Strategic Asset Management Plan

CitiPower Pty Ltd and Powercor Australia Ltd

December 2019

Approval and amendment record

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1 Purpose

The Strategic Asset Management Plan (SAMP) along with the Asset Management Policy (AMP) is an overarching document within the CP/PAL Asset Management System. The SAMP is subordinate to CP/PAL's strategic direction as defined by the five strategic pillars, presents CP/PAL high-level asset management objectives and describes the scope and role of the Asset Management System in the delivery of the business's corporate objectives. A high level representation of the CP/PAL Asset Management System is shown in figure 1.

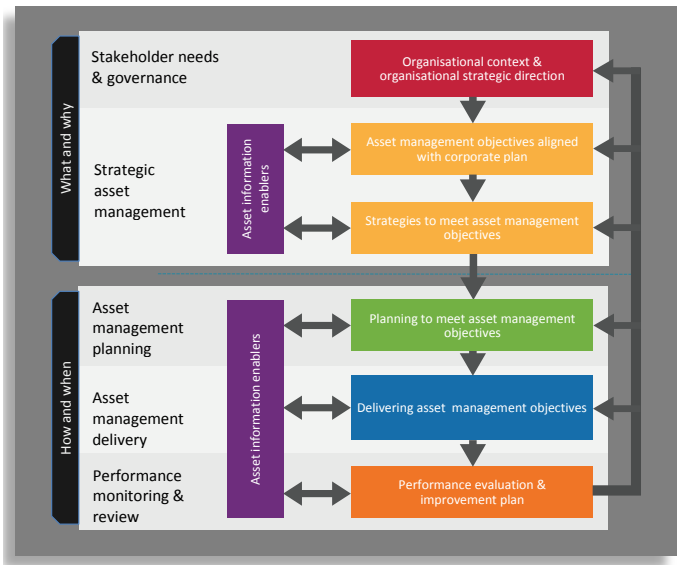


Figure 1: High level representation of the CP/PAL Asset Management System

An overview of the Asset Management System is provided in Section 7 of the SAMP and a full description in the accompanying Asset Management System Framework document (see references in Section 10).

The SAMP provides direction for the development of each of twelve Asset Management Strategies and sixteen Asset Class Strategies that, in turn, are used to develop subordinate Operational and Asset Management Plans. The hierarchical approach ensures that Strategies and Plans have line-of-sight back to overall corporate objectives.

The SAMP ensures that the Asset Management Policy is faithfully implemented and that all internal and external stakeholders are aware of CP/PAL's approach to asset management.

2 Organisational context

An overview of CP/PAL's role in the energy market as well as the market and regulatory obligations and issues faced by CP/PAL are provided in the following sections to give context to the SAMP.

2.1 CP/PAL role in the energy market

CP/PAL are regulated Victorian electricity distribution businesses responsible for the quality and reliability of electricity delivered to customers within these two networks. Our primary responsibility is planning, building, operating and maintaining the 'poles and wires' — a strategic community asset and core component of Victoria's and Melbourne's energy infrastructure. We seek to do this in a safe, reliable, efficient and prudent manner.

CitiPower is responsible for delivering electricity supply to Melbourne's central business district and inner suburbs, while the Powercor network delivers electricity across Melbourne's outer western suburbs, and central and Western Victoria.

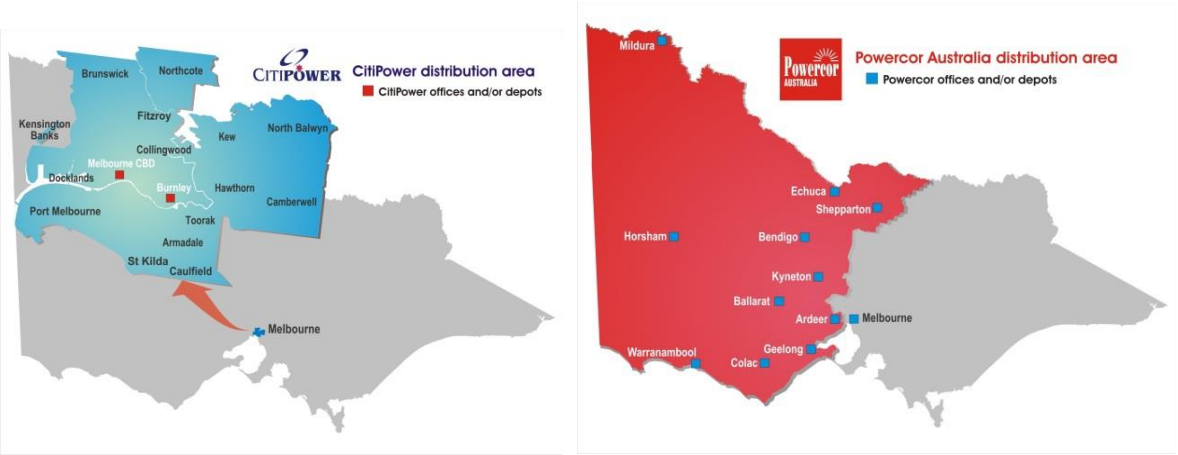


Figure 2: CP/PAL distribution network coverage

CitiPower's distribution network is the most efficient and reliable electricity distribution network in Australia and with more than 104 customers per kilometre of line, is also the most customer-dense network. The Powercor network is the most efficient and reliable regional and rural electricity network in Australia.

A summary of network statistics follows, which highlights distinct differences between the CP/PAL networks in terms of geographic area coverage, network line lengths and customer numbers.

Network Statistic	CitiPower	Powercor
Network line length	4,273 km	75,709 km
Network area	157 sq. km	145,651 sq. km
Customers	330,825	803,247
Poles	58,207	571,800
Underground lines	43.2%	13.9%

Source: Network performance reporting (December 2017)

Table 1: CP/PAL key network statistics

CP/PAL connect residential and commercial customers to a safe and reliable electricity supply. Our key distribution activities include[1]:

- Maintaining network safety and reliability to meet the current power supply needs of our customers;
- Extending and upgrading the network so that the future power supply needs of customers are met when required;
- Operating the network on a day to day basis;
- Connecting new customers to the network;
- Maintaining the public lighting system;
- Reading electricity meters; and
- Providing meter data to retailers

CP/PAL's vision of 'We connect you' represents a commitment to delivering safe, reliable and affordable supply of electricity. CP/PAL recognise that Australia's energy future is shifting, as demonstrated by a dramatic rise in renewable generation in the past decade. CP/PAL are using the latest technology to connect our customers with the right information and systems, and we're working with customers to bring energy into their businesses and homes to keep their world running they way they want it – smoothly with no fuss.

2.2 Market and regulatory obligations and issues

As distribution network service providers, CP/PAL are accountable to multiple regulatory bodies. The following sections describe the role of the regulators and the obligations that CP/PAL must fulfil.

2.2.1 Energy Safe Victoria

ESV is responsible for the safety and technical regulation of electricity in Victoria. Under the requirements of the Electricity Safety Act 1998, 'Major Electricity Companies' must submit and comply with their ESMSs. CP/PAL periodically reviews and submits their ESMS to ESV for acceptance. ESV periodically audits CP/PAL to ensure ongoing compliance with the legislated safety requirements. ESV also requires CP/PAL to report network performance under the requirements of the Distribution Business Electrical Safety Performance reporting guidelines. Further information on CP/PAL's interactions with ESV is provided in Section 3 – Stakeholders.

2.2.2 Australian Energy Regulator

In Australia, electricity distribution is regulated and CP/PAL are required to provide regulatory proposals to the AER every five years detailing our forecast work programs and efficient revenue requirements. This process is called the Electricity Distribution Price Review. The AER assesses our regulatory proposal and makes a decision on the revenues we can earn during the subsequent regulatory control period.

The AER is also responsible for administering the Service Target Performance Incentive Scheme (STPIS) and the f-factor scheme. The STPIS scheme applies to all Australian DNSPs and the f-factor scheme applies to Victorian DNSPs. The performance of CP/PAL's networks against the reliability targets determines the amount of revenue that CP/PAL can receive via the STPIS scheme, and as such are incentivised to outperform these targets in order to maximise revenue. The f-factor scheme was modelled on the STPIS scheme, and provides similar incentives for businesses to lower their bushfire risk.

[1] AER - CitiPower 2018 Pricing Proposal

2.2.3 Essential Services Commission

The Essential Services Commission oversees compliance & performance reporting by energy businesses. As a condition of our distribution licences, CP/PAL must demonstrate how we comply with our Electricity Distribution Licence and both Victorian and national regulatory instruments including the National Electricity Rules and the Electricity Distribution Code. The ESC conducts periodic compliance audits to ensure we are operating within these requirements.

3 Stakeholders

CP/PAL have a proud history of customer engagement and we recognise our responsibility to deliver electricity to all customers safely, reliably and efficiently. We have a responsibility to work with our customers and stakeholders to understand their requirements, and ensure that we deliver services that meet their needs now and into the future[2]. Our approach to stakeholder engagement is described in the CP/PAL Stakeholder Engagement Framework which guides how we will work with all stakeholders ranging from customers to regulators.

The asset management requirements of both our internal and external stakeholders are summarised in this section in terms of the following stakeholder groups:

- Customers
- Regulators
- Shareholders
- Workforce/employee

These requirements and expectations will be taken into account in the establishment of key strategic asset management issues and objectives later in this document.

3.1 Customer expectations

As part of our preparatory activities for the 2016-2020 regulatory price review, CP/PAL conducted a comprehensive Price Reset Stakeholder Engagement Program with the objective of engaging with customers and stakeholders in order to understand their current and future needs, concerns and preferences.

The customer and stakeholder expectations that emerged from this program are summarised below.

Customers:

- Want reliable supply of electricity for a reasonable price;
- Want efficient and targeted investment across our networks;
- Want CP/PAL to pay close attention to safety and maintenance and they support additional investment in activities that reduce the risk of fire danger;
- Expect forward and proactive planning to ensure the resilience, capacity and capability of the network;
- Believe future electricity needs are best met by a smart grid to enable choice and flexibility, taking pressure off the existing network and facilitating the connection of renewable energy sources; and

[2] CitiPower and Powercor – 2016-2020 Price Reset Appendix A – Our Customer Engagement (April 2015)

- Want greater access to readily understandable information about their electricity usage.

Integration of our customer's expectations and concerns into our planning is an important part of developing our regulatory proposal. To support the development of the 2021-2025 EDPR submission, CP/PAL are undertaking the next iteration of the Price Reset Stakeholder Engagement Program to clearly understand customer and stakeholder needs and expectations and ensure these are represented appropriately in the submission. The outcomes of this extensive program will be considered and incorporated into the next review of the SAMP to ensure that evolving customer and stakeholder expectations are taken into account through our asset management system.

3.2 Regulator expectations - ESV

As the safety and technical regulator for Victoria, ESV requires CP/PAL to demonstrate compliance with the requirements of the Electrical Safety Act. The act is underpinned by the following regulations:

- Electricity Safety (Management) Regulations 2009
  - Requires all MECs to submit an ESMS to ESV every five years for acceptance
- Electricity Safety (Bushfire Mitigation) Regulations 2013
  - Requires submission of a Bushfire Mitigation Management Plan to ESV for acceptance every 5 years
- Electricity Safety (Electric Lines Clearance) Regulations 2015
  - Requires annual submission of an Electricity Lines Clearance Management Plan to ESV for acceptance
- Electricity Safety (Installation) Regulations 2009
  - Specifies installation requirements for CP/PAL as a network operator. Obligations are captured in our regulatory obligations register and compliance is monitored via internal audit.

CP/PAL regularly communicate with ESV and proactively engage in ESV related safety and technical related issues and consultative forums.

CP/PAL's ESMS demonstrates how CP/PAL meet the obligations of section 98 of the Electricity Safety Act 1998 and the Electricity Safety (Management) Regulations 2009. The objective of our ESMS is to demonstrate our ongoing commitment to risk based network management, providing for safe, affordable and reliable supply of electricity. CP/PAL's ESMS complements our Safety Case to inform stakeholders including customers, employees, governments, regulators, retailers and other business partners as to how CP/PAL meets its electricity safety obligations to ensure the safety of public and its employees (including contractors).

Under the ESMS, CP/PAL are responsible for:

- Monitoring and reviewing proposed changes and promoting improvements to electrical safety legislation, regulations and guidelines
- Developing, reviewing and proposing strategies related to the safety of persons accessing the electricity networks
- Provision of advice and interpretation of electrical technical legislation and regulation to the business and external stakeholders
- Investigation, recording and reporting of incidents to ESV and AER (including F-Factor fire starts)

CP/PAL are required to report on all serious electrical incidents under the requirements of the Electrical Safety Act. A serious electrical incident is defined in the Electrical Safety Act as an incident involving electricity which causes or has the potential to cause:

- The death of or injury to a person
- Significant damage to property

- A serious risk to public safety[3].

The Electrical Safety (Management) Regulations 2009 require reporting of serious electrical incidents that:

- Cause the death of or injury to a person
- Cause significant property damage
- Cause significant disruption to the community
- Involve a transmission lineInvolve an imminent risk of electrocution[4]

Frequency and timeliness of reporting requirements varies depending on the nature and severity of the incident. An electrical incident may be classified under the following categories according to ESV's reporting guidelines[5]:

- Serious electrical incident requiring 48 hour notification
- Serious electrical incident only requiring 20 day reporting
- Monthly incident reporting – outages and vegetation inspection
- Quarterly incident reporting – non-serious electrical incidents
- Annual reporting – risk management review and summary of audits

3.3 Regulator expectations - AER

CP/PAL operate under an incentive framework governed by the AER. In terms of network performance, the key metrics which the AER measures CP/PAL against are outlined in section 4.2 - Reliability of this document.

CP/PAL are required to make a submission every 5 years via the Electricity Distribution Price Review process, detailing our forecast work programs and efficient revenue requirements. Based on this regulatory proposal, the AER makes an assessment and determines the amount of revenue that CP/PAL can earn during the following five year regulatory control period.

Under the National Electricity (Victoria) Law, the AER can issue a RIN which requires CP/PAL to maintain detailed information in order to prepare and submit detailed RIN responses. There are currently four RINs which require responses to be submitted annually:

- Annual reporting RIN
  - Information is collected to allow the AER to monitor network business outcomes against the determinations, develop performance reports and prepare for future determinations.
- Fire-factor (F-Factor) RIN
  - Fire-start reporting to allow the AER to monitor network business outcomes against the determinations and prepare for future F-Factor determinations.
- Economic Benchmarking RIN
  - Information on asset categories is collected to enable benchmarking analysis of the network business and to allow the AER to prepare for future determinations.
- Category Analysis RIN
  - Information on asset categories is collected to enable benchmarking analysis of the network business and to allow the AER to prepare for future determinations.

[3] Energy Safe Victoria "Electrical Infrastructure Safety – Electrical Incident and Safety Reporting Performance Guidelines" (2016)

[4] Energy Safe Victoria "Electrical Infrastructure Safety – Electrical Incident and Safety Reporting Performance Guidelines" (2016)

[5] Energy Safe Victoria "Electrical Infrastructure Safety – Electrical Incident and Safety Reporting Performance Guidelines" (2016)

In conjunction with the ESC, the AER are responsible for ensuring CP/PAL's ongoing compliance with the requirements of our Electricity Distribution Licence , the National Electricity Rules and the Electricity Distribution Code.

Information is regularly delivered to the ESC and AER to demonstrate how we comply with our Electricity Distribution Licence and is independently audited by the AER and the ESC. As a condition of our licence, we are required to comply with a number of Rules, Acts, legislative instruments, codes and guidelines. The AER and ESC conducts periodic compliance audits to ensure we are operating within these requirements.

3.4 Shareholder expectations

CP/PAL's shareholders expect a fair rate of return on their investments.

CP/PAL are owned by Cheung Kong Infrastructure Ltd (CKI) and Power Assets Holdings (PAH) (51% combined) and Spark Infrastructure (49%).

Both CKI and PAH are members of the Cheung Kong Group of companies and are listed on the Hong Kong Stock Exchange. In Hong Kong alone, members of the Cheung Kong Group included eight listed companies with a combined market capitalisation of around HK$750 billion. The Group operates in 53 countries and employs about 260,000 people worldwide.

The remaining 49 per cent of CP/PAL is owned by Spark Infrastructure, a specialist infrastructure group publicly listed on the Australian Stock Exchange. The group's objective is to invest in regulated utility infrastructure in Australia and overseas.

Spark Infrastructure is jointly managed by Cheung Kong Infrastructure (CKI) and RREEF Infrastructure. RREEF is the infrastructure investment arm of Deutsche Asset Management, the asset management business of Deutsche Bank AG. Deutsche Asset Management has $900 billion of funds under management in Australia and overseas.

Employment of diligent asset management practices which achieve least long term cost of operation of the networks supports CP/PAL's commitment to improving shareholder value.

3.5 Workforce/employee expectations

Technology advancements are continuing to influence a change in skillset requirements across the electricity industry. The advent of app-based technologies has changed the way we distribute, report and record information across our business and with this expanding use of technology comes a need to continue evolving the capabilities of our staff to develop and maintain these IT platforms.

Advanced metering infrastructure is now providing CP/PAL with more live information down to the customer supply level about how our network is operating and performing than has been available before. With more data now available, we are continuing to evolve our methods of evaluating and monitoring the condition and behaviour our assets.

As digital technology advancements continue to evolve, our employees will require ongoing support for training and development to expand their skillsets in order to successfully implement our asset management programs and systems going forward.

3.6 Summary of stakeholder requirements and expectations

The following table 2 summarises our stakeholder requirements and expectations.

Stakeholder	Requirements	Expectations

Stakeholder	Requirements	Expectations
Customers	Provision of electricity supply	Reliable supply for a reasonable price Efficient and targeted investment across our networks Pay close attention to safety and maintenance Invest in activities that reduce risk of fire danger Forward and proactive planning to ensure the resilience, capacity and capability of the network Implement smart grids to enable choice and flexibility, and alleviate pressure on existing networks Facilitate connection of renewable energy sources Greater access to readily understandable information about their electricity usage
Regulators (AER, ESV, ESC)	Compliance with: • National Electricity Rules (NER) • National Electricity Law (NEL) • Periodic application for revenue requirement assessment (EDPR) Submissions of: • Regulatory Information Notice reporting • Network Performance Reporting • ESMS	Efficient investment in the operation and use of the electricity services for the long term interests of electricity consumers with respect to: • Price • Quality • Safety • Reliability • Security of supply • Cost & value • Customer engagement • Innovation & technology • Information management
Shareholders	Strong governance Return on investment Safety performance Reliability performance	Responsible and efficient asset management to ensure positive returns on investment
Employees	Skills development and knowledge transfer Succession planning	Support for training and development to promote workforce stability and knowledgeable personnel to deliver enhanced asset management that aligns with the corporate strategic pillars Engagement with the business towards continuous improvement

Table 2: Stakeholder requirements

4 Network status

The status of CP/PAL's networks will be described in this section in terms of approaches to network safety, reliability, asset age and condition, future demand profiles, expected connections and associated augmentation planning and expenditure. The context provided in this section will provide the basis for identification of key opportunities and strategies.

4.1 Safety

CP/PAL's Network Safety Policy[6] clearly states our electricity safety commitments with regard to how we manage our electricity networks. The health and safety of all employees, contractors, customers and the general public is CP/PAL's highest priority[7]. CP/PAL are committed to minimising the safety risks of its electricity supply networks as far as practicable[8]:

- The hazards and risks to the safety of any person arising from the electricity supply network
- The hazards and risks of damage to the property of any person arising from the electricity supply network; and
- The bushfire danger arising from the electricity supply network.

Implementation of the Network Safety Policy is demonstrated within the ESMS and Safety Case documents.

CP/PAL's ESMS demonstrates how risks arising from the electricity networks are minimised as far as practicable throughout the key network activities of design, construction, commissioning, operations, maintenance and decommissioning. These activities are consequently considered risk mitigation controls under the ESMS. ESMS outputs are used to inform decision-making within the Asset Management System, forming part of the strategies and plans for the management of network assets.

The status of the CP/PAL networks in terms of safety performance, and three main areas of asset failure, bushfire mitigation and public safety will be outlined in the following sections.

4.1.1 Safety performance

CP/PAL's network safety performance outcomes are monitored on a periodic and event basis, to identify improvement opportunities to be implemented via asset management policy or programs. Ongoing review ensures that network safety outcomes meet business expectations and that risk is minimised to as far as practicable levels.

In addition to regulatory reporting requirements of safety incidents outlined in section 3.2, monthly reporting of network safety incidents is completed at the CP/PAL management level. Incident reporting is compiled in terms of ESV reportable incidents and corresponding benchmarks based on historic six yearly average performance indices, as shown in Figure 3.

[6] Appendix 5 - CitiPower and Powercor – Network Safety Policy (March 2018)

[7] Appendix 6 - CitiPower and Powercor – Health and Safety Policy (January 2014)

[8] Appendix 5 - CitiPower and Powercor – Network Safety Policy (March 2018)

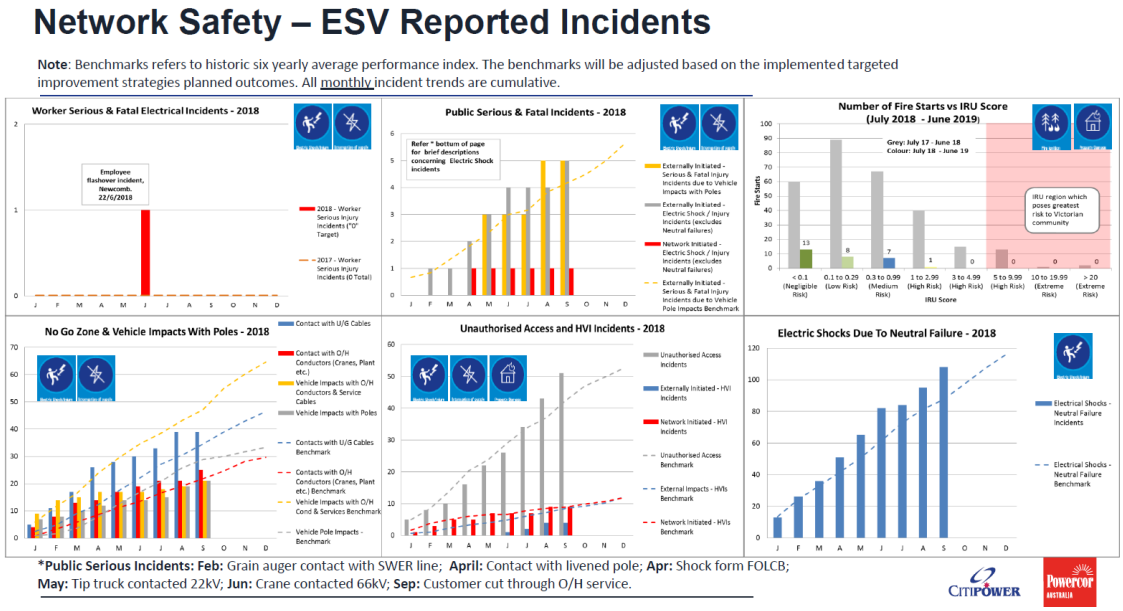


Figure 3 – Electricity Networks Network Safety monthly report (September 2018)[9]

In addition to safety issues, a range of other network performance and operational performance measures (e.g. supply reliability, asset failure rates, human errors, incident trends by causes/consequences, etc.) are undertaken. Data is sourced from the wider industry to identify possible trends in asset types or processes that could be improved.

4.1.2 Public safety

CP/PAL interact with a wide range of stakeholders in the broader community over a variety of interests and concerns. As a provider of an essential infrastructure service it is pivotal that CP/PAL operate its diverse asset population in a safe and sustainable manner in order to continue to meet the needs of the community. Company culture is a key linkage between the way CP/PAL's activities are conducted and impact that this has on the community.

- Our company values underpin everything that we do, and provide us an even greater focus to understanding and supporting our customers[10]:
- Live safely
- Be customer and community minded
- Succeed together
- Be the best you can be
- Improve our business

Our safety regulator ESV has a strong emphasis on compliance and consequently the ESMS is designed to achieve compliance with all reasonable national and state statutory requirements including safety needs of employees and the wider community relating to the electricity networks. This scheme is a reflection of the commitment to corporate social responsibility and risk mitigation approach that CP/PAL applies in its activities.

[9] Refer Appendix 1 for larger version

[10] CP/PAL - Electricity Safety Management Scheme

As outlined in section 3.2 of this document, CP/PAL are required to report on public safety incidents to ESV. Public safety incidents are reported in two main categories: asset failure and external interference. Historic annual reporting volumes are provided in Figure 4.

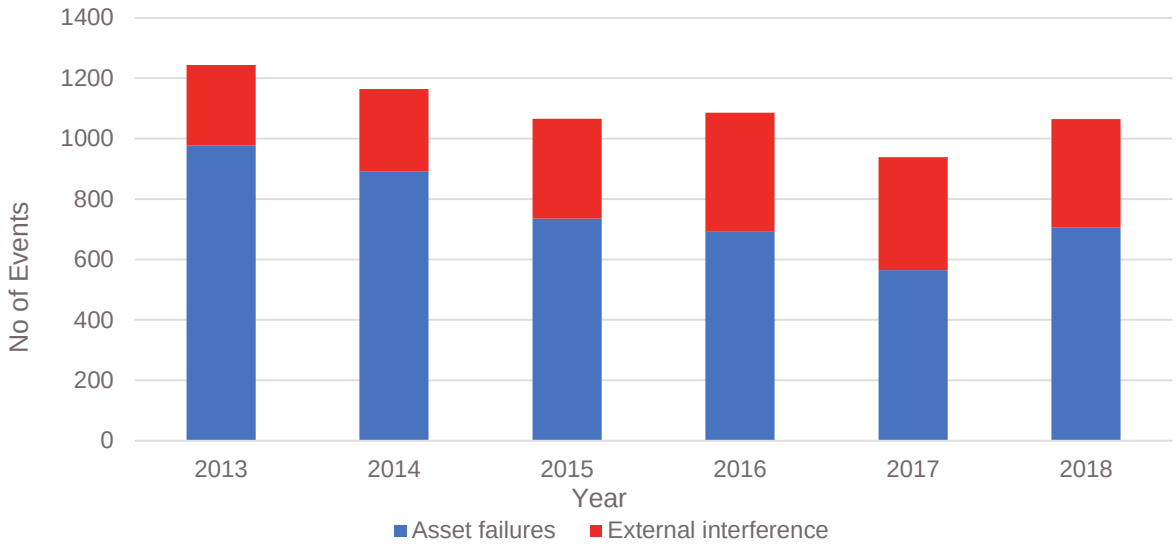


Figure 4: CP/PAL safety incident reporting by year

Source: ESV reportable safety incidents

Asset failure reportable incidents involve any asset failures with a potential public safety impact (including asset failures resulting in asset fire, ground fires, and no fire start). Reportable incidents involving external interferences include vehicle impacts, No Go Zone infringements, unauthorised access and fire starts caused by animal, tree and third party contacts.

4.1.3 Asset failures

Section 3.2 of this document outlined ESV's requirement for CP/PAL to report on serious safety incidents. Asset failures are a subset of these reportable incidents. Annual volumes of safety incidents resulting from asset failure are shown in figure 5. This data excludes failures due to external interference (eg. vehicle into pole).

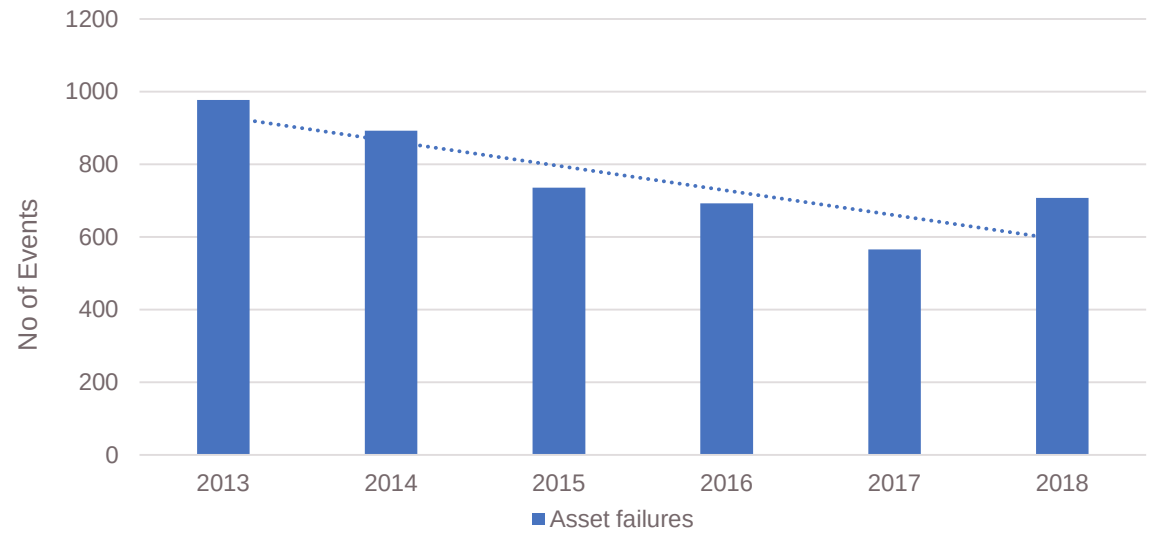


Figure 5: Reportable safety incidents resulting from asset failure by year

Source: ESV reportable safety incidents

Since 2013, the annual rate of asset failure related incidents has been declining as shown in figure 5. CP/PAL completed its first cycle of the 2.5 year asset inspection program in 2013, following changes implemented to the cyclic asset inspection program resulting from VBRC outworkings. In terms of the asset population, the main driver of this downward trend is due to an overall reduction in crossarm failures, compared to the performance of the remaining asset groups which were relatively stable over this time.

Influences on crossarm failure volumes include the introduction of shorter inspection cycles leading to improved rates of defect identification prior to crossarm failure, as well as the reduction of the wood crossarm population as the asset is replaced with steel crossarms under current CP/PAL standards.

Weather patterns remain a significant contributing risk factor to asset performance, with potential for increased volumes of pole-fires due to specific weather conditions which consequently contribute to increases in asset failure incidents. This presents ongoing challenges for CP/PAL in managing asset performance, given the unpredictable nature of weather patterns.

4.1.4 Bushfire mitigation

The Powercor Bushfire Mitigation Plan has been developed to minimise the risk of fire starts from its electrical assets as far as practicable by complying with legislative and regulatory requirements, whilst allowing flexibility within the business to encourage innovation, continuous improvement and the efficient use of resources[11].

The objectives of the Bushfire Mitigation Plan are[12]:

- Minimise the risk of fire starts from electrical assets
- Achieve compliance with the relevant legislative and regulatory requirements while providing flexibility within the business to encourage innovation, continuous improvement and the effective use of resources
- Define the companies approach to the management of the risk of bushfires caused by electricity assets
- Reference the policies and procedures relating to bushfire mitigation activities into one document
- Demonstrate a high level of commitment to meeting bushfire mitigation responsibilities

Powercor's bushfire mitigation framework is illustrated in Figure 6and demonstrates a comprehensive and whole of business approach to what is the biggest risk in the business[13].

[11] CP/PAL – 2017 Bushfire Mitigation Plan (pg 11)

[12] CP/PAL – 2017 Bushfire Mitigation Plan (pg 11)

[13] CP/PAL – 2017 Bushfire Mitigation Plan (pg 12)

Figure 6: Bushfire mitigation framework[14]

Section 113A (1) of the Electricity Safety Act 1998 (incorporating amendments as at 1 January 2012) requires that a major electricity company prepare and submit for acceptance a plan to ESV for the company's proposals for mitigation of bushfire in relation to the company's supply network at the end of each 5 year period[15].

The proactive planning and scheduling of this program is based principally on a whole of asset life approach that includes design, construction, operation, maintenance and removal. The annual governance systems of vegetation, asset inspection and maintenance activities are supported by a regime of reporting and auditing.

Approximately 51% of Powercor's network assets are located in HBRA. Electricity networks have been a source of fire ignition since their construction and consequently a considerable amount of investigation has been and continues to be undertaken into the causes of fires to enable preventative actions to be taken.

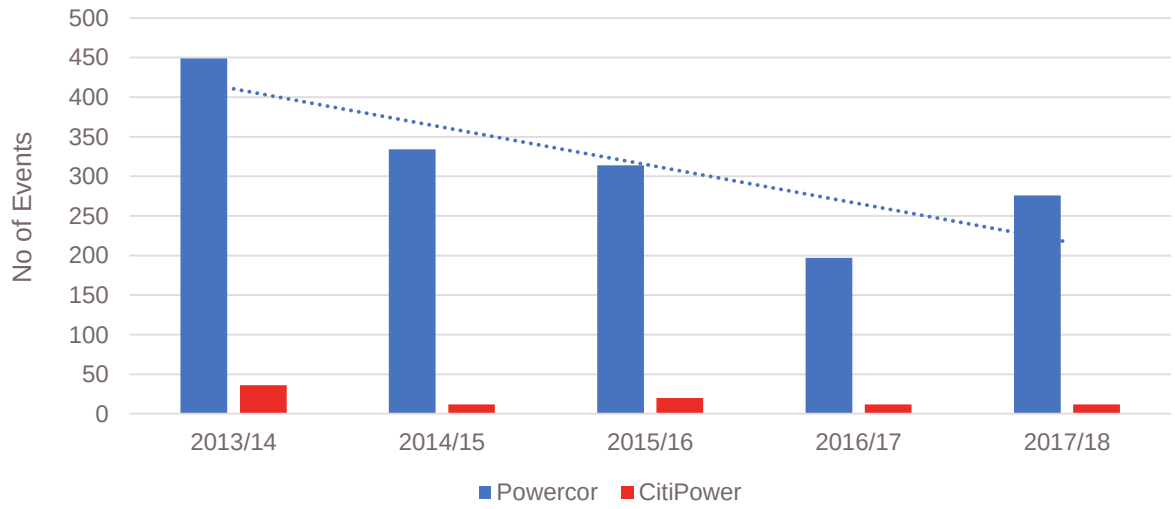


Figure 7: Fire starts

Source: ESV reportable safety incident data

[14] CitiPower and Powercor – 2017 Bushfire Mitigation Plan

[15] CitiPower and Powercor – 2017 Bushfire Mitigation Plan

A downward trend in asset failures corresponds to the declining trend in fire starts shown in Figure 7. CP/PAL have invested significantly in improvement programs to reduce fire start risk, including changes to standard materials, implementing faster protective equipment and targeted asset and vegetation management program improvements. In response to the VBRC, a program is underway to install Rapid Earth Fault Current Limiters in 22 Powercor zone substations to further reduce the risk of bushfires and fire starts. Installation at Gisborne, Woodend and Camperdown is complete with the remaining 19 due for completion by 2022.

4.2 Reliability

CP/PAL are subject to a range of reliability measures and standards. Under the Service Target Incentive Performance Scheme (STPIS), the key metrics to which DNSPs are incentivised include:

- System average interruption duration index (SAIDI):
  - Unplanned SAIDI calculates the sum of the duration of each unplanned sustained customer interruption (in minutes) divided by the total number of distribution customers. It does not include momentary interruptions that are one minute or less.
- System average interruption frequency index (SAIFI):
  - Unplanned SAIFI calculates the total number of unplanned sustained customer interruptions divided by the total number of distribution customers. It does not include momentary interruptions that are one minute or less. SAIFI is expressed per 0.001 interruptions.
- Momentary average interruption frequency index (MAIFI):
  - Calculates the total number of momentary interruptions divided by the total number of distribution customers (where the distribution customers are network or per feeder based, as appropriate).
  - While not a specific measure under the STPIS scheme, the customer average interruption duration index (CAIDI) is derived by dividing SAIDI by SAIFI. CAIDI represents the average amount of time a distribution business would take to restore supply once an interruption has occurred[16].

The following tables show the reliability service targets set by the AER for CitiPower and Powercor in it's Distribution Determination dated May 2016.

[16] AER – Explanatory statement – Draft amended service target performance incentive scheme (December 2017)

Feeder	Parameter	AER target (2016 – 20)[17]
CBD	SAIDI	9.130
	SAIFI	0.129
	MAIFI	0.005
	CAIDI (derived)	70.775
Urban	SAIDI	32.696
	SAIFI	0.484
	MAIFI	0.152
	CAIDI (derived)	67.554

Table 3 – CitiPower reliability service targets (2016–20)

Source: CitiPower distribution determination (AER, May 2016)

[17] 2021-2026 targets will be available following EDPR determination in 2020

Feeder	Parameter	AER target (2016-20)[18]
Urban	SAIDI	83.111
	SAIFI	1.047
	MAIFI	1.184
	CAIDI (derived)	79.380
Rural Short	SAIDI	113.191
	SAIFI	1.096
	MAIFI	2.678
	CAIDI (derived)	103.276
Rural Long	SAIDI	235.026
	SAIFI	1.976
	MAIFI	4.338
	CAIDI (derived)	118.940

Table 4 –Powercor reliability service targets (2016–20)

Source: Powercor distribution determination (AER, May 2016)

[18] 2021-2026 targets will be available following EDPR determination in 2020

4.2.1 Historic performance

The historic performance of CitiPower against its service reliability targets are shown in Figure 8.

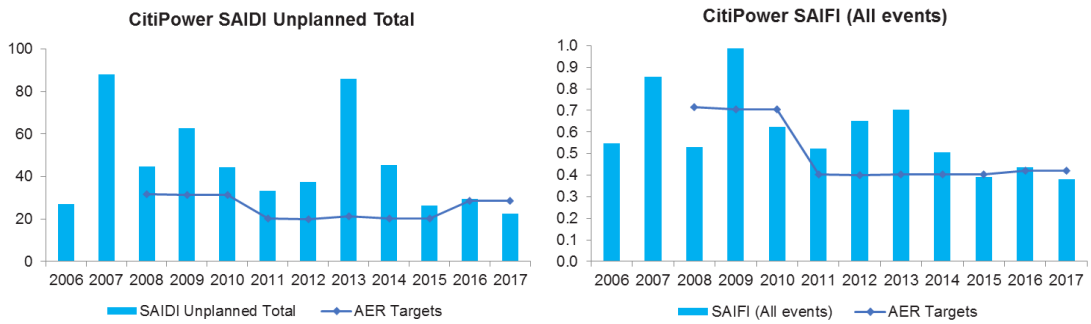


Figure 8: (a) CitiPower reliability performance – SAIDI and SAIFI

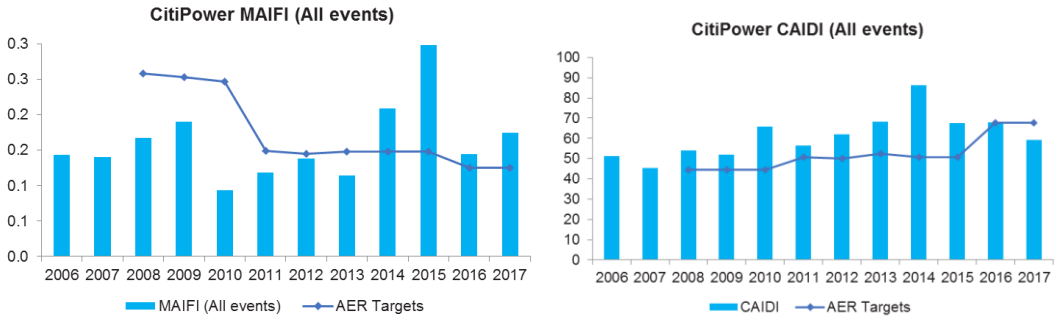


Figure 8: (b) CitiPower reliability performance – MAIFI and CAIDI

The historic performance of Powercor against it's service reliability targets are shown in Figure 9.

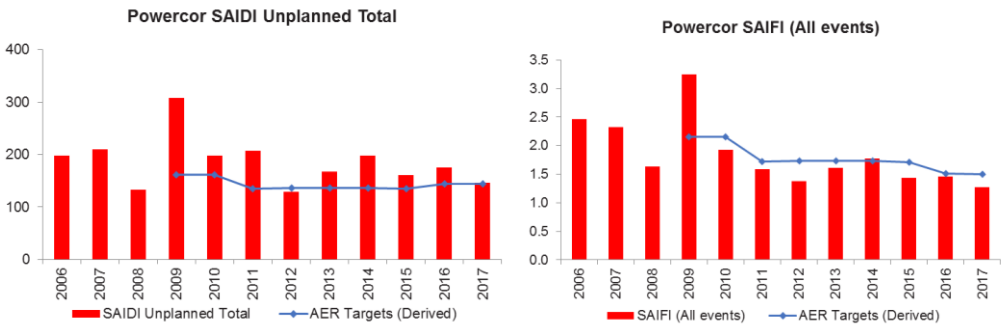


Figure 9: (a) Powercor reliability performance – SAIDI and SAIFI

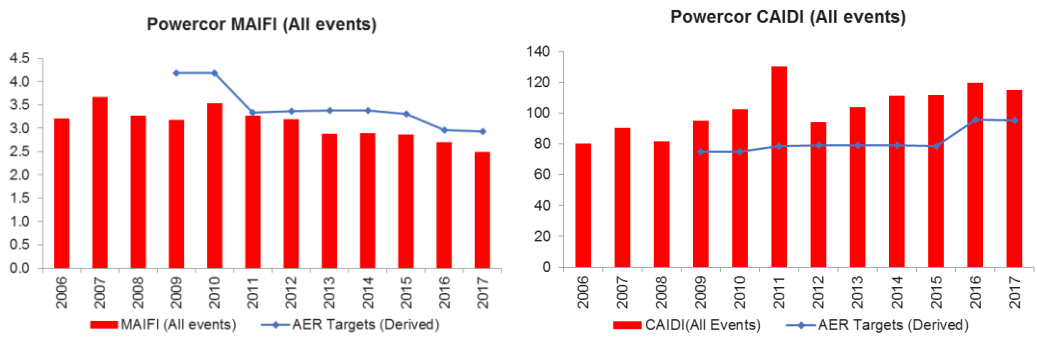


Figure 9: (b) Powercor reliability performance – MAIFI and CAIDI

4.3 Age and condition

There are many ageing assets within the CP/PAL networks. Figure 10 shows the overall asset age profile on the CP/PAL networks. Approximately 45% of in-service network assets were installed between 1963 and 1988 (age range 29 – 55 years).

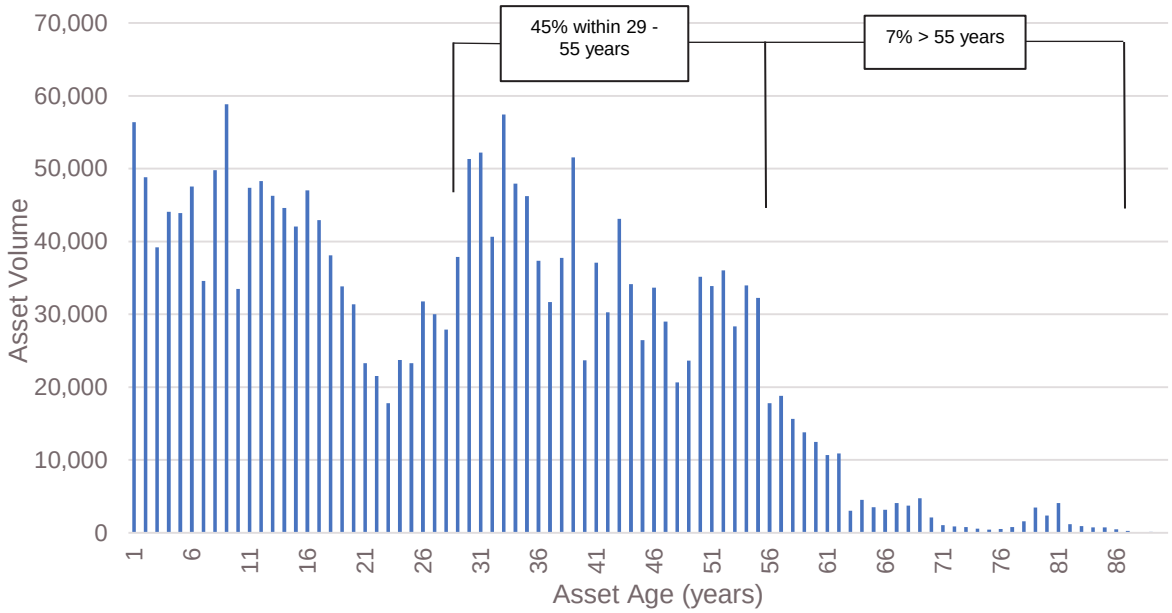


Figure 10: Asset age profile

Source: RIN 2018 Age of population

The age profile of overhead and underground lines is shown in figure 11. Across CP/PAL, 63% of overhead conductors fall within the age range of 29 – 55 years, with 16% of the conductor population over 55 years. Consequently this portion of the asset population is approaching or at the mature end of the asset life expectancy and will require an increasing focus as the bulk of the overhead conductor population continues to mature.

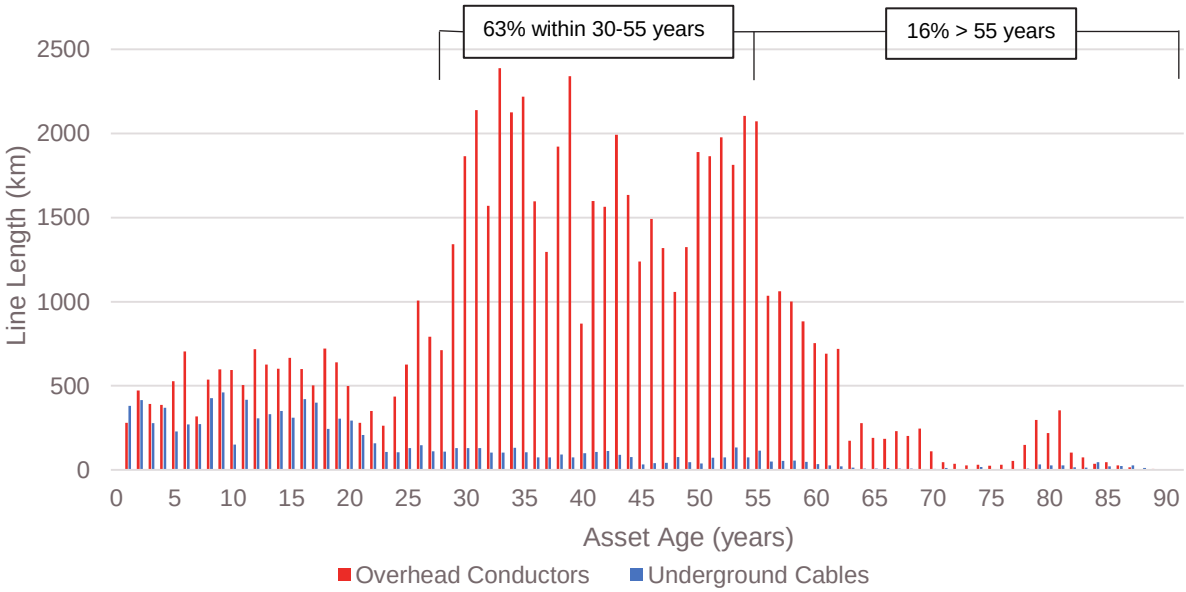


Figure 11: Overhead and underground lines age profile

Source: RIN 2018 Age of population

As the majority of the asset base continues to age, increasing asset replacement in various asset classes will be required to ensure safety and reliability is maintained. The increasing uptake of renewable and storage technologies and corresponding impact of altered network demand profiles may present challenges going forward in terms of asset replacement. Justification of long term capital investments could become increasingly difficult due to changing network usage profiles, which accordingly will have a direct impact on how CP/PAL manage their assets going forward and may require changes to asset and risk management practices.

Assets that continue to operate up to and beyond the economic life expectancy of the asset are comparatively efficient in a life-cycle sense, however these assets also have a greater likelihood of defect/failure and therefore must be managed appropriately. Figure 12 shows the percentage of the asset base that is at or above 85% of the economic life of the asset class.

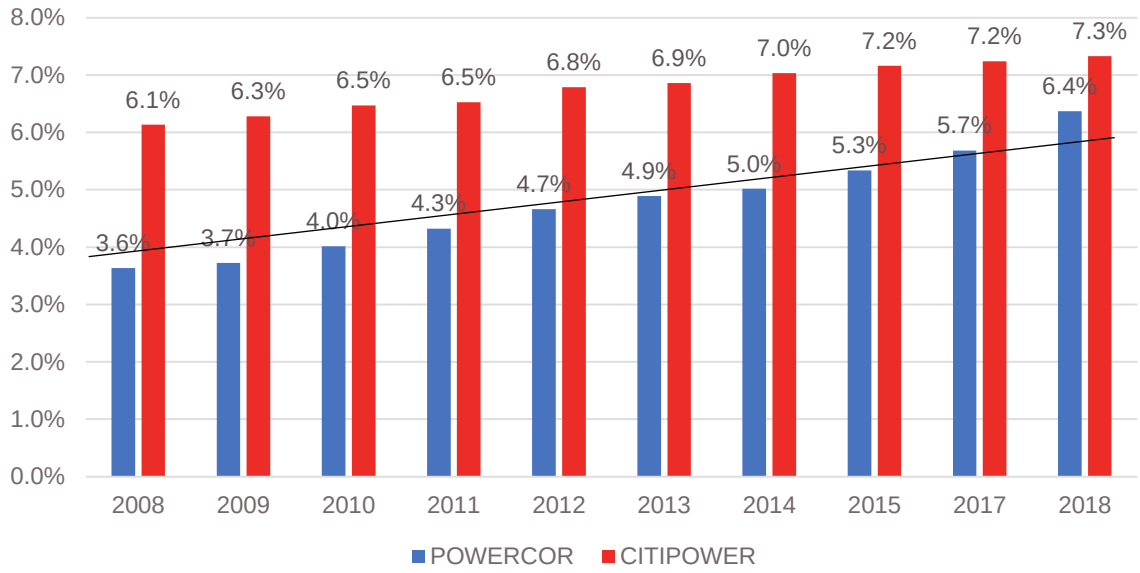


Figure 12: Asset base at 85% of economic life

Source: CP/PAL RIN 2018

As demonstrated in figure 12, a steady increase is evident from year to year in the volume of assets reaching or exceeding 85% of the economic life of the asset, further validating that CP/PAL's asset base is continuing to mature over time. Existing asset management practices of programmed inspection and condition monitoring ensure that the aging assets are being monitored, and as such there are no specific targets in place to constrain the volume of assets reaching this maturity level. As the percentage of the asset population at this level of maturity continues to grow, it follows that the introduction of additional condition monitoring and risk management approaches will be required to maintain performance levels, and annual asset replacement volumes are likely to increase with time. Therefore there will be an increasing focus on predicting future asset replacement profiles, to ensure that corresponding resource planning forecasts are proactively adapted to meet additional maintenance needs.

4.4 Asset utilisation

The extent to which CP/PAL utilise their assets has an important influence on the management of those assets. Utilisation on the Powercor network has been estimated at approximately 68%, while CitiPower is estimated at 53%, which represents the extent to which the assets are being loaded in terms of their capacity/rating.

Asset	CitiPower	Powercor
Subtransmission lines[1]	63%	59%
Distribution HV feeders[1]	63%	72%
Zone and subtransmission substations[2]	53%	68%
Distribution substations and low voltage	48%	53%
Overall network[2]	53%	68%

Table 5: Network utilisation

Source: 1. 2018 Network Planning & Development reporting, 2. 2018 RIN, 3. 2018 AMI data

In terms of capital investment alone, it may be considered reasonable to run the assets as close to their capacity as possible, to validate the basis for the installed capacity of the asset and also defer augmentation expenditure. However, from an asset management perspective this is usually not the case once the ongoing maintenance requirements are taken into consideration. The heavier the assets are loaded, the more maintenance investment is required at shorter intervals to ensure that the asset is maintained in a serviceable and reliable condition. Shorter maintenance intervals necessitate more frequent access to assets; however the flow on effect of heavily loaded network assets is reduced flexibility to reconfigure the network for access without outages. The resultant impact can be more frequent customer outages in order to access the assets for maintenance.

There is a balance to be struck between asset utilisation levels and maintenance requirements, and accordingly it is important to consider asset utilisation from a complete asset management perspective.

The ongoing impacts of renewables, storage technologies, community expectations of energy efficiency and changing network demands may influence our ability to justify asset replacements going forward. Any resultant reduction in network demand due to these influences will present challenges in justifying capital investment, and may influence the future approaches to asset management by CP/PAL going forward.

4.5 Future demand, connection and augmentation requirements

CP/PAL's DAPRs provide an overview of the current and future network changes. The DAPRs are aligned with the requirements of the National Electricity Rules (NER) and compliment AER data reporting requirements and also form a valuable input to the EDPR process.

The DAPRs set out the following information:

- forecasts, including capacity and load forecasts, at the zone substation, subtransmission and primary distribution feeder level;
- system limitations, which includes limitations resulting from the forecast load exceeding capacity following an outage, or retirements and de-ratings of assets;
- projects that have been, or will be, assessed under the regulatory investment test; and
- other high level summary information to provide context to CP/PAL's planning processes and activities.

The network planning standards and criteria applied in the development of the network are a significant decision point in terms of network-related costs. CP/PAL ensure that network investment is optimised against regulatory obligations, safety, demand expectations, asset availability and functionality.

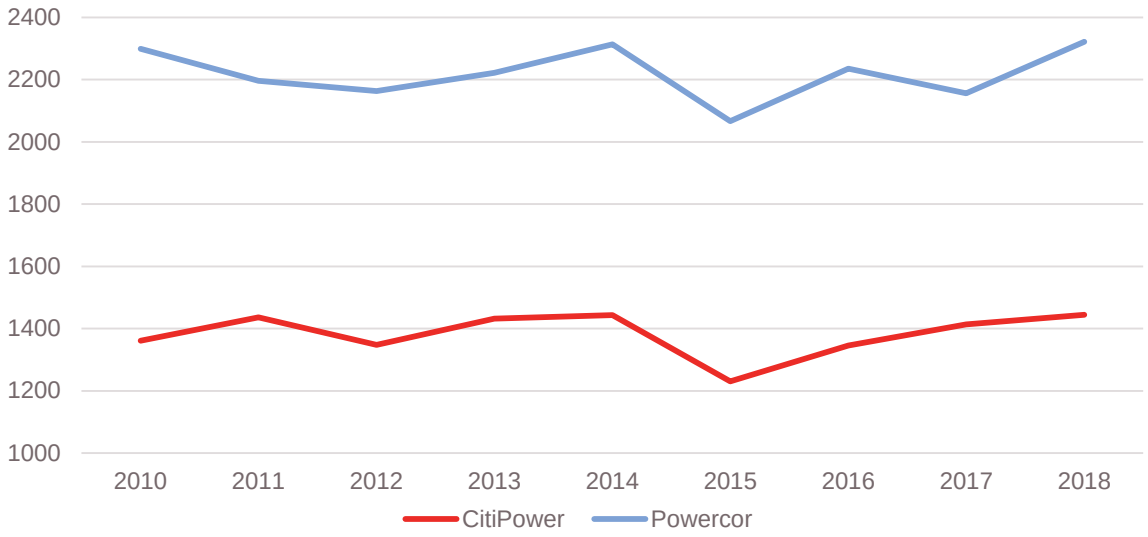


Figure 13: Network maximum demand (MW)

Source: CP/PAL RIN 2009 - 2018

CP/PAL use a risk based probabilistic planning approach to plan the sub-transmission and distribution networks. Studies are performed to assess the amount of load that would not be supplied if a network element becomes unavailable (out of service). This approach has the potential to defer significant augmentation expenditure compared to using a strict deterministic standard.

The probabilistic planning approach involves consideration of the likelihood of a plant outage coinciding with the peak loading season and the consequence of that outage. The approach assesses:

- the expected cost that will be incurred if no action is taken to address an emerging constraint, and therefore whether it is economic to augment the network capacity to reduce expected supply interruptions.
- the potential costs and other impacts that may be associated with very low probability events, such as single or coincident transformer outages at times of peak demand, and catastrophic equipment failure leading to extended periods of plant non-availability; and
- the availability and technical feasibility of cost-effective contingency plans and other arrangements for management and mitigation of risk.

CP/PAL undertake annual load forecasting for the next ten year period, using the latest summer and winter maximum demands for terminal stations, zone substations, and distribution feeders. The forecast is based on a 50% probability of exceedance and takes into account the underlying load growth and step increases in customer demand. The forecasts are reconciled against an econometrically derived forecast of terminal station demand, and compared to network asset ratings to identify constraints. System modelling is used to determine voltage compliance to the Distribution Code. These studies when coupled with the risk based approach to planning are the basis for determining a ten year plan of projects which is updated on an annual basis.

Further information is available in CP/PAL's published Distribution Annual Planning Reports.

4.6 Asset Investment Strategy

The approach by CP/PAL to capital investment decision making will be outlined in this section in terms of how asset management expenditure decisions are made. An overview of the overall capital expenditure governance approach will also be provided.

The Asset Management System Framework provides the basis for network investment requirements and also supports the five yearly Electricity Distribution Price Review process. The process establishes revenue requirements, funded through customer network supply charges for the operation and maintenance of the network.

Asset investment decisions are informed by data analysis and in general seek to address a need in the following areas:

- Network augmentation for future demand
- Customer initiated works
- Asset replacement
- Reliability performance
- Bushfire mitigation
- Safety improvement

The network planning standards and criteria applied in the development of the networks are a significant determination on network-related costs. The process of network planning ensures asset investment is optimised against regulatory obligations, safety, demand expectations, asset availability and functionality. This process is articulated in further detail in section 4.5 - Future demand, augmentation and connection requirements.

4.6.1 Determining asset management replacement expenditure

CP/PAL assets are subject to ongoing condition assessment methods via planned inspection and monitoring programs. These programs have been developed taking in to account regulatory obligations and industry knowledge, as well as being proven and established asset management methodologies.

CP/PAL are working towards consolidating with two main asset management methodologies, the application of which depends on the nature of the specific asset. The two asset management methodologies are outlined in the following sections.

4.6.2 Reliability and safety based regime

The reliability and safety based regime is based on RCM principles, regulatory obligations and risk assessment. This approach is applied to routine replacement expenditure for high volume assets such as poles, pole top-equipment, cross-arms, insulators, batteries etc. The approach considers the asset age, condition and operating environment of the asset.

RCM principles are used to determine what should be done to ensure that our physical network assets continue to operate at their intended performance levels at an efficient cost. For each asset class, the RCM approach identifies possible ways in which a defect may occur with the asset, and the root cause of the defect. For each type of defect, consideration of the possible impact on safety, fire starts, operations and other equipment in the network is assessed and a maintenance strategy is determined which relies on routine inspection of the assets by trained Asset Inspectors.

The location and timing of replacement of high-volume assets is determined once inspections are carried out and if a defect is located. The severity of the inspected defect will determine the maximum time that can lapse before action is taken.

4.6.3 Condition Based Risk Management

CP/PAL apply the CBRM methodology to plan the replacement of major assets of plant and equipment which involve significant expenditure, such as zone substation transformers and switchgear. This method takes into account the risk of deterioration of major items of plant when assessing condition.

The model is an ageing algorithm that takes into account a range of inputs including:

- condition assessment data, such as transformer oil condition;
- environmental factors, such as whether the assets are located indoors or outdoors, or coastal areas;
- operating factors, such as the load utilisation, frequency of use and load profiles that the asset is supplying.

These factors are combined to produce a Health Index for each asset in a range from 0 to 10, where 0 is a new asset and 10 represents end of life. The Health Index provides a means of comparing similar assets in terms of their calculated probability of failure. A Health Index profile gives an immediate appreciation of the condition of all assets in a group and an understanding of the future condition of the assets.

As part of the CBRM process, a consequence of failure of the asset is also calculated. The risk to CP/PAL is calculated by combining the probability of failure and the consequence of failure of the asset. CBRM is used to calculate how the asset risk will change in future years and determine the optimum replacement time for an asset.

The outputs of the CBRM model are reviewed to identify the projects that deliver greatest risk reduction. This is determined by calculating the difference between the risk in a future year if the asset is not replaced, and the risk that would result if the plant was replaced, then assessing the various options to deliver optimal risk reduction.

While the CBRM method identifies a proposed year for replacement of an asset, the project is then reviewed in conjunction with other augmentation and development plans in order to identify opportunities for synergies, such that the replacement schedule can coincide with other major works. The project is accordingly captured within a future works plan.

CP/PAL are developing a value based framework for use in portfolio prioritisation, which will consider the following elements that can contribute to the overall value of an investment:

- Risks mitigated by an investment
- Consequences of a given risk, with no mitigation
- Financial impacts such as cost savings
- Overall cost of the investment

CBRM outputs will feed into the value framework, which is discussed in more detail in section 4.6.5 - Portfolio optimisation.

4.6.4 Network Safety Risk

Under the ESMS, CP/PAL have an obligation to manage the safety of its electricity supply networks to minimise risk as far as practicable (AFAP).

AFAP means having regard to:

- the severity of the hazard or risk in question;
- the state of knowledge about the hazard or risk and any ways of removing or mitigating the hazard or risk;
- the availability and suitability of ways to remove or mitigate the hazard or risk; and
- the cost of removing or mitigating the hazard or risk. [19]

Hazards associated with the design, construction, commissioning, operation, maintenance and decommissioning of electrical networks are managed by eliminating safety risks as far as practicable.

The safety performance of CP/PAL's network is continually monitored and reviewed through bi-annual risk profiling[20]. The outcomes of these reviews, plus system audits and incident investigations are critical inputs when undertaking Formal Safety Assessment (FSA) workshops[21]. Risks identified during these workshops are captured in the ESMS risk register.

[19] CP/PAL Final Safety Case 2017 (page 10)

[20] CP/PAL Enterprise Risk Management Policy

[21] CP/PAL - Electricity Safety Management Scheme

FSAs involve assessment of electricity network risk with specific focus on the safety of employees, contractors and the public. The Formal Safety Assessment ESMS FSA Monitoring and Review Procedure involves:

- Establishing the risk context
- Identification of significant risks
- Assessment of risks
- Determination of risk control measures

Bushfire Mitigation and Electric Line Clearance requirements are included in the FSA reviews. Associated inputs include any assessed environmental changes that have occurred since the last review. Implementation of individual control improvements are also considered during the on-going network safety performance reviews to evaluate the effectiveness of the improvement actions.

The outcomes of the ESMS FSA and Bushfire Mitigation reviews assist in the development of improved asset management strategies, which consequently will influence capital expenditure planning.

4.6.5 Portfolio optimisation

CP/PAL have historically used an optimisation tool to determine the project investments that maximise strategic value with an acceptable risk exposure and for minimum cost, with due consideration of reliability and/or mandatory investment constraints.

CP/PAL are refreshing this approach and are implementing a new value framework comprising a set of measures that will form the basis for quantitatively prioritising investments. The value framework is being used to configure the Copperleaf C55 asset planning and investment tool to facilitate the quantitative prioritisation of investments going forward.

The value framework will take into consideration our strategic goals and the scope of the investments, based on existing data. All projects in the portfolio will be valued and optimised against a value function. The value function is a weighting of several value measures that are grouped into broader categories and are aligned with the organisation's strategic and operational objectives. The value measures being used in the CP/PAL value framework include the following considerations:

- Implementation cost
- Opex impact
- Capex impact
- Potential revenue
- Compliance risk
- Employee utilisation
- Customer risk
- Safety risk
- Bushfire risk
- IT security risk
- Environmental risk
- Reliability
- Asset risk
- Financial risk

For all of the above values, the 'value' has been defined as either a benefit to the customer and/or CP/PAL.

4.6.6 Capital investment governance

CP/PAL's Capital Investment Governance Policy outlines the business requirements which ensure that the appropriate governance and controls are applied when making capital investment decisions. A brief summary of the governance approach applied within CP/PAL is provided in this section.

Under the Capital Investment Governance Policy, projects must comply with the CP/PAL portfolio and projects controls framework. The control framework includes four stages and three approval gates, outlined in Figure 14 below. This framework applies to larger and more complex projects within the business. At each gate, there are specific approval requirements and decision outcomes.

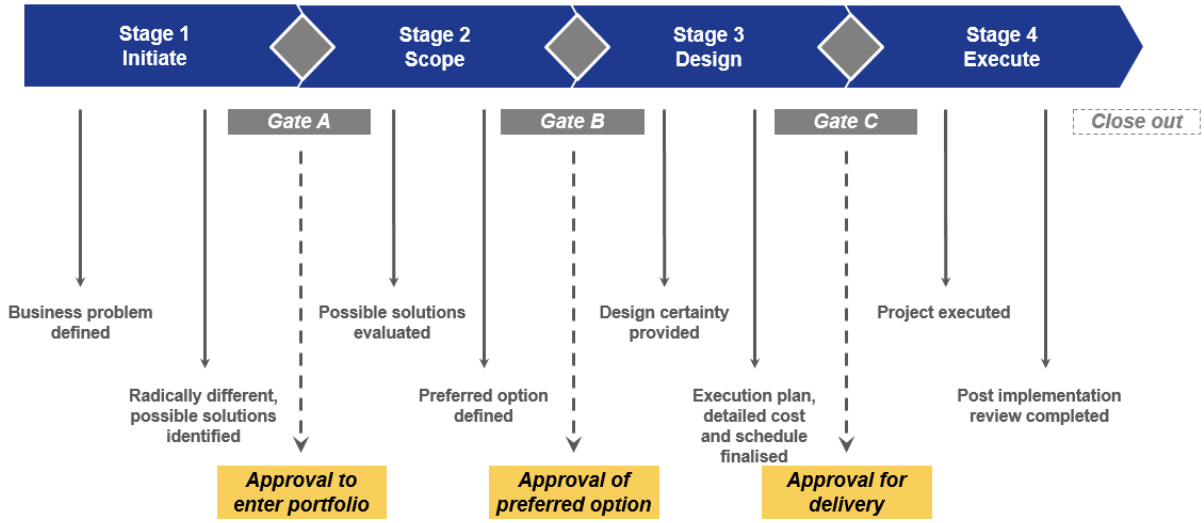


Figure 14: CP/PAL Portfolio and Projects Controls Framework

Smaller projects are subject to approval according to budget provision and the relevant delegation of authority in line management.

Further detailed information on CP/PAL's capital investment governance is available in the Capital Investment Governance Policy and the Portfolio and Projects Controls Framework.

4.7 Capital and recurrent expenditure

A breakdown of CP/PAL's capital and operating expenditure along with corresponding trends and asset management implications are provided in the following sections.

4.7.1 Capital expenditure

Network CAPEX investment covers the necessary activities for construction, augmentation, and replacement of CP/PAL network assets. Network CAPEX can be summarised into replacement, connections, augmentation and non-network categories.

Replacement capital expenditure relates to network asset replacements, and is largely driven by asset condition and performance. Asset replacement expenditure may also be driven by regulatory and compliance requirements, in particular bushfire mitigation and health and safety improvement programs. The installed asset profile varies across the CP/PAL network due to environmental and geographic influences on asset design and performance, and accordingly lines asset replacement expenditure varies year on year due to the cyclic nature of the asset inspection program targeting different geographic regions. Programmed major plant replacements along with significant outworking of government mandated programs to replace/upgrade assets in HBRA and bushfire construction areas are key drivers of annual network CAPEX.

Connections capital expenditure encompasses customer-initiated connections for new residential, commercial and industrial premises, and customer-requested augmentation works. Connections CAPEX is driven by in high voltage large capacity and small capacity embedded generation connections on the Powercor network, and high voltage and subtransmission augmentations driven by residential developments and commercial/industrial customer requirements.

Augmentation capital expenditure is driven by both network performance and demand growth. Performance related expenditure typically relates to reliability and safety improvements, while demand expenditure is driven by increasing network demand resulting in network capacity increase to ensure delivery of peak network demands. Examples of non-demand driven augmentation capital expenditure includes works to address security of supply

of the Melbourne CBD, and to install Rapid Earth Fault Current Limiters to reduce the bushfire start risk in the Powercor network.

Non-network capital expenditure relates to investments in property, and major non-network assets including vehicle fleets and major depot upgrades.

4.7.2 Operating expenditure

CP/PAL's maintenance OPEX covers the necessary operational activities for vegetation management, mainteance, emergency response, public lighting and alternative control services associated with CP/PAL network assets.

Maintenance operating expenditure represents CP/PAL's operational outworking of its periodic and condition based maintenance under the asset maintenance program. Asset replacement expenditure of a capital nature is excluded from these figures as it is captured in replacement capital expenditure in table 6. The maintenance program includes routine testing and asset inspection; extensive condition monitoring under this program enables the life extension of many assets beyond the nominal operating life of the given asset. Annual variations in maintenance expenditure are attributed largely to the cyclic nature of the program, and variation in network area coverage from year to year resulting in changing maintenance requirements.

CP/PAL have in place staff availability rosters to respond and repair faults at all network levels 24 hours a day, 7 days a week. This includes zone substation, distribution equipment and customer premises. Emergency response expenditure is influenced by network equipment performance, extreme weather/storm events and external influences (eg. vehicle impacts), which results in variable expenditure from one year to the next as a consequence.

Public lighting operating expenditure represents costs associated with inspection and monitoring of public light lamps/lanterns and pole infrastructure. The recent downward trend in OPEX associated with public lighting coincides with the introduction of LED energy efficient lighting; significant volumes of older public lights have been replaced with new LEDs under numerous council-driven replacement programs, resulting in much of the older equipment being removed/replaced prior to a potential failure of the asset. Improvements in public lighting management systems have also resulted in OPEX efficiencies associated with programmed replacements, whereby recently replaced assets are now more readily identifiable and excluded from maintenance replacements. As the population of LED lights on the network matures, operating and capital expenditure profiles associated with public lighting maintenance and replacements are expected to change as a result of differences between the LED technologies and legacy lighting equipment.

Operating expenditure relating to alternative control services represents contract commitments with customers based on pre-determined schedules of rates, including services provided by CP/PAL for truck visits, new connections, disconnections and reconnections at the request of customers and retailers.

4.7.3 CP/PAL's benchmarked position

Under the National Electricity Law (NEL) and NER, the AER regulates electricity network revenues with the goal of ensuring that consumers pay no more than necessary for the safe and reliable delivery of electricity services[22]. The AER has established a benchmarking program to measure the relative efficiency of all electricity networks in the National Electricity Market; the NER requires the AER to have regard to network benchmarking results when assessing and amending CAPEX and OPEX allowances[23] for network businesses.

[22] AER Annual Benchmarking Report – Electricity distribution network service providers 2019 (page 5)

[23] AER Annual Benchmarking Report – Electricity distribution network service providers 2017 (page 20)

The AER use a productivity index called the multilateral total factor productivity (MTFP) that relates total inputs to total outputs, and provides a measure of overall network efficiency relative to other networks[24]. The MTFP is used to compare total productivity levels between networks. Figure 16 shows the individual DNSP MTFP results from 2006 – 2018 and Table 8 shows the change in rankings between 2017 and 2018.

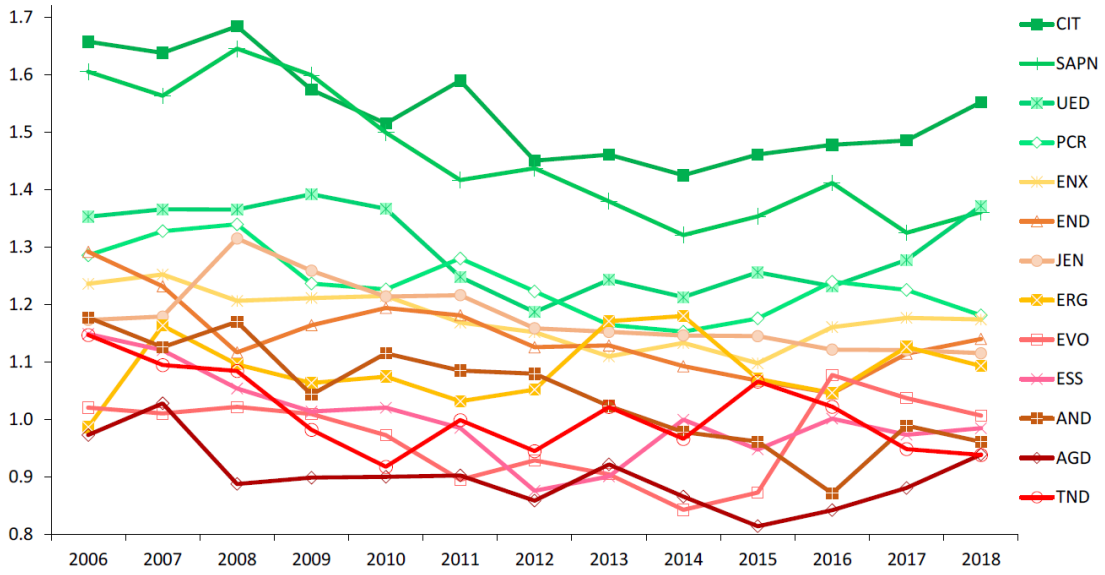


Figure 16: AER benchmarking – MTFP by individual DNSP, 2006 - 2018[25]

CitiPower continued to be the best performing DNSP, remaining in first place. The AER notes that CitiPower and Powercor have consistently rated in the top four most productive distribution service providers in the NEM.

[24] AER Annual Benchmarking Report – Electricity distribution network service providers 2017 (page 16)

[25] AER Annual Benchmarking Report – Electricity distribution network service providers 2019 (page 14)

DNSP	2018 Rank	2017 Rank	Change (2018)	Annual Change (2012 to 2018)
CitiPower (Vic)	1	1	4.4%	1.1%
United Energy (Vic)	2↑	3	7.2%	2.4%
SA Power Networks	3↓	2	2.7%	-0.9%
Powercor (Vic)	4	4	-3.7%	-0.6%
Energex (QLD)	5	5	-0.3%	0.3%
Endeavour Energy (NSW)	6↑	8	2.3%	0.2%
Jemena (Vic)	7	7	-0.5%	-0.6%
Ergon Energy (QLD)	8↓	6	-3.0%	0.7%
Evoenergy (ACT)	9	9	-3.0%	1.4%
Essential Energy (NSW)	10↑	11	1.2%	2.0%
AusNet Services (Vic)	11↓	10	-2.9%	-2.0%
Ausgrid (NSW)	12↑	13	6.6%	1.5%
TasNetworks	13↓	12	-1.1%	-0.1%

Table 8: AER benchmarking – MTFP ranking by individual DNSP[26]

The AER uses partial performance indicators (PPIs) by DNSP to provide a simple visual representation of input costs relative to particular outputs. The main inputs to this analysis are the DNSP opex and asset costs, or 'total costs'. The PPIs used are an average of the costs incurred from 2014-18, which mitigates the effect of one-off changes in opex or assets in a given year.

Figure 17 shows the total cost per customer against customer density. CitiPower is noted as being amongst the three DNSPs with the highest customer density, with lowest cost per customer. Powercor, a regional Victorian DNSP with low customer density, is noted as having low total costs per customer relative to the DNSPs in other states.

[26] AER Annual Benchmarking Report – Electricity distribution network service providers 2019 (page 13)

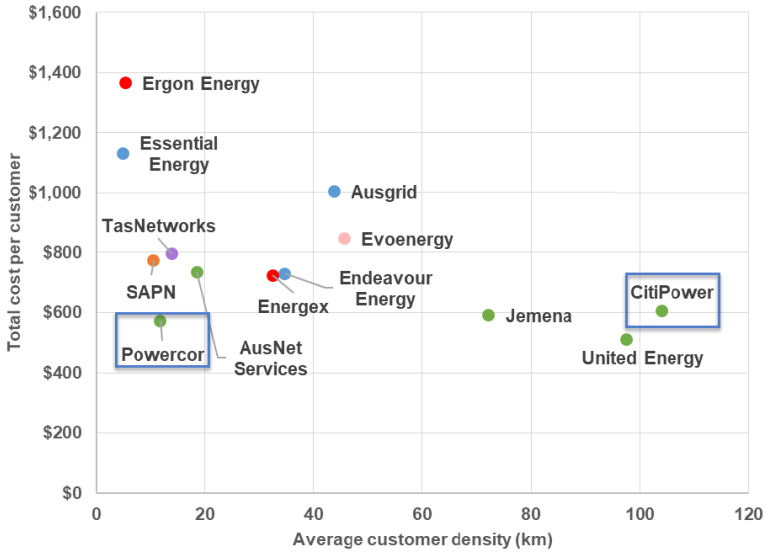


Figure 17: Total cost per customer ($2018) against customer density (average 2014-18)[27]

Figure 18 shows the total cost per MW of maximum demand ($2018) against customer density (average 2012-16). CP/PAL notably measure first and third in the lowest total cost per MW of maximum demand against customer density.

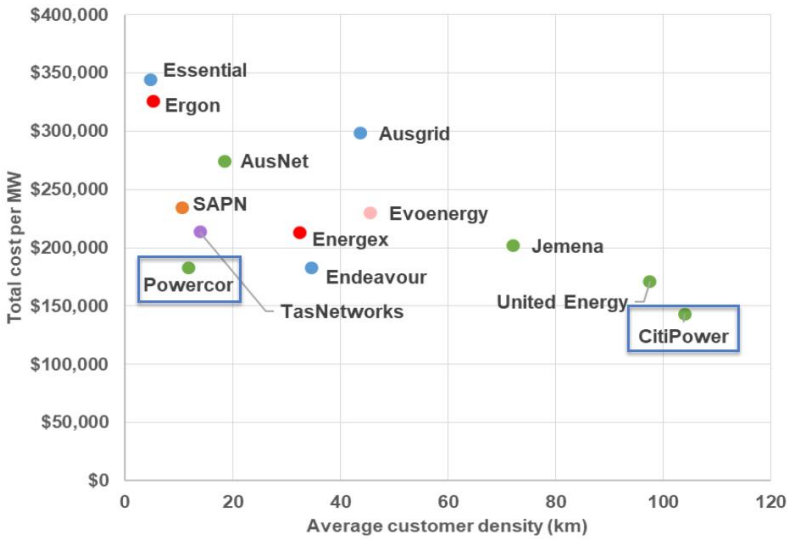


Figure 18: Total cost per MW of MD ($2018) against customer density (average 2014-18)[28]

[27] AER Annual Benchmarking Report – Electricity distribution network service providers 2019 (page 33)

[28] AER Annual Benchmarking Report – Electricity distribution network service providers 2019 (page 35)

5 Strategic decision and evaluation criteria

CP/PAL's decision and evaluation criteria for the selection of appropriate strategies are directly related to the corporate vision, strategic pillars and our established core values. Our corporate vision of 'We Connect You' is underpinned by the following five strategic pillars:

- Improving Stakeholder Engagement – Working with communities, government and partners
- Optimising Regulatory Outcomes – Secure the revenue we need to run our business
- Driving Operational Excellence – Be smarter about how we do things
- Delivering Customer Outcomes – Make it easy for our customer
- Building a Network for the Future – Ensure the network remains competitive

Figure 19: Corporate vision and strategic pillars

Our core values support the strategic pillars, in recognising that how the outcomes are achieved is as important as the outcome itself. Our core values provide us with clear sight as to how our stakeholders, employees and customers are fulfilling the vision of connecting for a bright future.

Core Value	Description
Live safely	Safety is our first priority. We never compromise health and safety, either at work or at home. We are constantly aware of the risks to ourselves and others and actively manage them. We share our experiences so that we all learn.
Be customer and community minded	We listen to our customer, strive to meet their needs and keep them informed. We make a positive contribution to our communities. We deliver on our promises.
Succeed together	We work together as a team and value the diversity and contribution of our workmates. We always act in a fair and responsible manner and show each other respect. We strive for success as a business while upholding the values that underpin everything we do.
Be the best you can be	We strive for excellence in everything we do and are always accountable for our own performance. We give our best at all times and help our workmates do their best as well.
Improve our business	We drive and lead change to be more efficient and effective for the benefit of our workmates, shareholders and other stakeholders.

Figure 20: Our core values

CP/PAL make various asset related decisions to enable delivery of reliable electricity distribution services to their customers. These decisions are made within frameworks that enable assessment of safety, risk, sustainability and cost. Strategic plans for CP/PAL's assets are developed alongside the regulatory submissions. CP/PAL's asset strategy decision making aims to find an optimal balance of risk, cost and performance to maximise customer and stakeholder outcomes.

The Asset Management Policy outlines the asset management principles to be followed to ensure that the corporate strategic objectives are achieved. Refer to Appendix 4 for the CP/PAL Asset Management Policy.

The following table shows the corporate strategic pillars mapped to the Asset Management Policy principles, which ensures that the key strategic focus areas of the businesses have been included in the asset management strategies and objectives.

Corporate strategic pillar	Asset Management Policy principle[29]
Improving stakeholder engagement	Enhance our reputation as a trusted service provider through active industry leadership and the delivery of safe and reliable services that meet the needs and expectations of our customers & communities Focus on maintaining a safe, affordable (least long term cost) and reliable network, when devising our plans for the development of our network. Monitor and evaluate appropriate metrics to effectively manage the network and customer service performance.
Optimising regulatory outcomes	Invest in programs that optimise total lifecycle management Develop high performance operations by engaging with our employees and ensuring that they have the right skills and capabilities. Embrace innovation and technology to continuously improve our asset management framework and activities consistent with recognised asset management standards for the long term benefit of our employees, shareholders, customers and stakeholders.
Driving operational excellence	Minimise safety risks as far as practicable Focus on maintaining a safe, affordable (least long term cost) and reliable network, when devising our plans for the development of our network. Adopt a risk based approach to managing our network Invest in programs that optimise total lifecycle management Comply with as a minimum all relevant regulatory and legislative requirements, as well as Australian, International and industry standards and any other requirements to which CP/PAL subscribes. Develop high performance operations by engaging with our employees and ensuring that they have the right skills and capabilities. Embrace innovation and technology to continuously improve our asset management framework and activities consistent with recognised asset management standards for the long term benefit of our employees, shareholders, customers and stakeholders. Monitor and evaluate appropriate metrics to effectively manage the network and customer service performance.

[29] CitiPower and Powercor Asset Management Policy - 2018

Corporate strategic pillar	Asset Management Policy principle[29]
Delivering customer outcomes	Minimise safety risks as far as practicable Enhance our reputation as a trusted service provider through active industry leadership and the delivery of safe and reliable services that meet the needs and expectations of our customers & communities Focus on maintaining a safe, affordable (least long term cost) and reliable network, when devising our plans for the development of our network. Embrace innovation and technology to continuously improve our asset management framework and activities consistent with recognised asset management standards for the long term benefit of our employees, shareholders, customers and stakeholders. Monitor and evaluate appropriate metrics to effectively manage the network and customer service performance.
Building a network for the future	Invest in programs that optimise total lifecycle management Develop high performance operations by engaging with our employees and ensuring that they have the right skills and capabilities. Embrace innovation and technology to continuously improve our asset management framework and activities consistent with recognised asset management standards for the long term benefit of our employees, shareholders, customers and stakeholders.

Table 9: Mapping of corporate strategic pillars to Asset Management Policy principles

The asset management objective key measures form the basis for evaluating the success of related Asset Class Strategies and Asset Management Plans in delivering against the five Strategic Pillars. The following table outlines the key asset management measures.

Asset management objectives	Measures
Manage and operate the network safely	Significant health and safety incidents (Class 4 and 5)
	Asset failures (ESV reported asset failures)
	Fire starts (ESV reported fire starts, measured July to June)
	F-factor (Ignition Risk Units) (ESV reported, measured July to June)
	Bushfire mitigation index (During declared fire danger period)
	Public safety incidents (ESV reported incidents)
	HSE Index (as per corporate HSE index)
	Switching incident frequency rate

Asset management objectives	Measures
Meet our network reliability performance targets	Unplanned SAIDI
	Planned SAIDI
	Unplanned SAIFI
	MAIFIe
	GSL payments for unplanned interruptions
	STPIS
Manage our assets on a total life cycle basis at least cost	Works program
	Zone substation capacity utilisation
Manage our compliance obligations	AER and ESC obligation compliance
	Metrology obligation compliance
	Network safety obligation compliance
Empower and invest in our employees	Employee opinion survey
Monitor opportunities and drive continuous improvement	Strategy, Program Delivery & Change business improvement initiatives
	Audit and improvement actions

Table 10. Key asset management measures

Alignment of the Asset Management Policy and objectives to the corporate strategic pillars is necessary to ensure that the corporate objectives are being achieved through implementation of our asset management objectives, and to ensure we are meeting the expectations of our stakeholders and shareholders.

Figure 21 demonstrates the alignment of CP/PAL's Asset Management Policy and objectives to the corporate strategic pillars.

Corporate Strategic Pillars					Asset management policy principles	Asset management objectives					
Improve stakeholder engagement	Build a network for the future	Optimise regulatory outcomes	Drive operational excellence	Deliver customer outcomes		Manage and operate the network safely	Meet our network reliability performance targets	Manage our assets on a total life cycle basis at least cost	Manage our compliance obligations	Empower and invest in our employees	Monitor opportunities and drive continuous improvement
			✓	✓	• Minimise safety risks as far as practicable.	✓					
✓				✓	• Enhance our reputation as a trusted service provider through active industry leadership and the delivery of safe and reliable services that meet the needs and expectations of our customers and communities.	✓	✓				
✓			✓	✓	• Focus on maintaining a safe, affordable (least long term cost) and reliable network when devising our plans for the development of our network.	✓	✓	✓			
			✓		• Adopt a risk based approach to managing our network.			✓			
	✓	✓	✓		• Invest in programs that optimise total lifecycle management.			✓			
			✓		• Comply with as a minimum all relevant legislative and regulatory requirements as well as Australian, international and industry standards and any other requirements to which CitiPower and Powercor subscribes.				✓		
	✓		✓		• Develop high performance operations by engaging with our employees and ensuring that they have the right skills and capabilities.					✓	
	✓	✓	✓	✓	• Embrace innovation and technology to continuously improve our asset management framework and activities consistent with recognised asset management standards for the long term benefit of our employees, shareholders, customers and other stakeholders.						✓
✓			✓	✓	• Monitor and evaluate appropriate metrics to effectively manage the network and customer service performance.	✓	✓				✓

Figure 21: Alignment of AM Policy, AM objectives and corporate strategic pillars

6 Key asset management strategic issues, opportunities, strategies and objectives

As the energy landscape continues to evolve with the changing needs of customers and stakeholders, CP/PAL will need to adapt and respond accordingly to meet these growing challenges.

This section outlines the key strategic issues that are emerging as challenges and opportunities for the CP/PAL electricity network. It also describes the approach being taken by CP/PAL to address these strategic issues and achieve the asset management objectives as summarised in this SAMP via the deployment of asset management strategy and asset class strategy documents.

6.1 Key strategic issues

6.1.1 Weather extremes

As climate change continues to bring changing weather patterns and extremes in temperature and storms, CP/PAL's networks will be challenged to perform and withstand conditions that potentially are outside of design limits. Consequently CP/PAL must be prepared to respond to impacts on a range of asset management factors including network performance, design standards and expected asset life. Such impacts have potential to significantly increase asset management costs, whether that is by increased cost of building redundancy into networks for reliability, or extreme-weather design resilience being reflected in design standards. Extended network outages give rise to greater penalties via STPIS/incentive schemes, while lines assets failures result in increased safety risks to the general public, with resulting increases in associated liabilities. The ability to continually adapt and respond with evolving asset management practices is critical to CP/PAL maintaining asset performance and life cycle management of the network assets.

6.1.2 Aging assets

The age profile of CP/PAL's asset population was presented in section 4.3 - Age and condition of this document, where it was demonstrated that the asset age profile is non-linear following significant network expansion from 1960 – 1985. As such, there is a high percentage of assets that are surpassing their design life and entering the mature stage of their lifecycles. The rate of progression of the asset population to this phase is expected to increase going forward, with subsequent increased risks of defects and failures due to larger populations.

As the maturity level of the asset population continues to grow, adequate asset management and resource planning will be required to ensure that programs are adapted to accommodate the growing mature population whilst ensuring overall network risk is maintained.

6.1.3 Asset health

An asset health index provides a value based assessment of the condition of the asset and the associated risk to drive short-term maintenance and long-term capital replacement strategies. Asset health indices are currently established for higher value assets using the CBRM methodology, whereas the management of distribution line assets have been historically driven by lagging factors, with condition monitoring leading to corrective work and asset replacements. In this scenario, all assets are treated equally without due consideration of relative risk and consequence outcomes.

In the present state, CP/PAL's asset management system does not provide visibility of the overall asset health. Visibility of asset health will ensure that higher risk assets are given appropriate management priority whilst managing the aging asset base. The introduction of the Value Framework and the C55 Copperleaf investment and planning tool is expected to provide a significant step towards visibility, in particular in relation to the asset risk modelling for distribution lines assets as well as major plant which will support quantification of network level risk.

6.1.4 Embedded generation and energy storage

The uptake of renewable energy solutions by smaller residential and commercial/industrial customers, as well as the advent of wind farms and large-scale solar farms will continue to present challenges to CP/PAL's distribution network management approaches as expectations of distribution network function continue to evolve.

Historically, generation sources have been centralised with large-scale generation plants supplying bulk energy needs via extensive transmission and distribution networks. As customer energy needs and expectations continue to evolve, CP/PAL will face challenges to adapt their traditional distribution networks to accommodate smaller generation sources while continuing to maintain capacity to deliver energy within existing power quality and safety requirements.

As customers adopt evolving energy storage and electric vehicle technologies, energy demand profiles will continue to change. As these technologies continue to advance and customer uptake increases, costs associated with these technologies will come down. As affordability improves, it would be expected that the rate of uptake by customers will continue increasing accordingly.

Decreasing energy demand has potential to impact CP/PAL's ability to justify network expenditure, however the advent of energy storage solutions also presents opportunities for CP/PAL whereby large-scale storage solutions and virtual power plants could become alternative network augmentation solutions to address peak demand needs.

6.1.5 Information and data management

Since the completion of the smart meter roll-out on the CP/PAL network, there is now more network data available than ever before. This immediately presents challenges for CP/PAL in terms of data storage requirements and data management; as the available data pool continues to grow with time, there will be an ongoing need for stringent management and storage of historic data to ensure that appropriate volumes of historic data remain available to support asset management needs.

Communication systems must be robust enough to handle the volume and frequency of data transmission; data governance is critical to ensure accurate and complete data is being stored in secure systems, in the interests of not only maintaining data integrity but also to ensure customer privacy is not breached.

Establishing strong information governance approaches will be critical to CP/PAL's management of both its asset and network usage information going forward, the importance of which is recognised via the development of an asset class strategy specific to information management.

As a result of the significant increase in data volumes available, CP/PAL have recognised the growing need for advanced data analytics skills amongst its workforce and have been actively expanding its data analytics capabilities via creation of a specialised Data Analytics team. The skillsets of this team will be critical going forward to CP/PAL's ability to extract value from the myriad of data available and produce tangible results via its asset management programs to improve the overall safety and performance of its network assets.

6.2 Asset management strategies and asset class strategies

CP/PAL are developing a suite of asset management strategies (AMS) and asset class strategies (ACS) to address the strategic issues identified in section 6.1 and achieve the AM objectives presented in section 5 of this SAMP. The AMS address key AM activities that apply across all asset classes, whereas the ACS focus on AM activities specific to the asset class. The AMS can influence the ACS, however the relationship is not hierarchical (ACS are not subordinate to the AMS). The relationship between the SAMP, AMS and ACS is presented in section 7.6 of this document. The AMS and ACS subjects will be summarised in the following sections.

6.2.1 Asset management strategy subjects

The twelve asset management subjects have been selected to cover key asset management activities that are not asset specific and apply across all asset classes. Key strategic issues, opportunities, strategies and objectives identified for each AMS are articulated in the relevant strategy document with alignment to the AM objectives and corporate pillars.

An overview of the asset management strategy subjects is provided below.

1. Network Operation and Utilisation
   - Structured approaches to improvements to a range of operational functions which together improve operational performance and utilisation of the network, including control and operations, network services, field services design and delivery, service performance and portfolio governance.
2. Asset Information and Systems
   - Asset data and information types, relationships between them and and the systems used to manage asset data and information.
3. Network Performance
   - Performance improvement programs to meet network reliability and performance requirements over the regulatory period, and an increasingly complex generation and distribution landscape requiring sophisticated technical responses from CP/PAL.
4. Bushfire Mitigation
   - Structured approaches to prevention of bushfires associated with the design, operation, construction and maintenance of network assets.
5. Vegetation and Line Clearance *(in development)*
   - Integration of vegetation and line clearance requirements into the asset management system to align with asset management objectives and ensure ongoing regulatory and statutory compliance.
6. Connections, Augmentation and Replacement
   - Improvement programs to manage the connections, augmentation and replacement processes to ensure the network remains capable of distributing a reliable supply of electricity to customers.
7. Maintenance Management
   - The rationale behind various maintenance management initiatives, projects and plans that together ensure the right maintenance is delivered at the right time and in the right way.
8. Network Safety
   - Integration of network safety practices into the asset management system to ensure visibility of regulatory and statutory compliance obligations, and alignment with asset management objectives.
9. Future Grid
   - Technologies and smart networks (including batteries, solar and wind generation, decentralised generation, demand management, metering, demand management) and associated impacts on network design, dynamics, monitoring and corresponding changing skill requirements.

10. Environment and Sustainability *(in development)*
   - Integration of environment and sustainability requirements into the asset management system to ensure visibility of regulatory and statutory compliance obligations and alignment with asset management objectives.

11. Asset Management System Performance *(planned for future)*
   - Description of the strategies and objectives that CP/PAL use to measure asset management system performance, and ensure optuimum asset management system effectiveness, efficiency and continued alignment with the SAMP objectives.

12. Asset Management System Resources *(planned for future)*
   - The assessment, selection, development, procurement or acquisition, deployment and application of human and non-human resources required to develop and implement the CP/PAL asset management system, and implement and monitor the asset management objectives.

6.2.2 Asset class strategy subjects

ACS subjects have been selected to provide coverage of network assets with similar management practices and/or network functions. Key strategic issues, opportunities, strategies and objectives identified for each ACS are articulated in the relevant strategy document, with alignment to the AM objectives and corporate pillars.

The sixteen asset management strategy subjects are listed below.

1. Poles and towers
2. Pole top structures
3. Overhead conductors

4. Underground cables
5. Zone transformers
6. Distribution substation plant miscellaneous
7. Public lighting
8. Zone substation plant misc.
9. Distribution transformers
10. SCADA and communications
11. Zone switchgear
12. Protection and control
13. Property and facilities
14. Metering
15. Distribution switchgear
16. Service lines

7 Asset management system

CP/PAL are establishing an asset management system that is aligned with ISO550001 – Asset Management System requirements. An overview of the CP/PAL asset management system will be provided in this section. For a more in depth description of the asset management system, refer to the corresponding Asset Management System Framework document.

The CP/PAL asset management system is structured into the following five levels, as shown in figure 22.

1. Stakeholder needs and governance
2. Strategic asset management
3. Asset management planning
4. Asset management delivery
5. Performance monitoring and review

Levels 1 and 2 describe what asset management strategies and objectives are to be targeted and provide details on why these are required. Levels 3 and 4 describe how and when asset management activities are undertaken to deliver the strategies and objectives. Level 5 describes the approach to be taken by CP/PAL monitor performance and review. A brief overview of each level follows.

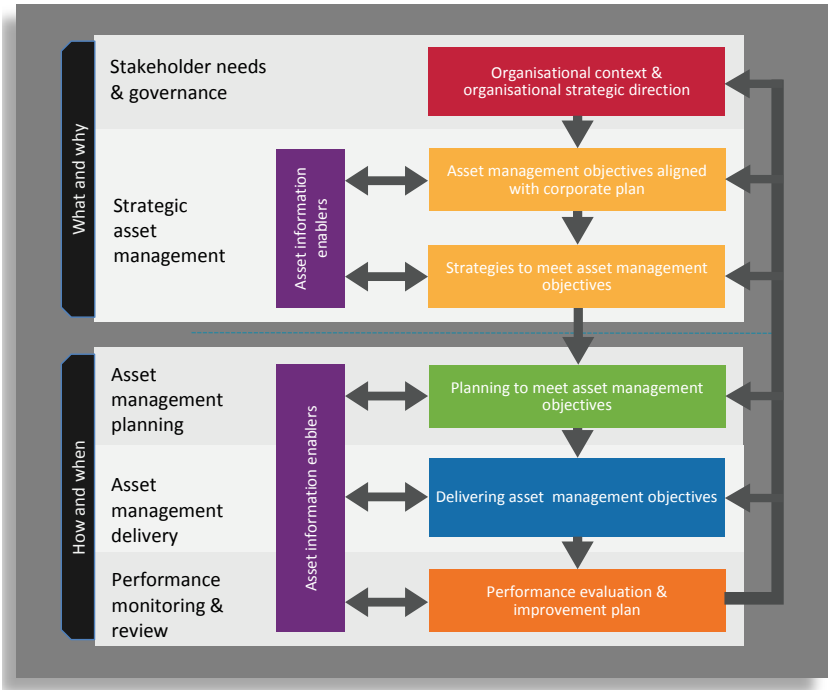


Figure 22: Scope of the CP/PAL Asset Management System

7.1 Stakeholder needs & governance

The direction of CP/PAL's asset management system direction is driven by the following key aspects:

- The five strategic pillars (section 6, figure 19)
- Business performance
- Standards, legislation and regulation
- Emerging technologies and energy solutions, to which CP/PAL must respond
- Corporate risk management framework
- AM Governance.

Stakeholder needs were presented in an organisational context in section 3 of this document. These factors provide the stakeholder and governance context as to why the asset management objectives and strategies are needed.

7.2 Strategic asset management

The strategic asset management level comprises the Asset Management Policy, objectives and supporting asset management strategies and asset class strategies.

The Asset Management Policy sets out CP/PAL's approach to asset management, providing employees with an understanding of management expectations with respect to asset management outcomes and direction for the development of asset management strategies and objectives. Refer to Appendix 4 for the CP/PAL Asset Management Policy.

The SAMP outlines the high level objectives and key strategic issues for asset management and links these to the corporate strategic pillars, taking into account network risk and asset investment strategies. The SAMP provides long-term guidance for the development of the various asset management and asset class strategies.

The asset management and asset class strategies outlined in sections 6.2.1 and 6.2.2 have been developed to align with the Asset Management Policy and to the needs of stakeholders, including the direction outlined in corporate strategic pillars and asset management related commitments made in our regulatory submission.

7.3 Asset management planning

Asset management planning comprises of three main streams: AM planning and life-cycle optimisation, asset management plans and asset investment planning.

The AM planning and lifecycle optimisation stream is undergoing further development, with key focusses on asset life cycle planning, optimisation and asset maintenance requirements in support of the strategic network planning and development function.

Detailed asset lifecycle plans are being developed through the ACS initiatives, with consideration of asset connections, augmentation and replacement. Reference to key supporting asset lifecycle documentation specific to each asset class will be made in the relevant asset class strategy. An overview of CP/PAL's approach to strategic network planning and development function is provided section 4.5 of this document.

CP/PAL determine asset maintenance requirements using two main methodologies – CBRM and RCM. An overview of these methods is provided in sections 4.6.2 and 4.6.3 of this document. The Asset Maintenance Strategy document provides detailed directions on the application of the maintenance requirements determination methods.

Asset maintenance plans are under development to deliver the AM strategies and associated objectives for the sixteen ACS subjects described in section 6.1.2. The asset maintenance plans identify required resources and timeframes for delivery of the strategies and objectives.

Asset investment strategies and processes are being further developed under the C55 Copperleaf project to assist with investment planning, budget planning and options analysis. Strategic documentation to support this will be developed throughout this project.

7.4 Asset management delivery

Asset management delivery comprises two main streams of activity – delivery of asset management activities and portfolio governance.

CP/PAL's asset portfolio governance is facilitated via existing standards, policy, procedures and processes that stipulate the requirements for asset management delivery. Monitoring of compliance is achieved via regular internal audit processes and reporting. The Asset Management Committee has been established to provide specific oversight and governance to the Asset Management System (refer to section 8.2).

Delivery of AM activities are supported by four key processes: Program Design and Delivery, Field Services, Works Program Delivery and Service Performance. These delivery programs are described in detail in the Asset Management System Framework document.

7.5 Performance monitoring and review

Evaluation of the asset management system will be undertaken via performance monitoring and review according to the requirements of the future asset management system performance strategy. Performance evaluation, internal audits, management review and performance improvement plans will contribute to continuing improvement of the asset management system.

The relationship between the various strategy and planning documents in the AMS is shown in Figure 23.

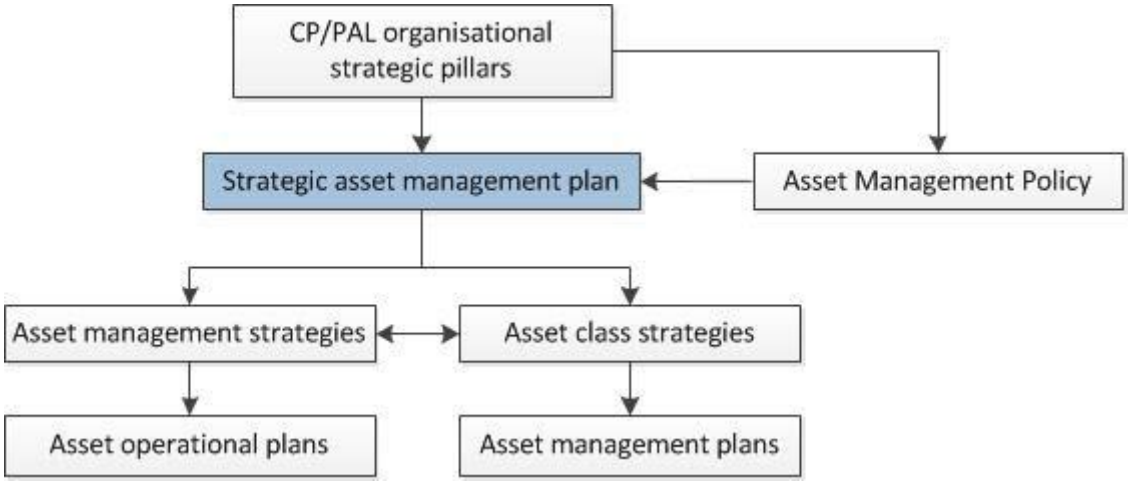


Figure 23: Strategy & planning document hierarchy

Together with the CP/PAL strategic development plan, the Asset Management Policy provides overall guidance for the development of SAMP strategies.

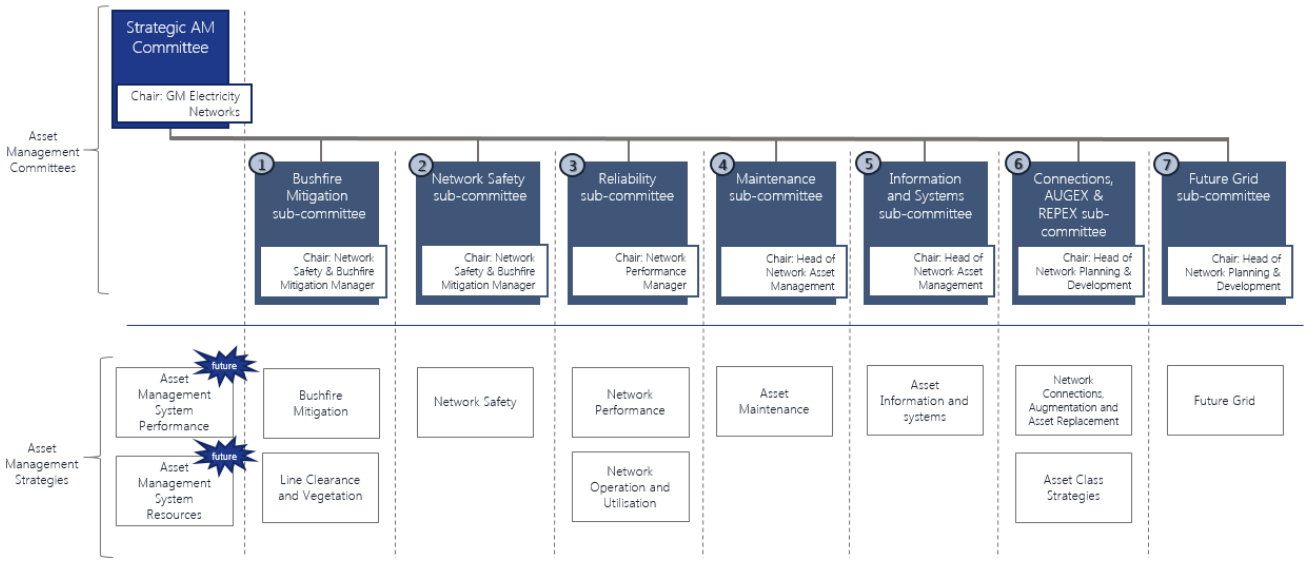
SAMP strategies and objectives provide guidance for the development of strategies and objectives for the twelve asset management subject areas and sixteen asset classes. Separate strategy documents are developed for each subject and class.

The asset management strategies and asset class strategies provide guidance for development of asset operational plans and asset management plans, to prioritise and program delivery of the asset management objectives and strategies.

8 Asset management leadership, organisational roles and responsibilities

8.1 Asset management governance

The Asset Management Committee has been established to provide governance and oversight of the asset management system. The structure of the committee has been established to align with the asset management strategy accountabilities. The Asset Management Committee structure is shown in Figure 24.



1. The vegetation management function is currently undergoing a business improvement program and is reporting strategically and operationally into a steering committee which includes the CEO. Discussions are being undertaken to align vegetation management under the Bushfire Mitigation Committee post the improvement program.

Figure 24: Asset Management Committee structure

Working groups have been formed to outwork business process driven AM operational activities; similarly project boards are being formed for AM project delivery outworking. The working groups and project boards will report to the relevant subcommittees to facilitate governance of the corresponding AM activities.

Refer to the Asset Management Process and the Asset Management System Framework document for further detail.

8.2 Asset management leadership

The asset management leadership roles and responsibilities are presented in table 13. Key activities for maintaining the AM documentation are listed along with associated management responsibility and accountability. Refer to the Asset Management Process supporting document for additional detail of the process for outworking of these activities.

Activity	Document	Responsibility	Accountability
Establishing and updating the Asset Management Policy	Asset Management Policy	Head of Network Asset Management	General Manager Electricity Networks
Establishing and updating asset management objectives	Strategic Asset Management Plan	Head of Network Asset Management	General Manager Electricity Networks
Establishing and updating the SAMP	Strategic Asset Management Plan	Lines Asset Strategy Manager	Head of Network Asset Management
Establishing and updating asset management strategies	Maintenance Management Asset Management System Performance Asset Management System Resources	Lines Asset Strategy Manager	Head of Network Asset Management
	Asset Information & Systems	Asset Information Manager	Head of Network Asset Management
	Network Performance	Network Performance Manager	Head of Network Control & Operations
	Network Operation & Utilisation	Control Manager	Head of Network Control & Operations
	Future Grid	Project Manager Network Solutions	Head of Network Planning & Development

Activity	Document	Responsibility	Accountability
	Network Safety	Network Safety Manager	Head of Network Compliance
	Bushfire Mitigation	Bushfire Mitigation Manager	Network Safety & Bushfire Mitigation Manager
	Vegetation & Line Clearance	Vegetation Manager	Network Safety & Bushfire Mitigation Manager
	Connections, Augmentation & Asset Replacement	Planning Policy Manager	Head of Network Planning & Development
	Environment & Sustainability	Sustainability & Environment Manager	Head of Health, Safety & Environment
Establishing and updating asset class strategies	Poles & Towers Pole Top Structures Overhead Conductors Public Lighting Service Lines	Lines Asset Strategy Manager	Head of Network Asset Management
	Underground Cables Zone Transformers Distribution Transformers Zone Switchgear Distribution Switchgear Zone Plant & Stations Miscellaneous Distribution Plant & Stations Miscellaneous	Plant & Stations Manager	Head of Network Asset Management

Activity	Document	Responsibility	Accountability
	SCADA Network Communications	Manager Communication Networks	Head of Network Asset Management
	Meters	Metering Standards Manager	Head of Network Asset Management
	Protection & Control	Protection Solutions Manager	Head of Network Asset Management
	Properties & Facilities Miscellaneous	Operations Manager – Facilities Management Services	Head of Procurement
Ensuring the asset management system supports delivery of the SAMP	Asset Management System Framework	Lines Asset Strategy Manager	Asset Management Committee

Table 13: Asset management leadership, roles, responsibilities and accountabilities

9 Definitions & glossary

A list of asset management abbreviations and definitions used in this strategy is contained in the description document, the overall reference for the CP/PAL Asset Management System Framework.

Abbreviation	
ACS	Asset class strategy
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AFAP	As Far As Practicable
AM	Asset Management
AMP	Asset Management Plan
AMS	Asset management strategy
BFM	Bush Fire Mitigation
CAPEX	Capital Expenditure
CBD	Central Business District
CBRM	Condition Based Risk Management
CKI	Cheung Kong Infrastructure Ltd
CP	CitiPower Pty Ltd
CP/PAL	CitiPower and Powercor
DAPR	Distribution Annual Planning Report
DNSP	Distribution Network Service Provider
ENA	Energy Networks Association

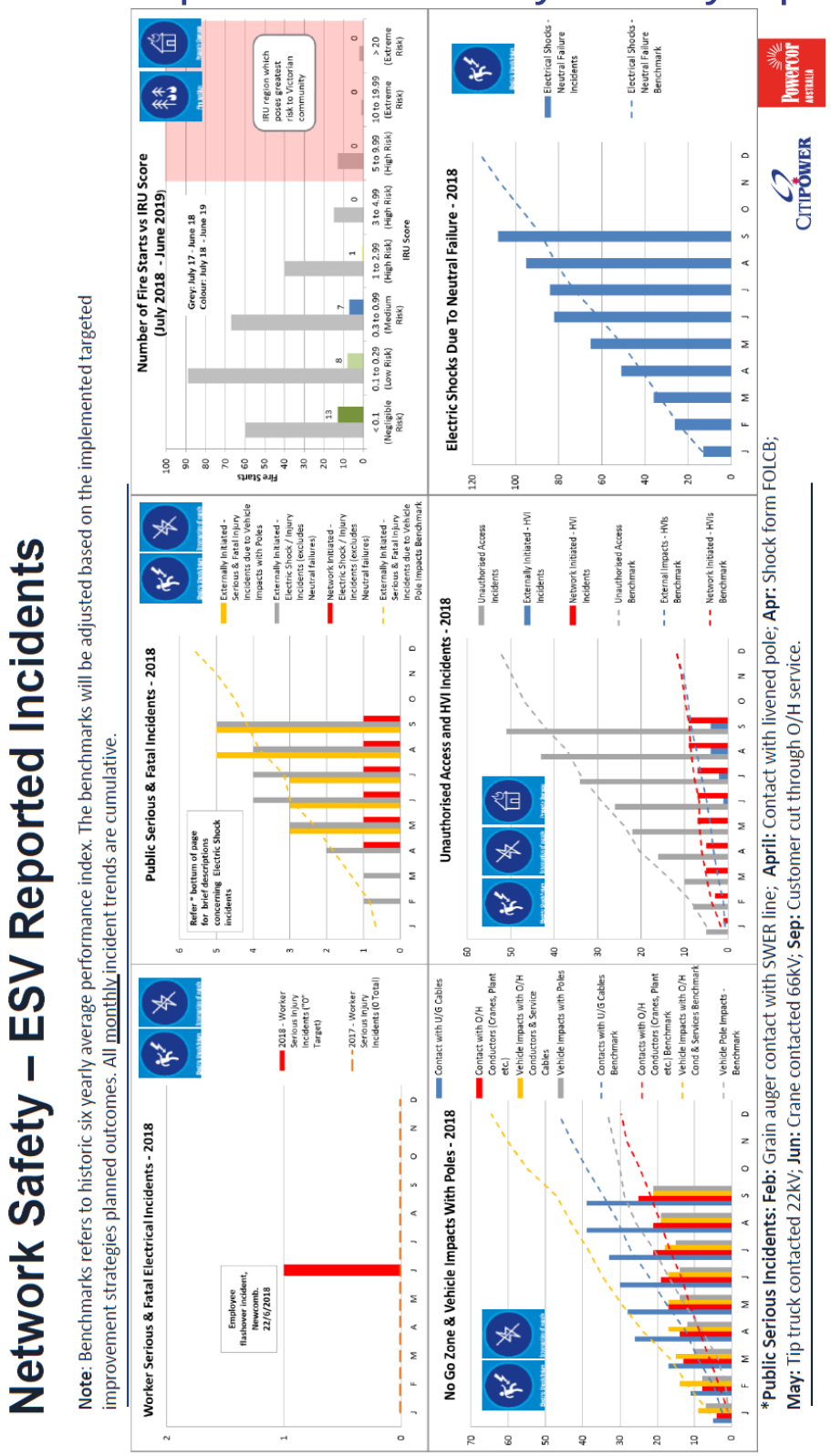
Abbreviation	
ESAA	Electricity Supply Association of Australia
ESC	Essential Services Commission
ESMS	Electricity Safety Management Scheme
ESV	Energy Safe Victoria
FSA	Formal Safety Assessment
GIS	Geographical Information System
HBRA	High Bushfire Risk Area
HV	High Voltage
kV	Kilovolts
LBRA	Low Bushfire Risk Area
MAIFI	Momentary Average Interruption Frequency Index
MD	Maximum Demand
MECS	Major Electricity Companies
MTFP	Multilateral Total Factor Productivity (AER benchmarking)
MW	Megawatt
NER	National Electricity Rules
NP&D	Network Planning and Development
OPEX	Operating Expenditure
PAH	Power Assets Holdings
PAL	Powercor Australia Ltd

Abbreviation	
PNS	Powercor Network Services
PPI	Partial Performance Indicator (AER benchmarking)
RCM	Reliability centred maintenance
RIN	Regulatory Information Notice
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SECV	State Electricity Commission of Victoria
STPIS	Service Target Performance Incentive Scheme
URD	Underground Residential Development
VBRC	Victorian Bushfire Royal Commission
VESI	Victorian Electricity Supply Industry

10 References

Document no.	Document name
	Asset Management Process
JEQA4UJ443MT-150-27597	Asset Management System Framework
JEQA4UJ443MT-150-27559	CP/PAL Asset Management Policy
JEQA4UJ443MT-173-106	CP/PAL Network Safety Policy
05-M800	CitiPower Bushfire Mitigation Plan
05-M810	Powercor Bushfire Mitigation Plan
	CP/PAL Safety Case
	AER Benchmarking
13-10-CP0006	VPN Enterprise Risk Framework
	CP/PAL Electricity Safety Management Scheme
JEQA4UJ443MT-229-71	Capital Investment Governance Policy
JEQA4UJ443MT-229-71	Portfolio and Projects Controls Framework

Appendix 1: Sample Network Safety monthly report



Appendix 2: Asset portfolio overview[30]

CP/PAL both have a large population of assets distributed through the areas illustrated in Figure A1-1 and Figure A1-2.

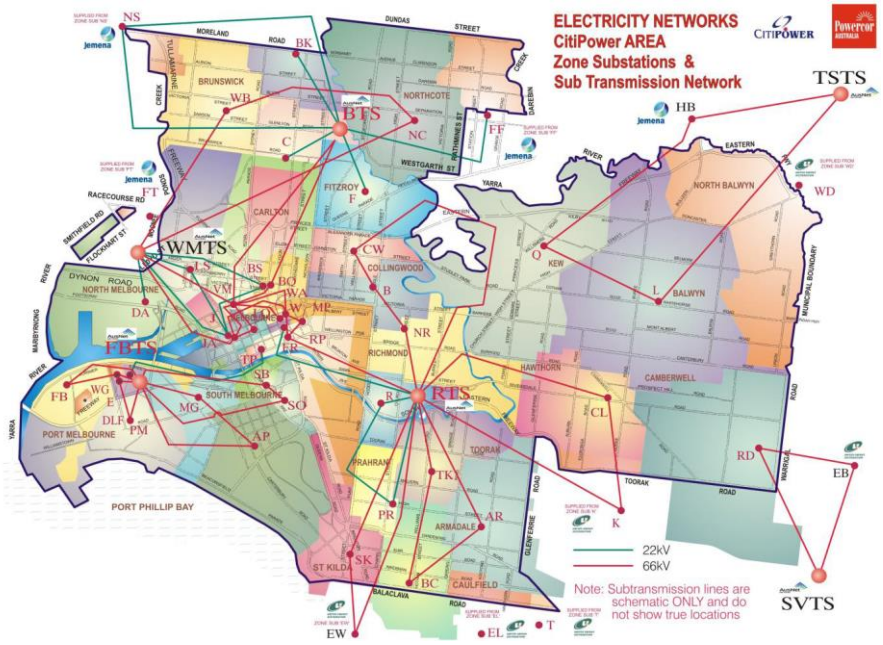


Figure A1-1: Map of CP network configuration

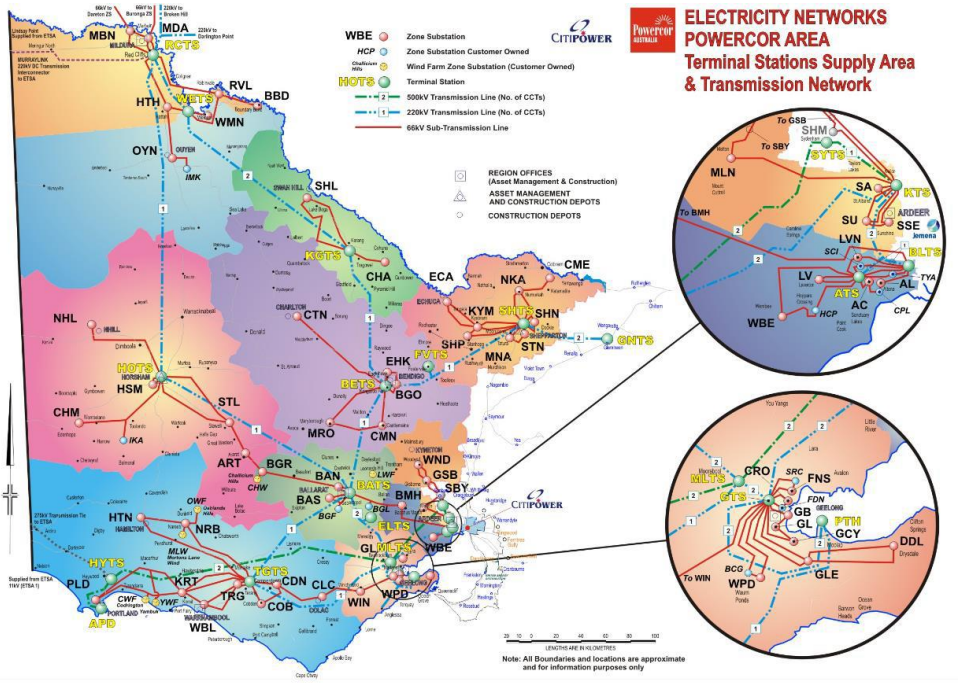


Figure A1-2: Map of PAL network configuration

[30] Extracted from 2017 CP/PAL Safety Case (pages 30-34)

These assets include:

- Zone substations
- Distribution substations
- Switchgear
- Secondary, control and protection
- equipment
- Earthing systems
- Overhead lines
- Service lines
- Consumer metering
- Private lines
- Underground cables;
- Public lighting
- Battery storage (for Powercor).

Zone substations are used to transform sub-transmission voltages (usually 66kV) to HV distribution voltages (typically 11kV or 22kV) and to act as controlling points between differing HV networks. Zone substations usually have much greater capacities than distribution substations and supply a larger load area. There are 107 and 140 zone substation transformers in CP/PAL networks respectively. A typical zone substation is shown in Figure A1-3 below.

Figure A1-3: Typical Zone Substation

Distribution substations transform HV distribution voltages (typically 11kV or 22kV) to power that can be used by households and most businesses (230/400V nominal voltage). These substations are mounted on poles (as shown in Figure A1-4 below), within buildings or inside small free standing enclosures.

Figure A1-4: Picture of a typical pole mounted distribution substation

Switchgear is used on both high and low voltages to control the flow of electricity and to take sections out of service for maintenance. They are located at various locations along the line to minimise customer disruption for planned or unplanned outages of electricity supply, such as circuit breakers as shown in Figure A1-5.

Figure A1-5: Picture of a Circuit Breaker within a Zone Substation

Secondary, control and protection equipment is used to detect and isolate faults from the system. For example, protection relays detect faults by comparing the currents and voltages against pre-determined voltage, current and time settings. After a fault condition is detected, the relay will issue a command to open a circuit breaker. Other common protection equipment includes current and voltage transformers, fuses and surge diverters. The primary role of these systems is to prevent or minimise damage to circuits and apparatus. Control equipment enables the communication, monitoring and remote switching activities of switchgear. This includes SCADA (Supervisory Control and Data Acquisition) systems.

Earthing systems are low resistance connections from electrical assets down to the ground and are generally metal cables, straps or bars. They have several purposes:

- To ensure the safety of all people working in the substation by limiting the step and touch voltages that can occur under fault conditions
- To allow fault and stray currents to be safely dissipated
- In zone substations and SWER isolating substations, they also connect the secondary windings of the transformers to earth in order to help maintain network voltages within the specified values with respect to earth and enable protection circuits to operate
- To facilitate the return of an earth fault current from faults on the network it supplies to the source of the fault current.

Overhead lines comprise conductors strung on wooden, steel and concrete poles. The conductor materials used are most commonly aluminium, steel or copper. Conductors are usually bare at higher voltages and mostly insulated at lower voltages. The CP and PAL networks have approximately 4,350km and 75,900km of overhead lines respectively, which includes high and low voltage lines (including services).

Powercor's assets mainly consist of overhead lines, as illustrated in Figure A1-6.

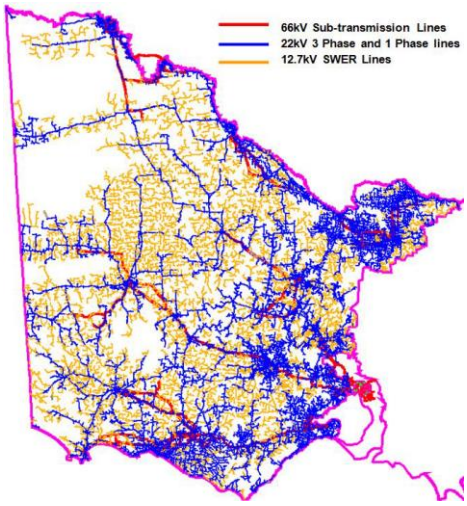


Figure A1-6: Powercor's HV Overhead Network

Service lines (services) may be insulated with overhead or underground conductors. Most houses are connected to our LV networks via service lines.

Poles support overhead lines and we have approximately 620,160 poles within the CP/PAL distribution areas. This pole population consists of timber, concrete or steel types as listed in Table A1-1 below:

Pole Type	CitiPower Network	Powercor Network
Wood	42,519	367,408
Concrete	4,639	125,912
Steel	11,080	68,600

Table A1-1–Pole Population type for CP/PAL

Consumer metering refers to the electricity meters that are installed to measure the amount of electricity used by individual premises. The vast majority of consumer metering supplied by CP/PAL is commonly known as ‘smart metering' and these devices are able to communicate, and to be read or switched remotely. The Advanced Meter Infrastructure (AMI) is illustrated below in Figure A1-7.

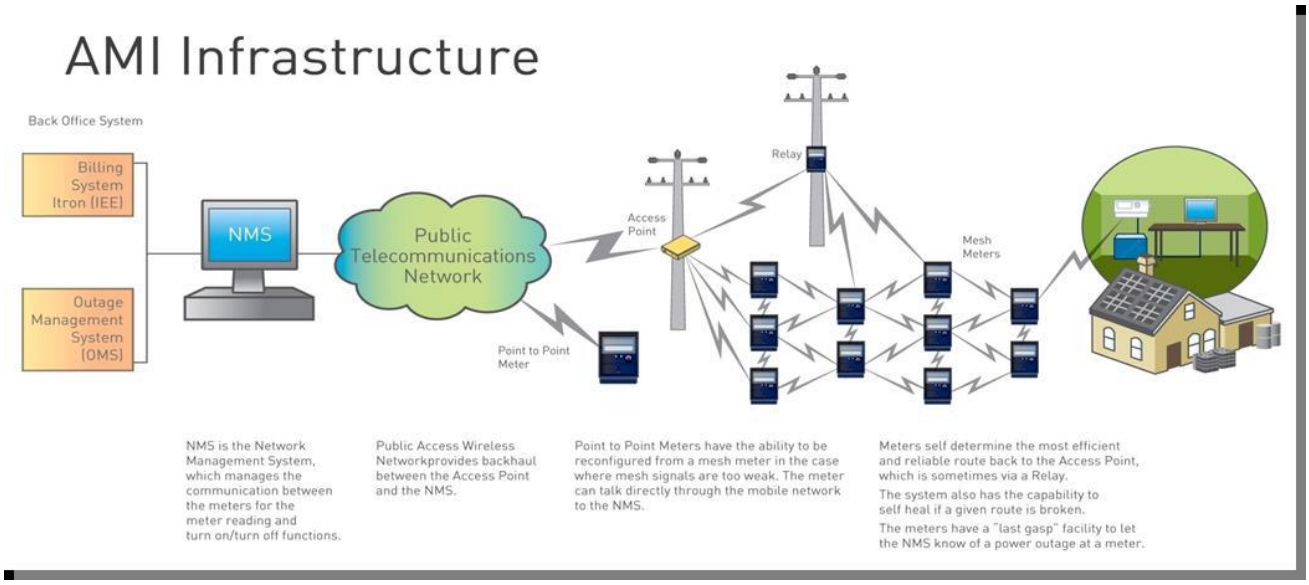


Figure A1-7: Advanced metering infrastructure

Private lines within the geographic area served by CP/PAL are listed as private high and low voltage lines. These are not CP/PAL network assets and are connected at a point of supply. CP/PAL’s statutory responsibility includes inspection and notification of defects of some private lines within their geographic area. Underground cables are used in areas like the Melbourne CBD and residential subdivisions. These cables commonly run between substations and supply the immediate area. There is a small volume of underground cabling associated with the sub-transmission system. As the name suggests, these cables are installed below ground level to provide some protection against interference. In the Powercor network there are a number of new areas that have regulated requirements based on design standards that include undergrounding of cables to reduce bushfire risk. Undergrounding cables will see a progressive increase over time.

Public lighting includes street lighting for vehicle and pedestrian visibility, public space lighting such as (public parks, gardens, car parks, bike paths) and also, feature lighting in commercial and industrial areas. Municipalities and road management agencies are usually responsible for the determination of where lighting is required with CP/PAL installing, maintaining or owning the light fittings. A number of municipalities have embarked in programs to replace existing public lighting lanterns to more efficient LED lighting.

Appendix 3: Mapping SAMP to ISO 55001

The following ISO 55001 clauses are covered by relevant sections of this SAMP:

Clause	ISO 55000 Clauses	Relevant Sections
4.1	Asset management objectives, included in the strategic asset management plan (**SAMP**), shall be aligned to, and consistent with, the organizational objectives.	Section 5 – Strategic decision and evaluation criteria
4.3	The organization shall determine the boundaries and applicability of the asset management system to establish its scope. The scope shall be aligned with the **SAMP** and the asset management policy. When determining this scope, the organization shall consider: — the external and internal issues referred to in 4.1; — the requirements referred to in 4.2; — the interaction with other management systems, if used. The organization shall define the asset portfolio covered by the scope of the asset management system. The scope shall be available as documented information.	Section 1 - Purpose Appendix 2 – Asset portfolio
4.4	The organization shall develop a **SAMP** which includes documentation of the role of the asset management system in supporting achievement of the asset management objectives.	Section 8 – Asset Management system
5.1	Top management shall demonstrate leadership and commitment with respect to the asset management system by: — ensuring that the asset management policy, the **SAMP** and asset management objectives are established and are compatible with the organizational objectives;	Section 5 - Strategic decision and evaluation criteria
5.3	Top management shall assign the responsibility and authority for: a) establishing and updating the **SAMP**, including asset management objectives; b) ensuring that the asset management system supports delivery of the **SAMP**;	Section 8.2 – AM Leadership
6.2.2	The organization shall establish, document and maintain asset management plan(s) to achieve the asset management objectives. These asset management plan(s) shall be aligned with the asset management policy and the **SAMP**.	Section 6.2 - Asset management strategies and asset class strategies
6.3.1	The asset management objectives shall: — be established and updated as part of the **SAMP**;	Section 5 - Strategic decision and evaluation criteria

Appendix 4: Asset management policy

Asset Management Policy

CitiPower & Powercor

CitiPower and Powercor are committed to providing our customers with a **safe, reliable and affordable supply of electricity** through the application of an effective asset management framework. Asset management activities must meet business objectives and benefit the current and future needs of all customers, stakeholders and employees.

We will achieve our commitment by adopting the following principles:

- Minimise **safety** risks as far as practicable.
- Enhance our **reputation** as a trusted service provider through active industry leadership and the delivery of safe and **reliable** services that meet the needs and expectations of our customers and communities.
- Focus on maintaining a safe, **affordable (least long term cost)** and reliable network when devising our plans for the development of our network.
- Adopt a **risk based approach** to managing our network.
- Invest in programs that **optimise total lifecycle** management.
- **Comply with** as a minimum all relevant **legislative and regulatory requirements** as well as Australian, international and industry standards and any other requirements to which CitiPower and Powercor subscribes.
- Develop high performance operations by **engaging with our employees** and ensuring that they have the right skills and capabilities.
- **Embrace innovation and technology** to continuously improve our asset management framework and activities consistent with recognised asset management standards for the long term benefit of our employees, shareholders, customers and other stakeholders.
- **Monitor and evaluate** appropriate metrics to effectively manage the network and customer service performance.

We **strive for excellence** in everything we do and are always accountable for our own performance including the management and operation of our network to achieve the objectives outlined in the policy.

Timothy Rourke
Chief Executive Officer
March 2018

CITIPOWER Powercor AUSTRALIA

A-001

Appendix 5: Network safety policy

Network Safety Policy

CitiPower & Powercor

The **health and safety** of all employees, contractors, customers and the general public is CitiPower and Powercor's highest priority. CitiPower and Powercor are committed to managing its electricity supply networks to **minimise as far as practicable:**

- The hazards and risks to the **safety of any person** arising from the electricity supply network;
- The hazards and risks of **damage to the property** of any person arising from the electricity supply network; and
- The **bushfire danger** arising from the electricity supply network.

We will achieve our commitment by adopting the following principles:

- **Live safe** and never compromise on health and safety
- Apply an **effective asset management** framework.
- Adopt a **risk based** approach to managing our network
- Apply a **total lifecycle** approach that considers design, construct, operate, maintain and decommission.
- Comply with as a minimum all relevant **legislative and regulatory requirements**.
- Comply with as a minimum all relevant **Australian, international and industry standards** and any other requirements to which CitiPower and Powercor subscribes.

Effective implementation and operation of this policy is demonstrated within the CitiPower and Powercor **Safety Case and Electricity Safety Management Scheme** (ESMS) documents.

This Policy is also to be read in conjunction with CitiPower and Powercor's

- Health and Safety Policy, and
- Asset Management Policy

Steven Neave
General Manager Electricity Networks
March 2018

CITIPOWER Powercor AUSTRALIA

Appendix 6: Health and safety policy

Health and Safety Policy

CitiPower Pty and Powercor Australia Ltd
(including Powercor Network Services and CHED Services)

The health and safety of our employees, contractors, customers and the community is CitiPower and Powercor's highest priority.

We live safe. We never compromise health and safety.

To achieve our safety commitment, we must all strive to adopt a 'whole of life' approach to safe behaviour, while focusing at work on:

- Leading through strong and visible leadership.
- Promoting a health and safety culture of cooperation, commitment and responsibility where safe behaviours are recognised and promoted.
- Ensuring adherence to health and safety policies, systems, practices and expectations.
- Intervening when unsafe acts or conditions are observed.
- Proactively identifying hazards and minimising risk during all aspects of the design, planning and execution of our work.
- Ensuring everyone understands the hazards associated with their work, the relative risk associated with the hazard, and the controls required to minimise risk exposure.
- Ensuring our contractors understand and follow this policy and all relevant sub-policies.
- Effectively consulting with each other about health and safety.
- Meeting or exceeding all relevant laws and management system requirements.
- Preserving the safety of the public in all matters under our operational control.
- Setting and holding ourselves accountable for achieving challenging and transparent health and safety objectives and targets.
- Driving continuous improvement and innovation in health and safety behaviours and performance.

Timothy Rourke
Chief Executive Officer
January 2014

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