Jemena Electricity Networks (Vic) Ltd

2026-31 Electricity Distribution Price Review - Revised Regulatory Proposal

Supporting justification document

LBRA Hazard Tree Management Program - Business Case

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Glossary

Hazardous Bushfire Risk Area	Region classified as having a high potential for bushfire occurrence as defined by the Country Fire Authority (CFA).
Hazard Tree Management Program	A structured program that is aimed at identifying, assessing and mitigating risks associated with trees that pose a threat to public safety, infrastructure, or environmental stability.
Hazard Tree Program Arborist	Identifies, assesses and manages trees within high bushfire risk areas to ensure public safety, infrastructure protection, and compliance with bushfire management standards.
Hazard Tree	Any tree that is likely to fall onto or come into contact with an electric line, as determined by a suitably qualified arborist
JEN 2026-31 Draft Plan (Draft Plan)	An early version of the 2026-31 electricity distribution price reset proposal was released in August 2024 to consult with customers.
Low Bushfire Risk Area	Region identified as a having a lower likelihood of bushfire occurrence as determined by the Country Fire Authority (CFA).
Next regulatory period	The regulatory control period covering 1 Jul 2026 to 30 Jun 2031.
Vegetation Assessor	A Vegetation Assessor evaluates and analyses plant species, health, and ecosystems to support environmental management and compliance, particular in relation to Electric Line Clearance.
Vegetation Management Program Leader	The Vegetation Management Program Leader oversees the planning and implementation of vegetation management activities in JEN, ensuring compliance with regulations and mitigation of network risks.

Abbreviations

AFAP	As Far As Reasonably Practicable
EDCoP	Electricity Distribution Code of Practice
ELCMP	Electric Line Clearance Management Plan
HBRA	Hazardous Bushfire Risk Area
HV	High Voltage
JEN	Jemena Electricity Networks (Vic) Ltd.
LBRA	Low Bushfire Risk Area
NEO	National Electricity Objective
NER	National Electricity Rules
ST	Sub Transmission
UHI	Urban Heat Island
VMS	Vegetation Management System

1. Executive Summary

Synopsis

- Overhead distribution assets in urban areas are vulnerable to damage due to the presence of trees and branches that come into contact with the assets, posing a safety hazard to members of the public and utility workers.
- JEN has green urban areas with large and increasing tree canopies that are worsening reliability and safety as the trees in these areas grow larger and older.
- The risk of trees and branches coming into contact with assets is compounded by increasing climate change which is causing increasingly severe and abnormal weather conditions.
- A recent government inquiry highlighted the need for preparedness of electricity distributors in the face of the increasing challenges associated with climate change.
- Four options have been considered to manage these risks. The recommended option is to implement a Hazard Tree management program by engaging an arborist to identify and manage Hazard Trees in the Low Bushfire Risk Area.
- This project is proposed to be ongoing from 2026 onward and throughout the 2026-31 regulatory control period (**next regulatory period**).

1.1 Business Need

Contact between vegetation and electricity infrastructure causes outages and damage. In addition, it is hazardous and can lead to fire starts and electrocution from fallen conductors. Society is increasingly dependent upon electricity as a primary source of energy increasing the importance of a reliable electricity supply.

With the greening of suburbs, an increased volume of vegetation is situated around electricity distribution infrastructure. Due to tree growth, an increased proportion of trees outside of the clearance space have the potential to fall onto or come into contact with electricity distribution equipment such as poles and wires which has impacted reliability.

In **Low Bushfire Risk Area** (**LBRA**) network areas, **Jemena Electricity Networks (Vic) Ltd**. (**JEN**) operates a Vegetation Assessment Program involving routine inspection and clearing of the regulated electric line clearance space. Unlike in the **Hazardous Bushfire Risk Area** (**HBRA**) where there is an established **Hazard Tree Management Program** that involves identification and assessment of **Hazard Trees** by vegetation assessors, the primary focus in the LBRA is on the clearance space. In addition, the assessors are not qualified arborists which limits their ability to identify Hazard Trees. Consequently, the current detection rates of Hazard Trees outside the clearance space is extremely low.

Hazard Trees are trees that are likely to fall onto, or come into contact with, an electric line usually due to the physical condition of the tree or immediate environmental surroundings and vicinity to an electric line. As a result, Hazard Trees have a higher probability of failure during extreme wind events, increasing the probability of damage to poles and wires and associated likelihood of supply interruptions. Depending on the size of the tree, this can often result in electric lines being brought to the ground, presenting an unacceptable risk to members of the public and our workers.

Severe weather events are becoming more frequent and increasingly unpredictable. Although these events remain relatively uncommon, their impact on the electricity network and critical infrastructure is substantial when they do occur. Maintaining reliability in this changing climate will require a combination of network hardening and protective measures. An important protective measure is the proactive management of hazard trees. Prevention of tree damage to the network during these events will reduce the demand upon restoration crews and greatly aid restoration times.

Two key safety risks are considered in this business case; the risk of contact by Hazard Trees resulting in live bare conductors on the ground and the risk of fire starts occurring through contact of assets with trees or other assets. Live bare conductors on the ground or at reduced heights pose a catastrophic consequence of electrocution if a member of the public comes into contact with the conductors (or accidentally energised structures). Fire starts pose the potential for very serious consequence, leading to pole fires or grass fires.

Issue No.	Description of Issue
1	Maintaining Network Reliability – Trees that fail and contact poles and wires have an adverse impact on network supply reliability.
2	Electrocution – Live bare conductors on the ground or at reduced heights pose a catastrophic consequence of electrocution if a member of the public comes into contact with the conductors or accidentally energised structures.
3	Fire Starts – Fire starts pose the potential for very serious consequence, leading to pole fires, grass fires.
4	Hazard Tree Assessment – The assessment of trees outside of the regulated electric line clearance space by a qualified arborist has not previously been performed in the LBRA.

Table 1 Current Issues associated with LBRA trees

Four options have been considered. The preferred option (option 4) is a strategic initiative that will reduce the public safety risk posed by the network whilst ensuring supply reliability of the network is maintained:

1. Do nothing
2. Underground High Voltage (**HV**) and Sub transmission (**ST**) lines adjacent to Hazard Trees
3. Reroute line, offset crossarms and apply covered conductor to HV and ST adjacent to Hazard Trees
4. Engage an arborist and initiate an LBRA Hazard Tree management program **(preferred option)**

1.2 Recommendation

It is recommended that an arborist be engaged and embark upon a Hazard Tree management program in the network's LBRA. The objective is to maintain network reliability and safety in the face of the increased probability of severe weather events and their impact on Hazard Trees. This option will address reliability and secondarily network safety by treating the hazard these trees pose. This alternative is more practical and significantly more financially viable than the alternatives.

The proposed program will require:

- Engagement of a dedicated arborist;
- Assessment based on a two-year assessment cycle; and
- Cutting, removal or management of identified Hazard Trees.

The total operating expenditure for this project is forecast to be $500k per annum.

1.3 Legal and Regulatory Considerations

The impact of the following legal and regulatory obligations, which JEN adheres to and complies with, are considered during the assessment,

- Electric Safety (Electric Line Clearance) Regulations 2020 - Regulation 9;
- Electricity Safety Act 1998 - S. 83B; and
- Electricity Safety Act 1998 - S. 98.

Further reference to how this business case achieves these obligations is captured in section 2.2 below.

The full details of the applicable regulations are found in Appendix B Regulatory Obligations.

2. Background

Melbourne's suburbs are becoming increasingly green, reflecting council and community expectations. However, this trend presents challenges for Jemena Electricity Networks (JEN), as much of its network is located in these greener areas. As trees grow older and larger, the risk of failure rises particularly among aging trees, which are more likely to shed large limbs or collapse entirely. Structural failure of large, unhealthy trees is a key concern, as they have a significantly heightened likelihood of contact with electrical assets within their fall zone.

A greater frequency of incidents where an increased volume of vegetation is brought down is resulting in greater volumes of outages. It also poses risks to the operational safety of JEN's network and the safety of the communities we serve. This increase in hazard has been observed as more established trees that are in poor health become Hazard Trees. Due to their large mass and height, they have increased potential to cause significant damage over a wider area.

The resulting increase in volume and size of trees combined with increased frequency and severity of inclement weather is causing an increase in the likelihood and consequence of these risk events occurring, and to the extent of damage that occurs. Vegetation-related outage data shows a clear upward trend in proportion of incidents where vegetation outside the clearance space contacts and damages electrical lines. Severe weather events that impact large areas and cause widespread damage can cause significant restoration times. The recent storm event in August resulted in prolonged outages.

Hazard Trees

A Hazard Tree is defined as any tree that is likely to fall onto or come into contact with an electric line, as determined by a suitably qualified arborist.[1] In the LBRA, vegetation overhanging lines is permitted provided it is outside of the minimum clearance space at all times. Pruning and cutting of vegetation to comply with clearance space requirements as per Electricity Safety (Electric Line Clearance) Regulations 2020 does not necessarily eliminate the risk posed by Hazard Trees as, by definition, they exist outside of the codified clearance space.

With the greening of Melbourne and the growth of vegetation, there are a greater quantity of trees that overhang electric lines or are otherwise large enough that, if they were to fall, they could come into contact with lines. Removal of every tree and branch outside of the clearance space that has the ability to fall upon lines would clearly be unacceptable by the community, nor is it necessary as many trees and branches would not be classified as Hazard Trees.

JEN currently has a dedicated HBRA Hazard Tree Program to identify and manage vegetation that is likely to fall on network infrastructure. However, there is currently no dedicated program or initiative for managing Hazard Trees within LBRA network regions outside of the electric line clearance space.

Proposed LBRA Dedicated Hazard Tree Management Program

JEN's proposed dedicated **Hazard Tree Management Program** will identify and manage vegetation that is likely to fall on electricity distribution infrastructure in the LBRA network region. The process for the assessment of trees for the Hazard Tree Management Program is detailed and requires assessment by a qualified arborist as per the regulations. The risk of these trees coming into contact with the network requires assessment of several factors:

- Sufficiently likely to fail such that it poses an unacceptable risk;
- Be of sufficient size to reach electric lines should it fail;
- Failure will result in sufficient falling momentum of vegetation such that it could cause damage of concern (conductors down etc); and
- Fall in the direction of electric lines.

[1] JEN, *BFM20 – Electric Line Clearance Management Procedure of JEN Bushfire Mitigation Plan 2024-2029*, (08 November 2024)

Currently, Hazard Trees and any obvious and problematic trees in LBRA areas are identified as part of the routine vegetation management program by vegetation assessors or alternatively by members of the public. Upon identification, a full assessment is undertaken by a qualified arborist before further action can be taken.

The existing assessment program is primarily focused on the clearance space, and Hazard Trees can be overlooked due to the intricate nature of identification.

Existing HBRA Dedicated Hazard Tree Management Program

In 2013, JEN introduced a dedicated and ongoing Hazard Tree Management Program across the entire HBRA network region. The 2-year cyclic program delivered a 70% decrease in the number of incidents due to vegetation contact and a reduction in the number of fire starts. In the first cycle, 994 Hazard Trees were identified and were subsequently removed or trimmed. Prior to the introduction of the dedicated program, an average of 50 trees were removed and 100 were cut each year in the HBRA and evidently many Hazard Trees remained despite the ongoing established routine vegetation assessment program. This is a natural consequence of growing vegetation.

The number of trees identified in the first year demonstrated that detection of Hazard Trees under the routine vegetation assessment program was insufficient. The dedicated HBRA program requires an arborist with a minimum qualification of National Certificate Level III in Arboriculture or equivalent qualification and at least three years of experience in assessing trees to ensure that Hazard Trees can be adequately detected to mitigate the risk posed.

HV and ST electric lines are prioritised for assessment within the HBRA dedicated Hazard Tree Management Program. Low Voltage bare mains in the HBRA are being removed or replaced with insulated conductor as a part of a separate initiative.

2.1 Customer Engagement

2.1.1 Our approach to engagement

JEN implemented an extensive customer engagement program in order to inform our 2026-31 regulatory proposal. As part of our engagement for the 2026-31 revenue determination process, we have tripled engagement hours and have aimed to capture the views of customers whose voices, without specialist and purposeful engagement, would not be heard. Our engagement strategy is underpinned by energy industry best practices, our engagement values and principles, and lessons learned from developing our past regulatory proposals. Our customer engagement objectives are:

- Build a deep understanding of our customers and their views – this involves understanding their needs, views and expectations.
- Shape our regulatory proposal based of customers' views – this involves providing our customers with unbiased and easy-to-understand information that they can engage with.
- Support growth of JEN's customer-focus culture – this involves bringing in our Board, Executive Team, Senior Managers and team members to play an active role in the engagement process.
- Build customer trust in our regulatory proposals – this involves engaging with customers throughout the entire reset process, giving them access and opportunities to provide input and feedback to show them how this is used in JEN's planning.

We are committed to fostering a customer-centric approach that meets the AER Better Resets guidelines.[2] This will ensure that our regulatory proposal is transparent, inclusive, and responsive to the needs of our stakeholders.[3]

[2] AER, Better Resets Handbook – Towards Consumer Centric Network Proposals, 2021.

[3] JEN, '*Att 02-24 – Engagement Strategy*', 2025

2.1.2 What our customers said

Early engagement with our customers identified network resilience as a top priority for the majority of customer groups.[4] Following the publication of our Draft Plan, which contained our early thinking on resilience, and some estimated costs to deliver these initiatives. JEN conducted a 'recall day' to ensure our customers were fully informed on the climate risks to the network, our proposed initiatives, and the associate costs. This also gave customers the opportunities to ask questions and seek clarification. This engagement gave JEN the opportunity to understand the nuance of our customers' views on the topic.

2.1.3 Customer Recall Day

In August 2024, following publication of JEN's Resilience Addendum, JEN conducted a 'trade-offs' discussion, during which customers were presented with four resilience packages. Each with different costs and customer outcomes attached. Following the session 91% of customers supported the level of expenditure proposed by this business case (or higher).[5] This option was favoured as customers felt it addresses concerns around fairness and increasing risk, while acknowledging the inherent uncertainties created by the current operating environment.

Some quotes to elaborate customers' preference for a balanced investment approach are provided below which illustrate the desire to balance investment in the face of uncertainty, and that a balanced approach is deemed to be more equitable.

> *Given we are dealing with unknown situations (when, where, how, etc.) it makes sense to future proof in a way that potentially everyone can benefit, not just a few, and still be economically reasonable* – Customer from the Recall Day
>
> *Fair equitable for all customers. Focus on important aspects of resilience. In time we may get better at this and re-evaluate investment requirements* - Customer from the Recall Day

2.1.4 Customer Engagement with Council

As one of the major stakeholders for the proposed changes to Hazard Tree management, engagement with local councils was made. Concerns were raised by councils over the likely removal of many trees, particularly mature ones that provide essential environmental and social benefits.

Reassurance was provided to council that the program will focus only on a Hazard Tree, not healthy, structurally sound trees and will be conducted by a suitably qualified arborist. There is no focus on tree pruning or seeking to expand existing tree pruning on healthy trees or clearance space distances. Consultation with local councils will be undertaken before any scheduled work.

In handling Hazard Trees, it is impractical and environmentally damaging to remove all Hazard Trees. Before any pruning or removal of a Hazard Tree, we consider factors such as:

- Habitat for rare or endangered species;
- Environmental or cultural significance of the area;
- Alternative construction methods to avoid tree cutting;
- Public safety, supply reliability, and site aesthetics; and
- The environmental and ecological impact of the proposed works.

Most Hazard Trees are not pruned or removed. For example, in the first inspection cycle across the hazardous bushfire risk area, only around 20 trees were removed whilst the remaining 974 trees were either monitored or pruned.

If a tree needs pruning or removal, with exception to emergencies, no tree will be pruned or removed without at least 14 days' notice provided to the local council. If a local council disagrees with an assessment, a negotiation

[4] JEN, *'Att 02-01 - Customer Engagement'*, 2025

[5] JEN, MosaicLab, *'Att 02-21 Draft Plan Recall Day'*, 2024

process is in place, with escalation options if necessary. In our experience, disputes over the safe outcome of Hazard Trees are rare, as they typically involve dead or dying trees.

It's therefore not expected that the removal of Hazard Tree vegetation will have significant impact on canopy targets given the estimated scale and scope of the program detailed further in this paper.

2.2 Identified Need

The hazard posed by large trees upon electric lines in LBRA regions of the Jemena electricity distribution system has increased due to increased quantities of larger trees and severe weather events. Over time, these factors have led to vegetation posing greater reliability challenges. The increasing frequency and severity of extreme weather events due to climate change increase the risk posed by Hazard Trees. It is expected that these factors will result in greater incidence of widespread network damage and prolonged outages. There is currently no dedicated program in place to manage Hazard Trees in the LBRA.

Additionally, under Section 98 of the Electricity Safety Act 1998, JEN is required to minimise hazards and risks to the safety of any person or property and bushfire danger arising from the supply network As Far as Reasonably Practicable (AFAP)6. To ensure that Jemena is compliant with the AFAP principle it is recommended that the preferred option be adopted immediately to manage the risk that Hazard Trees now pose given that NPV analysis demonstrates that doing so actually results in an overall reduction in costs over the do-nothing scenario.

Assessment of the hazard posed to the network by large trees requires specific knowledge, understanding and experience. A suitably qualified arborist has the necessary qualifications to be able to accurately assess a Hazard Tree scenario based upon many factors such as tree species, condition, prevailing weather conditions and land contours. It is for this reason that Regulation 9 of the Electric Line Clearance Regulations 2020 (see Appendix A1) sets out the requirement for an arborist to conduct this assessment. Whilst there is no obligation to clear trees outside of the regulated electric line clearance space, Regulation 9 permits the responsible person to cut or remove Hazard Trees, irrespective of whether it is likely to grow into the minimum clearance space.

2.2.1 Recent Historical Context

Vegetation contact from outside of the clearance space resulting in supply faults has been of increasingly prevalent occurrence over time. In response to storms in June and Oct 2021 the Victorian Government prepared an Electricity Distribution Network Resilience Review [1]. This report recommended that distribution businesses identify high risk locations and identify preferred investment strategies to mitigate future risks. Another severe weather event impacted Victoria in August 2024 and resulted in widespread power outages.

The compounding nature of natural disasters means that sustained power outages can interact with other disruptions such as those affecting telecommunications, utilities, and emergency services, amplifying the overall impact on society. Significant weather events are becoming more frequent despite decreasing overall rainfall due to climate change. Treatment of Hazard Trees is important to help reduce significant outages due to major weather events and mitigate associated resourcing challenges to restore supply more quickly.

6 Steps to reduce risk to the extent that is reasonable, given the costs and other factors.

2.2.2 Evidence of Reliability Impact Due to Vegetation and Weather Change

Figure 2 below presents annual outage volumes due to weather and vegetation-related outages.

A clear upward trend is evident in outages caused by weather and vegetation. This worsening trend indicates that external environmental pressures, including climate change and expanding tree size and canopy coverage, are increasingly compromising network performance.

Historically it has been observed that the number of outages due to vegetation is proportionate to the number of significant weather events experienced in that particular year where, in particular, in October 2021 (FY22) JEN experienced a succession of significant weather events contributing to an additional 84 incidents in that month alone. Comparatively, in FY23 and FY24 there were significantly less weather events resulting in vegetation contact with assets leading to outages.

The upward trend of faults underscores the need for targeted intervention. The proposed Hazard Tree Management Program, which includes arborist-led identification and treatment of high-risk trees, is a prudent and necessary response. It will help maintain reliability at historical levels and mitigate the impact of extreme weather events, such as those experienced in 2024, which saw a significant spike in vegetation related outages.

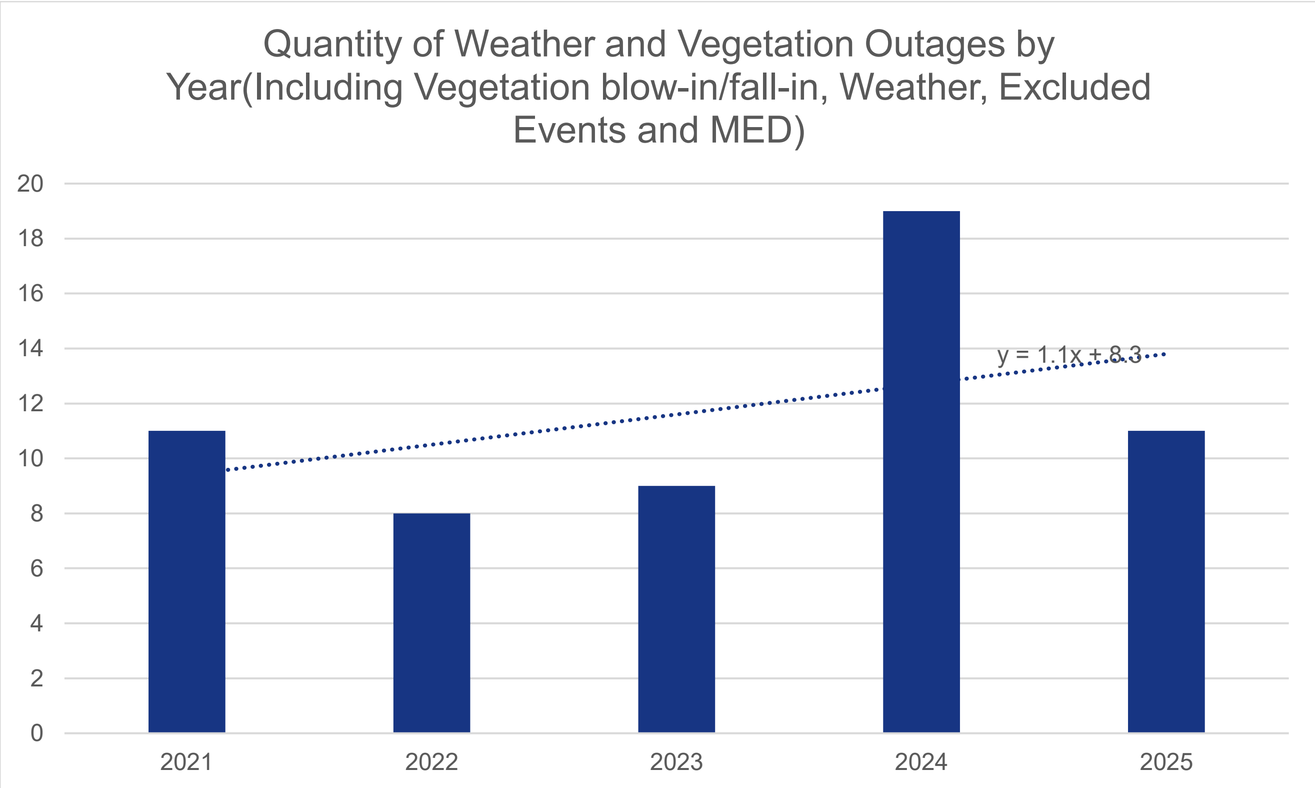

Figure 1 Outage Trends

The outage data in the above series for the year 2025 is incomplete, as it only covers the period from January to October at the time of writing. Inclusion of additional outages for the remainder of the year will drive further increases in outage trend.

JEN areas that have significant vegetation cover are shown in Table 3 below. The table details the worst effected zone substation supply areas across FY21-24 summarising the number of outages by supply area. The zone substation supply areas with the highest number of faults due to fallen vegetation are predominantly the most heavily vegetated and leafy areas often with dense suburban living. The areas indicated in Table 3 generally correlate with Figure 1 Victoria Tree Density Data below, as they correspond with map areas indicated in dark green (highly vegetated).

Zone Substation Supply Area	No. of outages from fallen vegetation
North Heidelberg (NH ZSS)	53
Airport West (AW ZSS)	41
Heidelberg (HB ZSS)	35
Pascoe Vale (PV ZSS)	17
Newport (NT ZSS)	15
Braybrook (BY ZSS)	14
Coburg South (CS ZSS)	14
Coburg North (CN ZSS)	13
East Preston (EPN ZSS)	13
North Essendon (NS ZSS)	11
Broadmeadows (BD ZSS)	11
Footscray West (FW ZSS)	10

Table 2 Number of Outages (10+) Sustained by ZSS Area between FY21-24

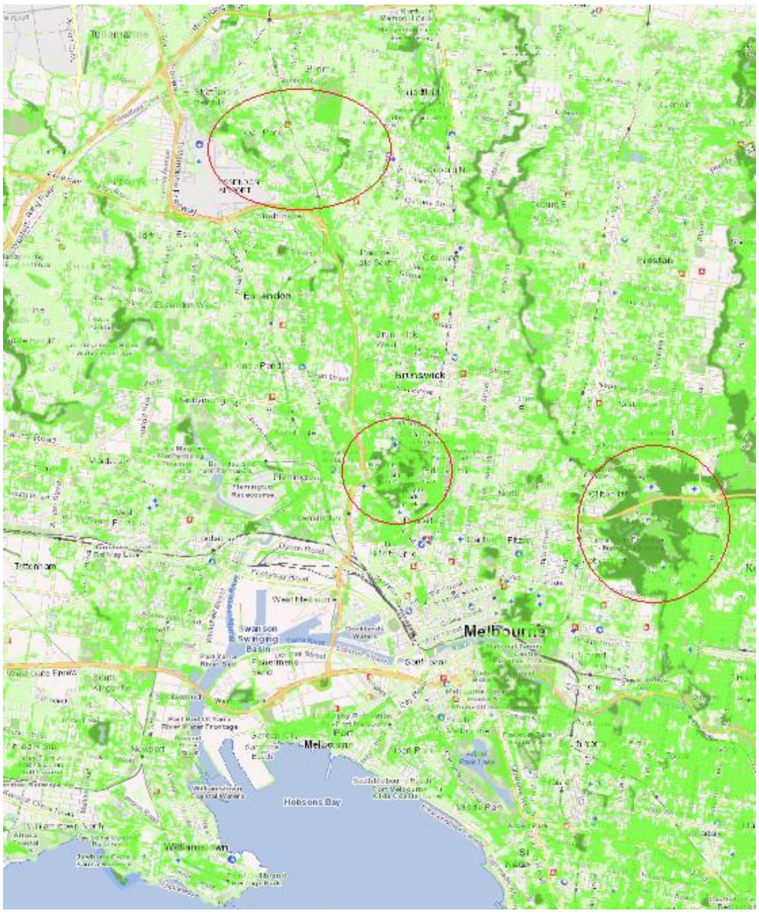

Figure 2 Victoria Tree Density Data [2]

AECOM Network Resilience Study - Climate Change

AECOM undertook a network resilience study in 2024 to investigate the likely impacts of climate change upon Jemena electricity distribution infrastructure. Among the findings was an expectation of worsening extreme wind and changed weather patterns. Higher exposure to risk associated with wind related hazards was noted in particular for areas such as the region surrounding Gisborne South and in proximity to Merri Creek and Darebin Creek.

These green areas correspond with ZSS regions that have above average fault incidence rates Jemena network and can be seen in the above figure containing tree density from the Victorian government database. Areas of dark green in Figure 1 above denote increased tree density.

An expectation of higher wind related risk to network associated with climate change is due to factors such as:

- Increasingly frequent severe weather events;
- Increased severity of weather events;
- Unusual weather patterns leading to changed wind direction (which can severely increase the chance of structural failure of trees); and
- Increased presence of very tall older trees that will be impacted by these weather events.

All of these factors increase the likelihood of Hazard Trees dropping limbs or collapsing entirely on to JEN infrastructure resulting in safety hazards, the potential of prolonged outages and costly repairs.

2.3 Business and Socio-economic Context

All vegetated HV and ST spans within the LBRA that may contain Hazard Trees are within the scope of this initiative. Vegetation that is located on council, private or privately owned land that falls under the responsibility of JEN are included within the scope.

The Jemena Electric Line Clearance Management Plan (**ELCMP**[7]) contains a process for consultation with those affected by tree cutting or removal. [8] This process contains notification, consultation and negotiation steps.

Historically on the JEN network, consultation with customers regarding the management of Hazard Trees has resulted in the negotiation of a satisfactory resolution for both the network and the customer. The community is considered through consultation, usually via council, during the notification process usually occurring when there is impact to council significant trees. Trees are recognised as significant for various reasons such as ecological, historical, aesthetic, cultural, environmental, habitat or species. This is consistent with our standing vegetation management program consultation processes for electric line clearance detailed further in the ELCMP.

The cutting of JEN responsible trees is conducted in accordance with the Australian Standard AS 4373-2007, ‘Pruning of amenity trees’ which specifies correct pruning methods and cutting standards. Hazard Trees are pruned to the same standards.

[7] JEN, 10.6 *Electric Line Clearance Management Plan 2021-2026*, (June 2023)

[8] JEN, *Electric Line Clearance Management Plan 2021-2026*, (June 2023) pg. 49

2.4 Safety & Risk Analysis

2.4.1 Identification of risks.

The two (2) key public safety risks associated with Hazard Tree management in the LBRA that have been identified and assessed are:

1. Vegetation outside the clearance space (Hazard Tree) contacts or falls into an electric line causing an energised bare conductor to be brought down less than 4.3m above the ground leading to electrocution

2. Vegetation outside the clearance space (Hazard Tree) contacts or falls into an electric line causing an asset failure that leads to the ignition of a fire start.

2.4.2 Risk assessment

The figure below illustrates the risk matrix that JEN applies when assessing the identified risks.

Likelihood		**Consequence**				
		1	**2**	**3**	**4**	**5**
		Minor	**Serious**	**Severe**	**Major**	**Catastrophic**
5	**Almost Certain**	**Moderate**	**High**	**Extreme**	**Extreme**	**Extreme**
4	**Likely**	**Moderate**	**Significant**	**High**	**Extreme**	**Extreme**
3	**Possible**	**Moderate**	**Moderate**	**Significant**	**High**	**Extreme**
2	**Unlikely**	**Low**	**Low**	**Moderate**	**Significant**	**High**
1	**Rare**	**Low**	**Low**	**Moderate**	**Moderate**	**Significant**

Figure 3 Risk Matrix

1. Live Conductor less than 4.3m above the ground due to vegetation contact from outside of the clearance space (Hazard Tree) leading to electrocution

Note: all HV and ST electric lines of the JEN network are bare (uninsulated).

From 2021-2024 there were 10 incidents of live conductors on the ground due to vegetation contact from outside of the clearance space caused by Hazard Trees.

The consequence from a member of the public making contact with the live conductor on the ground is considered to be **Catastrophic**, with a potential for electrocution.

In the event of HV and ST conductors, we expect that due to fault current, protection schemes will operate in the majority of cases and therefore the likelihood of this outcome is considered to be **Rare**.

*The untreated risk rating is therefore assessed to be **Significant** (as per Table 1, Risk Matrix).*

Due to the catastrophic nature of the consequence of this risk, JEN's duty to reduce the risk to any person should be minimised as far as practicable.

2. Fire start due to asset failure caused by vegetation contact from outside of the clearance space (Hazard Tree)

From 2021-2024 there were 6 incidents of fire starts due to contact from tree branches outside of the clearance space (Hazard Trees).

As urban feeders are located in the LBRA network region, the consequence from a fire start is considered **Serious** due to the potential for temporary harm to the environment, containment to a small area and usually some loss of or damage to third party property.

The likelihood of a fire start incident occurring is **Almost Certain**, as it is expected to occur once (or more) within 1 year.

*The untreated risk rating is therefore assessed to be **High** (as per Figure 1 - Risk Matrix).*

If left untreated this key risk presents an unacceptable liability in JEN's duty to reduce the risk to any person, property as far as practicable.

2.4.2.1 Hazard Controls

The following four options have been identified to minimise the risks described above.

Do Nothing

Continue to implement existing controls to the risks posed by Hazard Trees by using:

- Hazard Trees identified through the Electric Line Clearance assessment program by a **Vegetation Assessor** (not Arborist) – control deemed to be inadequate based on no. of fault occurrences over last 4-year period.
- Ad-hoc identification of hazardous vegetation by members of the public or JEN employees – control's effectiveness is low.
- Rely on existing protection schemes to isolate power to fallen wires and make the wire safe to touch – control does not always mitigate the potential consequence.

Underground all HV and ST Adjacent to Hazard Trees

This option involves converting existing overhead electric line spans that are at risk from Hazard Trees to underground, eliminating the risk for identified Hazard Trees contacting electric lines. This measure would be incredibly expensive relative to the other options proposed and would still require ongoing assessment unless the entire network was converted to underground as detailed in 3.3 – 'Options analysis' below.

Combination of Various Network Design Solutions

This option involves using a combination of measures, including:

- Rerouting overhead lines – Rerouting lines is limited by geography and the presence of alternative paths without Hazard Trees. This option would mitigate the risk posed by Hazard Trees but is estimated to only be appropriate in 20% of scenarios in LBRA. This control would need to be managed by regular inspection on an ongoing basis due to continued tree growth.
- Installing offset crossarms – Offset crossarms can provide additional estimated (3-4m) horizontal clearance from Hazard Trees. This control is of limited effectiveness and is only suitable in certain scenarios where design permits. For this control to be effective this Hazard Trees would still need to be assessed on an ongoing basis due to tree growth.
- Installing covered conductor to protect electric lines from Hazard Trees – Covered conductor for HV and ST is a non-preferred option used only when all other options are exhausted. This is due to additional safety implications with respect to reduced fault visibility for protection operation (due to the additional resistance between ground and conductor causing reduced fault current). Consequently, a live conductor could sit on the ground energised without protection operating increasing the public safety risk. Covered conductor does not reduce the likelihood of a Hazard Tree bringing down a line but may be seen to mitigate the risk of consequence. This option would only be used as a measure of last resort.

Engage a dedicated arborist and initiate LBRA Hazard Tree Management Program (Recommended Option)

This preferred option entails identification and cutting of trees that are likely to fall in such a way that part or all of the tree will fall onto an electric line and cause damage. This control will identify and treat the risk posed by a Hazard Tree minimising the likelihood of occurrence. It's estimated that a dedicated program can reduce the impact of Hazard Tree vegetation contact by 70% based on the effectiveness of the existing HBRA program. The timeframe to implement the treatment (cutting) following the identification (assessment) of Hazard Trees can be very short so the benefits would be realised quite quickly compared to options requiring engineering solutions.

2.5 Project Objectives and Assessment Criteria

2.5.1 Project objective

The impact of vegetation and weather upon JEN reliability has been worsening. Identification of Hazard Trees by a qualified arborist and a trimming program will help mitigate these impacts. Faults due to weather and vegetation carry associated risks to public health and safety due to downed conductors. Prolonged outages also carry risks due to the critical role that electricity plays in society.

Under Electricity Safety Act, s98, the general duty of major electricity companies, JEN has an obligation to apply additional controls to minimise safety risks as far as reasonably practicable (see section 1.3). The measure proposed in this business case is cost effective compared to the hazard reduction associated with vegetation coming into contact with and damaging electric lines and relative to the other options considered. Prolonged outages also pose safety concerns for members of the public during severe weather events.

2.6 Consistency with Jemena Strategy and Plans

JEN prides itself on an exemplary safety record. Our strategy includes the principle to "deliver safe, reliable, affordable energy and sustainable performance for all". Jemena Electricity Distribution Asset Class Strategy [9] contains an Operational Excellence directive that in part mandates the management of assets in a safe manner. The preferred option to implement a Hazard Trees Management Program in the LBRA is consistent with JEN's strategy and plans and legal obligations, as discussed in the previous section.

[9] JEN – RIN – Support – Electricity Distribution Asset Class Strategy – 20250131 – Public

3. Credible Options

3.1 Identifying Credible Options

The following credible options could be executed to address the risks posed by Hazard Trees upon electric lines in LBRA regions of the Jemena electricity distribution system:

1. **Option 1:** Do nothing.
2. **Option 2:** Underground HV and ST adjacent to Hazard Trees.
3. **Option 3:** Reroute line, offset crossarms and apply covered conductor to HV and ST adjacent to Hazard Trees
4. **Option 4:** Engage an arborist and implement LBRA Hazard Tree Management Program (Preferred Option).

3.2 Developing Credible Options

Table 3-1 shows the extent to which each option addresses the identified issues.

Issue	Option 1 Do Nothing	Option 2 Reroute Underground	Option 3 Reroute Above Ground, Offset Crossarms and Covered Conductor	Option 4 Engage Arborist and Implement LBRA Hazard Tree Management Program
Issue 1 Reduction of Risk of Electrocution	○	●	◑	●
Issue 2 Fire starts	○	●	◑	●
Issue 3 Maintaining Network Reliability	○	●	◑	●
Issue 4 Hazard Tree Assessment	○	◑	◑	●
Issue 5 Cost analysis	◑	○	○	●
Issue 5 NPV analysis	N/A	○	○	●

●	Fully addressed the issue
◑	Partially addressed the issue
○	Did not address the issue

Table 3 Effectiveness of Options

3.3 Options analysis

The affected JEN assets

In the LBRA, assets within scope which are affected by Hazard Trees include:

- 36,133 HV and ST spans
- Of which 16,508 HV and ST are vegetated spans
- 20% of vegetated spans are estimated to have Hazard Trees present *(based upon field observations by the **Vegetation Management Program Leader** and **HBRA Hazard Tree Program Arborist**)*
- 70% of the Hazard Trees are JEN's responsibility for management (with the remaining 30% of Hazard Tree management being a Council responsibility to manage)

Using the above data, it is estimated that there will be in the order of 600 Hazard Tree spans identified across the 5 year period.

Cost of Risk

Improvement to cost of risk due to safety benefit associated with prevention of 80 faults per year has been assessed utilising the Jemena HBRA AFAP Cost-Benefit calculation tool. Treatment of hazard trees under this program is conservatively estimated to reduce the risk of fires that cause injury and death by 50% over existing controls.

Given the characteristics of the JEN and associated LBRA and HBRA regions it is estimated that cost of risk is approximately 25% in LBRA network regions of that of HBRA network regions. This cost benefit has been appraised through the above process to be $91k per year for 80 faults. This cost has been proportionally applied dependent upon the expected reduction in volume of faults for each alternative. See appendix D Hazard Trees Risk CBA.

3.3.1 Option 1: Do Nothing

This option involves accepting the risk posed by Hazard Trees in the LBRA under existing measures. JEN will continue with existing controls and processes without implementation of any additional measures or change and accept the increasing safety risk posed by Hazard Trees with increased frequency of significant weather events and the greening of Melbourne. This approach carries the benefit of slightly reduced operational expenditure but also poses unacceptable risk.

Approach

Maintain existing measures through routine Vegetation Management Program and ad hoc identification of Hazard Trees.

Impact on Reliability

Degraded reliability performance remains with gradually worsening outcomes increasing due to increased tree growth and heightened, more severe and frequent weather events. Reliability will continue to worsen with prolonged outages during extreme weather events to be expected in areas with significant tree coverage.

Impact on Safety

Risk to operational network safety performance remains with gradually worsening outcomes increasing due to increased tree growth and heightened, more severe and frequent weather events.

Issues

Continued occurrence of incidents caused by problematic Hazard Trees due to insufficient detection with current controls. This results in degradation of network reliability and network safety outcomes.

Cost Analysis

We are currently experiencing an average of 80 faults per year due to contact from Hazard Tree vegetation as per Section 2.2.1.

With outcomes from incidents ranging from fault location and restoration of supply to customers, to asset damage requiring repair, to significant property damage in some cases the remediation cost (including 3rd party damage claim cost) for each fault sustained is estimated to be approximately $5k on average,

Remediation is therefore evaluated at $400k operating cost per year.

With aforementioned factors increasing the future likelihood and consequence it is estimated that the remediation cost will increase by 7.5% per year without treatment.

$2026	Costs
Faults	80
Average cost of remediation (per span)	$5k
Total cost	$400k (+7.5% /year)

Cost of risk of 80 faults ($2026): 91k

$2026	RY26/27	RY27/28	RY28/29	RY29/30	RY30/31
Opex	91.3k	95.9k	100.7k	105.7k	111k
Capex	400k	451.5k	509.6k	575.3k	649.3k
Total	491.3k	547.4k	610.3k	680.9k	760.3k

Table 4 Option 1: Total Costs Across Regulatory Period

Outcome

Heightened risk of damage to assets and property, risk to the public via fire starts and electrocution due to increased failure of Hazard Trees associated with increasingly severe weather and increased presence of Hazard Trees as vegetation grow in Melbourne.

Due to ongoing and increasing remediation costs and no change in outcome, the Net Present Value (NPV) is considered low.

3.3.2 Option 2: Underground HV and ST Adjacent to Hazard Trees

This option involves rerouting overhead electric line spans that are at risk from Hazard Trees to underground. This approach would be more expensive compared to the other options and would still require the effective identification of Hazard Trees throughout overhead parts of the network through an arborist's full network assessment. This would also be an ongoing process unless the entire network was undergrounded.

Approach

Begin by targeting zone substation areas with a higher occurrence of faults due to vegetation contact (from outside of the clearance space) such as North Heidelberg, Heidelberg and Airport West. Undergrounding of network would likely occur in ad hoc fashion leading to inefficient conversion of overhead electricity distribution to underground.

Impact on Reliability

There would be significantly improved reliability as underground lines would not be impacted by Hazard Trees.

Impact on Safety

There would be significantly improved operational network safety as underground lines would not be impacted by Hazard Trees.

Issues

- Considerably more expensive compared to the other options
- Ongoing requirement to undergrounding sections of the network
- Arborist still required to assess the remaining overhead electric line spans.

Cost Analysis

Despite costs involved in cutting Hazard Trees being eliminated, an arborist regularly assessing the network is still required. Additionally, there will be further costs related to undergrounding electric line spans.

FTE arborist salary is based on industry standard in line with existing roles that are occupied.

$2026	Costs
50% FTE Arborist	$70k/year (@50% utilisation)

The costs related to undergrounding cables are $2-3k per metre, noting that typical span length is 50m.

$2026	Costs
Underground cable costs (depending on road type, ground type etc.)	$2-3k per metre

The installation costs for cable head poles are $50k per cable head pole.

$2026	Costs
Cable head pole installation	$50k per cable head pole

Finally, the costs related to design and surveying are assumed to be $20k.

$2026	Costs
Design / Survey costs	$20k

The average cost per span is approximately $250-300k.

Cost applied to the entire network are outlined below:

$2026	Costs
Total spans	600
Treatment rate per span	$250k
Total cost	$140M-150M

The assumption of total costs for the whole regulatory period have been set out below:

$2026	RY26/27	RY27/28	RY28/29	RY29/30	RY30/31
Opex	$70k	$73.5k	$77.2k	$81k	$85.1k
Capex	$30,000k	$31,500k	$33,075k	$34,728.8k	$36,465.2k
Total	**$30,070k**	**$31,573.5k**	**$33,152.2k**	**$34,809.8k**	**$36,550.3k**

Table 5 Option 2: Total Costs Across Regulatory Period

At a total cost of over $150M ($2026) for the next regulatory period, this option is prohibitively expensive relative to other options being considered. This represents extremely low Net Present Value (NPV) due to the scale of investment required.

Outcome

Proceeding with this option would result in substantially improved network safety outcomes due to the elimination of identified risk posed by Hazard Trees.

3.3.3 Option 3: Reroute Line, Offset Crossarms, Apply Covered Conductor to HV and ST adjacent to Hazard Trees

Using a combination of measures, being rerouting lines, offset crossarms, and, as a last resort, applying covered conductor to protect electric lines from Hazard Trees where the former two measures are deemed to be not viable. This approach would also be expensive and would also require the effective identification of Hazard Trees throughout the network by an arborist. Some areas of the network would not be suitable for any of these treatments which would limit the effectiveness of this option. This approach would require ongoing management due to growth of trees.

Rerouting lines is limited by geography and is very costly. This approach would likely only be possible in less densely populated areas and trees often encroach on both sides of road. Due to these limitations, it is estimated to be appropriate in 20% of Hazard Tree situations.

Offset crossarms can provide an additional estimated (3-4m) horizontal clearance from private street trees. This does not eliminate the risk but mitigates it as trees may grow into the hazard space again. Due to design and geographical constraints, this approach is estimated to be available to be used and appropriate in approximately 20% of Hazard Tree situations.

Covered conductor is a non-preferred option used only by exception when all other options are exhausted because of other consequential impacts where insulated cables may not cause sufficient fault current for the protection system to detect the fault. Additionally, a fault involving conductor contact with the ground or with trees would have increased electrical resistance due to the cable insulation which would result in reduced fault current. Hence, for insulated cable, there is an increased likelihood of energised conductor laying on the ground, potentially exacerbating risks rather than mitigating them. In addition, covered conductor does not remove the likelihood of a Hazard Tree bringing down lines.

Approach

For 600 spans across the network identified to contain Hazard Trees its estimated 120 spans could be rerouted & another 120 spans could have offset crossarms installed to mitigate risk. Given potentially lengthy lead times for construction works to take place, prioritisation would take place by targeting zone substation areas with a higher rates of faults due to vegetation contact (originating outside of the clearance space) such as North Heidelberg, Heidelberg & Airport West to achieve greatest effect. Inspection program would need to be ongoing due to growth of trees.

Impact on Reliability

Re-routing lines removes lines contact risk associated with proximity to a Hazard Tree by removing the line and reconstructing it away from the Hazard Tree. Offsetting crossarms reduces risk of contact by increasing the clearance of the line from an adjacent Hazard Tree. Covering conductor (in exceptional circumstances) reduces risks associated with contact by Hazard Trees but can impact protection system effectiveness so is considered a last resort. These measures would maintain reliability however due to tree growth this would likely be temporary.

Impact on Safety

Along with the impact upon reliability safety would be maintained due to the reduced likelihood of damage to electrical infrastructure. The insulated conductor control measure for Hazard Trees does not reduce the safety risks associated with conductors on ground therefore is not generally considered an option.

Issues

- Considerably expensive options (see below cost analysis)
- Ongoing risks, even if treatment is applied to the entire network
- Trees may grow so large that previously applied measures might be ineffective
- An arborist still required to assess the remaining overhead electric line spans.

Cost Analysis

Despite costs involved in cutting Hazard Trees is eliminated, an arborist is still required.

FTE arborist salary is based on industry standard in line with existing roles that are occupied.

$2026	Costs
50% FTE Arborist	$70k/year (@50% utilisation)

The indicative costs associated with re-routing lines are set out below, 2 bays minimum per Hazard Tree is assumed due to deviation of line. Re-routing lines could be utilised for approximately 20% of Hazard Tree cases.

$2026	Costs
Installation of 2 new poles	$50k per pole
Replacement of 2 existing poles	$50k per pole
Design / Survey costs	$20k
Total cost	~$220k

Most commonly 3 consecutive crossarms (2 bays) are required due to design constraints. Offset crossarms could be utilised for approximately 20% of Hazard Tree cases, with indicative costs set out below:

$2026	Costs
Crossarm costs	$10k per crossarm
Design costs	$5k
Total cost	~$35k (2 bays)

Finally, covered conductors would be utilised when all other options are exhausted, and are applied rarely due to safety issues as a result of the possibility of reduced efficacy of protection systems. However, the assumed costs for permitted installation are set out below:

$2026	Costs
Covered Conductor costs	$30k per span

The assumption of costs applied to the entire network are outlined below:

$2026	Costs
Total spans	600
Treatment rate per span	
- Reroute lines	120 spans (20%) – 120 x $220k = $26.4M
- Offset crossarms	120 spans (20%) – 120 x $35k = $4.2M
- Covered Conductor	0 spans (by exception only)
Total cost	$30.6M (addresses 40% of the hazard spans)

Remediation

In line with Option 1, the no. of faults requiring remediation caused by Hazard Trees was 80 without treatment.

Noting that Option 3 addresses estimated 40% of spans via reconstruction, under the assumption that the remaining 60% of spans are not treated, no. of faults expected to trend downwards towards 48 per year.

Increased likelihood and consequence estimated to increase remediation cost by 7.5% per year.

$2026	Costs
Faults	48
Average cost of remediation (per span)	$5k
Total cost	$240k (+7.5% /year)

Cost of risk of 48 faults ($2026): 55k

The projection for total costs for the next regulatory period have been set out below:

$2026	RY26/27	RY27/28	RY28/29	RY29/30	RY30/31
Opex	$124.8k	$131k	$137.6k	$144.4k	$151.7k
Capex	$6,360k	$6,696.9k	$7,053.1k	$7,429.8k	$7,828.5k
Total	$6,484.8k	$6,827.9k	$7,190.6k	$7,574.3k	$7,980.2k

Table 6 Option 3: Total Costs Across Regulatory Period

Outcome

This option would result in a recovery of reliability and improved safety dependent upon expenditure in the program. The results would not be immediate, and expenditure would be ongoing. Some areas would not be suitable for this approach and would suffer from continued impact upon reliability and safety due to Hazard Trees. This approach would still require engagement of an arborist as tree growth would require ongoing assessment. Due to the effectiveness of this option (40% network treated only) and the significant outlay across the regulatory period, the NPV is considered very low.

3.3.4 Option 4: Engage Arborist and Implement LBRA Hazard Tree Management Program

This option comprises engaging a dedicated arborist to identify Hazard Trees in all LBRA areas for HV and ST electric lines and manage the cutting of identified Hazard Trees. This measure is the most cost effective and it provides ongoing protection to areas of the network where trees might grow sufficiently large as to become new Hazard Trees and can be deployed much more quickly across a larger portion of the LBRA than the other credible options being considered.

Approach

Inspect the entire LBRA network on a two-year rotation. Where Hazard Trees are identified, organise trimming and cutting. Reducing the risk high risk Hazard Trees could be actioned more quickly under this option as trimming and cutting can be completed rather than lengthy reconstruction of the network.

Impact on Reliability

This option results in a more timely treatment of the reliability impact of Hazard Trees, due to corrective action being conducted more immediately after identification than any engineering solution. Based upon the HBRA Hazard Tree arborist and tree cutting program results, this option is estimated to reduce the no. of events from Hazard Trees contacting electrical assets by 70%. This option is designed to maintain network reliability and safety in the face of the increasing impact associated with Hazard Tree growth.

Impact on Safety

Along with maintained reliability, public safety and fire starts risk would also be maintained.

Issues

There could be resistance by some customers and councils to cutting trees, however historically engagement with those expressing concerns has resulted in favourable outcomes with all trees that have required cutting. The JEN Customer Resolution is very experienced in resolving these matters.

Cost Analysis

$2026	Costs
50% FTE Arborist	$70k/year (@50% utilisation)

The estimated costs related to cyclical cutting are assumed to be the following:

$2026	Costs
Cutting costs	$360k/year (120 spans/year x $3,000/span)

<u>Remediation Costs</u>

It is estimated this option will reduce the risk of occurrence by 70% per year, reducing the expected no. of faults to 24 per year in the first year and further in subsequent years.

Increased likelihood and consequence are estimated to increase remediation cost by 7.5% per year.

$2026	Costs
Faults	24
Average cost of remediation (per span)	$5k

$2026	Costs
Total cost	$120k (+7.5% /year)

Cost of risk of 24 faults ($2026): 27k

The assumption of total costs for the whole regulatory period have been set out below:

$2026	RY26/27	RY27/28	RY28/29	RY29/30	RY30/31
Opex	$500k	$500k	$500k	$500k	$500k
Total	$500k	$500k	$500k	$500k	$500k

Table 7 Option 4: Total Costs Across Regulatory Period

Outcome

This option is estimated to mitigate the impact of faults due to contact by Hazard Trees by 70% pa which results in maintained reliability and safety of the network over the current situation due to management of risk of impact of Hazard Trees upon power lines and electricity distribution infrastructure. This option offers a positive NPV of $340k when considering reduction in cost of risk. Consideration of severe and infrequent events due to climate change has not been considered in this analysis. They would likely drive this benefit higher.

4. Recommendation

The external influences of tree growth and climate change are impacting reliability of JEN infrastructure and safety of the system due to issues such as downed conductors and fire starts. It is recommended that an arborist be engaged to identify Hazard Trees and that they be cut as necessary to maintain reliability and safety of JEN.

Given that tree growth will require ongoing assessment, the arborist would be engaged on a continual basis 50% FTE. It is recommended that Option 4 be adopted. It is practicable to engage a suitably qualified arborist to conduct an ongoing Hazard Tree Program in the JEN LBRA to identify, manage and treat Hazard Trees in order to maintain historically acceptable levels of network reliability and risk to public safety. This program should be managed on an ongoing basis given the changing nature of the profile of vegetation near electricity assets.

As an operator, it is our duty to minimise risks as far as practicable to the safety of any person, damage to the property and the bushfire danger arising from the supply network. Financial modelling utilising the Jemena Investment Framework Model yields an NPV benefit of $340,000 over the do-nothing scenario. This analysis would suggest that JEN would be failing to meet its obligations under s98 – see Appendix B3, if it were not to implement the program given that it potentially results in a net financial benefit. Managing reliability and restoration times during significant weather events also has an impact upon public safety due to the reliance upon electrical supply especially during such events.

Compared to other options, the preferred option results in a net beneficial present value (NPV). Alternative options cannot be justified financially. It maintains the reliability of customer supply and addresses the identified key risks and issues mitigating the likelihood of electrocution from live assets and the risk of fire start resulting in damage.

The business case proposes an initial incremental operating expenditure of $500,000 (FY26$) to implement a dedicated LBRA Hazard Tree Management Program. While this figure represents the starting annual cost, projected increases in subsequent years are expected, driven primarily by inflation. This option has been demonstrated as feasible to implement from a financial and operational perspective whilst achieving effective safety outcomes by minimising risk as far as practicable.

Appendix A
Regulatory Obligations

A1. Electric Safety (Electric Line Clearance) Regulations 2020

9 Responsible person may cut or remove Hazard Tree

(1) This clause applies to a responsible person referred to in section 84, 84C or 84D of the Act.

(2) The responsible person may cut or remove a tree for which the person has clearance responsibilities

if a suitably qualified arborist has—

(a) assessed the tree having regard to foreseeable local conditions; and

(b) advised the responsible person that the tree, or any part of the tree, is likely to fall onto or otherwise come into contact with an electric line.

Note

Under section 86B of the Act a Council, in a municipal fire prevention plan, must specify procedures and criteria for the identification of trees that are likely to fall onto, or come into contact with, an electric line, and procedures for the notification of responsible persons of trees that are Hazard Trees in relation to electric lines for which they are responsible.

(3) For the purposes of this clause it is irrelevant that the tree is not within, and is not likely to grow into, the minimum clearance space for an electric line span.

A2. Electricity Safety Act, s83B

The general duty of specified operators, including Jemena, is to minimise bushfire danger.

(1) A specified operator must design, construct, operate, maintain and decommission an at-risk electric line to minimise as far as practicable the bushfire danger arising from that line.

A3. The Electricity Safety Act, s98

The general duty of major electricity companies, including Jemena is to minimise safety risks.

Duties of the Electricity Safety Act 1998 (ESA) which requires a Major Electricity Company (MEC) to design, construct, operate, maintain and decommission its supply network to minimise As Far As Practicable (AFAP) the hazards and risks to the safety of any person, damage to the property and the bushfire danger arising from the supply network.

A4. National Electricity Rules (NER)

Considerations regarding the operating expenditure objectives set out in the NER (clause 6.5.6) are particularly relevant to JEN's expenditure decisions:

a) *A building block proposal must include the total forecast operating expenditure for the relevant regulatory control period which the Distribution Network Service Provider considers is required in order to achieve each of the following (the operating expenditure objectives):*

   (1) *Meet or manage the expected demand for standard control services over that period*

   (2) *Comply with all applicable regulatory obligations or requirements associated with the provision of standard control services*

   (3) *To the extent that there is no applicable regulatory obligation or requirement in relation to:*

      (i) *The quality, reliability or security of supply of standard control services; or*

      (ii) *The reliability or security of the distribution system through the supply of standard control services,*

   to the relevant extent:

      (iii) *Maintain the quality, reliability and security of supply of standard control services*

      (iv) *Maintain the reliability and security of the distribution system through the supply of standard control services.*

   (4) *Maintain the safety of the distribution system through the supply of standard control services.*

A5. Victorian Electricity Distribution Code of Practice

Additionally, the Victorian Electricity Distribution Code of Practice (**EDCoP**) sets out provisions relevant to JEN's planning, design, maintenance, and operation of its network, most relevantly section 19.2 (Good Asset Management) and section 13.3 (Reliability of Supply):

Section 19.2 **– Good Asset Management**

A distributor must use best endeavours to:

a) *Assess and record the nature, location, condition and performance of its distribution system assets*

b) *Develop and implement plans for the acquisition, creation, maintenance, operation, refurbishment, repair and disposal of its distribution system assets and plans for the establishment and augmentation of transmission connections:*

   - *To comply with the laws and other performance obligations which apply to the provision of distribution services including those contained in this Code*
   - *To minimise the risks associated with the failure or reduced performance of assets*
   - *In a way which minimises costs to customers taking into account distribution losses.*

c) *Develop, test or simulate and implement contingency plans (including where relevant plans to strengthen the security of supply) to deal with events which have a low probability of occurring, but are realistic and would have a substantial impact on customers.*

Section 13.3 – Reliability of Supply

A distributor must use best endeavours to meet targets determined by the AER in the current distribution determination and targets published under clause 13.2.1 and otherwise meet reasonable customer expectations of reliability of supply.

Appendix B
Cost Benefit Analysis

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B1. Cost options

Overview of Options Analysis				
Options	Option 1 - Status Quo	Option 2 - Underground lines	Option 3 - Reroute and offset line	Option 4 - Hire arborist and trim trees
Recommended Option				✓
NPV of Net Economic Benefits ($000)	**-**	**(121,547.7)**	**(24,576.6)**	**340.2**
NPV of Total Economic Benefits ($000)	-	-	-	-
Avoided cost at asset failure	-	-	-	-
Improved energy reliability	-	-	-	-
Reduced energy losses	-	-	-	-
Other Economic Benefits	-	-	-	-
NPV of Incremental Total Costs ($000)	-	121,547.7	24,576.6	(340.2)
Total Incremental Net Capex	-	*121,635.4*	*24,438.7*	*(1,767.3)*
Total Incremental Opex - One-off	-	-	-	-
Total Incremental Opex - Ongoing	-	*(87.7)*	*137.9*	*1,427.1*
Sensitivity on Economic Benefit NPV ($000)				
Economic Benefits turn out to be 10% lower	-	(121,547.7)	(24,576.6)	340.2

Table 8 NPV Options Analysis Summary Table

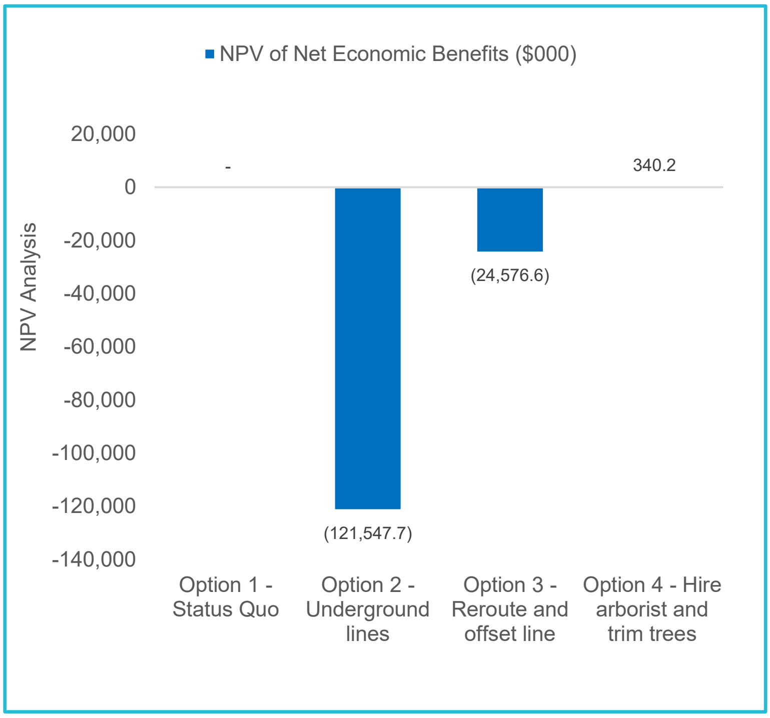

Figure 4 Options NPV Analysis Results

Appendix C
Hazard Trees Risk CBA

C1. Risk CBA

AFAP COST-BENEFIT CALCULATION:

Refer to guidance in Appendix 2 - ALARP/AFAP Review Procedure (JEM AM PR 0017)

Reviewed Date: 6/04/2022

Notes: **Cells highlighted in yellow require user input / entries in red are mandatory for the calculation**

SCENARIO:

SC1 - Potential for a fatality caused by a bushfire start

STEP 1		LAYERS OF PROTECTION (LOPA) CALCULATION - INITIATING EVENT FREQUENCY					Comments
Number of events		Major consequence bushfires in extreme conditions leading to fatality	29	events per	20	years	29 major consequence fatality bushfires from 2000 - 2020. http://royalcommission.vic.gov.au/Commission-Reports/Final-Report/Volume-2/Chapters/Electricity-Caused-Fire.html https://www.ffm.vic.gov.au/history-and-incidents/past-bushfires
Events per year			1.45	events / year	1	event in	0.7 years

STEP 2	LAYERS OF PROTECTION (LOPA) CALCULATION - RISK REDUCTION FACTORS		Comments
- LIKELIHOOD MODIFIERS -	RRF	Risk factor %	
Likelihood modifier - (100% = no risk reduction, 1% = large reduction)	3.0	33%	Historical proportion (1-4%) of all bushfires (in "normal circumstances") caused by Electricity assets. ESV Powerline Bushfire Safety Taskforce: Final Report 2011 - https://esv.vic.gov.au/safety-education/bushfire-and-powerline-safety/powerline-bushfire-safety-taskforce/ However, disproportionately for major consequence fires in extreme conditions, Royal Commission report highlights 5 out of 15 major fires in Black Saturday(2009) caused by electricity (33%).
Likelihood modifier - (100% = no risk reduction, 1% = large reduction)	126.0	0.8%	JEN ground/veg fires in HBRA - ESV DB Qtly report 2020 (10 JEN fires out of 1260 total of all DBs in 10yrs = 0.8%)
Likelihood modifier - (100% = no risk reduction, 1% = large reduction)	1.1	95%	Royal Comm recomm 27 - All JEN HBRA SWERS removed. Assume each Royal Comm element reduces risk by 5% (compared to VIC average of all DBs over past 20yrs)
Likelihood modifier - (100% = no risk reduction, 1% = large reduction)	1.1	95%	Royal Comm recomm - Increased ESV regulatory enforcement - Assume each Royal Comm element reduces risk by 5%
Likelihood modifier - (100% = no risk reduction, 1% = large reduction)	1.1	95%	Royal Comm recomm 33 - Installation of armour rods /spreaders / spacers / vibration dampers in HBRA - Assume each Royal Comm element reduces risk by 5%
Likelihood modifier - (100% = no risk reduction, 1% = large reduction)	5.0	20%	No JEN line construction areas so lower contact risk from JEN (no extreme consequence areas - closest = 100km) - 80% reduction in risk
ALL Likelihood modifiers RRF (Risk Reduction Factor)	**2,226.7**		
Residual Likelihood of Hazardous event	**6.51E-04**		1 event in 1,536 years
Residual Likelihood	**Rare**		
Initiating event Consequence rating	**Catastrophic**		
Residual risk rating	**Significant**		

STEP 3	TOTAL COST CALCULATION – BENEFITS			Comments	
1 - BENEFIT COST CALCULATION -					
Total cost of lives					
Value of statistical life		$ 5,700,000	VoL	Value of statistical life (Australian Government Best Practice Regulation Guidance Note)	https://www.pmc.gov.au/sites
Value of life year		$ 213,000	VLY	Value of statistical life year (Australian Govt)	
Value of permanent incapacitating injury (modifies VoL)	Injury = internal permanent	$ 1,185,600		0.208 * VoL (AIHW 1999 for unintentional internal injury)	http://dro.deakin.edu.au/view/DU:30046704

Value of serious injury (modifies VLY)	Injury = burn <20% < 6mth recovery	$ 16,827		0.158 * VLY * 0.5 (AIHW 1999 for burn injury)	-
Value of minor injury (modifies VLY)	Injury = slight/minor <1 wk recovery	$ 1,100		Slight injury - UK Health and Safety Executive – Cost Benefit Analysis (CBA) checklist	https://www.hse.gov.uk/risk/theory/alarpcheck.htm
Possible Number of Fatalities		9.2	N	183 bushfire fatalities in 20 years = 9.2 per year 2005 (4), 2006 (1), 2009 (173), 2013 (5)	Fatalities from 1926 - 2013, Forest Fire Management Victoria https://www.ffm.vic.gov.au/history-and-incidents/past-bushfires
Possible Number of permanent incapacitating injuries		0			
Possible Number of serious injuries		0			
Possible Number of minor injuries		0			
Cost of lives		**$ 52,155,000**	CoL	Total cost of loss of N lives / injury	

Other benefits cost			
Asset damage	$ -	$	
Legal costs (managing the incident and any prosecution / regulatory / coronial inquest consequences)	$ 50,000,000	$	Assume $50m worst case if 100% Jemena at fault and insurance does not pay. Need to consider excess
Damage to Reputation	$ 10,000,000	$	Assume loss of reputation causes loss of new project work
Other benefits cost	**$ 60,000,000**	OC	Total cost of 'other benefits' cost savings to the business and society of avoidance of an incident
TOTAL BENEFIT COST (= Cost of Lives + Other Benefits cost)	**$ 112,155,000**	CoB	Total benefit cost savings to the business and society of avoidance of an incident

STEP 4	MAX JUSTIFIABLE SPEND CALCULATION (MJS)			
Key inputs for Max Justifiable spend:				
Number of years considered (yrs)	1	T		For comparison purposes, all values are calculated on a per annum basis
Gross Disproportion value	10	Gd	Factor 1 - 10	Value depending on level of risk, the higher the risk, the higher the factor to be adopted. This is a subjective value. Suggest using 10 for fatality risks for conservatism, 5 for incapacitating injury, 3 for serious injury, 1 for minor injury/property damage/legal/reputation damage. Examples from the UK HSE include 10 for worst case fatality aversion.
Frequency of hazardous event (before further risk reduction) - copied from RESIDUAL LIKELIHOOD	6.51E-04	F0	per year	

Initiative No.	Applicable to Scenario (Y/N)	Cost (1yrs)	Frequency Hazardous event F0 (before control)	%Effectivess Estimation of % reduction in risk - Eliminates the risk completely = 100% - Reduces the risk by half = 50% - Reduces the risk by factor of 10 = 10% - Reduces the risk by factor of 100 = 1%	Assumption for %Effectiveness	Frequency Hazardous event F1 (after control) = F0 * %effectiveness	MJS (1yrs) = CoB * (F0 - F1) * T * Gd	Justified on pure cost/benefit?
Risk Reduction Associated with Hazardous Tree Inspection and Trimming 80 Faults	Y	NA	6.51E-04	50%		3.26E-04	$ 365,175	NA

25% Scale Factor Applied to HBRA	$	91,293.71

Appendix D
References

D1. References

[1] Network Resilience Review Final Recommendations Report, May 2022

[2] Victoria Tree Density Data, digitaltwin.vic.gov.au, 2025

[3] Network Resilience Study Findings Report, June 2024