United Energy Wood Pole Management

A review of sustainable wood pole safety outcomes

Public report

September 2022

This report has been endorsed by the Commissioner and Chairperson of Energy Safe Victoria.

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Contents

Executive summary

Overview

Energy Safe Victoria (**ESV**) is conducting a series of investigations into Victorian electricity distribution businesses to ensure that their respective pole management practices deliver sustainable safety outcomes for all Victorians.

ESV has reviewed United Energy's wood pole management practices to assess whether they are expected to deliver sustainable safety outcomes for Victorians. This includes United Energy's systems for identifying the need to replace or reinforce wood poles before they fail or otherwise become a safety concern.

This report presents the findings of our investigation of United Energy's wood pole management systems and practices.

Summary of findings and implications

Summary of findings

United Energy's application of its wood pole management system, in compliance with the accepted Electricity Safety Management Scheme (**ESMS**), has historically resulted in the second lowest unassisted wood pole failure rate of Victorian distribution Major Electricity Companies (**MECs**). ESV has identified several findings that, when fully addressed, will strengthen United Energy's pole management practices.

From the review into United Energy's wood pole management, ESV concludes that:

1. United Energy's pole management practices are focussed on short term outcomes. More can be done to ensure that the condition (and consequently the safety outcomes) of United Energy's pole population are maintained or improved in the longer term.
2. United Energy has not demonstrated that all unassisted pole failures have been adequately investigated and that all hazards and risks of the pole population are being adequately managed.
3. ESV has identified several improvement opportunities for United Energy drawing from preceding wood pole management investigations of Powercor and AusNet Services that appear to be common to Victorian MECs.

During the investigation ESV identified inconsistent and out-dated documentation across the suite of asset management and inspection practices, particularly in relation to failure investigation, serviceability criteria and management of risk controls for reinforced poles.

Implications to sustainable safety outcomes

The safe management of wooden power poles is a compliance and enforcement focus for ESV. The findings of this investigation suggest that United Energy may not have effective asset management controls in place to adequately identify and respond to an increasing network safety risk posed by its population of reinforced poles.

Notwithstanding United Energy's relatively low historical rate of unassisted wood pole failure and lower population of assets in hazardous bushfire risk areas (**HBRA**), the failure rates associated with this population are increasing. This outcome is inconsistent with the legislation, to minimise safety risks as far as practicable (**AFAP**), and community expectations.

ESV identified inconsistent and out-dated documentation across United Energy's asset management and inspection practices. ESV is concerned that United Energy is overly reliant on the unassisted pole failure rate (a lagging indicator), for confidence in its pole management practices.

Response to findings

ESV will consider all feedback received through the public consultation process and determine appropriate enforcement action to ensure all findings are addressed to minimise risks to the safety of people, property damage and bushfire danger as far as practicable.

Introduction

Purpose of this report

This report summarises the findings of the detailed investigation undertaken by ESV into the United Energy wood pole asset management practices. The objective of the investigation was to ascertain whether those practices will produce sustainable safety outcomes.

Background to this report

ESV is conducting a series of investigations into Victorian electricity distribution businesses to ensure that their respective pole management practices deliver sustainable safety outcomes for Victorians.

The investigation forms part of ESV's commitment to progressively review the adequacy and sustainability of the wood pole management practices of Victorian MECs.

This report continues the series of investigations and summarises a detailed investigation of United Energy's approach.

How this report is structured

The executive summary provides an overview of the assessment and findings relating to United Energy's wood pole management.

The body of this report provides the following information:

- Chapter 2 presents an overview of United Energy's wood pole population and performance
- Chapter 3 sets out the approach to the assessment undertaken by ESV
- Chapter 4 provides a summary of the findings from the detailed assessment undertaken by ESV
- Chapter 5 provides concluding remarks.

This report also includes two appendices:

- Appendix A provides a list of abbreviations used in this report
- Appendix B outlines the regulatory bodies and oversight they apply to MECs in Victoria, and specifically how the network safety is regulated.

Consultation

ESV is committed to providing an opportunity for public comment on its investigation and findings into the management of wood poles. This is an important step in providing community confidence in the safety of the electricity distribution networks across Victoria.

ESV invites interested parties to make a submission on this draft report. The closing date for submissions is 05 October 2022.

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

or

Find the link to an online submission form on our website at Electrical incident and technical investigation reports page

or

Post your submission to:

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

Overview of United Energy's wood pole population

United Energy has a large service area across east and south-east Melbourne and the Mornington Peninsula, with approximately 143,000 wood power poles in the distribution network. While the observed historical failure performance has been lower than other MECs, ESV has reviewed the extent to which the performance measures accurately reflect the condition of the wood poles, and the extent to which the systems and practices used by United Energy will ensure the safety risk is minimised in accordance with the *Electricity Safety Act 1998* (Vic) (**Act**).

In this section, the characteristics of the United Energy network and wood pole population are presented as important context to the findings included in subsequent sections of this report.

Business overview

United Energy distributes electricity to more than 670,000 customers across east and south-east Melbourne and the Mornington Peninsula. Ninety per cent of its customers are residential. The overhead electricity network consists of 10,200 kilometres of power lines that traverse an area of 1,472 square kilometres and are supported by 215,540 power poles and public lights. It is the third largest of the Victorian distribution networks, with less than ten percent of its poles located in HBRA.

Figure 1: United Energy service area

Wood pole population

There are approximately 168,000 wood and concrete poles supporting distribution and sub-transmission networks across the United Energy network, with 142,748 (or 85%) being wood poles, as at July 2021.[1]

United Energy's population of wood and concrete power poles is the third largest pole population of all Victorian MECs. United Energy has primarily used wooden poles, with concrete installed by exception only.

The composition of poles by material type and bushfire risk classification by MEC is shown in the tables below.

Table 1: Summary of focus questions for wood pole performance and characteristics[2,3]

MEC (Distribution)	Total wood poles	Total concrete poles	Total wood and concrete poles
Powercor	364,900	130,090	494,990
AusNet Services	185,837	132,095	317,932
United Energy	142,748	25,234	167,982
Jemena	60,667	19,692	80,359
CitiPower	42,616	4,740	47,356

Approximately ten per cent of United Energy's population of wood and concrete poles are located within Victoria's HBRAs, which is materially lower than Powercor and AusNet Services.

Table 2: Comparison of wood and concrete pole volumes in HBRA and Low Bushfire Risk Areas (LBRA)

MEC (Distribution)	HBRA	LBRA	% poles located in HBRA
Powercor	286,094	208,896	58%
AusNet Services	198,215	119,717	62%
United Energy	16,171	151,811	10%
Jemena	4,312	76,047	5%
CitiPower	0	47,356	0%

ESV has observed from comparative analysis of the age and volume of wood, concrete, and reinforced poles in five Victorian MEC networks that United Energy has:

- a relatively high percentage of non-reinforced wood poles (73%) of total poles;
- a relatively high percentage of total poles older than 45 years;
- one of the lowest percentage of concrete poles (15%) to total poles
- a moderate percentage of reinforced poles (12%) to total poles.

[1] ESV analysis of United Energy, In-Service Pole Data , Spread sheet July 2021

[2] Powercor and AusNet Services detailed technical report into wood pole management

[3] ESV analysis of Jemena and CitiPower data submission, August 2021

In United Energy's network the wood poles in HBRA, on average, have a considerably lower age than wood poles located in LBRA. ESV considered whether the lower average age of wood poles in HBRA could be due to more conservative management practices for poles in HBRA that have resulted in a higher renewal rate of the population. From the information provided for the investigation, over the previous eight years, the rate of replacement of poles in HBRA is not materially different to the rate of replacement in LBRA. From this observation there is insufficient evidence to link the management practices for poles to the younger population in HBRA, this outcome may be due to the original construction of the network and more recent network growth into peri-urban areas.

The age of a wood pole is not the sole determinant of its condition. For example, the service life of a wood pole can be extended by using wood preservatives, termiticide, and pole reinforcement techniques. ESV has considered how the age of the wood pole populations varies between Victorian MECs.

Current condition assessment of wood poles

In managing its wood poles, United Energy undertakes cyclic condition assessments and classifies the poles as Serviceable, Limited Life or Unserviceable. Table 3 provides a definition of each classification.

Table 3: Definition of serviceability classifications

Classification	Definition[4]
Serviceable	Condition assessment confirms the asset is safe to continue in service until at least next inspection visit.
Limited Life	Pole could become unserviceable before the next cyclic inspection.
Unserviceable	Not suitable for continued service. Must be changed, reinforced or non-destructive tested within a time dependent on the condition of the pole.

Source: Adapted from United Energy Asset Inspection Manual

The United Energy Asset Inspection Manual (**AIM**) establishes the serviceability criteria that are to be met to allow a pole to be classified as Serviceable or Limited Life.

Table 4 shows the breakdown of the pole population by serviceability status. At the time of this analysis United Energy had identified 209 Unserviceable wood poles identified for intervention (reinforcement or replacement) within a time dependent on the condition of the pole and 1,159 Limited Life poles requiring annual re-inspection, on its network.

[4] United Energy, Asset Inspection Manual, section 03, pg 4 of 48

Table 4: Number of wood poles by serviceability classification (as at July 2021)[5]

Classification	Number of Poles	Percentage
Serviceable	146,866	87.4%
Reinforced	19,739	11.8%
Limited Life	1,159	0.7%
Unserviceable [6]	209	0.1%

Source: United Energy data provided during investigation

ESV has reviewed the serviceability data provided by United Energy and does not consider that as representative of a population of unsafe wood poles. In addition, ESV has inspected over 1,000 wood poles during this investigation and those results support this finding.

While United Energy acknowledges that a proportion of its population of reinforced poles are at or approaching end of life, it is unclear to ESV how United Energy is monitoring or managing the changes in risk. Specifically, whether the risk treatment plans are adequate for an increasing cohort of reinforced poles that are expected to be approaching end of life.

ESV observed an increasing trend of failure in a component of United Energy's pole population, specifically reinforced poles, which may indicate a declining trend in condition and may require replacement to mitigate an increasing safety risk. This hypothesis was tested in the ESV assessment that follows.

Failure performance of wood poles

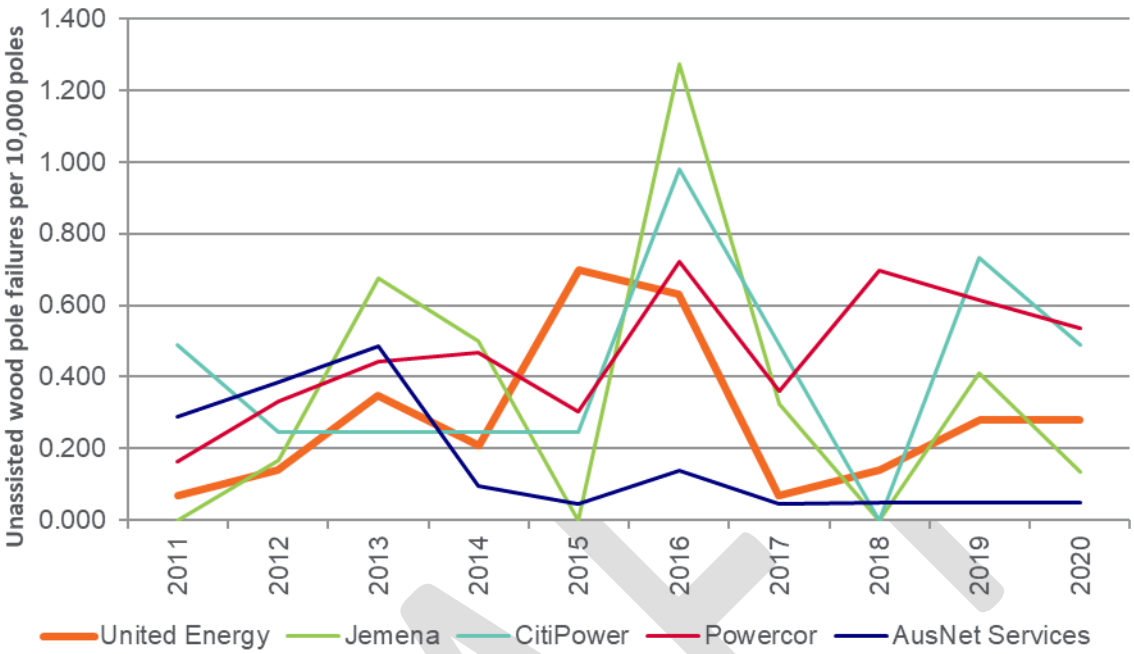
The cause of a pole failure can be classified as assisted or unassisted, being as a result of forces and factors beyond the reasonable control of United Energy (assisted) or within the control and design parameters for normal service (unassisted). Assisted pole failures include those poles that are damaged or broken by third-parties or storm events that exceed the design specifications of the pole. ESV has focussed on unassisted pole failures.

United Energy's five-year average unassisted pole failure rate of 0.28 per 10,000 poles is the second lowest of the Victorian MECs. Nonetheless, this failure rate has increased steadily since 2017.

[5] Total pole numbers may vary through the report due to alternate sources

[6] These Poles were identified at last inspection and marked for intervention (treatment by reinforcement or replacement) within a time dependent on the condition of the pole

Figure 2: Comparison of unassisted wood pole failures per 10,000 poles by MEC



Source: ESV analysis of Regulatory Information Notices and ESV quarterly reports[7]

United Energy has attributed the higher unassisted pole failures over the 2015-2016 period to two factors:

- ineffective inspection of poles in pavement
- termite infestation, which were not identified during inspection

ESV also observed that pole failure targets varied between those published in the United Energy safety strategy and pole lifecycle plan, which was not adequately explained.

Updated data provided by United Energy to that previously reported to ESV, show the increase in unassisted pole failures since 2017 being more pronounced than first reported.

The inconsistent unassisted failure data found throughout key asset management documents that are controlled by the United Energy network management teams cast a level of doubt on how the failure data is being used to inform strategic investment decisions.

ESV has identified an opportunity for United Energy to recognise and provide stronger consideration to unassisted pole failure performance within its pole strategy.

[7] Analysis has used AER RIN data from businesses with comparable failure definitions. United Energy data was obtained from ESV quarterly reports.

Approach to assessment of United Energy's wood pole management

This section describes ESV's approach to the assessment of United Energy's wood pole management systems and practices.

For the purpose of this review, a sustainable approach to wood pole management is defined as one that consistently "*minimises risks to the safety of any person or property arising from the supply network, as far as practicable*", pursuant to section 98 of the Act.

Approach to the assessment

Similar to previous investigations, a two-stage approach was undertaken consisting of a background review into current knowledge of United Energy's wood pole practices to inform the planning and launch of stage two, the detailed investigation into United Energy's wood pole management systems and practices.

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

ESV issued a formal Information Request to acquire United Energy's documents, data and information (including United Energy's own analysis and independent reports) to support its investigations. ESV acknowledges United Energy's contribution and cooperation with this investigation.

United Energy and ESV held an initial workshop in August 2021. The purpose of the workshop was to provide United Energy with an opportunity to inform and confirm ESV's understanding of United Energy's approach to managing its wood pole assets.

A series of follow-up discussions and workshops were held with United Energy staff. Due to the work restrictions in place as part of Victoria's COVID-19 response, these discussions were held online.

United Energy was provided with a draft copy of the investigation findings to comment on errors of fact. ESV has made corrections to the report based upon United Energy's feedback, as it deemed necessary.

Consideration given to reported performance

Each MEC is required to report serious electrical incidents and the progress of safety initiatives in accordance with the reporting guidelines published by ESV. This includes wood pole failure.

When reviewing wood pole failure performance, it is important to note that failure rates are considered a lagging indicator of whether inspection and management practices have been adequate, rather than a leading indicator of preventative safety performance. For example, robust inspection and management practices consistently applied to the population of wood poles may result in low failure rates, however if the underlying condition of the population of wood poles is poor and/or deteriorating, the level of intervention volumes may be high and/or increasing. Where the required intervention volume is not undertaken, the network safety risk will rise, and the resulting rate and number of pole failures will increase some time thereafter.

ESV has considered both the current and historical pole failure rates in its investigation of wood poles, and importantly whether current asset management practices are likely to affect the observed failure rates and safety outcomes, over the medium to long-term.

Requirements to demonstrate level of safety

The Act establishes general duties to be met by MECs, as a part of the safety management regime. The duties require a MEC to design, construct, operate, maintain and decommission its supply network to minimise as far as practicable (**AFAP**) hazards and risks to people and property, and bushfire danger arising from the supply network.

In determining what is practicable the Act requires a MEC to have regard to the severity of the hazard or risk, and the state of knowledge, availability, suitability, and cost of removing or mitigating the hazard or risk.

One approach that may be deemed acceptable in discharging this duty where there are known methods that are available and suitable to remove or mitigate a hazard or risk is to implement all controls to the extent that the cost of doing so is not grossly disproportionate to the risk reduction achieved. However this approach cannot be used to undermine existing standards and good practice and may not be found to fully acquit the MEC of its general duty in all cases.

A summary of the regulatory framework that applies to MECs is provided in Appendix B.

The Act also requires that all MECs that operate electricity supply networks, have an accepted Electricity Safety Management Scheme (**ESMS**) that is an enforcement tool for their operation, to which an entity will be held to account. An ESMS functions as a principle-based, outcome-focused requirement of the regulatory system that enables the industry to improve on the efficiency of its operations, provided it meets legislated safety requirements.

ESV has published the *Energy Infrastructure Safety Management Policy* and the supporting *Electricity Safety Case (ESMS) Preparation and Submission Guideline for MECs* to improve MEC awareness of how ESV interprets and applies the safety management regime, and how ESV expects compliance with statutory and regulatory requirements should be achieved.

In addition, all MECs are required to have an accepted Bushfire Mitigation Plan (**BMP**) that complies with the *Electricity Safety (Bushfire Mitigation) Regulations 2013* (Vic).

The purpose of the ESMS and BMP can be described as:[8]

a. The ESMS:

   (i) Specifies safety and risk management systems, policies and practices, including the AFAP decision-making methodology

   (ii) describes a Formal Safety Assessment (**FSA**) that identifies and assesses hazards and risks arising from the supply network

   (iii) specifies the outcomes of risk control decisions made by the MEC in relation to safety risks identified in the FSA.

b. The BMP:

   (i) specifies preventative strategies and programs in place to mitigate network caused bushfire danger

   (ii) specifies the management systems, processes and procedures in place to meet the prescriptive regulatory requirements to mitigate the risk of fire.

[8] Energy Infrastructure Safety Management Policy page 11

Accordingly, in legislative terms, the BMP is a specific, prescriptive document to address bushfire risk that forms part of the ESMS. It outlines in practical terms, the key controls that the MEC will implement to minimise bushfire danger arising from its supply network AFAP.

The approach to management of hazards and risk as documented in the ESMS is central to a review of asset management, and specifically how a MEC has demonstrated the assessment and application of its risk controls to minimise safety hazards and risk AFAP.

In this investigation, ESV has referred to these overarching requirements, and where required referred to the obligations of the Act in making findings.

Findings

The wood pole management practices undertaken by United Energy have resulted in the second lowest unassisted wood pole failure rate of Victorian distribution MECs. ESV has identified a number of actions that, when fully implemented, will support the safety risk being maintained or improved.

In this section, the key findings arising from the detailed investigation are presented.

In preparing the summary of findings, ESV has sought to group together a number of findings that contain technical detail. In doing so, the nature and focus of the finding is unchanged. ESV management will recommend enforcement action to the ESV Commission to address each of the technical items.

Overview

The findings are grouped into five key assessment areas:

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

Strategy and management plan

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

Key strategy and management plan findings

The key findings and observations relating to this section are summarised in the table below.

Table 5: Summary of key findings and observations for strategy and management plan

Finding	Elaboration
Asset management principles are consistent with good industry practice	ESV observed that the asset management principles, as described in United Energy's Asset Management Policy, are consistent within an Asset Management System that aligns to ISO 55001:2014 and recognises key stakeholders and external obligations.
Elements of United Energy's asset management system documentation include conflicting information and are not being maintained consistent with its own requirements	A demonstration of how United Energy achieves its electricity distribution asset management objectives was not evident to ESV. The asset management system documentation also included conflicting statements. The linking of objectives to measures and targets is a common method for demonstrating how objectives are achieved, which was not made clear to ESV.
United Energy's Poles life cycle plan does not demonstrate that its pole management strategy minimises safety risks AFAP	The lifecycle analysis included in United Energy's Poles life cycle plan does not demonstrate that its pole management strategy minimises safety risks AFAP. United Energy's As Far As Practicable Assessment Procedure (UE PR 2365), approved in November 2019, appears to provide a key element of how United Energy may demonstrate that it is meeting its obligations to minimise risk AFAP. However, it is unclear to ESV how this has been applied to the management of United Energy's fleet of wood power poles. The assessment procedure is highly focused on assessing new controls. The procedure could be improved to consider assessing the impact on risk when an existing control is modified.
United Energy's pole lifecycle plan does not adequately consider condition-based lead indicators to highlight underlying emerging issues or trends	An approach to pole management that combines a condition-based assessment with an aggregate risk of failure is consistent with good industry practice. United Energy considers unassisted pole failure performance within its pole strategy, a lagging indicator of the adequacy of management practices. It is unclear to ESV how the United Energy pole lifecycle plan is informed by the unassisted pole failure targets.
United Energy's asset management data on poles, relied upon for asset management decisions, is not an accurate representation of its pole population	The findings from a recent internal review initiated by United Energy on its data management practices for poles are consistent with the observations made by ESV on the accuracy and quality of the pole data records.

Pole characteristics and performance

ESV reviewed the characteristics of United Energy's wood pole population and performance of the fleet of wood poles by referring to its wood pole performance measures and, where appropriate, industry benchmarks for comparison. As ESV is primarily interested in key safety measures, ESV has not considered other outcome measures, such as the Service Target Performance Incentive Scheme (**STPIS**) reliability impacts measure.

Key pole characteristics and performance findings

The key findings and observations relating to this section are summarised in the table below.

Table 6: Summary of key findings and observations for pole characteristics and performance

Finding	Elaboration
United Energy has the third largest population of power poles in Victoria, primarily consisting of wood poles, with a historical unassisted wood pole failure rate that is low compared to industry peers	United Energy has a population of 167,982 wood and concrete power poles, being the third largest pole population of all Victorian MECs. United Energy's five-year average of 0.28 unassisted pole failures per 10,000 poles is the second lowest of the Victorian MECs. However, this has increased steadily since 2017.
United Energy has approximately 10 percent of its power poles located in HBRA and the average age for a wood pole in HBRA is considerably lower than poles in LBRA	Of United Energy's 167,982 wood and concrete poles approximately ten per cent are located within Victoria's HBRA. In HBRA, on average, a wood pole has a considerably lower average age than a wood pole located in LBRA.
United Energy has a population of reinforced wood poles that are at or approaching end of life	While United Energy acknowledges that a proportion of its population of reinforced poles is at or approaching end of life, it is unclear to ESV how United Energy is monitoring or managing the changes in risk. Specifically, whether the risk treatment plans are adequate for an increasing cohort of reinforced poles that are approaching end of life. ESV sought to understand these trends, and the rationale for changes to the level of intervention volumes observed and whether this trend was indicative of future intervention volumes.
ESV observed that United Energy is monitoring pole performance against targets that were set in 2018	ESV found that the pole performance targets set in 2018 on a rolling average basis have not been refreshed for a number of years. It is unclear how these targets are used to drive performance in United Energy's network, and what actions are taken by United Energy when performance falls outside the nominated failure performance targets. ESV identified that if the pole failure target had been updated at the end of 2020, then the pole failure performance at the mid-point of 2021 would be equal to, or above, the target. United Energy was monitoring this performance as below the target set in 2018.

Finding	Elaboration
ESV observed inconsistent reporting of unassisted pole failure statistics and targets	Notwithstanding United Energy's low unassisted wood pole failure rate, an assessment of the trend was not evident to ESV in United Energy's asset management documents. ESV has observed inconsistent reporting of unassisted failure statistics across various sources namely; regulatory failure reporting, pole lifecycle plan, UE Safety strategy and data provided by United Energy during the investigation.
United Energy has been unable to demonstrate that all unassisted pole failures have been adequately investigated	From the information available to ESV. United Energy has not investigated all pole failures. From the reports that were made available to ESV, there was limited depth of analysis, inconsistent evidence of recording, tracking, and completing recommended actions arising from investigation of failed poles.

Inspection method and practices

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

The objective of wood pole inspection practice is to provide sufficient information to reliably establish the condition of individual poles. Like most MECs, United Energy uses a combination of visual inspection techniques and the 'dig, sound, 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 addressed, lead to pole failure.

Key inspection method and practices findings

The key findings and observations relating to this section are summarised in the table below.

Table 7: Summary of key findings and observations for inspection method and practices

Finding	Elaboration
Ground-based inspection practices are consistent with general Victorian MEC practice	This has included retaining a reasonably consistent AIM since State Electricity Commission of Victoria (**SECV**) times, particularly for inspection and testing instruction.
The effectiveness of the Asset Inspection practice appears to be tracked through the failure outcomes of the wood pole population	In discussion with ESV, United Energy appeared to treat the application of the inspection activity and its auditing as a prescribed requirement, more so than a critical control for management of poles. There does not appear to be evidence of the analysis of deficiencies and trends from corrective actions being undertaken by United Energy from its audits, or that the audits are adequately focussed on the asset inspection activity and applied by a suitably qualified resource.

Finding	Elaboration
	United Energy was unable to produce documented requirements for WoodScan audits.
United Energy's application of competency standards and training documentation for inspectors can be improved	An Asset Inspector must have, at a minimum, a level of competency for undertaking pole condition assessment. There does not appear to be a documented process or procedure for determining and maintaining the competency of inspectors. There is no requirement for Asset Inspectors to complete formal refresher training on technical tasks in the AIM.
The application of the Asset Inspection practice can be improved	Several requirements for the accurate inspection of wood poles require improvement, including: • Inspection of poles with 'insufficient' access to conduct sounding and excavation due to reinforcement/stakes and underground cable covers. • United Energy does not provide adequate instruction for the 'sound test.' • For any non-destructive wood pole testing device that measures the section modulus of the pole, the ability to accurately test pole cross sections at locations within the top 600 mm of the reinforcement is important. In addition, there appears to be a backlog of requested improvements or changes to the AIM that have not been reviewed or actioned.
United Energy has not demonstrated that changes in the HBRA Summer Audit Program reflect a risk reduced AFAP	In previous versions of the United Energy Fire Prevention Plan (**FPP**) the HBRA Summer Audit Program has involved a 100% audit of the United Energy HBRA. In the current FFP the coverage has been altered to '50 to 100% of the UE HBRA'. In response to an ESV request, United Energy has provided examples of assets identified during these inspections that required follow up; however has not provided evidence demonstrating that the hazard presents significantly lesser risks than previously thought, to assist in determining if the reduced coverage represents a level of risk that has been reduced AFAP.

Assessment of pole condition and risk

ESV reviewed the methods applied by United Energy to ascertain the condition of each wood pole, and the pole's 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 applied to it, based on the installed equipment on the pole and the wind and other forces acting upon it. A pole's strength and its ability to withstand these forces decline over time. If a pole's residual

strength – that is, the remaining strength of a pole at a certain point in its life cycle - is assessed as not being capable of withstanding the loading forces on it, until the next test, then it is at an elevated risk of failure.

If the assessed residual strength results in there being an elevated likelihood of failure, some form of action is required to mitigate the pole failure risk.

Key assessment of pole condition and risk findings

The key findings and observations relating to this section are summarised in the table below.

Table 8: Summary of key findings and observations for assessment of pole condition and risk

Finding	Elaboration
There is a procedural gap around assessing and capturing the extent of pole external decay and pole score, that has potential to lead to false comfort around pole fleet serviceability	The loss of pole diameter or girth, due to external decay, has a significant impact on the remaining strength of a timber pole. Structurally, in order to minimise deflection and stress in a pole, it is ideal to have sound timber at the maximum distance from the centre of the pole. There is no procedure included that details how the Asset Inspector is to estimate the depth of decay. The absence of clear instructions risks this critical aspect of pole serviceability being inconsistently applied by asset inspectors.
There is conflicting and inconsistent serviceability criteria listed throughout the United Energy AIM	A number of inconsistencies relating to serviceability criteria have been observed within the United Energy AIM. Without correct instruction for assessment of pole condition, this may lead to inconsistent application and classification of poles at risk of failure. In addition to this, United Energy does not record all pole condition measurement values that are specified in serviceability criteria. For example, ESV understands that a single sound wood value is recorded as the minimum value and it is unclear to ESV how the criteria for average sound wood is applied and audited when reliant on multiple sound wood measurements.
United Energy has the lowest residual strength threshold for poles to be categorised as serviceable amongst the Victorian MEC's (using Woodscan)	United Energy has not demonstrated that the lower threshold applied, when compared to its peers, is reasonable and minimises risk AFAP. ESV notes that United Energy applies a more frequent inspection cycle for limited life poles. In addition to this, ESV observed that United Energy has a higher serviceability threshold for assessment of reinforced poles as Limited Life, as compared to non-reinforced poles, when assessing with dig, sound and drill. A higher threshold that compensates for the loss of strength that is the result of the application of a bolted reinforcement system, in not present in WoodScan thresholds.
ESV considers that United Energy could undertake further analysis to	United Energy currently relies on the engineering design methods adopted from SECV, which rely on Work stress

Finding	Elaboration
adequately demonstrate compliance with AS/NZS 7000:2016	methods. United Energy presented a review commissioned on behalf of the VESI Distribution businesses as demonstration that the existing designs are equivalent to the same design carried out using the AS/NZS 7000 'limit state' method for wood and concrete poles. United Energy has not provided adequate assurance that in the absence of considering age-based strength reduction, included through loss of fibre-strength with age, that its methods provide an equivalent or improved level of safety with the prevailing standard.
Limited assessment of timber deterioration rates has been undertaken	When assessing the wood pole management practices of other Victorian MECs, ESV observed that analysis had been undertaken to assess the different deterioration rates of timber pole species. Some species common to United Energy's network are shown to have a higher deterioration rate with additional measures introduced concerning the serviceability thresholds of these timber pole types.

Wood pole management forecast and delivery

ESV reviewed the methods applied by United Energy 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 it serves.

Key wood pole management forecast and delivery findings

The key findings and observations relating to this section are summarised in the table below.

Table 9: Summary of key findings and observations for assessment of forecasting and delivery

Finding	Elaboration
United Energy's use of industry standard reinforcement systems is reasonable, but additional reference material should be produced to demonstrate compliance with current standards including AS/NZS 7000:2016	United Energy has been using Utility Asset Management (**UAM**)'s proprietary **RFD** (ReinForced Design) Pole Reinstatement System as its standard reinforcement option for some time. The UAM RFD System has been used successfully in Australia by several MECs for over 20 years for its life extension benefits. United Energy relies upon a series of VESI commissioned reports to demonstrate compliance with AS/NZS 7000:2016. ESV considers the application of pole reinforcement systems as a practice within MECs for which additional reference material should be provided to fully demonstrate the compliance of these systems to current standards.

Finding	Elaboration
No delivery risks have been identified	A large proportion of work is currently outsourced, and this strategy has been in place for some time.
United Energy's forecasting methodology is not consistent with good industry practice and can be improved	United Energy's modelling relies on linear trending of historical intervention volumes to generate a forecast, for poles, rather than distinguishing and accounting for the intervention drivers such as asset condition or risk. The performance and condition drivers of United Energy's pole intervention forecast, and the outcomes of the forecast, are not well demonstrated.
United Energy has not undertaken long-term forecasting or modelling of its pole population requirements	United Energy has not presented a long-term model of its pole population that considers the service life of its pole population and so predict the changes to pole condition, risk and intervention volumes over time.
Recent data suggests United Energy has not been achieving the forecast increase of pole interventions	The forecast modelling exercises over the past three years has shown an increasing intervention trend, however United Energy's actual pole interventions have not increased at the rate included in the forecast. United Energy was unable to demonstrate that a review of its forecast against delivered volumes, for the purpose of assessing the forecast methodology for adequacy and potential improvements, had been undertaken for any forecast produced with the current forecasting methodology.
The management of reinforced poles, including forecast volumes, requires improvement	Collectively, the observations included in this investigation report suggest that the risk of failure of a reinforced pole may be increasing, and that United Energy's management of reinforced poles, including its serviceability assessment practice, should be reviewed to ensure the treatment of reinforced poles remains appropriate. It is not clear from United Energy's pole lifecycle plan how the business intends to monitor and track the performance of its fleet of reinforced poles.

Concluding remarks

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

In this section, ESV provides its concluding remarks and identifies implications for further investigations arising from this review.

Concluding remarks

In summary of the investigation undertaken, ESV concludes that:

1	**United Energy's pole management practices are focussed on short term outcomes. More can be done to ensure that the condition (and consequently the safety outcomes) of United Energy's pole population are maintained or improved in the longer term.**
2	**United Energy has not demonstrated that its pole management strategy minimises safety risks as far as practicable.**
3	**ESV has identified several improvement opportunities for United Energy drawing from preceding wood pole management investigations of Powercor and AusNet Services that appear to be common to Victorian MECs.**

United Energy has not demonstrated that its pole management strategy minimises safety risks as far as practicable

United Energy's modelling relies on historical intervention volumes to generate a forecast for pole interventions, rather than distinguishing and accounting for the intervention drivers such as asset condition or risk (despite the approach being called condition-based intervention). United Energy has not demonstrated the forecast is based on assessment of the condition and risk of its pole population and the future requirements of the asset class.

United Energy has delivered short term actual volumes that differ from the level of increase that has been forecast as being required to manage this safety risk. From the information provided for this investigation, and in combination with findings in earlier sections of this report, United Energy has not provided assurance to ESV that there are no underlying hazards and risks with the condition of the population, and specifically whether these risks are being minimised AFAP.

Consideration of risk is not adequately considered within United Energy forecasting methodology, such as the safety and risk outcomes of the proposed / forecast pole intervention levels. Clear consideration of risk in the development and delivery of asset management plans is a clear requirement of all MECs.

ESV supports the development of long-term scenario modelling for wood pole interventions to assist MECs in assessing whether or not the volume of pole interventions are likely to achieve sustainable safety outcomes .

ESV considers that this type of modelling should regularly be updated to reflect changes to the wood pole population, practices and systems of the MEC that have an impact on the sustainable management of the wood pole population over the long term.

Appendix A: Abbreviations

Term	Definition
Act	Electricity Safety Act 1998
ACCC	Australian Competition and Consumer Commission
AER	Australian Energy Regulator
AFAP	As Far As Practicable
AS/NZS	Australian and New Zealand Standard
BMP	Bushfire Mitigation Plan
COVID-19	Coronavirus Disease 2019
ESMS	Electricity Safety Management Scheme
ESV	Energy Safe Victoria
HBRA	High Bushfire Risk Area
FPP	Fire Prevention Plan (United Energy's BMP)
ISO	International Organization for Standardization
LBRA	Low Bushfire Risk Area
MEC	Major Electricity Company
RFD	UAM proprietary Pole Reinstatement System
SECV	State Electricity Commission of Victoria
STPIS	Service Target Performance Incentive Scheme
UAM	Utility Asset Management Pty Ltd
VIC	Victoria

Appendix B: Regulatory framework

Regulatory bodies

The Victorian distribution and transmission network businesses are each referred to in legislation as a 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.

United Energy 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 safety regulator for electricity, gas and pipelines in Victoria. ESV oversees a statutory regime that requires MECs to develop, submit and comply with an ESMS, five-yearly Bushfire Mitigation Plan, and an annual electric line clearance management plan, to the satisfaction of ESV. MECs 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, among 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.

How network safety is regulated

The safety of the Victorian electricity networks is governed by 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 2020* 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 management regime (inclusive of ESMS) utilises principle, performance and outcome based regulatory approaches in addition to 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.

Who is responsible for safety outcomes?

Operating an electricity network involves managing risk and it is incumbent upon all MECs, including United Energy, to minimise risk AFAP.

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

How is this responsibility discharged?

The Act establishes general duties to be met by MECs, as a part of the safety management regime. The duties require a MEC to design, construct, operate, maintain and decommission its supply network to minimise as far as practicable (**AFAP**) hazards and risks to people and property, and bushfire danger arising from the supply network.

In determining what is practicable the Act requires a MEC to have regard to the severity of the hazard or risk, and the state of knowledge, availability, suitability, and cost of removing or mitigating the hazard or risk.

One approach that may be deemed acceptable in discharging this duty where there are known methods that are available and suitable to remove or mitigate a hazard or risk is to implement all controls to the extent that the cost of doing so is not grossly disproportionate to the risk reduction achieved. However this approach cannot be used to undermine existing standards and good practice and may not be found to fully acquit the MEC of its general duty in all cases.

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.