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Creating a safer state with electricity and gas

Draft Report:

Powercor Wood Pole Management

An assessment of sustainable wood pole safety outcomes

Public Technical Report

December 2019

VICTORIA State Government

Preface

This draft public technical report has been prepared for public consultation by Energy Safe Victoria (ESV) pursuant to the objectives, powers and functions conferred on it by The Electricity Safety Act 1998 (Act).

Specifically, this report provides a summary of the detailed technical review undertaken by ESV into the Wood Pole Management policies and practices of Powercor following the investigations into the state of power poles in the South West Region of Victoria. ESV welcomes comment and feedback on this draft report.

This report has been endorsed by the Director of Energy Safety in Victoria.

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Contents

Executive summary

Overview

In July 2019, **Energy Safe Victoria** (ESV) released its technical investigation report titled, '*The condition of power poles in South West Victoria*', following the St Patricks Day fires in March 2018. These fires resulted in significant loss of property and stock, and trauma to the community. A fire at Garvoc, referred to as The Sisters fire was caused by the failure of a wooden power pole within **Powercor Australia's** (Powercor) network.

ESV concluded in the July 2019 report that there was no immediate systemic risk of wood pole failures in the South West region at that time. ESV provided a commitment that it would do further work over the subsequent six months to assure itself that Powercor's asset management practices relating to wood pole management will deliver sustainable safety outcomes for the community. This report addresses the findings of that further work.

For the purposes of this review, sustainable safety outcome have been defined as consistently minimising the safety risks presented to persons and property by the network, as far as practicable.

ESV has reviewed and assessed Powercor's wood pole management approach. For Powercor's practices to produce sustainable safety outcomes ESV requires 13 recommendations to be addressed.

ESV concludes that:

1. The wood pole management system in place in March 2018, at the time of The Sisters fire at Garvoc, would not deliver sustainable safety outcomes for the future.
2. Since March 2018, Powercor has improved its wood pole management system, which has the effect of increasing the volume of wood pole replacements and reinforcements. However, these changes alone will not deliver sustainable wood pole safety outcomes for the future.
3. Powercor is progressing further improvements to its wood pole management system based on a more comprehensive risk assessment and better inspection practices that, if fully implemented, will as far as practicable, deliver sustainable safety outcomes for the community.

The detailed technical investigation included:

- desktop analysis of Powercor's documentation, including asset management strategies and plans, work practices, models, and pole asset data
- field visits
- meetings/workshops with Powercor representatives and representatives of services providers to Powercor
- written information requests for additional detail or clarification of Powercor's past, current, and proposed methodologies and the outcomes from applying them.

Powercor's proposed improvements to its wood pole management system has led it to forecast a four-fold increase in annual wood pole replacements and reinforcements each year for at least the next 10 years, to deliver sustainable wood pole safety outcomes.

Powercor must submit plans to the Australian Energy Regulator (AER) for approval of its expenditure every five years. ESV will participate in the AER's review, providing input on network safety considerations, and to ensure safety programs that are justified to the AER are transparently

monitored and reported by ESV[1]. The electricity distribution price review (EDPR) process for the next regulatory period 2021/2025 is currently underway, with the AER planning to publish its determinations on or around 31 October 2020.

ESV has made 10 recommendations to ensure that Powercor diligently implements its proposed improvements to its wood pole management regime. A further three recommendations require ESV to establish reporting protocols with Powercor, establish performance measures and to closely monitor Powercor's progress of the wood pole management improvement plan. ESV will hold Powercor to account for the delivery of the plan.

ESV acknowledges Powercor's contribution to this investigation.

ESV will commence similar audits and investigations into the pole management practices of the other Victorian distribution businesses in 2020.

Summary of Recommendations

Strategy and management plans

Recommendation 1

Powercor is to develop a wood pole management improvement plan incorporating all recommendations and initiatives, and submit it to ESV no later than 5.00pm, 28 February 2020. The plan is to include clear and measurable milestones that can be monitored through evaluation and reporting (see Recommendation two). When the plan is accepted by ESV, the plan commitments must be incorporated into an updated Powercor Bushfire Mitigation Plan for ESV to monitor and enforce compliance.

Recommendation 2

ESV is to, in consultation with Powercor, establish a regulatory reporting protocol by 28 February 2020 for monitoring Powercor's progress against its wood pole management improvement plan (as referenced in the updated Powercor Bushfire Mitigation Plan). Powercor will report progress to ESV quarterly until all recommendations have been delivered.

Recommendation 3

Powercor is to update its wood pole management documentation to incorporate its revised wood pole objectives, strategies, performance measures, forecast, plans and improvement initiatives (and to otherwise address ESV's findings regarding the shortcomings of its Asset Class Strategy document).

Inspection method and practices

Recommendation 4

Powercor is to revise its Asset Inspection and Training Manual (or equivalent) to clearly articulate the 'sound test' procedures and practices to provide a rigorous basis for inspector training, application in the field, and auditing.

Recommendation 5

Powercor is to revise its inspection auditing process and performance reporting to improve the quality and consistency of inspections.

[1] 2017 Independent Review of Victoria's Electricity and Gas Network Safety Framework – recommendation 22

Recommendation 6

Powercor is to provide evidence to ESV that the asset inspector training and competency modules and assessment undertaken by the asset inspection service provider comply with National Certificate II accreditation and with Powercor's asset inspection standards.

Assessment of pole condition and risk

Recommendation 7

Powercor is to complete the development and implementation of its Serviceability Index (SI)-based serviceability assessment methodology, to lead to a more accurate representation of the likelihood of pole failure over time.

Recommendation 8

Powercor is to proactively explore (if feasible with broader industry), the development of non-destructive wood pole inspection technology to improve the accuracy of pole condition assessments.

Recommendation 9

Powercor is to complete the development of its pole risk-based asset management intervention methodology to improve the management of pole risk. If implemented appropriately, this approach will enable Powercor to prioritise the poles for intervention in higher risk areas by considering the consequence of failure to the community.

Wood pole management forecasting and delivery

Recommendation 10

Powercor is to improve its asset performance monitoring by developing pole asset performance metrics and health reporting dashboards, with appropriate targets to monitor and review performance levels.

Recommendation 11

ESV, in consultation with MECs, is to revise the reporting guidelines to include performance indicators relating to wood pole management in the quarterly and annual performance reporting. This will include the establishment of leading and lagging indicators and clarification for the classification of assisted and unassisted pole failures, allowing ESV to monitor wood pole performance. This should build on and extend existing safety performance reporting by ESV.

Recommendation 12

Powercor is to finalise its proposed forecasting methodology, its forecast pole replacements/reinforcements and include the forecast pole interventions in its Bushfire Mitigation Plan.

Recommendation 13

ESV is to monitor quarterly wood pole performance and delivery of Powercor's forecast intervention volumes (up to and including 2025/26). The approved volumes are to be included in the updated Bushfire Mitigation Plan, with ESV using its powers to hold Powercor to account for delivery.

Introduction

Purpose of this report

This draft public technical report summarises, for public consultation, the findings and recommendations of the detailed technical investigation undertaken by **Energy Safe Victoria (ESV)** into **Powercor Australia's (Powercor)** wood pole asset management practices. The objective was to ascertain whether those practices will produce sustainable safety outcomes.

This report does not cover any legal proceedings associated with the 2018 St Patrick's Day fires.

Background to this report

On 17 and 18 March 2018, the South West Region of Victoria experienced a number of fires. These fires resulted in significant loss of property and stock, and trauma to the community. Following investigation by ESV, the cause of The Sisters fire at Garvoc was determined to be the failure of a wooden power pole within Powercor's network.

Since March 2018, there has been significant community concern relating to the potential for further fires to be caused by electricity distribution assets, wavering confidence in Powercor's ability to effectively manage its network safely, and particularly of its pole management practices to deliver sustainable safety outcomes.

In May 2019, ESV released its draft technical investigation report titled, '*The condition of power poles in South West Victoria'*, to address these concerns and invite public comment. The final version of the report incorporated and addressed feedback received from members of the public and released in July 2019.

The report concluded that Powercor's power pole inspection and maintenance process is fit for purpose and there is no immediate systemic risk of pole failures in the South West region at that time. However, ESV decided a more detailed technical investigation was required to assure itself that Powercor's wood pole management practices would deliver sustainable safety outcomes for the community in the long term, and committed to provide a report on its findings to the public by December 2019.

This report presents the findings and recommendations of the further investigation by ESV of Powercor's wood pole management regime.

How this report is structured

The executive summary provides an overview of the technical assessment, findings and recommendations relating to Powercor's wood pole management.

The body of this report provides the following information:

- Chapter 2 outlines the regulatory bodies and oversight that applies to **major electricity companies (MECs)** in Victoria, and specifically how the network safety regulatory requirements are managed.
- Chapter 3 provides an overview of Powercor's wood pole population and performance.
- Chapter 4 sets out the approach to the technical assessment undertaken by ESV.
- Chapter 5 provides a summary of the findings and recommendations from the detailed internal technical assessment undertaken by ESV.
- Chapter 6 provides concluding remarks.

Consultation

Electrical assets are known to have caused serious bushfires in many areas of Victoria. The community concerns regarding the safety risks posed by power poles and network distribution assets are particularly significant in the South West Region of Victoria due to the community having recently experienced a bushfire caused by the failure of a power pole owned and operated by Powercor.

Losses to farm infrastructure, livestock and farm livelihoods were considerable. The fire also caused, and continues to cause, significant emotional trauma to those affected.

ESV is committed to providing an opportunity for public comment on its investigation into Powercor's management of its wood pole assets. This is an important step towards restoring community confidence in the safety of the electricity distribution network in the region.

ESV invites interested parties to make a submission on this draft report. The closing date for submissions is 5.00 pm, 7 February 2020.

Email your submission to consultation@energysafe.vic.gov.au

or

Post your submission to:

Energy Safe Victoria
Consultation Response
PO Box 262
Collins St West VIC 8007

A community consultation program is also in place. More information is available at www.esv.vic.gov.au. In the interests of transparency ESV will make submissions on this draft report publicly available on its website. Should you wish any parts of your submission to remain confidential, clearly indicate the relevant sections of the submission and your reasoning for the request. ESV will determine whether or not to withhold or publish the submission following consultation with you.

Regulatory framework

Regulatory bodies

The Victorian distribution and transmission network businesses are each referred to in legislation as a Major Electricity Company (MEC) and, although generally similar in engineering principles for transmitting electricity, are vastly different in other aspects. Each MEC's service area has very different characteristics such as network design and operating environments, geography and customer base that can affect their network safety performance. For these reasons the MECs cannot be compared directly with each other.

Powercor is one of five MECs in Victoria that hold a distribution licence under the Electricity Industry Act 2000, and is required to comply with the network safety regulation administered by ESV to which this report relates.

ESV is the independent technical regulator responsible for electricity, gas and pipelines in Victoria. ESV oversees a statutory regime that requires MECs to develop, submit and comply with an **Electricity Safety Management Scheme (ESMS),** five-yearly **bushfire mitigation plans (BMP)**, and an annual electric line clearance management plan, to the satisfaction of ESV. MEC's must also actively participate in ESV audits to test the compliance of their safety systems.

In addition to the network safety requirements and systems, each of the MECs is regulated by the **Australian Energy Regulator (AER)**. The AER is the economic regulator of the wholesale electricity and gas markets in Australia. It forms part of the **Australian Competition and Consumer Commission (ACCC)** and enforces the national electricity rules that, amongst other things, provide powers to the AER to determine the revenue requirements and therefore the maximum prices that energy network owners (including the Victorian MECs) can charge.

This report does not directly detail the requirements of the AER, however references to the AER have been included where they relate to decisions on the level of investment proposed by Powercor for the management of its wooden power poles.

How network safety is regulated

The safety of the Victorian electricity networks is governed by the **Electricity Safety Act 1998 (the Act)** and relevant regulations, under which the businesses must adhere to the following:

- Electricity Safety (Management) Regulations 2019, referencing the Australian standard for an ESMS (AS5577) which set out the requirements for an ESMS that must be submitted by all MECs for acceptance and audit by ESV
- Electricity Safety (Bushfire Mitigation) Regulations 2013, which set out the requirements for a BMP that must be submitted by all MECs for acceptance and audit by ESV
- Electricity Safety (Electric Lines Clearance) Regulations 2015, which set out the requirements for an Electric Line Clearance Management Plan that must be submitted for acceptance and audit by ESV
- Electricity Safety (General) Regulations 2019, which specify the safety requirements relating to electrical installations and electrical work and certain requirements for electricity suppliers.

The electricity infrastructure safety regime (inclusive of ESMS) utilises principle, performance and outcome based regulatory approaches rather than prescriptive requirements. The primary reason is that the safety risks are complex, geographically diverse, have significant consequences (regardless of frequency), and often require tailored solutions. The regime also describes how MECs will meet the

general duties of the Act, and comply with regulations and prescribed standards, in order to minimise safety risk.

How network safety requirements are factored into pricing decisions

MECs (including Powercor) must periodically apply to the AER to assess their revenue requirements during the regulatory price review period (typically, every five years). The national electricity rules lay out the framework that the AER applies in undertaking this role for distribution and transmission networks respectively.

The framework- requires the AER to set a ceiling on the revenues or prices that a network can earn or charge during a regulatory period. In determining the ceiling, the AER forecasts how much revenue a business needs to cover its efficient costs (including operating and maintenance expenditure, capital expenditure, asset depreciation costs and taxation liabilities) and provide a commercial return on capital.[2]

Similarly, in determining regulatory price review submissions the AER considers how MECs:

- comply with all regulatory obligations or requirements associated with the provision of standard control services
- maintain the quality, reliability and security of standard control services
- maintain safety outcomes from the network through the supply of standard control services
- prudently direct an efficient amount of expenditure to maintain acceptable levels of risk **as low as reasonably practicable (ALARP).**

Who is responsible for safety outcomes?

Operating an electricity network involves managing risk and it is incumbent upon all MECs, including Powercor, to minimise the risk to safety **as far as practicable (AFAP).**

It is therefore the responsibility of MECs to manage safety risk to comply with their obligations.

How is this responsibility discharged?

MECs are required to proactively eliminate, where practicable, the risk of an incident before it occurs, or otherwise to minimise the risk of failure to the extent that the cost of doing so is not grossly disproportionate to the risk reduction achieved. This is the effect of legislative and regulatory instruments that oblige MECs to maintain a safe workplace, safe systems of work, a safe supply and the safety of staff and the public[3]. This goes beyond an obligation to mitigate the risks when a safety incident, despite precautions, actually occurs.

The required practice is to determine what is reasonably practicable by undertaking an economic test where risks should be reduced to a low level, or as far as practicable, incurring expenditure as necessary up to the point at which the expenditure would be grossly disproportionate to the benefit achieved.

ESV holds MECs to account by monitoring and enforcing the safety of the design, construction, operation, maintenance and decommissioning of their networks. It also monitors compliance with their obligations under the Act to minimise risk, as far as practicable, as articulated in each MEC's ESMS and BMP.

[2] AER website

[3] For example: Occupational Health and Safety Act 2004 (Vic); National Electricity Objective, National Electricity Rules, Electricity Safety Act 1998 (Vic).

Overview of Powercor's wood pole population

Business overview

Powercor owns and manages Victoria's largest electricity distribution network, with more than half a million poles and 82,000 kilometres of power lines. The network provides electricity for about 750,000 customers in central and western Victoria, as well as Melbourne's western suburbs.

It is the largest of the distribution networks covering more than half the state and much of it is located in **Hazardous Bushfire Risk Areas (HBRA)**[4] in regional Victoria (refer to Figure 1).

Figure 1: Powercor service area[5]

Wood pole population

There are 5 million timber power poles currently in service throughout Australia. Most are native hardwood forest species that have suitable structural characteristics and are highly resilient to rot.

In Victoria, 74 per cent of all electricity distribution business's in-service poles are wood, and at least 50 per cent of them were installed over 40 years ago[6].

[4] Hazardous bushfire risk area (HBRA) as defined in *section 3 of the Electricity Safety Act 1998*, means an area to which a fire authority has assigned a fire hazard rating of 'high' under section 80, fire hazard rating.

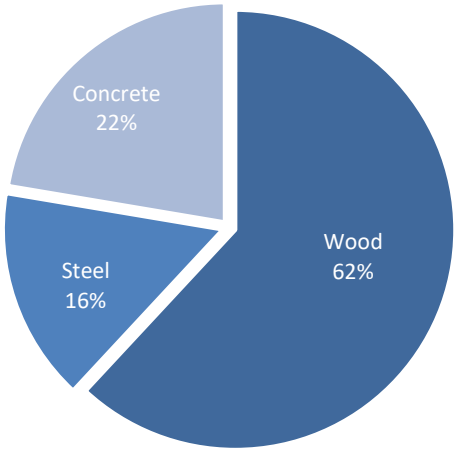
[5] Source: Talking electricity website

Powercor owns a large fleet of 577,000 power poles, which are used to support the overhead electricity network throughout central and western Victoria, as well as in Melbourne's outer western suburbs. The network contains 82,000 kilometres of power lines that traverse 145,650 square kilometres and provides electricity for nearly 750,000 customers.

Powercor's fleet of poles are installed in just about every type of operating environment including rural towns, national parks, farms, mountains and coastal environments.

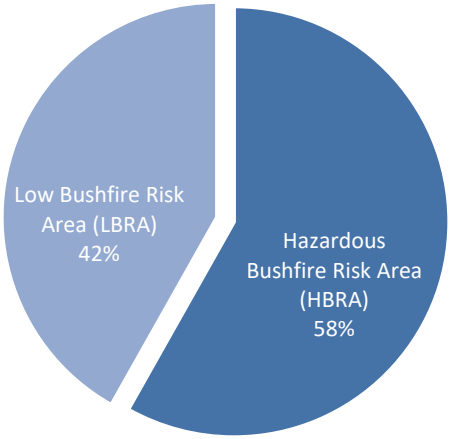
The population of power poles is predominantly of wooden construction (365,900, 62 per cent) of which 58 per cent (212,200) are located in HBRA, as shown in the figures 2 and 3 below.

Figure 2: Composition of pole materials



Source: Powercor

Figure 3: Location of wood poles by bushfire risk area

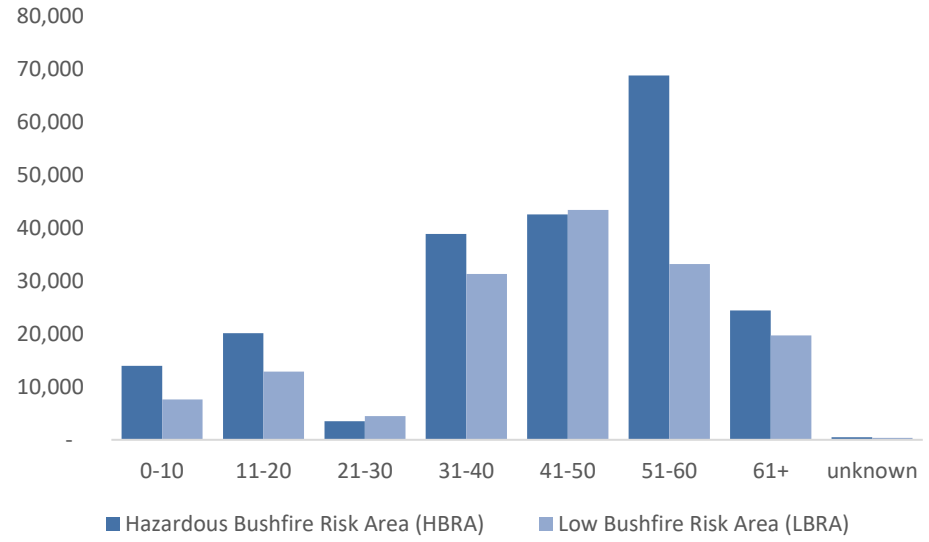


Source: Powercor

The average age of the wood pole population is 44 years, with 53 per cent (194,000) already over 45 years of age. The distribution of wooden power poles by age and by bushfire risk area is shown in Figure 4.

[6] Australian Timber Pole Resources for Energy Networks: http://era.daf.qld.gov.au/id/eprint/3071/2/dpiandena_timber_pole_review06-sec.pdf

Figure 4: Age profile of wood poles installed by bushfire risk area as at 2019



Source: Powercor

Timber used for wood poles are classified by strength and durability (i.e. Class 1, 2, 3 and 4 poles)[7]. Timbers of the same class may deteriorate at different rates due to local environmental conditions. The national timber pole standard[8] states that only durability class 1 and 2 can be used for power poles without preservative treatment[9]. New poles are designed to withstand wind of up to 180km/h.

Powercor has some of the oldest poles in the Victorian electricity distribution networks.

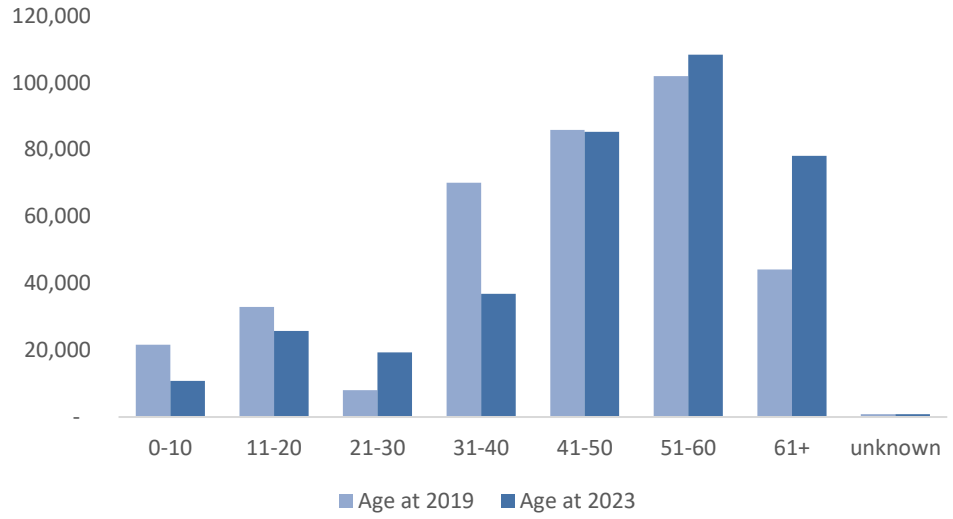
To provide an indication of the increasing age profile, when the age of each wood pole is increased by five years (without replacement), by the year 2023, the largest increase is to the poles in the 61+ years category.

[7] Australian Standard AS 5604-2005 Timber - Natural durability ratings

[8] Australian Standard AS 2209-1994 'Timber - Poles for overhead lines'

[9] Australian Standard AS 1604.1:2012 'Specification for preservative treatment Sawn and round timber'

Figure 5: Age of wood poles installed as at 2019 and 2023



Source: Powercor

Current condition assessment

In managing its wood poles, Powercor undertakes cyclic condition assessments and classifies the poles as Serviceable, Added Control Serviceable (ACS) or Unserviceable (P1, P2). Table 1 provides a definition of each condition.

Table 1: Pole condition classification definitions[10,11]

Classification	Definition
Serviceable	These poles are assessed as being serviceable
Added Control Serviceable (ACS)	These poles are assessed as having sufficiently deteriorated to warrant an increased inspection frequency
Unserviceable Priority 2	These poles are assessed as having deteriorated to a point which requires reinforcement or replacement (P2 shall be replaced, repaired or have appropriate action taken within 32 weeks)
Unserviceable Priority 1	These poles are assessed as having deteriorated to a point which requires priority replacement (P1 shall be replaced, repaired, made safe or have appropriate action taken within 24hrs)

Source: Powercor

As shown in Table 2, at the time of this analysis, Powercor has identified 1,045 Unserviceable wood poles. Class 3 poles are expected to feature prominently as Added Control Serviceable and Unserviceable in the coming years.[12]

[10] Powercor, Asset Class Strategy – Poles and Towers, May 2019, Table 4, p.9

[11] Powercor, Network Asset Maintenance Priority Policy, document no: 05-C001.A-025, issue 4.4 dated July 2019, p.5-6

[12] Powercor Asset Class Strategy – Poles and Towers 2019, P.8

Table 2: Current number of Powercor poles by condition (as at April 2019)

Pole Condition	Number of Wooden power poles	Percentage
Serviceable	348,935	95.5%
Added Control Serviceable	15,376	4.2%
Unserviceable[13]	1,045	0.3%
Grand Total	**365,356**	**100.0%**

Source: Powercor

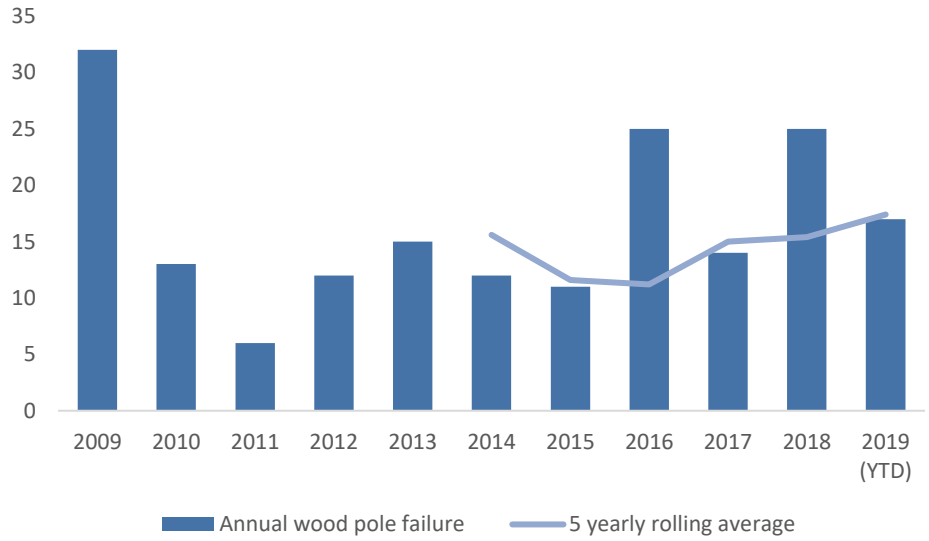
Powercor's risk control measure for Unserviceable poles is to extend their life by reinforcement (also referred to as nailing or staking) or replacement. In determining the suitability for pole reinforcement an additional internal and external condition assessment inspection is undertaken above ground line.

Approximately 26,500 (seven per cent) of the wood pole fleet has been reinforced.

Powercor wooden pole failure

The number of wooden pole failures shows an increasing trend over the last few years as illustrated in Figure 6. Powercor sets a threshold and monitors the performance of wood pole failures based on Powercor's five-year rolling average, which can be seen to be increasing since 2016.

Figure 6: Powercor's wood pole failures



Source: Powercor

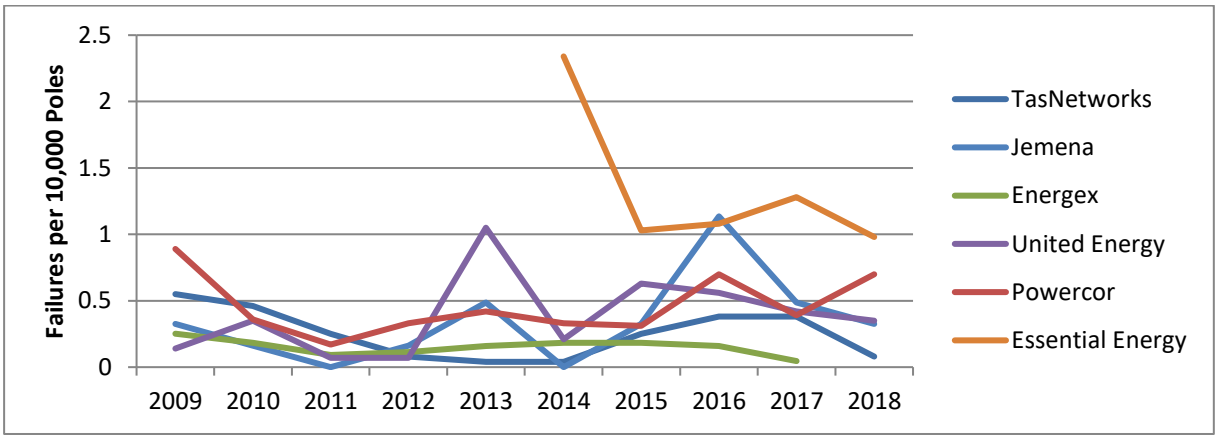
Currently the average annual number of unassisted pole failures across Australia is 0.7 per 10,000 poles with Victoria averaging 0.3 per 10,000 poles[14].

[13] Note: Powercor had identified one Unserviceable P1 pole which was replaced within 24 hours in accordance priority policy

[14] Sourced from the Australian Energy Regulator's Regulatory Information Notice data submitted by Victorian DNSPs 2011 to 2018; other DNSPs 2016 to 2018

While in aggregate, the average annual pole failures per 10,000 poles for Powercor are commensurate with its peers across Victoria, and lower than the Australian average. However, the increasing trend is one that requires further review by Powercor (refer Figure 7).

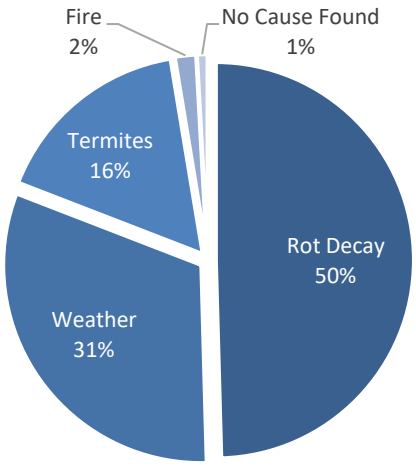
Figure 7: Comparison of wooden pole failures per 10,000 poles



Source: ESV analysis of Regulatory Information Notices[15]

Without intervention the failure rate will continue to increase as poles age. The major causes of unassisted wooden pole failure are rot decay (50 per cent) followed by weather (31 per cent) and termites (16 per cent) (refer Figure 8). Unassisted pole failures occur when the pole is no longer able to withstand the forces it was designed to withstand (such as wind and the weight of power line conductors).

Figure 8: Cause of wood pole failures



Source: Powercor

The data provided to ESV as a part of this review suggests that the condition of the wooden power pole population is declining, and greater investment will be required to mitigate an increasing safety risk. This hypothesis was tested in the assessment that follows.

[15] Utilises AER RIN data from businesses with comparable unassisted pole failure definition

Approach to assessment of Powercor's wood pole management

Introduction

The focus of the assessment in this report is taken from the two commitments made by ESV in the July 2019 technical investigation titled, '*The Condition of power poles in the South West region of Victoria*', namely to:

1. Assess the sustainability of Powercor's wood pole management approach; and
2. Investigate the efficacy of Powercor's pole condition assessment process.

This assessment is an end-to-end analysis of Powercor's wood pole asset management life cycle process, which identifies and reviews key practices and decisions within the current process, as well as considering the future improvements proposed by Powercor to its wood pole management approach.

For the purpose of this review, a sustainable approach has been defined as consistently minimising the safety risks presented to persons and property by the network, as far as practicable.

Approach to the assessment

ESV undertook discussions, workshops and field visits with Powercor and its key service provider representatives. ESV reviewed Powercor's strategies, documents, work practices, data, pole performance, and forecast modelling to support the findings and recommendations for inclusion in this report.

ESV also held discussions and workshops with the AER and will continue to foster this relationship to assist a balanced assessment of network safety outcomes and economic assessments for future **Electricity Distribution Price Reviews (EDPR)**.

A series of formal Information Requests to acquire Powercor's documents, data and information (including Powercor's own analysis and independent reports) were utilised to support ESV's investigations. ESV acknowledges Powercor's contribution to this investigation.

Powercor and ESV held a workshop on 19 September 2019. The purpose of the workshop was to provide Powercor with the opportunity to inform and confirm ESV's understanding of Powercor's approach to managing its wood pole assets to deliver sustainable network safety outcomes. The agenda included Powercor's: -

- wood pole strategy and management plan
- inspection method and practices
- assessment of pole condition and risk, and
- wood pole management forecast and delivery.

Powercor also presented its planned improvement initiatives and timelines for completing them. ESV subsequently received several updates to the documentation provided at the 19 September 2019 workshop and has incorporated them into this assessment.

The findings of this review have been discussed with Powercor. Powercor was provided with a draft copy of the technical review report to comment on errors of fact. ESV has made corrections to the report based upon Powercor's feedback, as it deemed necessary.

Findings and recommendations

Energy Safe Victoria (ESV) has reviewed and assessed the findings regarding Powercor's wood pole management approach, reconciled them to the review's overall objectives, and requires the thirteen recommendations outlined to be addressed.

Drawing from the elements of the assessment approach described in the previous section, the findings and consequential recommendations are grouped into four assessment areas that specifically address Powercor's:

- strategy and management plan
- inspection method and practices
- assessment of condition and risk, and
- wood pole management forecast and delivery.

For each recommendation, the actions required and the responsible party has been identified. The timing for the implementation of the recommendations requiring Powercor's action will be agreed between Powercor and ESV and included in Powercor's (required) wood pole management improvement plan by February 2020. ESV will closely monitor Powercor's progress against the plan and will hold Powercor to account for its delivery.

Strategy and management plan

This section focuses on the overarching strategy for the management of Powercor's wood pole population, including how Powercor is reviewing the condition and risk of the pole population to ensure sustainable safety outcomes are delivered to the communities in its service area.

ESV considered key questions including:

- Does Powercor have an effective strategy for the management of its wood poles?
- Will Powercor's strategy deliver sustainable safety outcomes?
- Does Powercor adequately understand the condition and health of its wood pole population?
- What is the performance of Powercor's wood pole population (including failure rates) and how does it compare with other similar electricity network businesses?
- Is Powercor adequately responding to criticisms of its wood pole management practices, particularly those in response to The Sisters fire at Garvoc?

Key findings

Powercor's current asset management principles, risk framework, and asset wood pole management objectives are adequate

ESV has no material concerns with these aspects of Powercor's asset management system, noting that they are aligned with Powercor's corporate strategic objectives and relevant regulations and standards.

The current version of Powercor's wood pole strategy document is inadequate

Powercor's principal reference for its wood pole asset management strategy is its *Asset Class Strategy – Poles and Towers* document. Within this document, performance targets are incomplete, data is out of date, performance analysis is incomplete, and the strategic analysis is immature. However, Powercor demonstrated to ESV that in 2019 it undertook strategic analysis that has not yet been incorporated into its strategy document.

An increasing number of failures should have been an indicator to Powercor that its wood pole strategy was not effective

The current strategy has resulted in an average age at which a wood pole is replaced of 53 years. In 2018, there are more than 120,000 poles older than 53 years. Powercor has identified only 4.2 per cent of the wood pole population (approximately 15,376 poles) as being in the latter stage of their lifecycle. ESV considers it is more likely than not that a greater number of poles are approaching end of life than has been identified by Powercor.

Powercor had experienced a decrease in the number of poles identified to be in poor condition by its inspectors, which subsequently has led to a reduction in the number of pole interventions. This is incongruent with the fact that Powercor's pole failure numbers have been increasing steadily since about 2015. While the number of pole failures is not excessive, the number of failures per year is above the median of industry peers.[16]

Powercor has adopted a reasonable approach to classifying poles where information is incomplete

Powercor currently has more than 50,000 wood poles of unknown timber species. All poles of this type are being managed as durability Class 3 poles and are assessed under more conservative serviceability criteria.

Recommendations

Recommendation 1
Powercor is to develop a wood pole management improvement plan incorporating all recommendations and associated initiatives, and submit it to ESV no later than 5.00 pm, 28 February 2020. The plan is to include clear and measurable milestones that can be monitored through evaluation and reporting (see Recommendation two). When the plan is accepted by ESV, the plan commitments must be incorporated into an updated Powercor Bushfire Mitigation Plan for ESV to monitor and enforce compliance.
Recommendation 2
ESV is to, in consultation with Powercor, establish a regulatory reporting protocol by 28 February 2020 for monitoring Powercor's progress against its wood pole management improvement plan (as referenced in the updated Powercor Bushfire Mitigation Plan). Powercor will report progress to ESV quarterly until all recommendations have been delivered.
Recommendation 3
Powercor is to update its wood pole management documentation to incorporate its revised wood pole objectives, strategies, performance measures, forecast, plans and improvement initiatives (and to otherwise address ESV's findings regarding the shortcomings of its Asset Class Strategy document).

Inspection method and practices

ESV reviewed the inspection methods, training and practices applied by Powercor and its inspection service provider to collect information regarding the strength and performance of each wood pole in its wood pole population.

ESV considered key questions including:

[16] the median values are determined from the 10-years of normalised wood pole failure data for the six comparator distribution businesses shown in Figure 7

- Does Powercor have reasonable inspection methods and practices?
- Are those methods and practices aligned with good industry practice?
- Are Powercor's inspectors appropriately trained and competency assessed to ensure compliance and consistency of practice?
- How does Powercor govern and manage the quality of inspection practices?
- Is Powercor adequately inspecting its wood pole population?
- Are the inspection results accurate and reliable?

The objective of wood pole inspection practice is to provide sufficient information to reliably establish the condition of individual poles. Like most MEC's, Powercor uses a combination of visual inspection techniques and the 'sound, dig, and drill' technique to determine the presence and impact of internal rot, termite attack, and other causes of wood pole strength reduction which, if not replaced or reinforced, lead to pole failure.

Key findings

Powercor's current inspection procedures are consistent with general industry practice

With the exception of the 'sound' test (referred to separately below), Powercor's inspection processes generally align with their documented standards and procedures, with the service provider applying general industry standard pole inspection work practices.

Like a number of MEC's, Powercor also deploys a supplementary inspection technology (WoodScan) to provide an enhanced method of determining a pole's residual strength.

Powercor's sound test procedure is inadequately documented and inconsistently applied

The sound test is part of the 'sound, dig and drill' inspection technique. It is a critical aspect of wood pole inspection and condition assessment as it identifies where further testing of the pole may be required.

The sound test procedure in Powercor's Asset Inspection Manual does not clearly articulate when and how it is to be undertaken. As a consequence, ESV found evidence of the sound test being poorly understood and applied inconsistently by inspectors. This undermines condition assessment accuracy and repeatability.

Without a clear procedure for the sound test, the auditing process is also compromised.

Auditing of the quality of inspection practices is inadequate

Powercor's primary asset inspection service provider has an auditing strategy and procedure in place that clearly articulates the overall framework and disciplines for the auditing of Asset Inspectors. The document adequately addresses auditing performance, accountabilities and responsibilities as well as guidelines for handling of non-conformances and actions.

However, the service provider's inspection audit and performance reporting does not ensure minimum frequency audit criteria are being met nor that the required breadth of pole class inspections is being consistently achieved.

Powercor also does not undertake any independent external audits of the service provider's full pole inspections to validate compliance with its Asset Inspection Manual.

Compliance of the asset inspection training and competency modules has not been demonstrated

The asset inspection service provider's training program under the new competency based National Certificate II accreditation was initiated in August 2018 with the intake of trainee asset inspectors. ESV

has not been provided with sufficient supporting training and competency documentation to confirm that the training program:

- complies with the National Certificate II accreditation requirements
- satisfies regulation 7(1)(j) of the *Electricity Safety (Bushfire Mitigation) regulations 2013*
- complies with Powercor's asset inspection network training standards.

Recommendations

Recommendation 4
Powercor is to revise its Asset Inspection and Training Manual (or equivalent) to clearly articulate the 'sound test' procedures and practices to provide a rigorous basis for inspector training, application in the field, and auditing.
Recommendation 5
Powercor is to revise its inspection auditing process and performance reporting to improve the quality and consistency of inspections.
Recommendation 6
Powercor is to provide evidence to ESV that the asset inspector training and competency modules and assessment undertaken by the asset inspection service provider comply with National Certificate II accreditation and with Powercor's asset inspection standards.

Assessment of pole condition and risk

ESV reviewed the methods applied by Powercor to ascertain the condition of each wood pole, and its ability to continue to meet the requirements of service (or not) as an input to the development of its wood pole management plan

The serviceability assessment can be referred to as a test that the pole is able to withstand the loading forces applying to it, based on the installed equipment on the pole and the wind and other forces acting on it. A pole's strength and its ability to withstand these forces declines over time. If a pole's residual strength – that is, the remaining strength of a pole at certain point in its life cycle - is assessed as not being capable of withstanding the loading forces on it, then it is at an elevated risk of failure.

Depending on the assessed residual strength in relation to expected loading forces, the pole may be classified as being at an elevated likelihood of failure and some form of action is required to mitigate the pole failure risk.

ESV considered key questions including:

- Does Powercor adequately assess the remaining life of a pole?
- Does Powercor consider the risks of a failure of power pole in its assessment, including bushfire consequences?
- Is Powercor's approach aligned with other similar electricity network businesses in Victoria?
- Is Powercor consistently replacing and reinforcing poles before they fail?

Key findings

Powercor's serviceability classifications and definitions are reasonable

Powercor's methods of converting condition information into a serviceability classification are aligned with the historic industry definitions and practice.

With the exception of its Visual Appearance criterion[17], which Powercor has recently introduced in response to community concern, the remaining condition assessment criteria are consistent with common industry practices.

Powercor's serviceability criteria in place at the time of The Sisters fire at Garvoc was not identifying enough Unserviceable poles

Over the last five years, the number of poles classified as Unserviceable has reduced sharply whilst unassisted pole failure rates have been increasing. These trends are inconsistent with each other and do not align with the increasing age of the wood pole population. While there are other contributing factors, this mismatch appears to be because the serviceability assessment criteria did not adequately recognise the cumulative effect of significant loss of pole strength through degradation of the fibre strength.

Powercor has now responded to the declining trend in poles being classified as Unserviceable by:

- increasing the Safety Factor threshold[18] for Unserviceable poles
- increasing the frequency of inspections of AC Serviceable poles, and
- introducing the 'Visual Appearance' assessment criterion.

Collectively, these changes are expected to lead to an increase in the number of poles being classified as Unserviceable each year. Unserviceable poles are replaced or reinforced within prescribed time limits.

Powercor's serviceability assessment improvement initiatives have accelerated in 2019

Powercor plans to adopt Serviceability Index-based criteria as the basis for its serviceability assessment. This will provide more explicit representation of fibre strength degradation and the capacity to incorporate actual design loading on the pole (i.e. rather than to assume adequate safety factors). This new approach should lead to more accurate representation of the likelihood of pole failure over time.

Powercor also intends to introduce a risk-based asset management (RBAM) intervention criterion based on a methodology that takes into account both the likelihood of failure of poles and the consequences of failure. Based on the information provided by Powercor, it will target poles that provide a high consequence of failure, typically AC Serviceable poles located in HBRA. This proposed approach is a positive step and will increase the number of poles replaced or reinforced over time.

The majority of Powercor's improvement initiatives relating to its assessment of wood pole serviceability have been initiated in 2019, with more planned for 2020 and 2021.

Powercor is reviewing alternate inspection technologies

Assessing the remaining life of a wood pole and how that changes over time as it approaches failure is very difficult. Traditional inspection techniques have several drawbacks and asset managers have been seeking alternatives for at least 20 years.

A number of Victorian and interstate distribution businesses continue to conduct their own independent investigation and trialling of the various non-destructive inspection technologies requiring significant investment. Cross business discussions are occurring, but there is not a coordinated approach to research and development in Victoria or across Australia. There are no alternate

[17] To avoid confusion with Powercor's existing visual condition assessment criteria, ESV refers to Powercor's recently introduced three additional visual assessment criteria as the 'Visual Assessment criterion'

[18] The Safety Factor is a measure of the remaining strength of a wood pole; the lower the Safety factor, the higher the likelihood of unassisted pole failure; increasing the Safety factor threshold for classifying poles as Unserviceable has the effect of classifying more poles as Unserviceable.

techniques or combination of techniques that have been proven to reliably replace the sound, dig and drill technique.

Further exploration and investment in the development of enhanced non-destructive technologies that are capable of capturing potential pole degradation and fibre strength loss along the full length of a pole to avoid drilling of poles as a part of the inspection process is encouraged.

Powercor has engaged external expertise to improve its serviceability assessment

Powercor has engaged expert advice to consult on its serviceability assessment improvement initiatives. It has also participated in an inaugural Australian utility power pole conference hosted by the University of the Sunshine Coast, which proposed creating a national centre for timber durability and design life research at its campus. If it is established, the national centre may be a useful means for Powercor to cost-effectively participate in relevant research to accelerate improvements to its wood pole serviceability assessment.

Powercor's serviceability assessment improvement initiatives are likely to result in a higher number of poles being classified as requiring treatment

From the information provided by Powercor, the combination of the proposed enhancements to its systems and tools to calculate pole serviceability are likely to drive an increase in the number of poles classified as Unserviceable, and in turn increase the level of pole reinforcements and replacements.

ESV considers that the proposed enhancements have the potential to improve on Powercor's current methods. They will need to be calibrated over time with data from the field, including actual pole residual strength data for the relevant species of wood poles in the network.

Recommendations

Recommendation 7
Powercor is to complete the development and implementation of its Serviceability Index (SI)-based serviceability assessment methodology, to lead to a more accurate representation of the likelihood of pole failure over time.
Recommendation 8
Powercor is to proactively explore (if feasible with broader industry), the development of non-destructive wood pole inspection technology to improve the accuracy of pole condition assessments.
Recommendation 9
Powercor is to complete the development of its pole risk-based asset management intervention methodology to improve the management of pole risk. If implemented appropriately, this approach will enable Powercor to prioritise the poles for intervention in higher risk areas by considering the consequence of failure to the community.

Wood pole management forecasting and delivery

ESV reviewed the methods applied by Powercor to determine the required future level of wood pole inspection and treatment (reinforcement and replacement) and its resource plans to deliver the wood pole management plan, to ensure sustainable safety outcomes are delivered to the communities in its service area.

ESV considered key questions including:

- Does Powercor adequately forecast the inspection and treatment requirements of its wood poles to manage safety risk?

- Will the wood pole management plan, including forecast pole replacements and reinforcement deliver sustainable safety outcomes for the future?
- Does Powercor have sufficient capacity (including through its service providers) to deliver its wood pole management plan?
- Is Powercor effectively monitoring delivery of its wood pole management plan?

Key findings

The forecasting methodology in place at the time of the Garvoc fire was not consistent with good industry practice

Powercor's current forecasting methodology is based on trends derived from its historical results. If its methodology were applied to the current declining trend of pole defects and conversion rates, it would likely result in a forecast indicating a declining need for pole replacements and reinforcements. This is not consistent with its wood pole population characteristics and performance, which suggests an increasing need to replace and reinforce poles.

Powercor has proposed a new forecasting methodology, however two of the three components are not yet approved nor implemented

Two key components of Powercor's forecast pole reinforcement and replacements are based on simulations of its proposed forecasting methodology.[19] The component methodologies have not yet been finalised, approved, or implemented.

Powercor also does not have risk-values[20] for its poles to enable it to forecast replacement volumes or to demonstrate that it will select the right pole at the right time for replacement or reinforcement based on risk. Ongoing calibration of some values with failure investigations and field results is required over time.

ESV considers it possible that the forecast pole reinforcement and replacements will vary considerably from the simulation volumes as the components of Powercor's methodology are refined.

The remaining component of the forecast is based on defects, for example fruiting body, repeat termite attack, and so on, and the outcomes of an internal review in 2019. However, ESV is unable to conclude with confidence that the basis for the forecast is reasonable.

Reporting of unassisted pole failure statistics should be independently verified

Monitoring pole failure statistics is an important indicator of the condition and risk of the wood pole population. Specifically, pole failures classified as unassisted indicate that the wood pole management plan has not identified a pole that was expected to fail under normal conditions (as opposed to those that may fail due to third party damage or extreme weather).

Currently the assessment and reporting of this data is left largely to the discretion of inspectors and asset managers based, at least in part, on subjective criteria.

Using high pole strength utilisation factors for different bushfire zones is appropriate

Powercor has made some assumptions of the remaining strength of poles to inform the risk of failure. In the absence of quantifiable data, ESV considers this a reasonable and conservative approach. This will increase the number of poles classified as Unserviceable, in high bushfire consequence areas.

[19] Powercor's proposed forecasting methodology is based on (i) application of its proposed new Serviceability Index to assess likelihood of failure and (ii) consideration of the consequences of pole failure to determine the risk of failure.

[20] Risk value is a measure of the cost of the possible consequences of a pole failure at a particular location multiplied by the likelihood of the pole failing and by the likelihood of the consequence occurring. It enables the monetised comparison of risk posed by individual poles and therefore selection of the riskiest poles for replacement or reinforcement.

Powercor's forecast wood pole replacement and reinforcement program for the five-year period commencing 2021/22 represents a 400 per cent increase from current levels

Powercor's wood pole intervention forecast represents a more than four-fold increase compared to the average of the actual interventions over last four years (2015-2018). If all forecast interventions are implemented, this will improve pole safety outcomes compared to remaining at the current intervention levels.

Powercor has also forecast a further seven per cent increase over the following five-year period.

Powercor has not demonstrated that its forecast wood pole replacement and reinforcement program will lead to sustainable safety outcomes

While the proposed 400 per cent increase in annual pole intervention volumes will have a beneficial impact on pole safety risk, Powercor has not provided sufficient evidence to ESV of its claims that:

- the work program will minimise risk as far as practicable while maintaining acceptable performance levels; and
- the work program has been tested as prudent and efficient.

Powercor has advised that the proposed forecasted increase of intervention works will have the effect of maintaining the average age of the wood pole population at 44 years. Powercor has stated that this is not its strategy, nor one of its performance measures. Powercor infers that the pole failure rate will be within an acceptable range with the proposed investments, but this has not been demonstrated to ESV.

The Powercor-Service provider contractual arrangement for inspection services is reasonable

The contractual arrangement between Powercor and the asset inspection service provider supports the objective of delivering safe, timely and quality inspection services. The contract is structured with a balanced approach to technical expectations and performance outcomes. It provides a framework to help incentivise delivery of quality asset inspection services, rewarding continuous improvement.

Powercor's pole inspection delivery performance and reporting are adequate

Although the impact of recent changes to pole inspection frequency has been challenging, Powercor and the asset inspection service provider are managing the program and transition of works adequately.

At the time of the review there are no poles that are overdue for inspection.

While the existing reporting method is adequate, ESV considers that it could be improved by monitoring key risks, actual results and trends in performance indicators.

Recommendations

Recommendation 10
Powercor is to improve its asset performance monitoring by developing pole asset performance metrics and health reporting dashboards, with appropriate targets to monitor and review performance levels.
Recommendation 11
ESV, in consultation with MECs, is to revise the reporting guidelines to include performance indicators relating to wood pole management in the quarterly and annual performance reporting. This will include the establishment of leading and lagging indicators and clarification of the classification of assisted and unassisted pole failures, allowing ESV to monitor wood pole performance. This should build on and extend existing safety performance reporting by ESV.

Recommendation 12
Powercor is to finalise its proposed forecasting methodology, its forecast pole replacements/reinforcements and include the forecast pole interventions in its Bushfire Mitigation Pan.
Recommendation 13
ESV is to monitor quarterly wood pole performance and delivery of Powercor's forecast intervention volumes (up to and including 2025/26). The approved volumes are to be included in the updated Bushfire Mitigation Plan, with ESV using its powers to hold Powercor to account for delivery.

Concluding remarks

In summary, ESV concludes that:

1	**The wood pole management system in place in March 2018, at the time of The Sisters fire at Garvoc, would not deliver sustainable safety outcomes for the future.**
2	**Since March 2018, Powercor has improved its wood pole management system, which has the effect of increasing the volume of wood pole replacements and reinforcements. However, these changes alone will not deliver sustainable wood pole safety outcomes for the future.**
3	**Powercor is progressing further improvements to its wood pole management system based on a more comprehensive risk assessment and better inspection practices that, if fully implemented, will as far as practicable, deliver sustainable safety outcomes for the community**

ESV will continue to monitor the improvements to the wood pole management system proposed to be undertaken by Powercor, including undertaking further reviews as necessary, to ensure that Powercor meets its obligations to provide a safe electricity network.