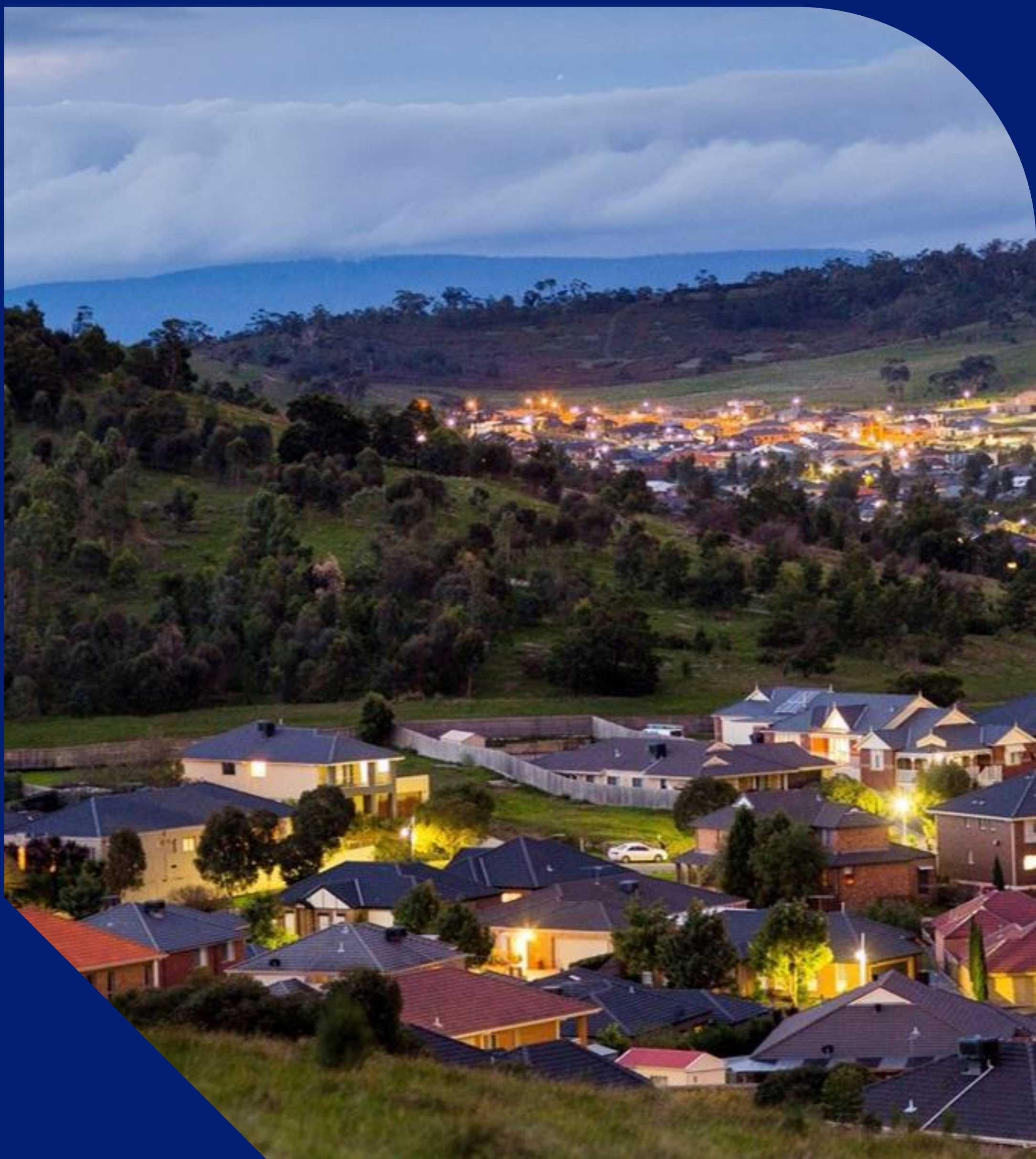
AusNet

Poles

AMS - Electricity Distribution Network



Document number:	AMS 20-70
Issue number:	9
Status:	Draft
Approver:	Rod Jones
Date of approval:	

Table of contents

1. Executive Summary

This document is part of the suite of Asset Management Strategies relating to the AusNet electricity distribution network. The purpose of this strategy is to outline the inspection, maintenance, replacement and monitoring activities identified for economic life cycle management of galvanised steel, steel reinforced concrete, wood, and glass reinforced concrete poles in AusNet's electricity distribution network.

Proactive management of pole application, inspection, maintenance, refurbishment and replacement practice is required to ensure that stakeholder expectations of costs, safety, reliability and environmental performance are met.

Australian hardwood poles form approximately 43% of the entire pole population, steel reinforced concrete poles (introduced in the early 1970s) make up 32% of the population with the remainder galvanised steel lighting poles (25%). Glass reinforced concrete poles introduced to the network since 2019 contribute less than 1% of the overall pole population.

Pole reinforcement techniques such as pole staking were introduced in the late 1980s to manage the rising wood poles replacement rates. Approximately 11% of the wood pole population have been reinforced to economically extend their expected service life. AusNet is also trialling pole base replacement which aims to extend the serviceable life of wood poles by removing 40% of the timber (below ground to 1.5m above ground) and replacing it with a steel section.

The distribution network pole inspection program is undertaken through a combination of ground (test and inspected) and aerial based inspection activities as approved by Energy Safe Victoria, satisfying the requirements for inspections and intervals outlined in the Electricity Safety (Bushfire Mitigation) Regulations 2023.

This document forms part of our Asset Management Strategies for compliance with relevant standards and regulatory requirements. This document demonstrates responsible and prudent asset management practices by outlining economically justified outcomes, considering probability of failure (PoF) and consequence of failure (CoF).

The overall approach to quantified asset risk management is detailed in *AMS -01-09 Asset Risk Assessment Overview*. Sections 5.1, 5.2 and 5.3 of this document AMS 20-70 Poles, describe the considerations and methodologies to determine PoF, CoF, and risk treatments that are unique to poles.

1.1. Asset Strategy Summary

In line with our asset management objectives, AusNet applies a full life-cycle asset management philosophy for the managing electricity distribution network assets to:

- improve network performance.
- leverage advances in technology and data analytics.
- reduce bushfire risk.
- reduce electric network shocks from network assets and
- meet quality of supply obligations.

This management philosophy supports continuous improvement of key processes relating to acquiring pole assets, operating a poles and wire network, maintaining pole assets, and disposing of pole assets as they reach the end of their useful life. A suite of standards, policies, procedures, and performance measures applicable to this asset class inform AusNet Management, employees, and service providers to manage through the lifecycle delivery process.

Condition-based replacement triggered by inspection programs is the fundamental strategy used to manage pole assets. The business rules governing refurbishment or replacement to generate a continuous, prioritised refurbishment and replacement program are documented in *30-4111 Asset Inspection Manual* and are used in the electronic asset management system (SAP).

1.1.1. New Assets

This section differs from the replacement of existing pole assets once they reach end of life. New pole assets resulting from augmentation or customer-initiated works, shall consider:

- The availability, procurement costs, transport costs and supply of poles.
- Establishing new public lighting installations on galvanised steel poles.
- Establishing new service poles using Copper Chromium Arsenate (CCA) treated wood poles.
- Establishing new Low voltage (LV) only circuits on CCA treated wood poles.
- Establishing new simple Medium voltage (MV) structures on CCA treated wood poles;
- Establishing new complex MV structures on concrete poles.
- Establishing new sub-transmission structures on concrete poles.
- Effective earthing all conductive poles in accordance with published standards; and
- Customer required pole materials which conform to technical and approved standards..

1.1.2. Inspections/testing and Monitoring

All Poles installed on the Electricity Distribution Network shall be recorded and managed in the Enterprise Asset Management Database (SAP). Over the life of the pole asset, a visual inspection and (in the case of Wood poles) a sound wood test shall be performed on a cyclic basis and continuously monitored. Inspection cycles are set out in the *BFM 10-01 Bushfire Mitigation Plan – Electricity Distribution Network,* and the *BFM 21-79 Bushfire Mitigation Manual*. All Poles:

- Shall be subject to a cyclic inspection and test as per criteria provided in the *30-4111 Asset Inspection Manual*, and in compliance with the requirements and Electricity Safety (Bushfire Mitigation Regulations),
- Shall include inspection of Stay wires and Stay rods at the same time as the pole.
- Shall have the test results recorded in SAP.

1.1.3. Maintenance

Any defects found through inspection of the pole asset or as part of a fault are to be recorded in SAP and maintained as per the *30-4111 Asset Inspection Manual* and the *SOP 70-03 Standard Maintenance Guidelines*

1.1.4. Refurbishment

Once a pole has reached a point where its serviceability has reduced and intervention is required, the first intervention option is to refurbish the pole to safely extend the service life as per the criteria set out in the *30-4111 Asset Inspection Manual*. The following shall be assessed:

- Reinforcement of wood poles on condition;
- Reinforcement of galvanised steel poles on condition;
- If technically feasible, all poles shall be reinforced to extend the expected remaining service life; and
- If technically feasible, reinforce underground residential distribution (URD) steel poles in place of replacement.

1.1.5. Replacement

Should a pole not meet the criteria for refurbishment the second option is to replace the pole. The following will apply:

- Replace poles on unserviceable condition.
- Replace deteriorated wood poles, which have previously been treated for termite infestation with other pole types as per the *SOP 70-03 Standard Maintenance Guidelines*;
- Replace stay wire and rod as required;
- Replace bed log when replacing deteriorated poles; and
- If technically and economically feasible, undertake partial (~40%) pole (pole base) replacement instead of a full replacement as per criteria stated in the *SOP 70-03 Standard Maintenance Guidelines*;

1.1.6. Improvement initiatives, including research and development

AusNet's asset management strategies apply a full life cycle philosophy for the management of its electricity distribution network. This management philosophy supports a continuous improvement approach requiring research into emerging technologies and development of leading maintenance practices. This list represents some of the challenging topics AusNet is exploring with an aim to economically, reliably and safely advance the resilience of the asset:

- Monitor trial and implement more economic materials and technologies for poles, reinforcement techniques and preservative treatments;
- Investigate alternative inspection techniques to monitor wood deterioration;
- Investigate, trial and implement the usage of non-destructive testing for steel poles;
- Develop stay solutions for concrete poles;
- Establish guidelines for economic extension of wood pole life using staking and refurbishment of pole top assets;
- Establish guidelines for economic extension of wood pole life using pole base replacement on poles and refurbishment of pole top assets.
- Establish guidelines for economic replacement of poles when other assets are being replaced;
- Investigate safety issues of poles in relation to proximity of the carriageway;
- Investigate, develop and implement new wood rot prevention techniques to protect reinforced wood poles and control decay at reinforcement attachment points;
- Investigate, develop and implement economic new wood life extension techniques;
- Undertake investigation and trial on Wagner Composite Fibre poles; and
- Continue to monitor the performance of glass reinforced concrete pole.

2. Introduction

2.1. Purpose

The purpose of this document is to outline the inspection, maintenance, replacement and monitoring activities identified for economic life cycle management of galvanised steel, steel reinforced concrete, wood, and glass reinforced concrete poles in AusNet's Victorian electricity distribution network. This document is intended to be used to inform asset management decisions .

This document forms part of our Asset Management Strategies for compliance with relevant standards and regulatory requirements. This document demonstrates responsible and prudent asset management practices by outlining economically justified outcomes, considering PoF and CoF.

The overall approach to quantified asset risk management is detailed in *AMS -01-09 Asset Risk Assessment Overview*. Sections 5.1, 5.2 and 5.3 of this document *AMS 20-70 Poles*, describe the considerations and methodologies to determine PoF, CoF, and risk treatments that are unique to poles.

2.2. Scope

This Asset Management Strategy applies to all poles associated with the distribution electricity network.

Assets relating to pole top infrastructure are described in:

- *AMS 20-52 Conductor*
- *AMS 20-57 Cross-arms*
- *AMS 20-58 Distribution Transformers*
- *AMS 20-60 MV Switches and ACRs*
- *AMS 20-66 Insulators – High and Medium Voltage.*

2.3. Asset Management Objectives

AusNet's high-level asset management objectives constitute:

- Operate to our risk appetite.
- Optimise risk, cost and performance.
- Improve network reliability.
- Meet customer service objectives.
- Reduce safety risks and meet our obligations.
- Support the energy transition.
- Increase community energy resilience.
- Sustainability and modernisation of the network.

The asset management objectives are supported by following electricity distribution network specific objectives:

- Improve network performance.
- Leverage advances in technology and data analytics.
- Reduce bushfire risk.
- Reduce electric shocks from network assets.

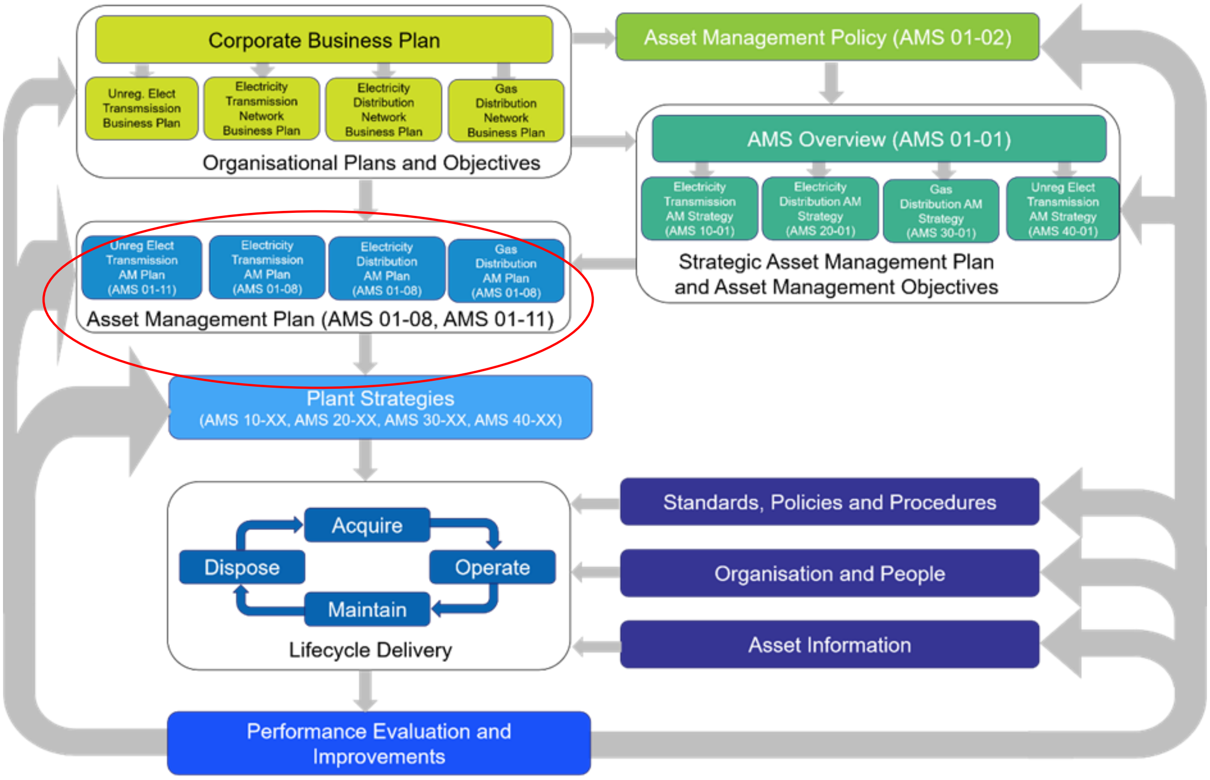
- Deliver Rapid Earth Fault Current Limiters (REFCLs).
- Meet metering compliance obligations.

The asset management objectives are stated in the *AMS 01-01 Asset Management System Overview (Section 9.1)* and the electricity distribution network asset management objectives are stated in *AMS 20-01 Electricity Distribution Network Asset Management Strategy (Section 8).*

AusNet uses a formal Asset Management System to ensure that the objectives are aligned throughout all levels of the business. AusNet's asset management system AMS 01-01, including the policy AMS, objectives and its underlying methodology, context, process, decision making criteria and certification are detailed in *AMS 01-01*. This electricity distribution network asset management strategy is one of several asset management related documents. It provides more specific information on the issues and strategies specific to this Asset Class.

The suite of documents together comprises the Asset Management System as represented in Figure 1, circled in red.

Figure 1: Components of the Asset Management System



3. Asset Description

3.1. Function

Poles provide load bearing structural support for overhead conductors and equipment in the electricity distribution network. The purpose of poles is to establish safe electrical and physical clearances between electrical conductors and the ground, and other structures. Moreover, sufficient strength is required to withstand forces.

3.2. Population

3.2.1. Population Overview

AusNet's electricity distribution network has more than 422,000 wood, concrete, galvanised steel and glass reinforced concrete poles. Table 1 summarises the breakdown of the poles by pole type.

Table 1 - Pole Population by Type- October 2024

POLE TYPE	NUMBER OF ASSETS	PERCENTAGE OF FLEET
Wood Pole	**180,708**	**42.8%**
Concrete Pole	**135,455**	**32.1%**
Steel Pole	**103,982**	**24.6%**
Glass Reinforced Concrete Pole	**2,026**	**0.5%**
TOTAL	**422,171**	**100%**

Source: AusNet.

3.2.2. Population Considerations

The population profile for poles is crucial for effective lifecycle management. This profile includes detailed data on the quantity, types, locations, and specifications of these assets within the electricity distribution network.

A comprehensive understanding of the population profile allows asset managers to:

- **Identify critical assets**: Determine which poles are essential for maintaining the integrity and reliability of the network.
- **Allocate resources efficiently**: Plan and allocate maintenance resources effectively by knowing the exact number and location of assets.
- **Risk management**: Assess and manage risks associated with different assets. For example, if the population profile indicates poles are in bushfire-prone areas, poles will be inspected at regular intervals as per regulatory requirement.
- **Optimise maintenance schedules**: Develop optimised maintenance schedules based on the distribution and condition of assets. For instance, poles that are deemed as limited life will have a sound wood test completed along with a visual inspection at every 30-months interval in both High Bushfire Risk Areas (HBRA) and Low Bushfire Risk (LBRA) regions.
- **Enhance reliability and safety**: Ensure that all components, including wood, concrete, steel, and glass reinforced concrete poles, meet the required standards for reliability and safety. For example, if the result of an inspection reveals that a wood pole has deteriorated to a respective measurement, it will be prioritised for the appropriate intervention, such as but not limited to; reducing the sound wood test interval, treatment, reinforcement, pole base replacement or full pole replacement.
- **Support strategic planning**: Inform long-term strategic planning and investment decisions.

3.2.3. Geographic Impact Areas

AusNet's electricity distribution network supplies electricity to customers across eastern and north-eastern Victoria, and in Melbourne's north and east. This region encompasses a diverse range of geographic locations, each with specific environmental impacts on poles. Understanding these impacts is essential for effective asset management within AusNet's electricity distribution network.

Notable examples include:

- **High Wind Areas**: High wind areas, particularly in elevated regions and open plains, subject poles to significant stress and fatigue
- **Corrosive Areas**: Coastal areas where salt and pollutants are prevalent can cause corrosion of metallic components in poles.
- **Bushfire Areas**: Bushfire-prone areas may pose a risk of fire damage to pole infrastructure.

3.2.4. Population by Type

3.2.4.1. Asset Type: Wood Poles

- **Summary Explanation of Form and Function**: Wood poles are made from various species of timber. They provide structural support for overhead conductors and equipment.
- **Purpose within the Asset Class**: Wood poles maintain safe electrical and physical clearances between conductors and the ground, structures, or other conductors.
- **Purpose within the Network Design**: They are commonly used throughout the network, particularly in rural = area, to support distribution lines.
- **Process Function**: Wood poles distribute electrical power from substations to end-users, ensuring stable and reliable delivery of electricity.

Figure 2 – Typical Wood Pole

AusNet procures wood poles to Australian Standard AS 2209-1994, which classifies wood species according to its code. The strength group and durability class are listed in 30-4111 Asset Inspection Manual .

The wood poles specification can be found in DES 10-18.

Since 1993, Class 1 wood poles are regal species wood, often dressed octagonally by suppliers. Class 2 wood poles usually have a natural round profile.

The entire Class 3 poles are creosote pressure treated. The Copper chromium arsenate (CCA) treated Class 1 and 2 wood poles were introduced in 1992, which represent a small proportion of the overall wood pole population.

3.2.4.2. Asset Type: Concrete Poles

- **Summary Explanation of Form and Function**: Concrete poles are made of steel-reinforced concrete, offering robust structural support. They are electrically conductive and require insulation and earthing systems.
- **Purpose within the Asset Class**: Concrete poles provide durable and long-lasting support for overhead conductors and equipment.
- **Purpose within the Network Design**: They are often used in urban and suburban areas where high strength and longevity are required.
- **Process Function**: Concrete poles support overhead electrical distribution systems, facilitating the delivery of electricity to consumers.

Figure 3 – Typical Concrete Pole

Steel reinforced concrete poles have been used in Victoria since the early 1970s. They are electrically conductive and require additional engineering of insulation and earthing systems to ensure safe and reliable performance.

3.2.4.3. Asset Type: Galvanised Steel Poles

- **Summary Explanation of Form and Function**: Galvanised steel poles are primarily used for street lighting and support for distribution lines.
- **Purpose within the Asset Class**: These poles offer high strength and relatively light weight, making them suitable for various environmental conditions.
- **Purpose within the Network Design**: Used extensively in areas requiring reliable and durable infrastructure.
- **Process Function**: Galvanised steel poles support street lighting and overhead distribution lines, ensuring stable and reliable electrical distribution.

Figure 4 – Typical Galvanised Steel Pole

Galvanised steel poles have been predominately used as streetlight poles within the electricity distribution network. Similar to concrete poles, galvanised steel poles are electrically conductive and require additional engineering of insulation and earthing systems to ensure safety and reliability.

3.2.4.4. Asset Type: Glass Reinforced Concrete Poles

- **Summary Explanation of Form and Function**: Glass reinforced concrete poles are made from engineered cement composites, providing a combination of strength and durability.
- **Purpose within the Asset Class**: These poles offer lightweight yet strong support for overhead conductors and equipment.
- **Purpose within the Network Design**: Used in various locations within the network, particularly where high strength-to-weight ratio is advantageous.
- **Process Function**: They support the distribution network by providing reliable structural support for electrical distribution lines and equipment.

Figure 5 – Typical Glass Reinforced Concrete Pole

In mid-2018, AusNet conducted field trials of engineered cement (Titan^{TM}) poles for use on our distribution and sub-transmission networks. The main advantages of the glass reinforced concrete poles are their durability and non-conductive properties. Such pole type is now approved for general use.

The strategy utilised to replace poles with the preferred type is detailed in *SOP 70-03 Standard Maintenance Guidelines*.

3.3. Age

Understanding the age profile of poles aids asset management and lifecycle planning. Knowing the age distribution of these assets and matching that to historical deterioration rates based on species helps in predicting the long-term volumes of maintenance, upgrades, or replacements accordingly.

Short term volume forecasting is closer aligned to previous inspection results for sound wood measurements, species type and other measures such as recorded pest activity. Age is not the driver for condition of the asset.

3.3.1. Age profile

The historical expansion of the distribution network has resulted in considerable infrastructure installations and replacements causing the asset age profile to be sporadic. The service age profile of all poles on the distribution network is shown in Figure 6. Approximately 2% of the poles have a service age exceeding 80 years.

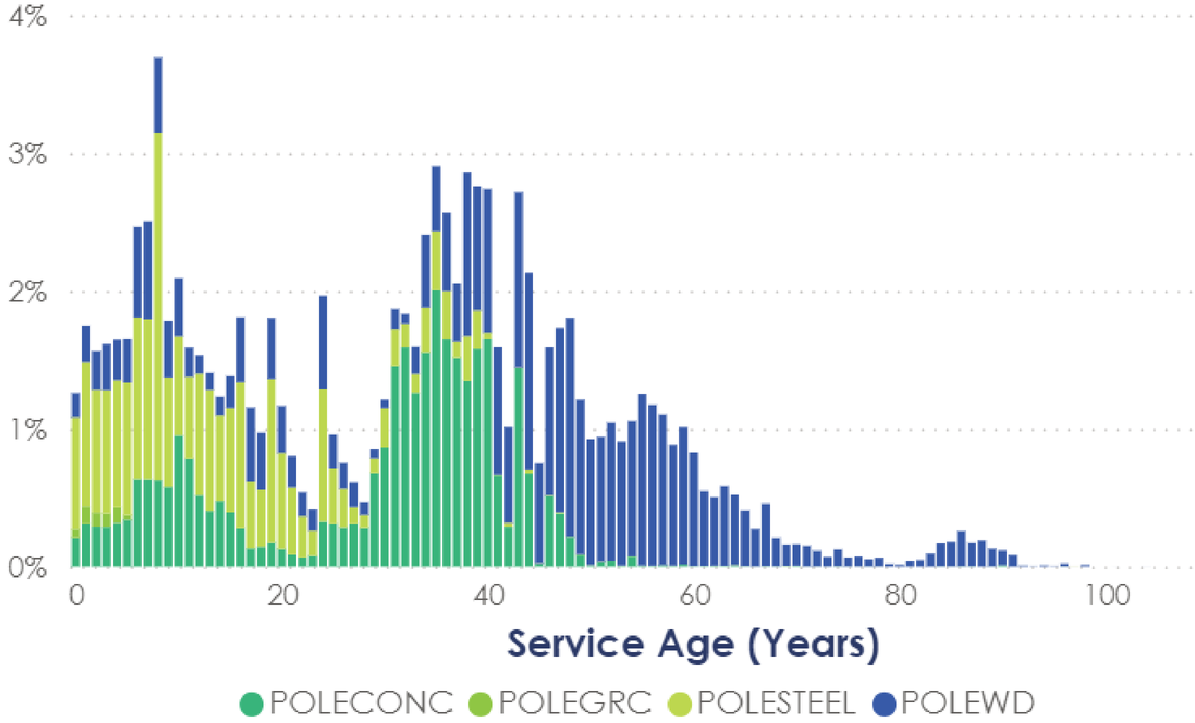


Figure 6 - Service age of all poles – October 2024

3.3.2. Wood poles

The service life of a wood pole can be extended by using wood preservatives, termiticide, pole reinforcement techniques and pole base replacements. The age profile of wood poles is shown in Figure 7.

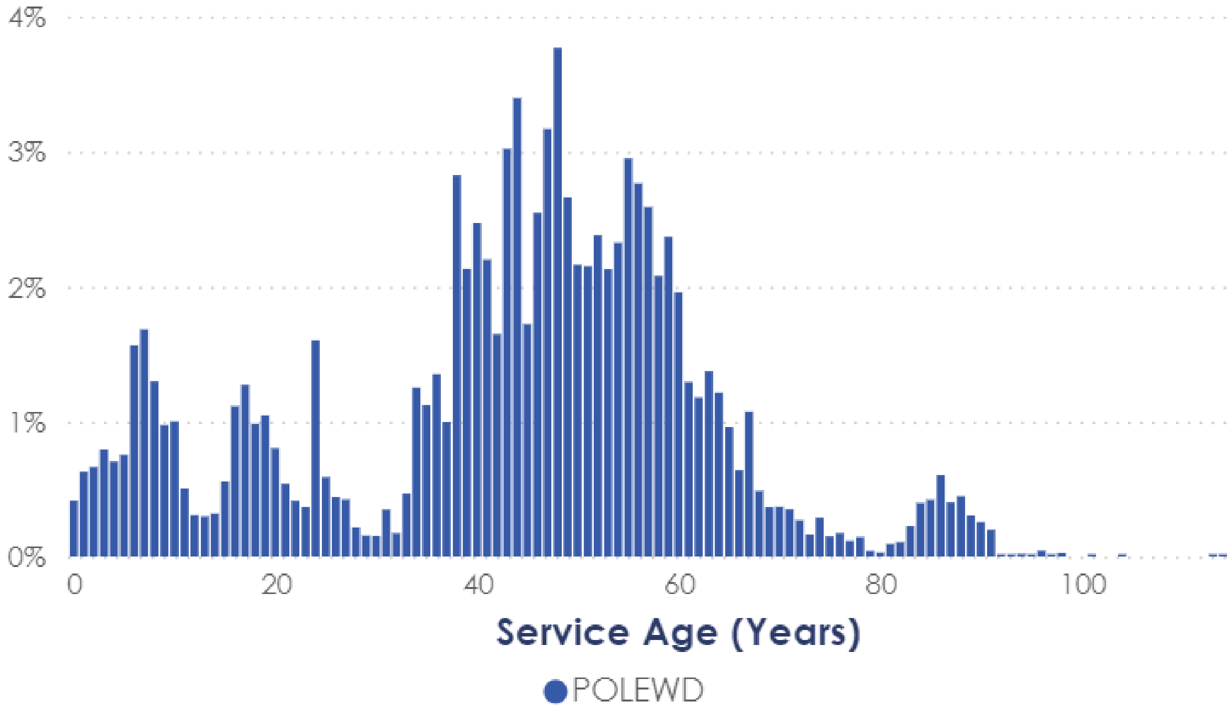


Figure 7 – Service age of wood poles - October 2024

Approximately 11% of the wood pole population have been reinforced e.g. Pole staking. Poles that have been reinforced are expected to have their serviceable life extended by an additional 10 to 15 years. Pole reinforcement procedures and criteria can be found in the *SOP 70-03 Standard Maintenance Guidelines*.

The service age profile of reinforced wood poles shows an average age of 56 years with a standard deviation of 13 years. In contrast, wood pole without a reinforcement has an average age of **41** years with a standard deviation of **20** years. This suggests that on average, wood poles reinforcement can extend their service life by **15** years.

3.3.3. Concrete poles

Less than 1% of the concrete pole are exhibiting signs of external corrosion; this is being monitored and currently has no effect on the serviceability of these poles.

Currently the technical life for concrete poles has not been determined; however, with the oldest installations approaching 52 years and fewer than ten have been replaced due to deterioration, it is expected to last beyond 60 years and may well achieve a mean service life of 100 years. This will be determined through the ongoing inspection and condition assessment regime and analysis of deterioration and replacement rates.

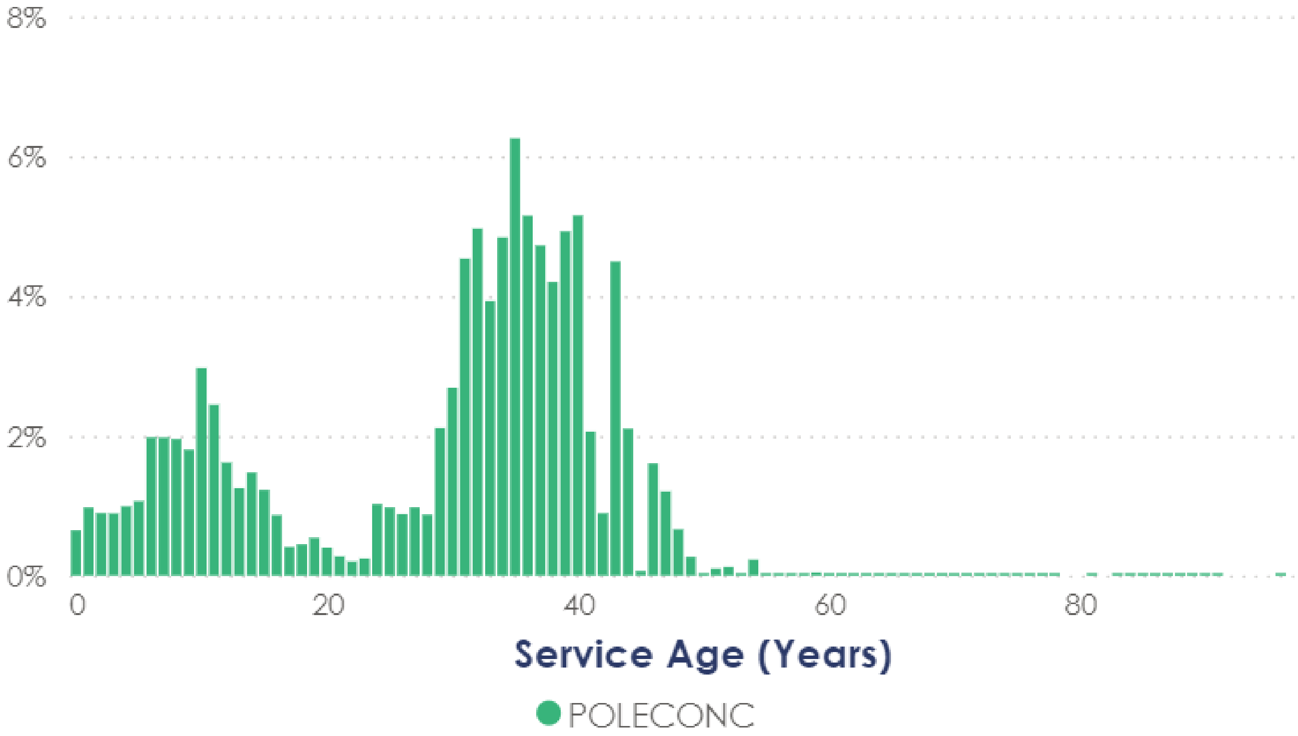


Figure 8 shows the increasing usage of concrete poles from late 1970's to the 90's due primarily to the shortages in wood pole availability.

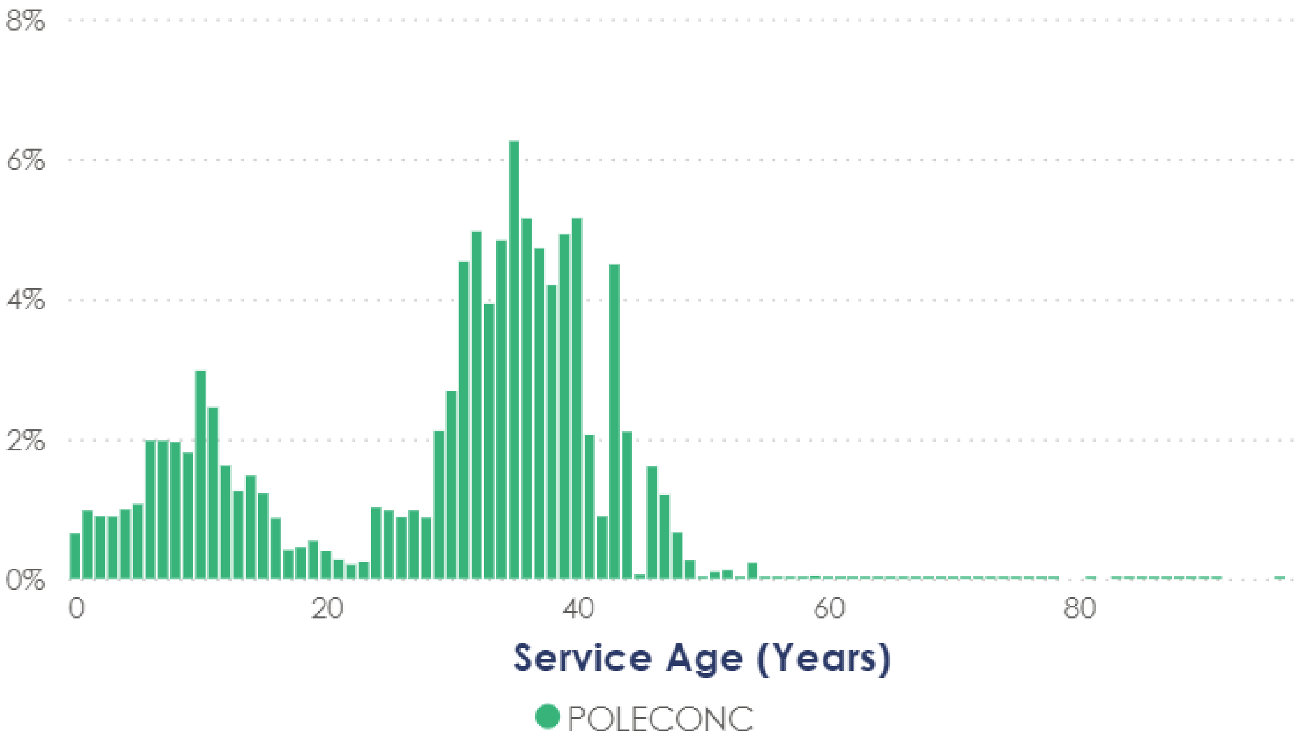


Figure 8 – Service age of concrete poles - October 2024

3.3.4. Galvanised Steel poles

Galvanised steel poles have an expected service life of 35 years and a standard deviation of 6 years when employed as utility poles in the Electricity Distribution Network.

However, due to the improved galvanising techniques, it is expected that galvanised steel poles installed after the 1990s should have an estimated expected life of nearing 50 years. Reinforcement works such as staking galvanised steel poles are currently applied to extend the service life of a pole.

Reinforcement criteria and procedures can be found in the *SOP 70-03 Standard Maintenance Guidelines*.

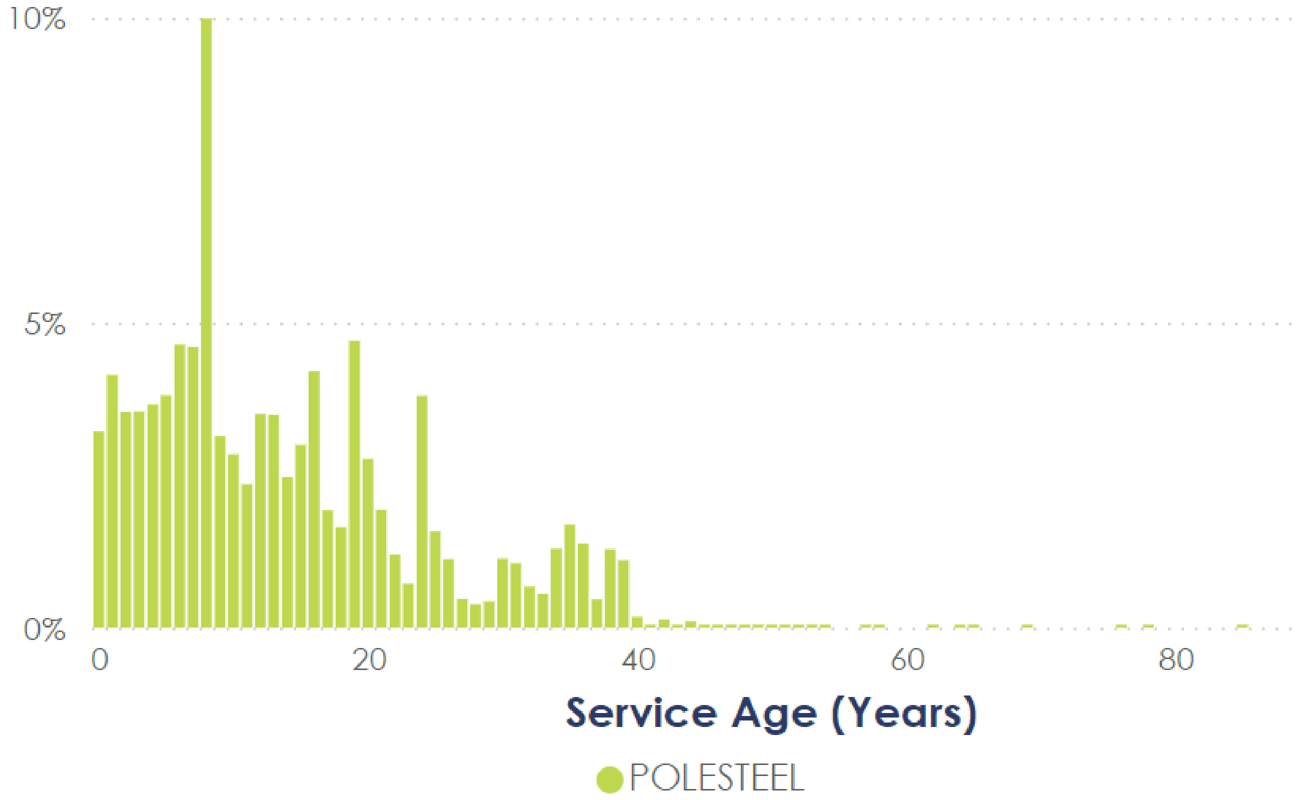


Figure 9 – Service age of galvanised steel poles - October 2024

3.3.5. Glass Reinforced concrete poles

Glass Reinforced concrete poles have been installed on AusNet's network since 2019, the technical life has not yet been determined.

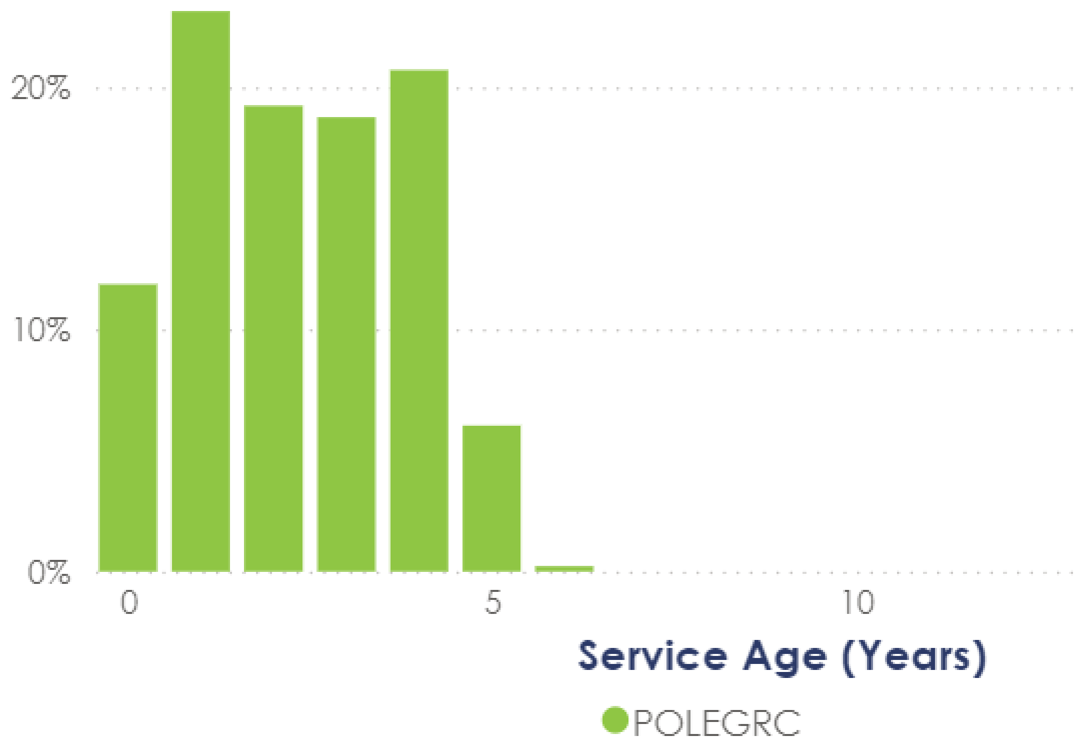


Figure 10 – Service age of glass reinforced concrete poles - October 2024

4. Risk Management

AusNet maintains a risk management system designed in accordance with AS ISO 31000 Risk Management – Guidelines to ensure risks are effectively managed to provide greater certainty for the owners, employees, customers, suppliers, and the communities in which we operate.

In the electricity distribution network, AusNet aims to maintain risk. Risk treatments required to achieve this over time include replacement, refurbishment, and maintenance activities, and are developed based on current risk and extrapolated risk.

The overall approach to quantified asset risk management is detailed in AMS -01-09. Section 5.1, 5.2 and 5.3 of this document describe the considerations and methodologies to determine PoF, Cof, and risk treatments that are unique to poles.

4.1. Probability of Failure

The criticality of each asset is determined by considering two main factors: the probability of failure (PoF) and the consequence of failure (CoF). The PoF is influenced by factors such as environmental conditions (e.g., high winds, corrosion, bushfire risk), and historical failure rates. Advanced diagnostic tools and inspections help in quantifying this probability. The CoF is assessed based on the potential impact on network reliability, safety, and service continuity. This includes the number of customers affected, the strategic importance of the asset in the network, and the cost of repairs and downtime.

Assets that fall into the high-risk category (high PoF and high CoF) are prioritised for maintenance, upgrades, or replacement. This approach ensures that resources are allocated efficiently, focusing on assets that pose the greatest risk to network reliability and safety.

4.1.1. Condition Assessment

4.1.1.1. Condition Assessment Protocol

Condition assessments are a critical element of lifecycle management for poles. These assessments provide vital information on the current state and performance of poles, enabling informed decision-making regarding maintenance, repair, and replacement.

Condition assessments involve a systematic evaluation using specific benchmarks and a rating scale to describe the health and performance of poles. AusNet employs a standard approach to condition assessments that employs a 5-point rating scale to assign The AusNet 5-point rating scale is designed to categorise assets based on their current condition and performance.

AusNet's standard condition assessment protocol therefore follows these high-level scoring criteria:

- **Condition 1 (C1):** A rating of Condition 1 indicates an asset in very good condition, typically with no visible defects and optimal functionality. These assets are expected to have a long remaining service life. Example: A pole with no signs of defects or failure. Routine inspection and condition monitoring is recommended. The standard AusNet Asset Condition scoring card benchmarks the remaining useful life of Condition 1 (C1) assets at 95%.
- **Condition 2 (C2)**: A rating of Condition 2 reflects good condition. It does not require intervention between scheduled inspections nor do they show any trends of deterioration in condition or performance. The standard AusNet Asset Condition scoring card benchmarks the remaining useful life of Condition 2 (C2) assets at 70%.
- **Condition 3 (C3)**: A rating of Condition 3 signifies average condition, typically require some maintenance activity. Assets demonstrate typical deterioration in condition or performance. The standard AusNet Asset Condition scoring card benchmarks the remaining useful life of Condition 3 (C3) assets at 45%.
- **Condition 4 (C4)**: A rating of Condition 4 indicates worse than average condition. Specialist work may require managing specific defects. Pole may be classified as "Limited Life" depending upon the material type The standard AusNet Asset Condition scoring card benchmarks the remaining useful life of Condition 4 (C4) assets at 25%.
- **Condition 5 (C5)**: This category includes assets which are inspection and maintenance intensive. Assets are approaching the end of economic life. Assets is now considered "Limited Life" and is being managed

through to the “Unserviceable” condition and replacement. The standard AusNet Asset Condition scoring card benchmarks the remaining useful life of Condition 5 (C5) assets at 15%.

The condition scoring methodology outlined above provides high-level scoring criteria that apply to distribution poles within AusNet’s electrical distribution network. These scoring criteria offer a broad framework for assessing the general condition and remaining life of an asset.

4.1.1.2. Asset Specific Monitoring Considerations

To accurately evaluate the condition of each specific asset within a given asset class, it is also essential to further refine the benchmarks associated with condition scoring. Each asset class, such as wood, concrete, steel, and glass reinforced concrete poles, has unique characteristics and operational requirements that necessitate more detailed benchmarks. Developing these more granular benchmarks may involve considerations such as:

- **Customising Indicators**: Identifying specific indicators of wear, degradation, and performance relevant to each asset type. For instance, wood poles may be evaluated based on structural integrity and decay levels, while concrete poles may be assessed for corrosion and cracking. Example: Custom indicators for wood poles could include measurements of remaining sound wood or termite activities, ensuring precise evaluations tailored to their specific functions.
- **Detailed Inspections**: Conducting thorough inspections tailored to the asset class, incorporating both visual assessments and technical measurements. Example: Detailed inspections for wood poles might include non-destructive testing and aerial inspection.
- **Historical Data Analysis**: Assessing historical performance and maintenance data to establish norms and thresholds for each condition score. This helps in predicting future performance and planning proactive interventions. Example: Analysing historical failure data of poles can help establish condition thresholds that predict future degradation patterns, guiding proactive replacement strategies.
- **Environmental Factors**: Considering the impact of local environmental conditions, such as exposure to coastal salt air for steel poles or poles in high bushfire risk areas, which can influence asset condition.

4.1.2. Condition Profile

To provide a consistent assessment of the condition of the whole asset group, a common condition scoring methodology has been developed. This methodology uses the known condition details of each asset and grades that asset against common asset condition criteria.

There are 5 different condition scores that have been applied to each distribution pole, ranging from “Very good” (C1) to “Very poor” (C5).

4.1.2.1. Pole condition summary

Figure 11 shows the overall condition profile of all AusNet's pole types.

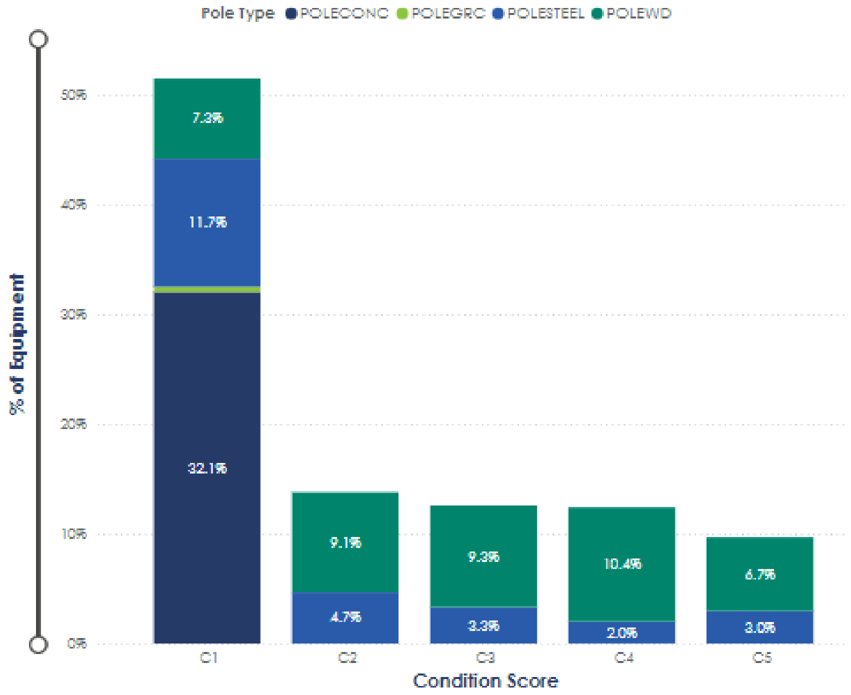


Figure 11 – Overall condition profile of AusNet's pole type – September 2024

4.2. Pole condition by pole type

4.2.1. Wood poles

The condition of wood poles is shown in Figure 12. Approximately 16% of wood poles are in condition C5, which may subject to replacement or reinforcement. The condition 4 and 5 of Wood Poles consist of more than 20 different wood species.

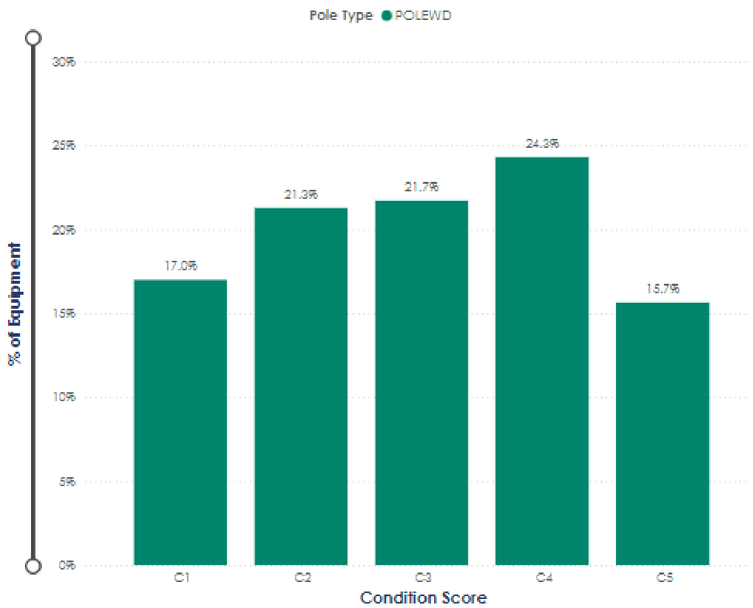


Figure 12 - Wood Pole Condition - September 2024

Historically, White Stringybark poles have been the single largest species of poles requiring replacement. However, since 2009, there has been a substantial increase in the number of Messmate poles approaching the end of their serviceable life. The condition summary of wood poles by species is shown in Table 2.

Table 2 - Condition Summary of Wood Poles by Species – September 2024

CONDITION	MESSMATE	WHITE STRINGYBARK	OTHERS	TOTAL
C1	1.3%	0.1%	15.6%	17%
C2	9.1%	0.4%	11.8%	21.3%
C3	8.6%	1.7%	11.4%	21.7%
C4	7.9%	1.8%	14.6%	24.3%
C5	4.5%	1.6%	9.6%	15.7%

The majority of wood poles are in a serviceable status as shown in Figure 13. It is observed that the White Stringybark poles have been extensively staked, which is a leading indicator of increasing replacement rates over the next decade.

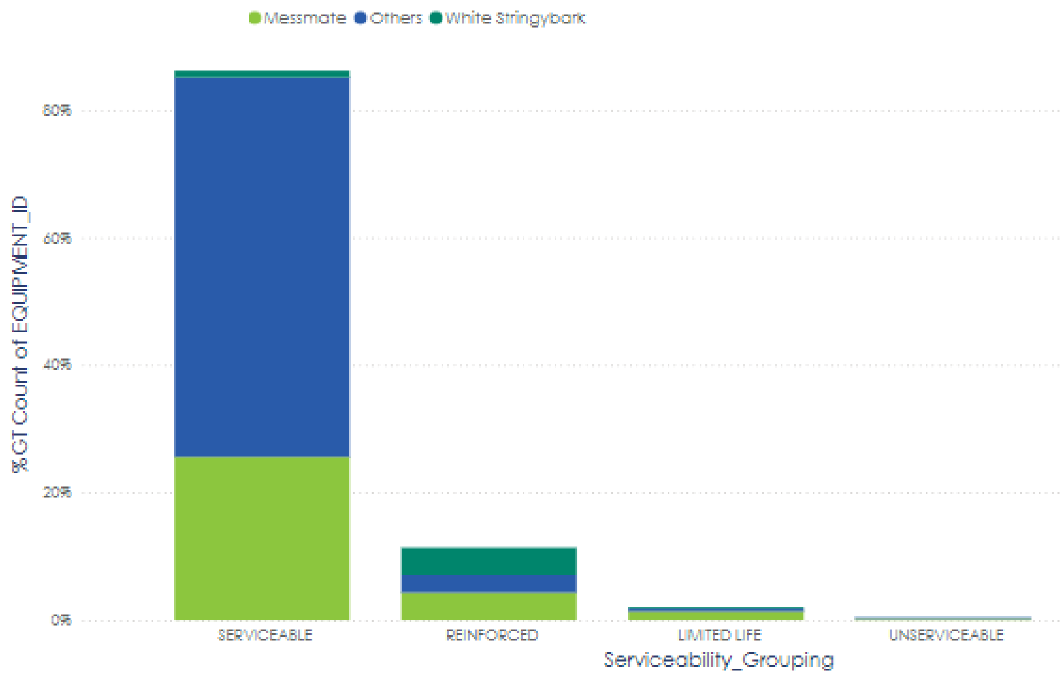


Figure 13 - Service Status of Wood Pole by Species - September 2024

To address the increasing deterioration rates of wood poles, a combination of pole replacements and proven life extension methods (such as pole staking and pole base replacements) will be required to manage intervention volumes. This will reduce pressure on material supply and construction resources, while at the same time limiting the impact on customer PSAIDI, as pole staking and pole base replacements may be safely performed under live operating conditions.

4.2.2. Concrete Poles

Concrete poles have thus far required very little maintenance in comparison to wood poles. Visual condition assessments have identified significantly less than 1% of the concrete pole population as being unserviceable or limited life. Therefore, more than 99% of the concrete poles are in very good condition.

The damage to unserviceable or limited life concrete poles has primarily been caused by the action of third parties, for example vehicle impact. The classification placed upon these assets and the ongoing inspection regime is expected to be adequate to monitor any increase in the level of degradation prior to failure. There have been very few planned concrete pole replacements due to the deterioration of the concrete structure.

Overall, the population is considered to be in a very good condition. The existing maintenance inspection regime will continue until such time that future deterioration trends emerge.

4.2.3. Galvanised Steel Poles

Galvanised steel poles require relatively less maintenance. The current cyclical visual inspection of steel poles can identify surface corrosion at or just below ground level of a steel pole.

Galvanised poles that are in "poor" or "very poor" condition can be reinforced. Works such as staking deteriorated galvanised steel poles has been a business-as-usual process since 2016.

There is no programmed remediation approach currently employed for below ground corrosion of a steel pole.

4.2.4. Glass Reinforced Concrete

The usage of glass reinforced concrete was started in 2019) on the distribution network. All are in serviceable status given their age. Overall, the population is considered to be in very good condition.

4.3. Consequence

To effectively manage the lifecycle of poles, it is essential to understand the criticality of these assets. This involves evaluating the consequence of failures. The consequence assessment is a key component of asset management as it helps prioritise maintenance, upgrades, and replacements.

To measure the criticality of assets, AusNet Services utilises a consequence of failure approach. This approach involves evaluating both the likelihood of failure and the consequence of such failures. The process starts by identifying key risk factors, including environmental exposure, historical performance data, and the results from regular condition assessments.

The criticality of each asset is determined by considering two main factors: the probability of failure (PoF) and the consequence of failure (CoF). The PoF is influenced by factors such as environmental conditions (e.g., high winds, corrosion, bushfire risk), and historical failure rates. Advanced diagnostic tools and inspections help in quantifying this probability. The CoF is assessed based on the potential impact on network reliability, safety, and service continuity. This includes the number of customers affected, the strategic importance of the asset in the network, and the cost of repairs and downtime.

Assets that fall into the high-risk category (high PoF and high CoF) are prioritised for maintenance, upgrades, or replacement. This approach ensures that resources are allocated efficiently, focusing on assets that pose the greatest risk to network reliability and safety.

Specific examples of high-risk versus low-risk assets include:

- **High-Risk Assets**: Poles located in areas prone to bushfires, high winds, or coastal regions where corrosion is accelerated are considered high-risk due to their increased likelihood of failure and significant impact on network reliability if they fail. For example, a pole in a bushfire-prone area that has been assessed as having a high probability of failure would also pose a severe risk to public safety and service continuity.
- **Low-Risk Assets**: Poles in stable, urban environments with minimal environmental stressors are typically considered low-risk. These assets have a lower probability of failure and, if they do fail, the impact on the overall network is less severe compared to high-risk assets. For instance, a pole in a non-corrosive, low-wind area with low customer density may be scheduled for less frequent maintenance due to its lower criticality.

The detailed methodology of the consequence assessment is described in section 2 of AMS -01-09.

4.4. Risk Treatment

Risk treatments are required to maintain risk by targeting reduction of PoF or CoF depending on the nature of the risk. Treatment measures include asset replacement, asset refurbishment, inspections, testing or system redesign, and are achieved through capital projects or operational expenditure. Risk treatment options are described in the section on 'Risk Treatment' in *AMS 01-09 Asset Risk Assessment Overview*.

Capital replacement is a major component of asset risk management. The prerequisites for replacing assets:

- replacement of an asset will result in a material risk reduction;
- risks can't be feasibly managed through maintenance or refurbishment; and
- monetised risk exceeds the replacement cost – i.e., replacement is economic.

4.5. Risk and options analysis

The pole inspection program is approved by Energy Safe Victoria and compliance with the Electricity Safety (Bushfire Mitigation) Regulations.

During an inspection of a wood pole, "sound wood measurement" at ground level and 1m above ground level, as well as "girth measurement" are recorded in the Enterprise Asset Management System – SAP. This information is used to derive the service status and condition of the pole. Inspection procedures are detailed in the *30-4111 Asset Inspection Manual*.

For a concrete pole, the condition assessment relies upon a visual assessment along its length for cracking and rust staining to determine the overall condition of the pole.

For a glass reinforced concrete pole, visual inspection will be used to assess the pole condition.

The condition of a galvanised steel pole is based upon a visual inspection, at ground and below ground level. The extent and impact of the corrosion is assessed, and the pole is considered as either "Serviceable" or "Unserviceable".

Pole reinforcement such as pole staking is predominantly applied to wood and some steel poles, which act as a preventative maintenance activity to extend the expected service life of poles. If a pole is classified as a "Limited Pole" by a trained inspector and is considered as an unsuitable candidate for "staking", the inspection frequency will be changed according to the *30-4111 Asset Inspection Manual*. When the extent of internal deterioration has increased and the pole attains the classification of "Unserviceable", it will be scheduled for a replacement. "Limited Life" poles deemed suitable to be staked will reinstate its "Serviceable" status.

The reinforcement and replacement criteria are described in detail in the *SOP 70-03 Standard Maintenance Guidelines*. It serves as a purpose to clearly indicate the standards that shall be employed in the issue of planned work guidelines for the maintenance of distribution poles.

These rules have been developed using a risk-based approach to reduce the risk of a pole failure "as far as practicable" as required by the Electricity Safety Act.

5. Performance

5.1. Performance Analysis

In the context of asset management for poles, assessing asset performance is a vital tool for effective lifecycle management. Performance information provides a comprehensive understanding of how these assets behave under various conditions, enabling asset managers to make informed decisions that enhance the reliability, safety, and efficiency of the electrical distribution network.

Performance data helps identify trends and patterns in asset behaviour, which are crucial for making strategic decisions regarding maintenance, upgrades, and replacements. Understanding how assets perform over time allows for proactive management, reducing the risk of unexpected failures. The assessment employed by AusNet involves analysing failure trends and any significant impacts resulting from failure, which provides valuable insights into the health and reliability of the assets.

5.2. Performance Profile

5.2.1. Pole Failures

A pole failure or functional failure is when an asset is unable to fulfil a function to a standard of performance which is acceptable to user. The function of a pole has been defined in Section 3.1.

The trend and breakdown of the causes of notification completed for the period 2019 to 2023 is shown in Figure 14.

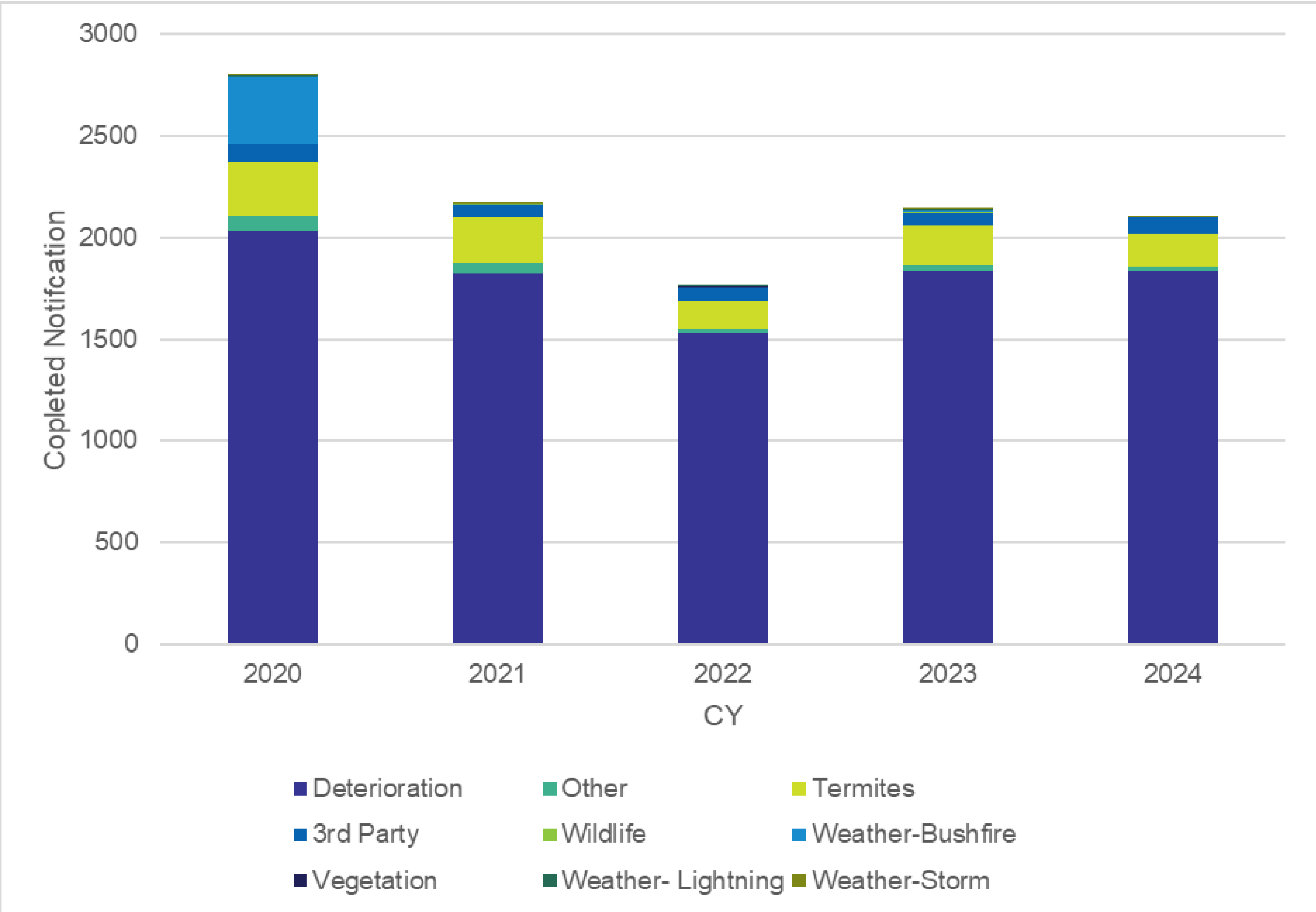


Figure 14 - Notification completed per Calander Year (CY) – 2019 to 2023

The following Figure 15 shows the cause of completed notifications, which indicated the majority of notifications are due to pole deterioration.

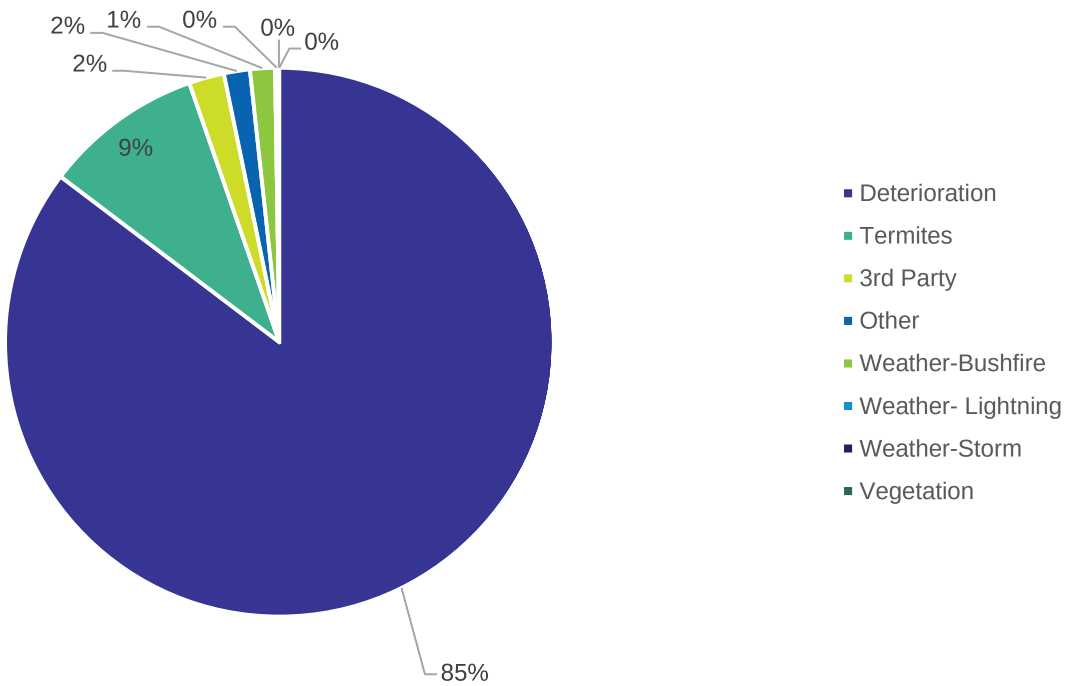


Figure 15 - Cause of Notification

5.3. Failure Modes

5.3.1. Application of Failure Modes

Understanding failure modes is an important tool that supports measuring the criticality of assets, especially when assessing the risk of potential failures and their potential impact on the overall system. By identifying and analysing the various ways in which an asset can fail (including the root causes and mechanisms of failure), asset managers can better predict and mitigate risks.

5.3.2. Failure Modes by Asset Class

As noted above, assessing failure modes and utilising the detailed information about each mode plays a crucial role in various aspects of Asset Management Planning. Understanding failure modes enhances the effectiveness of risk management efforts and ensures the optimal performance and reliability of assets within the electrical distribution network. Some notable failure modes for poles are detailed in the below section.

5.3.2.1. Wood Pole Failure Modes

- **Wood Rot**

  Wood rot is the principal cause of wood pole downgrading. Rot occurs both internally and externally in the vicinity of the ground line. Rot reduces the cross-sectional area of sound wood and thus the structural strength of the pole over an extended time. The extent of sound wood can be assessed by drilling and probing the wood and once a pole reaches a reduced sound wood measurement at or below 60mm a non-invasive tool "wood scan" is utilised to assess the pole strength

On average the first signs of deterioration occur after 25 to 30 years' service. The 'warning time' (or P-F interval) from when rot is first detected until when the pole becomes unserviceable can be as short as seven years but is typically 20 years. The use of boric-acid based fungicides is effective in slowing the progression of rot, but the act of drilling for inspection and treatment can further reduce the strength of the pole.

- **Termites**

  Termites are insects that may be found in trees, logs, poles and most wood products. In Victoria, termites usually enter the pole from just below ground to the base of the pole. Several types of termites have been found in network poles. Examples include subterranean termites destroying sound wood, damp wood termites found in decaying wood and ambrosia beetles that may have riddled the timber with numerous galleries before significantly undermining the structural strength of the wood pole.

  Termites have been found in approximately 3% of all wood poles across the network. Damage varies from being confined to a gallery in the middle of the pole, destroying a wood cross arm, up to a full nest within the pole. Termite attack is difficult to predict in wood poles and early detection is challenging for asset inspectors. However, termite damage in new poles is rare.

- **Pole fires**

  Pole top fires occur in fog, dew, drizzle or light rain, and in most cases, this follows a long period of dry weather in which airborne pollutants have coated the insulators.

  Pollutants include diesel fumes, coal dust or dust from roads or agriculture, fertilisers, or airborne salt spray in coastal areas. The pollution facilitates the passage of leakage currents from the phase conductor to ground via points of concentration where the insulator is fastened to the cross arm or where metal braces attach to the cross arm. At these points of concentration, the current density is sufficient to ignite the wood cross arm which smoulders and then becoming flames. If unattended, the fire will destroy the cross arm and pole top.

  Pole fires rarely develop into grass fires or bushfires, as they usually occur at times of high humidity and generally do not occur at times of high ambient temperature.

  On December 2016, the Victorian Government published the "F-Factor Scheme order 2016" (the 2016 order). It targets incentives towards fire ignitions that pose the greatest risk of harm via ignition risk units (IRUs), which fire is weighted by a "location factor" and a "fire risk factor"[1]. Currently, 50% of poles are in a High Bushfire Risk area. AusNet has implemented programs targeting fire ignitions which have resulted in a decline in Asset Fires. Asset fires can be tracked in the following dashboard (insert dashboard link). Since 2015 AusNet has an average of less than a single ignition per annum due to pole failure leading to a ground fire (Figure 16).

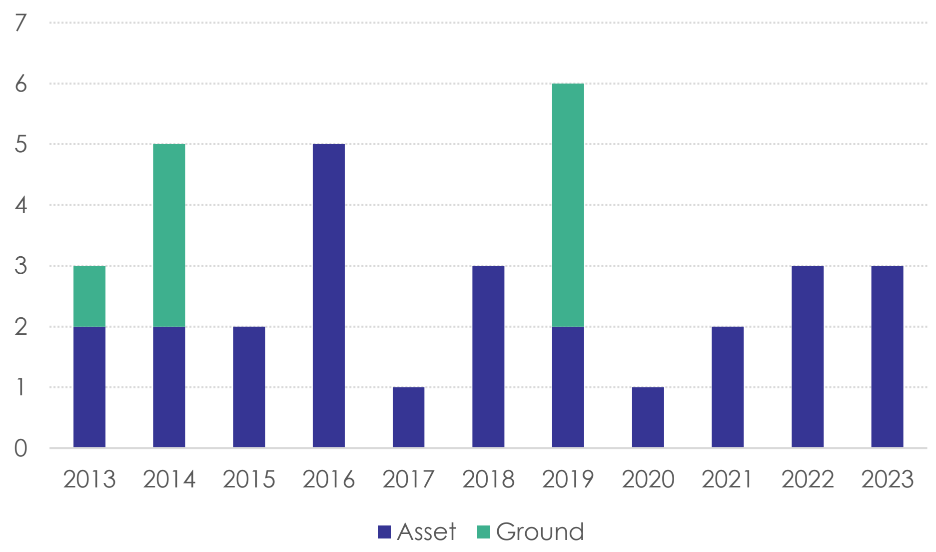


Figure 16 – AusNet Pole Fires: 2013 - 2023

[1] Electricity f-factor scheme 2016-22 for Victorian electricity distribution network service providers

- **Damage by motor vehicle or third-party impact**

  Poles may subject to shock loading due to motor vehicle or third-party impact, which exceeds the design loading for the pole. The structure of the pole is damaged as a result.

5.3.2.2. Concrete Pole Failure Modes

- **Concrete Cracking**

  Some of the aggregate used for poles has contained pieces of iron or iron bearing stone, either of which can cause dense rust spots on the surface. In most cases, these are not structurally harmful. Pole deterioration by rusting of reinforcing steel can result in the prominence of vertical cracks and rust stains, which may reduce the service life of a pole. These are usually seen above ground to a height of one metre on the north side of the pole.

- **Steel Corrosion**

  High salinity ground water accelerates the corrosion of the steel reinforcing in concrete poles, leading to concrete spalling and subsequent loss of structural strength near ground level. In the 1980s, stainless-steel plates were introduced to seal the hollow butt of concrete poles and slow the rate of corrosion of the internal steel reinforcing cage. Mechanical damage to the outer layer of concrete can also expose the steel reinforcing of concrete poles to corrosion and subsequent concrete spalling, which, if undetected or uncorrected, may ultimately cause structural failure of the pole.

- **Damage by motor vehicle or third-party impact**

  Poles may be subjected to shock loading due to motor vehicle or third-party impact, which exceeds the design loading for the pole. The structure of the pole is damaged as a result.

5.3.2.3. Galvanised Steel Pole Failure Modes

- **Ground-line corrosion**

  Ground-line corrosion is the primary failure mode of direct buried galvanised steel poles. Many factors determine the rate of ground-line corrosion, including soil type, soil contaminants, moisture content and ground-water salinity.

  Poles installed prior to 1990 were directly buried with no protective coatings for the relatively thin steel walls, and structural failures due to ground-line corrosion have occurred after service life of 10 years. Direct buried poles now have bitumen-mastic surface coatings applied to the below-ground portion of the pole to slow the corrosion rate.

  Plate-set galvanised steel poles have not exhibited ground-line corrosion, but have shown mechanical damage from vehicles, structural cracking, cracked base-plate welds, and missing or rusted base-plate fasteners.

5.3.3. Mean time to Unserviceable Summary

The process used to derive these expected service life (Table 3) consists of three steps:

- Derive the Weibull plots based on approximately 37,000 poles that were inspected and classified as unserviceable from 2015 to 2023.
- From this data, hazard rate can be derived to calculate the probability density function.
- From the hazard rate, average age that a pole is expected to become unserviceable can be determined.

Table 3 - Mean time to unserviceable summary

POLE TYPE	SERVICE STATUS	MEAN TIME TO UNSERVICEABLE
Pole Wood	Serviceable	48 years
Pole Wood	Reinforced	51 years
Pole Steel	Serviceable	18 years
Pole Concrete	Serviceable	N/A (insufficient EoL data for calculation)
Pole Glass reinforced Concrete	Serviceable	N/A (insufficient EoL data for calculation)

5.3.4. Pole interventions

Pole interventions (including reinforcement or replacement) are undertaken to ensure safety and reliability are not compromised. The volume is realised annually depending on inspection results each year. There are four variable factors that determine the intervention options for unserviceable poles each year, including:

- Volume of poles made Unserviceable;
- Suitability of Limited Life poles for economical remediation by staking;
- Suitability of poles for economical pole base replacement (replacing the bottom half of the wood pole for steel); and
- Deteriorated poles that have already been staked.

Traditional dig and drill for sound wood test continues as the most efficient and effective method for identifying internal wood deterioration. The asset inspector will review the wood shavings extracted and measure the deterioration from within the drilled hole. A determination of sound wood is then established. To collect a precise wood measurement reading to complete the inspection, a "wood scan" device which is a non-invasive tool will undertake an acoustic scan of the wood pole. This advance technology can assist inspectors to determine the service status of a pole. Operating procedures and criteria can be found in *30-4111 Asset Inspection Manual*

WoodScan® technology utilises sound waves to measure the density of the pole. It reads the whole cross section of a pole, measuring the rot profile and calculates the section modulus of the pole. These measurements along with the pole fibre strength are used to calculate the pole residual strength and tip load capacity. This results in a consistent outcome and constant factor of safety for pole species and sizes.

6. Future Developments

6.1. Research and Development

Effectively managing the process of investing in research and development (R&D) and seeking funds for R&D activities is a core element of asset class planning. R&D investment ensures that the organisation stays at the forefront of technological advancements, develops innovative solutions to emerging challenges, and enhances the reliability, safety, and efficiency of its assets. For example, developing new materials with improved structural properties for buildings or advanced monitoring systems for environmental systems can significantly extend their lifespan and reduce maintenance costs. Research and development is the process of researching and investing in an idea, process, practice, or technology that has not been realised in the market yet; it is a step before tracking innovation and technology because the investment to build and take the item to market still needs to be proven.

In order to economically extend the service life of a great range of deteriorated poles, a list of research and development activities are shown in Table 4.

Table 4 - Research and Development

REF	DETAILS OF MATERIAL CONSIDERATIONS
01	Monitor trial and implement more economic materials and technologies for poles, reinforcement and preservative treatments.
02	Investigate alternative inspection techniques to monitor wood deterioration.
03	Investigate, trial and implement the use of non-destructive testing for steel poles.
04	Develop stay solutions for concrete poles.
05	Establish guidelines for the economic extension of wood pole life using staking and pole base replacements
06	Establish guidelines for economic replacement of poles when other assets are being replaced.
07	Investigate safety issues of poles in relation to proximity of the carriageway
08	Investigate, develop and implement new wood rot prevention techniques to protect reinforced wood poles and control decay at reinforcement attachment points.
09	Investigate, develop and implement economic new wood pole life extension
10	Undertake investigation and trial on Wagner Composite Fiber poles
11	Continue monitor the performance of glass reinforced concrete pole

7. Asset Strategy Considerations

In line with our asset management objectives, AusNet applies a full life-cycle asset management philosophy for the managing electricity distribution network assets to:

- improve network performance;
- leverage advances in technology and data analytics;
- reduce bushfire risk;
- reduce electric network shocks from network assets; and
- meet quality of supply obligations.

This management philosophy supports continuous improvement of key processes relating to acquiring pole assets, operating a poles and wire network, maintaining pole assets and disposing of pole assets as they reach the end of their useful life. A suite of standards, policies, procedures and performance measures applicable to this asset class inform AusNet Management, employees and service providers to manage through the lifecycle delivery process.

Condition-based replacement triggered from inspection programs is the fundamental strategy used to manage pole assets. The business rules governing refurbishment or replacement to generate a continuous, prioritised refurbishment and replacement program are documented in *30-4111 Asset Inspection Manual* and are used in the electronic asset management system (SAP).

7.1. Meeting compliance obligations

7.1.1. Compliance with inspection requirements

The distribution pole inspection program is undertaken through a combination of ground (test and inspect) and aerial based inspection activities. This combination of ground and aerial based inspection is approved by Energy Safe Victoria as satisfying the requirement for inspections and intervals contained in the Electricity Safety (Bushfire Mitigation) Regulations. Details of inspection cycles can be found in Bushfire mitigation Plan – Electricity Distribution Network BFM 10-01 and Bushfire Mitigation Manual BFM 21-79 and *30-4111 Asset Inspection Manual*.

7.1.2. Compliance with technical standards and operational procedures

Effectively managing compliance with technical standards and operational procedures is an important element of Asset Class Planning. Adhering to these standards ensures that the assets are designed, constructed, maintained, and operated in a manner that meets industry best practices, enhances safety, and ensures reliability. Compliance with technical standards helps prevent asset failures, reduces risks, and ensures interoperability within the electrical distribution network. For example, ensuring that all components of various asset types are installed and maintained according to the regulations and Australian Standards can prevent unplanned failure and operational faults, enhancing network reliability. Inspection procedures are detailed in the *30-4111 Asset Inspection Manual* and *SOP 70-03 Standard Maintenance Guidelines*.

7.1.3. Compliance with safety regulations

Ensuring adherence to safety regulations and standards is a key objective of AusNet's asset management strategies and practices. Pole asset management activities include conducting regular safety audits and risk assessments, managing Pole assets in accordance with the Bushfire Mitigation Plan, providing ongoing safety training and competency assessments, regularly reviewing and updating emergency response plans, engaging with the community to raise awareness about electrical safety around poles, and adopting new technologies and practices to enhance network safety. By integrating these safety activities into asset management strategies, AusNet can effectively minimise safety risks "as far as practicable," as outlined in the *Electricity Safety Act 1998* and reflected in *ESMS 20-01 Electricity Safety Management System*.

7.2. New Assets

7.2.1. New Asset Considerations

The asset strategy for the introduction of new assets provides high-level guiding principles and overarching goals for asset management, focusing on long-term planning and sustainability. This strategy outlines the aspects of asset upgrades or changes, detailing the conditions under which new assets may be introduced into the network. This is not a like-for-like replacement but rather a strategic change or upgrade to a different type of asset to enhance reliability, improve efficiency, and incorporate advanced technologies. It serves as a roadmap that is ideal to follow if possible, guiding the decision-making process for integrating new assets into the AusNet network.

A list of targeted activities apply to new asset is shown in Table 5.

Table 5 - Targeted Activities on New Assets

REF	DETAILS OF MATERIAL CONSIDERATIONS
01	Monitor the availability, procurement costs, transport costs and supply of wood poles.
02	Monitor the availability, procurement costs, transport costs and supply of concrete poles.
03	Monitor the availability, procurement costs, transport costs and supply of glass reinforced concrete poles.
04	Establish new public lighting installations on galvanised steel poles.
05	Establish new service poles using CCA treated wood poles
06	Establish new LV only circuits on CCA treated wood poles.
07	Establish new simple MV structures on CCA treated wood poles
08	Establish new complex MV structures on concrete poles.
09	Establish new sub-transmission structures on concrete poles.
10	Effectively earth all conductive poles in accordance with published standards.
11	Customer requests pole materials will be considered.

7.3. Inspections and Monitoring

7.3.1. Inspections and Monitoring Planning Considerations

A strategic plan for inspections and monitoring provides high-level guiding principles and overarching goals for asset management, focusing on long-term planning and sustainability. This strategy outlines the ideal framework and objectives for conducting inspections and monitoring activities, such as enhancing reliability, improving efficiency, and incorporating advanced technologies. It serves as a roadmap that is ideal to follow if possible, guiding the decision-making process for establishing comprehensive inspection and monitoring protocols within the AusNet network.

A list of targeted activities apply on inspection and monitoring is shown in Table 6.

Table 6 - Targeted Activities on inspection and monitoring poles

REF	DETAILS OF MATERIAL CONSIDERATIONS
01	All poles shall be subject to a cyclic inspection involving a condition assessment and any other visual inspections as per the criteria established in the *30-4111 Asset Inspection Manual*.
02	Stay wires and rods shall be inspected at the same time as the pole.
03	Perform distribution pole inspection program through a combination of ground (test and inspected) and aerial based inspection activities, as per the requirements Electricity Safety (Bushfire Mitigation) Regulations.

7.4. Maintenance Planning

7.4.1. Maintenance Planning Considerations

A strategic plan for maintenance provides high-level guiding principles and overarching goals for asset management, focusing on long-term planning and sustainability. This strategy outlines the ideal framework and objectives for conducting maintenance activities, such as enhancing reliability, improving efficiency, and incorporating advanced technologies. It serves as a roadmap that informs the decision-making process for establishing comprehensive maintenance protocols within the AusNet network. This involves creating a structured approach to regular maintenance activities to ensure optimal performance and longevity.

A list of targeted activities apply on maintenance planning is shown in Table 7.

Table 7 - Targeted Activities on Maintenance Planning

REF	DETAILS OF MATERIAL CONSIDERATIONS
01	**Wood poles** Since 1987, several different diffusing wood preservatives have been applied during pole inspections to control decay of the internal heartwood. Most of the products applied have slowed the rate of decay. The most successful product used is the "Polesaver" which uses a boric acid-based fungicide to arrest decay. This product has contributed to the reduction in number of poles becoming "Unserviceable" each year. If asset inspectors detect termite activity in a wood pole, the pole will be labelled and a specialist contractor is employed to treat the infestation. The *30-4111 Asset Inspection Manual* details the treatment procedure. After the treatment, ongoing inspections will be performed to confirm the cessation of the termite activity. In most recent years, there has been an increased effort in ensuring stay wires on poles are operating in the way in which they were first installed.
02	**Concrete poles** Concrete poles require very little maintenance. A common requirement is the plugging of precast holes to prevent insect infestation. Less commonly but more significantly, are repairs following impact from motor vehicles. Missing concrete and exposed steel reinforcing can result in structural collapse. Vertical cracking and rust staining often indicate that the concrete and steel reinforcing no longer offers mutual support, and concrete spalling is imminent. The loss of small areas of concrete, without damage to the steel reinforcing can be repaired. However, the loss of large sections could require replacement of the pole.
03	**Galvanised steel poles** Maintain galvanised steel poles as per *30-4111 Asset Inspection Manual* and *SOP 70-03 Standard Maintenance Guidelines*

7.5. Refurbishment and Replacement Planning

7.5.1. Refurbishment Planning Considerations

A strategic asset strategy for refurbishment and replacements provides high-level guiding principles and overarching goals for asset management, focusing on long-term planning and sustainability. This strategy outlines the aspects of asset refurbishments or like-for-like replacements, detailing the conditions under which existing assets may be renewed or replaced within the network. This process ensures continued reliability and efficiency, manages obsolescence, and maintains adequate spares. It serves as a roadmap that is ideal to follow if possible, guiding the decision-making process for renewing or replacing assets within the AusNet network.

A list of targeted activities apply to pole replacement and refurbishments is shown in Table 8.

Table 8 - Targeted activities on pole refurbishment and replacement

REF	DETAILS OF MATERIAL CONSIDERATIONS
01	Refurbishment: Reinforce wood poles on condition.
02	Refurbishment: Reinforce galvanised steel poles on condition.
03	Refurbishment: Where technically feasible all wood poles shall be reinforced to extend expected remaining life for a minimum of two years.
04	Refurbishment: Where technically feasible, reinforce Underground Residential Distribution (URD) steel poles in place of replacement.
05	Refurbishment: Reinforcement works can be performed as a preventative maintenance activity to reinforce the poles resulting in a safe extension of the useful life. The reinforcement criteria is detailed in the *30-4111 Asset Inspection Manual*.
06	Replace galvanised steel, concrete and wood and glass reinforced concrete poles on unserviceable condition.
07	Replace deteriorated wood poles, which have previously been treated for termite infestation with other pole types as per the *SOP 70-03 Standard Maintenance Guidelines*.
08	The selection of replacement poles shall follow the same guidelines as for New Assets. The exception to this is Pole Base Replacement.
09	Replacement: Where technically and economically feasible, undertake partial (~40%) wood pole (pole base) replacement with steel, in place of a full replacement. Pole base replacement criteria is detailed in the *SOP 70-03 Standard Maintenance Guidelines*
10	Replace stay wire and rod as required, replace bed log when replacing deteriorated poles.

8. Abbreviations and definitions

TERM	DEFINITION
AMS	Asset Management Strategy
CCA	Copper chromium arsenate
FMECA	Failure Modes Effects Criticality Analysis
IRU	Ignition Risk Units
LV	Low voltage
MV	Medium Voltage
NDT	Non-Destructive Testing
R&D	Research and development
REFCL	Rapid Earth Fault Current Limiters
RSL	Remaining Service Life
URD	Underground Residential Development

9. Resource references

NO.	ID (LINK)	TITLE
1	30-4111	Asset Inspection Manual
2	AMS 01-01	Asset Management System Overview
3	AMS 20-01	Electricity Distribution Network Management Strategy
4	AMS 01-09	Asset Risk Assessment Overview
4	AMS 20-52	Conductor
5	AMS 20-57	Cross-arms
6	AMS 20-58	Distribution Transformers
7	AMS 20-60	MV Switches and ACRs
8	AMS 20-66	Insulators – High and Medium Voltage
9	BFM 10-01	Bushfire Mitigation Plan- Electricity Distribution Network
10	BFM 21-79	Bushfire Mitigation Manual
11	ESMS 20-01	Electricity Safety Management Scheme: Electricity Distribution Network
12	DES 10-18	Wood Poles Specification
13	SOP 70-03	Standard Maintenance Guideline

10. Schedule of revisions

ISSUE	DATE	AUTHOR	DETAILS OF CHANGE
1	11/02/08	A Sammour	Initial draft
2	31/03/09	N Pappas J Costolloe D Postlethwaite	Editorial, forecasts & RCM analysis added
3	30/04/09	J Kenyon	Editorial by technical writer
4	24/06/09	D Postlethwaite	Update of 2008 staking & replacements
5	29/06/10	C Goff	Updated mean pole age data
6	06/01/15	T Gowland	Major revision including FLC Modelling
7	04/06/19	I Kwan	Major revision
8	29/02/24	M Durox	Introduction of risk-based maintenance principles Substitution of dynamic information for dashboards links Comments on supply risk of wooden poles
9	23/12/24	I Kwan D McCrohan	Major revision

AusNet

Level 31
2 Southbank Boulevard
Southbank VIC 3006
T +613 9695 6000
F +613 9695 6666
Locked Bag 14051 Melbourne City Mail Centre Melbourne VIC 8001
www.AusNetservices.com.au

Follow us on

@AusNetServices
@AusNetServices
@AusNet.Services.Energy

AusNet