance

There is a fundamental requirement for TasNetworks to periodically inspect the assets to ensure their physical state and condition does not represent a hazard to the public.

Most activities associated with metering assets are related to compliance with legislative requirements, and are typically in-service testing tasks. Where TasNetworks identifies a component of a metering installation such as meter, wiring or fuses that are not performing in accordance with statutory or legislative requirements, those components will be repaired or replaced in accordance with good electricity industry practice.

7.2.2 Routine Maintenance versus Planned Asset Replacement

It is more economical to replace meter families consisting of small volumes of meters rather than complete compliance testing for these families. TasNetworks is currently evaluating the impact on customer pricing of replacing meters in the field and completing testing off-site versus on-site meter testing for LV CT connected meters.

7.2.3 Refurbishment

A condition assessment is made on meters removed from service to determine which meters are suitable for refurbishment and returned to service. Meters deemed unsuitable or belonging to families that have failed compliance testing are written off and destroyed via TasNetworks' recycling contractor.

7.2.4 Planned Asset Replacement versus Reactive Asset Replacement

The management strategy for metering assets has allowed for specific trade-offs between capital and operational expenditure where improved metering assets allow for savings in maintenance, inspection or meter reading programs. Reactive replacements are generally several times more expensive, incurring overtime, call-out penalties and other additional costs.

Replacement is generally only preferred when this is a more economic proposition compared to ongoing maintenance costs over the estimated remaining service life of the metering assets. These are identified from the maintenance and inspection activities and feed into the list of proposed capital expenditure projects for prioritisation.

Regular inspection of certain metering assets may be deferred based on meter age or model if it has been deemed more cost effective to replace such meters rather than retain the existing units in-service with a higher risk of non-compliance. Older induction meters may be replaced with electronic meters with communication capabilities, allowing for remote reading. As remote reading becomes a more prevalent practice, it is expected to decrease operational meter reading and time-of-use switching costs.

7.2.5 Non Network Solutions

There are no non-network solutions available for regulated metering.

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 metering installations, and network replacement of metering equipment due to performance issues.

7.3 Non Routine Maintenance

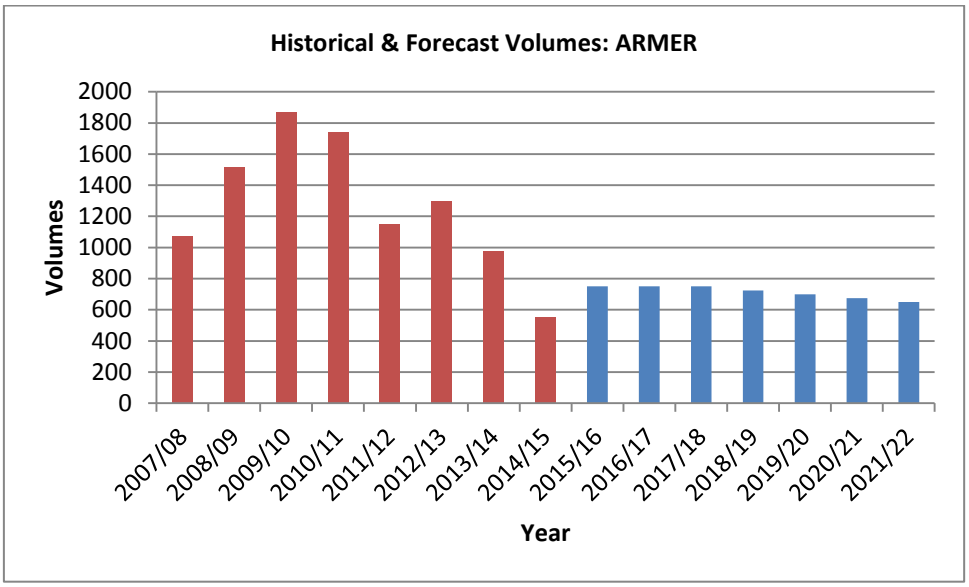
7.3.1 Metering equipment repair - ARMER

In general the assets are not maintainable and are deemed consumable items (replaced on failure) with volumes based on historical rates as recorded in TasNetworks category analysis RIN reporting

for regulated metering assets. Assets that fail in service must be replaced to ensure ongoing supply to the consumer and prevent loss of revenue.

Figure 11 below shows historical and forecast volumes of tasks for this work category.

Figure 11: Historical and Forecast Volumes - ARMER



7.4 Reliability and Quality Maintained

7.4.1 Meter equipment auditing and testing - AIMET

TasNetworks ensures that meters are all error-tested prior to installation. Electronic energy meters to be re-used are tested using Dewar laboratory test equipment. New meters are purchased with a test certificate, issued by the manufacturer.

Inspection of meters for compliance is a mandated requirement in accordance with Chapter 7 of the NER and TasNetworks has adopted the testing regimes prescribed in table S7.3.2 and S7.3.3 of the NER for type 6 meters, with volumes calculated according to the number of installed meters to ensure compliance.

Compliance testing of direct connect meters is conducted in accordance with Australian Standard AS 1284.13-2002. TasNetworks utilises testing by attributes, which requires tests to be conducted on a random sample of meters in each meter family. Meters selected for testing will include a mix of in-service connected meters and meters removed from service due to customer initiated replacements. The sample size is determined by the number of meters in each meter family. All LV Current Transformer connect meter installations that TasNetworks is responsible for will be scheduled for testing inspection on a 5-yearly cycle.

New families were created in 2013 for PAYG meters that were transferred to the TasNetworks distribution business in that year. The first testing and inspection programs for the PAYG meters are scheduled for 2015/16, within three years of the transfer of ownership.

Table 2 shows the planned projected meter testing volumes for the period 2015/16 to 2021/22.

Table 2: Meter testing volumes by category

Metering category	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	Total
Single phase electronic	0	400	0	0	0	0	0	400
Single phase mechanical	575	100	0	0	0	0	0	675
Multi-phase electronic	0	175	200	0	0	0	0	375
Multi-phase mechanical	100	0	0	0	0	0	0	100
CT electronic	407	303	226	475	216	407	303	2,337
CT mechanical	0	0	0	0	0	0	0	0
PAYG	285	0	0	0	0	0	0	285
Type 7	500	500	200	200	200	200	200	2,000
Total	**1,867**	**1,478**	**626**	**675**	**416**	**607**	**503**	**6,172**

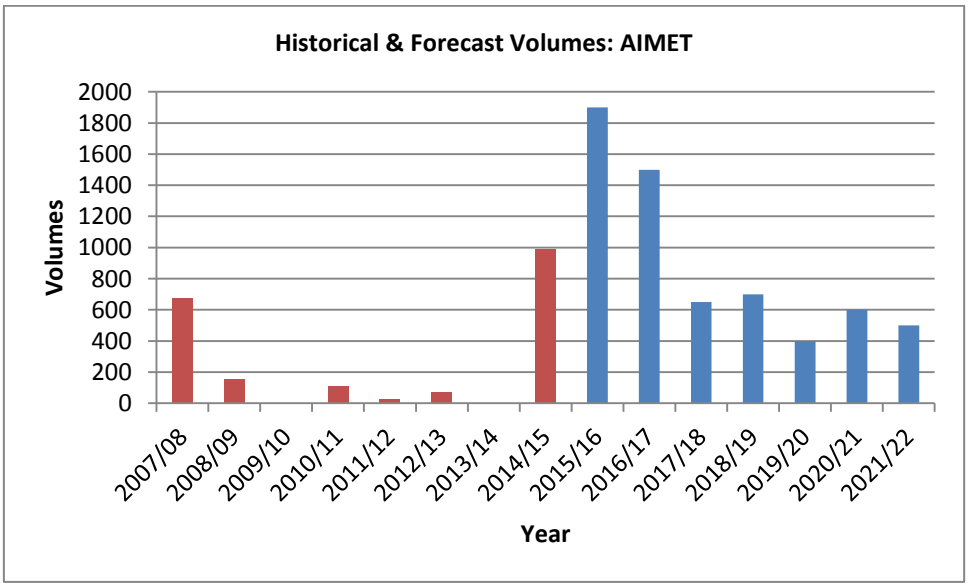
The performance of the direct connect meter population will be assessed by the use of statistical sampling in accordance with AS/NZ 1284.13. Statistical sampling provides an objective, acceptable methodology to determine the sample size for the population.

The sample is randomly selected from the population so that each meter making up the population group has the same chance of selection and the probability of selection is known. The result can then be statistically evaluated, objectively interpreted and the precision and reliability calculated.

All direct connect and CT connect meters are tested using calibrated portable test equipment or calibrated laboratory test benches.

Figure 12 below shows historical and forecast volumes of tasks for this work category.

Figure 12: Historical and Forecast Volumes - AIMET



7.5 Regulatory Obligations

7.5.1 Scheduled meter reading quarterly/monthly - MSDMR

Volumes calculated to comply with the requirements of Chapter 7 of the NER and according to the number of installed regulated meters with an allowance made for meter churn following the introduction of metering contestability on 1 December 2017.

This program includes reading PAYG meters. Access issues identified by meter readers at PAYG installations are managed via the existing business processes for maintaining safe access to all meters. Issues addressed include unrestrained dogs, locked gates or doors and clear access to meters.

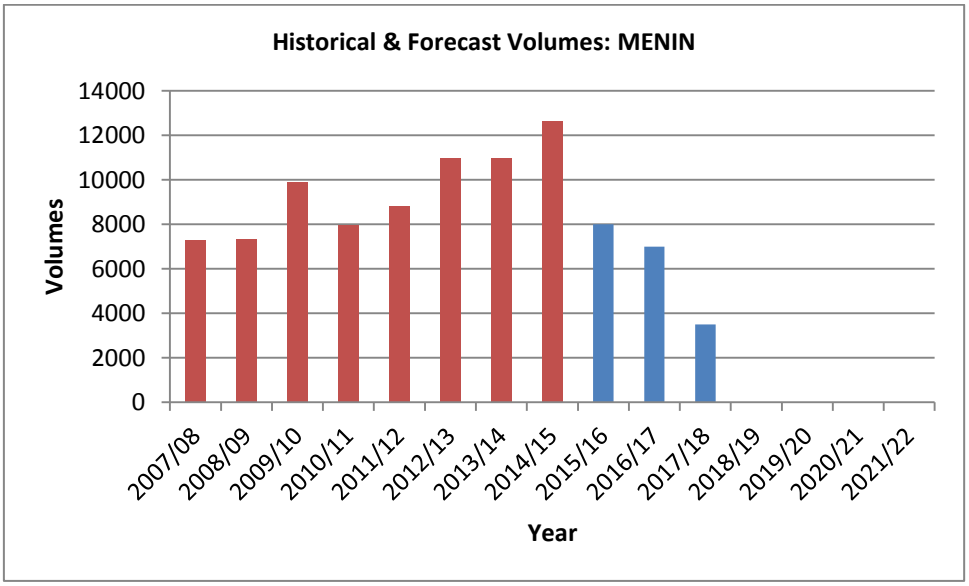
7.5.2 Install Metering Equipment (New Installations) - MENIN

Under the National Electricity Law, TasNetworks has legal and compliance obligations to connect customers to the network. TasNetworks also has the obligation (as Responsible Person for type 6 meters) under chapter 7 of the NER to ensure that all connections to the network have compliant metering equipment installed.

Volumes are consistent with customer growth forecasting for new connections and historical volumes for additions and alterations to existing customer installations. This category of work will cease following the planned implementation of the AEMC draft rule on 1 December 2017 (refer section 6.7).

Figure 13 below shows historical and forecast volumes of tasks for this work category.

Figure 13: Historical and Forecast Volumes - MENIN



7.6 Replacement

7.6.1 Replace metering equipment - MEREP

Under the National Electricity Law, TasNetworks has legal and compliance obligations to replace any meters declared as non-compliant in the earliest practical timeframe, and this is non-discretionary. TasNetworks will make best endeavours to comply and maintain its meter asset

fleet in accordance with the all legal and compliance obligations. Failure to do so could result in fines, and/or deregistration as an accredited Meter Provider.

There are two key drivers for asset replacement:

- Assets found to be non-compliant from the testing regimes must be replaced to ensure compliance with Chapter 7 of the NER; and
- Planned replacement to address specific business needs such as access, obsolete technologies, obsolete network tariffs and safety issues.

The replacement program is designed to continue to rationalise the meter fleet by removing meter types with small numbers of meters and to upgrade the meter fleet to current industry practices by installing electronic type meters, in lieu of induction disc type technology. This will allow for reduced use of time switches since the new meters can have on-board contactors for time-of-use loads. TasNetworks invested in a significant capital replacement program during the period 2008 to 2012 to remove non-compliant meters from the network. This program has tapered since 2012 as the volume of non-compliant meters has reduced.

Electronic meters will also allow communications to be installed for remote sites to reduce the cost of meter reading in remote locations (particularly for installations requiring monthly reading). New technology will also allow for monitoring power quality, provide capability for remote disconnect/reconnect and can allow for retail products for customers without changing the meter.

Projected volumes for replacement will be based on any identified non-compliant asset families, and minimum services that a replacement meter installed at a small customer's premises must be capable of providing in line with the AEMC draft rule of 26 March 2015 which defines the new arrangements for the provision of metering services.

TasNetworks will minimise the meter replacement volumes to identified non-compliant meters until the planned implementation of the AEMC draft rule on 1 December 2017 (refer section 6.7). Table 3 shows the planned projected meter replacement volumes for the period 2015/16 to 2016/17.

Table 3: Meter replacement volumes by category

Metering category	2015/16	2016/17	Total
Single phase electronic meter	1,016	1,371	2,387
Single phase electro-mechanical meter	461	0	461
Multi-phase electronic meter	203	2,076	2,279
Multi-phase electro-mechanical meter	288	0	288
Low Voltage Current transformer - with electronic meter	31	0	31
Low Voltage Current transformer - with electro-mechanical meter	636	0	636
Pay-As-You-Go (PAYG) meter	2,500	1,500	4,000
Total	**5,135**	**4,947**	**10,082**

The meter types currently scheduled for replacement include:

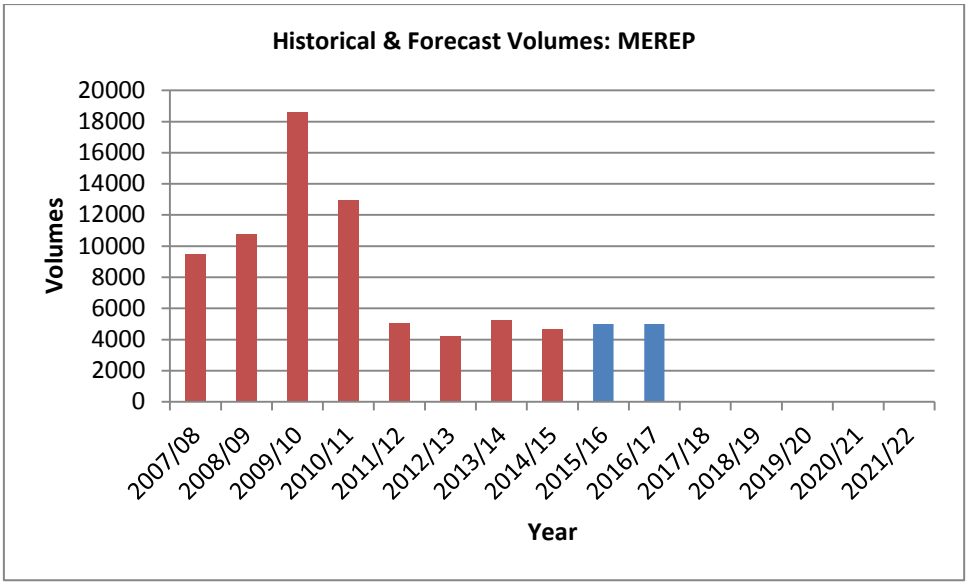
- Ampy - AP, 5162K, 5165F, 5192B
- Email - BAZ, SD series
- Nilsen - EMS2621

- Warburton Franki - HMT, WF2
- Allowance is made in the POW to replace PAYG meters with faulty displays as identified by meter readers throughout each year.

Details of the projected replacement program are shown in section 14.

Figure 14 below shows historical and forecast volumes of tasks for this work category.

Figure 14: Historical and Forecast Volumes - MEREP



7.6.2 Meter equipment removal and disposal - ADMET

This program is for the removal of meters from installations that are abolished and for disposal of obsolete meters resulting from the meter replacement program.

Volumes for removal are customer driven and are linked to the meter replacement volumes for disposals.

7.7 Investment Evaluation

The installation of new customer meters and replacement of meters that fail compliance testing is entirely compliance driven.

The management strategy for metering assets has allowed for specific trade-offs between capital and operational expenditure where improved metering assets allow for savings in maintenance, inspection or meter reading programs. Specifically, regular inspection of certain metering assets may be deferred based on meter age or model, as it has been deemed more cost effective to replace such meters rather than inspect them. This is particularly true for CT connected electro-mechanical meters that will be replaced rather than tested.

7.8 Spares Management

Spare meters 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. Meters removed from service and deemed suitable for reuse are returned to stock following refurbishment.

7.9 Disposal Plan

All removed meters will be returned to the meter workshop where they will be assessed to determine if suitable for reuse or disposal. Meters identified for disposal are sent for recycling.

7.10 Summary of Programs

Table 4 provides a summary of all of the programs described in this management plan.

Table 4: Summary of Regulated Metering programs

Work Program	Work Category	Project/Program
Alternative Control - Operational Expenditure	Meter Reading (MSDMR)	Scheduled Meter Reading Quarterly/Monthly
	Metering Equipment Auditing and Testing (AIMET)	Meter Equipment Auditing and Testing
	Metering Equipment Repairs (ARMER)	Metering Equipment Repair
	Meter Equipment Removal and Disposal (ADMET)	Metering Equipment Removal and Disposal
Alternative Control - Capital Expenditure	Install Metering Equipment (New Installations) (MENIN)	Install Metering Equipment (New Installations)
	Replace Metering Equipment (MEREP)	Replace Metering Equipment

8 Financial Summary

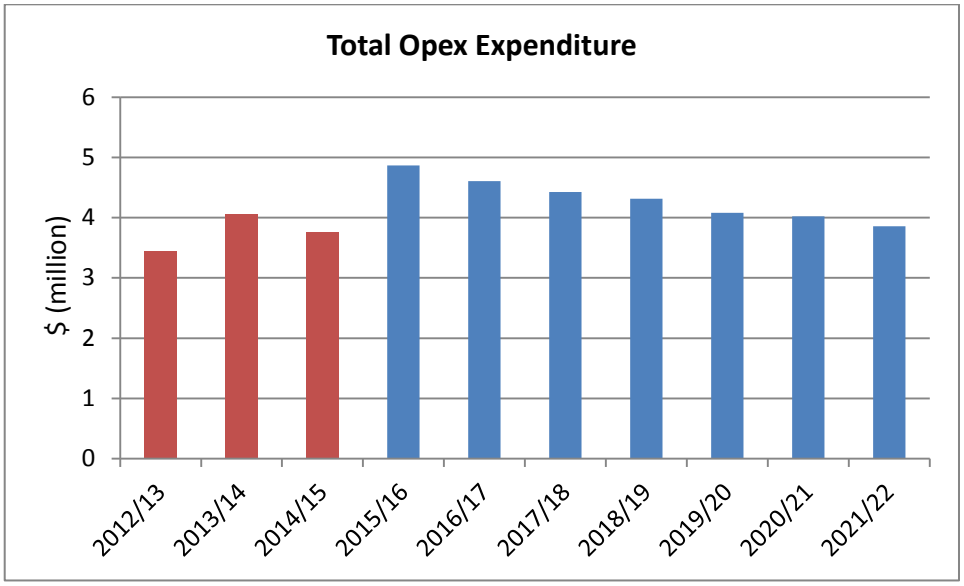
8.1 Proposed OPEX Expenditure Plan

All proposed volumes of work to 2021/22 are based on either compliance for testing and reading of meters, or historical maintenance practices and fault responses. The historic and projected allowances for OPEX are shown in Table 5 and illustrated in Figure 15.

Table 5: 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	$ 4.36	$ 4.40	$ 4.25	$ 4.87	$ 4.61	$ 4.43	$ 4.32	$ 4.08	$ 4.02	$ 3.86
Actual	$ 3.44	$ 4.06	$ 3.76							

Figure 15: OPEX expenditure profile



8.2 Proposed CAPEX Expenditure Plan

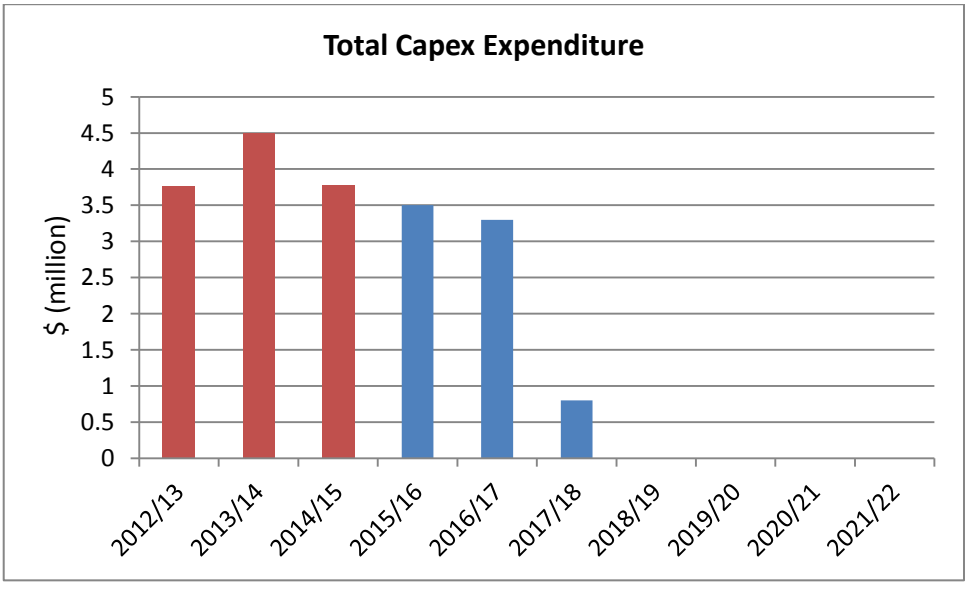
The proposed capital program of work can be divided into customer driven new metering installations and network replacement of metering equipment. The installation of new customer meters and replacement of meters that fail compliance testing is all compliance driven.

The historic and projected allowances for CAPEX are shown in Table 6 and illustrated in Figure 16.

Table 6: CAPEX 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	$ 3.75	$ 3.59	$ 3.50	$ 3.50	$ 3.30	$ 0.80	$ 0.00	$ 0.00	$ 0.00	$ 0.00
Actual	$ 3.76	$ 4.50	$ 3.77							

Figure 16: CAPEX expenditure profile



TasNetworks had previously deferred the replacement program for all ERT metering until 2017/18; however, the implementation of the proposed AEMC rule change relating to the provision of metering services on 1 December 2017 may affect this replacement program.

All meter replacements will be limited to new installations and replacement of non-compliant meters until December 2017.

9 Resources Used in the Provision of Metering Services

9.1 Meter Testing Equipment

TasNetworks has invested significant capital in electricity meter testing equipment, to enable the business to test meters and instrument transformers of all sizes, with capacities ranging from single and three phase domestic, commercial and industrial loads to high voltage installations.

Key items of testing equipment include:

- Dewar single phase laboratory meter test bench (12 position);
- Dewar three phase laboratory meter test bench (6 position);
- MTE PTS 2.3 portable polyphase meter test set. (3 sets);
- Red Phase Model 465C polyphase meter test set. (3 sets);
- Red Phase Model 462E phantom load set. (3 sets);
- Red Phase Model 590C Current Transformer Error testing equipment- field use (3 sets);
- Red Phase Model 590D Voltage Transformer Error test testing equipment – field use (3 sets);
- Red Phase Model 590G Current Transformer Error testing equipment – field use (1 set);
- Red Phase Model 704 CT circuit burden tester (6 sets);
- Accessories, software, clip on CTs, special leads;
- Unigor Multimeters;
- AMP sticks for measuring primary and secondary currents; and
- Design 2000 Phase Angle Meters.

9.2 Meter Test Equipment Management

Red Phase, MTE meter test equipment and Dewar laboratory test bench reference standards are sent to a National Association of Testing Authorities (NATA) certified testing authority annually for testing and calibration. A logbook accompanies each set and the testing authority issues certificates following each calibration. Hand held test equipment is also annually error tested by a certified testing authority.

9.3 Personnel

TasNetworks has a highly experienced team of over 30 employees, including professional engineers and technicians in its metering teams across the business. TasNetworks supplements these employees with external contractors to manage peak demand for tasks as required. External contractors are required to complete TasNetworks metering training and maintain Authorised Service Provider status for metering with TasNetworks. These people, using TasNetworks

processes and procedures, are capable of providing meter installation and maintenance services described in this management plan.

10 Responsibilities

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

Review of this management plan is the responsibility of the Responsible Person for Type 6 meters.

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.

11 Related Standards and Documentation

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

1. National Electricity Rules (NER) Chapter 7
2. AS 1284.13: 2002 Electricity Metering In-Service Compliance Testing
3. Metering Technical Specification MM-TS-09-00
4. Asset Management Policy
5. TasNetworks Business Plan 2015/16
6. Metering (Unregulated) Type 1-4 Asset Management Plan
7. Connection Assets Asset Management Plan

12 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
Scheduled metering reading	MSDMR	High	Compliance	OPEX	Medium	Budget	3.36	3.48	3.60	3.48	3.36	3.24	3.12
						Volumes	1.12M	1.16M	1.2M	1.16M	1.12M	1.08M	1.04M
Metering auditing and testing	AIMET	Medium	Compliance	OPEX	Medium	Budget	0.665	0.525	0.228	0.245	0.140	0.210	0.175
						Volumes	1,900	1,500	650	700	400	600	500
Metering equipment repairs	ARMER	Low	Compliance	OPEX	Low	Budget	0.300	0.300	0.300	0.290	0.280	0.270	0.260
						Volumes	750	750	750	725	700	675	650
Meter equipment removal & disposal	ADMET	Low	Safety	OPEX	Low	Budget	0.200	0.200	0.200	0.200	0.200	0.200	0.200
						Volumes	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Replace metering equipment	MEREP	High	Compliance	CAPEX	Medium	Budget	1.7	1.7	0.0	0.0	0.0	0.0	0.0
						Volumes	5,000	5,000	0	0	0	0	0
Install metering equipment (new installations)	MENIN	High	Customer initiated	CAPEX	Medium	Budget	1.8	1.6	0.8	0	0	0	0
						Volumes	8,000	7,000	3,500	0	0	0	0

13 Appendix B - Meter Testing Program

Table 7: Meter testing program by meter type

Category	Make	Model	Installed Volume	Method	Standard	Last Test Date	Test Result	Test Cycle	Next Test Date	Sample Volume
Single phase electronic	Ampy	EM1210	32502	Sample	AS 1284.13 Variables	TBC	Pass	7 years	2016/17	100
	EDMI	Mk 7A	58790	Sample	AS 1284.13 Variables	TBC	Pass	7 years	2016/17	150
	Email	A11	1883	Sample	AS 1284.13 Variables	TBC	Pass	7 years	2016/17	50
		A11LD	470	Sample	AS 1284.13 Variables	TBC	Pass	7 years	2016/17	25
	Siemens	SAM	3909	Sample	AS 1284.13 Variables	TBC	Pass	7 years	2016/17	75
Single phase mechanical	Email	M1	67770	Sample	AS 1284.13 Variables	2007	Pass	7 years	2016/17	150
		M2	6869	Sample	AS 1284.13 Variables	2003	Pass	7 years	2016/17	75
		M3	146896	Sample	AS 1284.13 Variables	2007	Pass	7 years	2016/17	150
	Landis & Gyr	CL	22243	Sample	AS 1284.13 Variables	2007	Pass	7 years	2016/17	100
	Warburton Franki	WF3	27818	Sample	AS 1284.13 Variables	2007	Pass	7 years	2016/17	100
Multi-phase electronic	Ampy	EM3330	3718	Sample	AS 1284.13 Variables	TBC	Pass	7 years	2017/18	75
	EDMI	Mk 10	2395	Sample	AS 1284.13 Variables	TBC	Pass	7 years	2016/17	50
		Mk 10A	3747	Sample	AS 1284.13 Variables	TBC	Pass	7 years	2016/17	75
		Mk 10D	1327	Sample	AS 1284.13 Variables	2014	New	3 years	2016/17	50
	Email	EM3030	5324	Sample	AS 1284.13 Variables	TBC	Pass	7 years	2017/18	75
		EM3330	2757	Sample	AS 1284.13 Variables	TBC	Pass	7 years	2017/18	50
Multi-phase	Email	SDM	12766	Sample	AS 1284.13 Variables	2006	Pass	7 years	2015/16	100

Category	Make	Model	Installed Volume	Method	Standard	Last Test Date	Test Result	Test Cycle	Next Test Date	Sample Volume
mechanical										
CT electronic	EDMI	EDMI	9	NER	S7.3.2 NER			5 years	annual	9
		Mk 10	247	NER	S7.3.2 NER			5 years	annual	247
		Mk 10A	325	NER	S7.3.2 NER			5 years	annual	325
		Mk 10E	240	NER	S7.3.2 NER			5 years	annual	240
	Email	EM3050	431	NER	S7.3.2 NER			5 years	annual	431
		Q4	360	NER	S7.3.2 NER			5 years	annual	360
PAYG[1]	Ampy	5071	5760	Sample	AS 1284.13 Variables	2013	New	3 years	2015/16	75
	Landis & Gyr	LG_PAYG	3087	Sample	AS 1284.13 Variables	2013	New	3 years	2015/16	50
	Schlumberger	SC_PAYG	118	Sample	AS 1284.13 Variables	2013	New	3 years	2015/16	10
	Siemens	PAYG	477	Sample	AS 1284.13 Variables	2013	New	3 years	2015/16	25
		S_PAYG	9603	Sample	AS 1284.13 Variables	2013	New	3 years	2015/16	75
		SA_PAYG	2229	Sample	AS 1284.13 Variables	2013	New	3 years	2015/16	50
Type 7	N/A	N/A		Sample	S7.2. NER	2013	New	Annual	2015/16	500

[1] PAYG meters transferred to TasNetworks (then Aurora DB) in 2013 without test results from Aurora Retail. TasNetworks will treat these meters as new families for the purpose of compliance testing and aims to complete the first test cycle within three years of this date.

Table 8: Meter testing program by year

Category	Make	Model	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
CT Electronic	Various	Various	407	303	226	475	216	407	303
Multi-phase mechanical	Email	SDM	100						
PAYG	Ampy	5071	75						
	Landis & Gyr	LG_PAYG	50						
	Schlumberger	SC_PAYG	10						
	Siemens	PAYG	25						
		S_PAYG	75						
		SA_PAYG	50						
Single phase electronic	Ampy	EM1210		100					
	EDMI	Mk 7A		150					
	Email	A11		50					
		A11LD		25					
	Siemens	SAM		75					
Single phase mechanical	Email	M1		150					
		M2		75					
		M3		150					
	Landis & Gyr	CL		100					
	Warburton Franki	WF3		100					
Multi-phase electronic	EDMI	Mk 10		50					
		Mk 10A		75					
		Mk 10D		50					
	Ampy	EM3330			75				
	Email	EM3030			75				

Category	Make	Model	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
		EM3330			50				
Type 7	N/A	N/A	500	500	200	200	200	200	200
Total			**1,867**	**1,478**	**626**	**675**	**416**	**607**	**503**

14 Appendix C - Meter Replacement Program

Table 9: Meter replacement program by meter type

Category	Make	Model	Reason for Replacement	2015/16	2016/17	Total
Single phase electronic	Ampy	5162K	Uneconomic to test	285		285
		AP	Faulty displays		1,371	1,371
	Nilsen	EMS2621	Unsupported product	726		726
Single phase mechanical	Email	BAZ	Failed testing 2005	324		324
		CAZ	Uneconomic to test	1		1
		M3_2R	Uneconomic to test	2		2
		MC2	Uneconomic to test	2		2
		MC3	Uneconomic to test	3		3
	Landis & Gyr	CM	Uneconomic to test	8		8
	Warburton Franki	HMT	Uneconomic to test	5		5
		WF2	Uneconomic to test	115		115
Multi-phase electronic	Ampy	5165F	Uneconomic to test	203		203
		5192B	Faulty displays		2,076	2,076
	Landis & Gyr	L4	Uneconomic to test	1		1
Multi-phase mechanical	Email	PAZ3	Uneconomic to test	1		1
		SD	Failed testing 2006	212		212
		SDME	Uneconomic to test	56		56
	Landis & Gyr	MF3	Uneconomic to test	3		3
		ML240	Uneconomic to test	4		4
CT mechanical	Email	A1R	Uneconomic to test	8		8
		E1R	Uneconomic to test	6		6
		Q3	Uneconomic to test	17		17
		SD2R	Uneconomic to test	4		4
		SDM	Uneconomic to test	632		632
PAYG	Various	Various	Faulty displays	2,500	1,500	4,000
Total				**5,135**	**4,947**	**10,082**

15 Appendix D - Certificate of registration ISO 9001:2008

DNV BUSINESS ASSURANCE

MANAGEMENT SYSTEM CERTIFICATE

Certificate No. 147509-2013-AQ-AUS-JAS-ANZ

This is to certify that the Management System of

Tasmanian Networks Pty Ltd

at

1-7 Maria Street, Lenah Valley TAS 7000

has been found to conform to

AS/NZS ISO 9001:2008

This Certificate is valid for the following product or service ranges:

The registration covers the Quality Management System for the provision of construction, operational and maintenance services to the electricity industry. This includes bid management, contract management, project management, metering services, industry training, fleet management, warehousing and distribution and procurement services and electrical safety management scheme administration.

Initial Certification date:
02.07.1996

This Certificate is valid until:
31.12.2016

The audit has been performed under the supervision of
Mahmoud Nabavi
Lead Auditor

JAS-ANZ

Place and date:
Sydney, 30.06.2014

for the Accredited Unit:
DNV CERTIFICATION PTY LTD, AUSTRALIA
ABN: 63 075 143 743

Yngve Amundsen
Management Representative

Accreditation by the joint accreditation system of Australia and New Zealand, Acc S 1311292 AS
Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid. Refer to appendix for current certificate site address.
URL:www.jas-anz.org/register
HEAD OFFICE. Det Norske Veritas AS, Veritasveien 1, 1322 Hovik, Norway. Tel: +47 67 57 9900 Fax: +47 6757 9911 - www.dnv.com

16 Appendix E – Excerpt from Connection Assets Asset Management Plan: Metering Transformer Testing Program

16.1 Low Voltage Metering Current Transformers

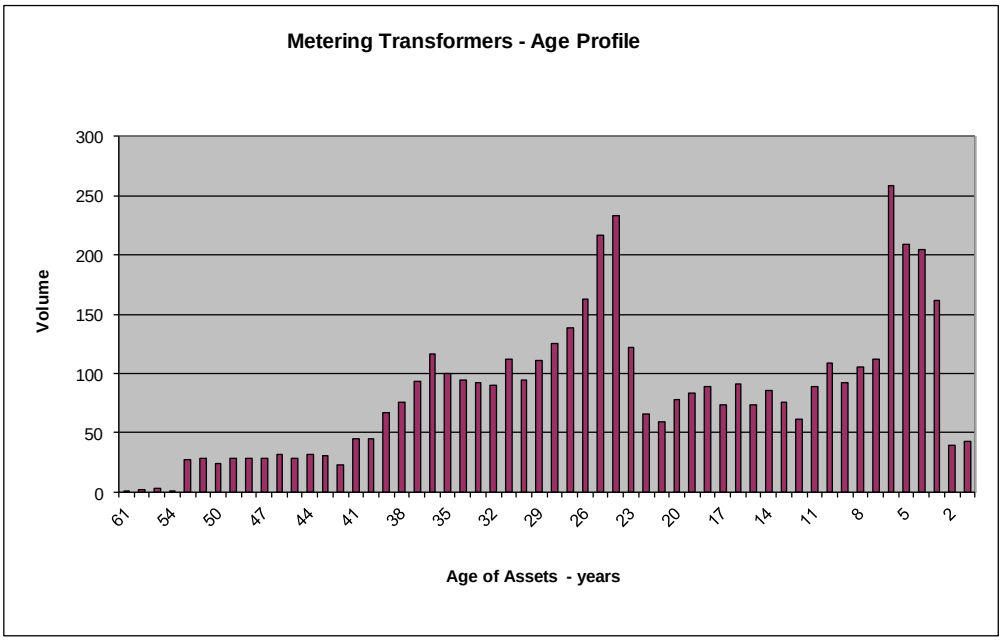
There are approximately 4,600 sets of LV metering current transformers (CTs) installed in the network as at March 2014, with approximately 60 being more than 50 years old.

The age profile of metering CTs is shown in Figure 11.

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 11: 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. **Error! Reference source not found.** 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[2]	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**

16.2 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.

16.3 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.

16.4 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.

[2] 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.

16.5 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).

16.6 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 8 shows the test points for each CT test.

Table 8: 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

16.7 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.

16.8 HV Metering Installations

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