

Safety performance report on Victorian electricity networks

October 2022

This report has been endorsed by the Victorian Energy Safety Commission.

Authorised and published by the Victorian Government
Melbourne October 2022

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ISSN 2653-5068

This document is available online at esv.vic.gov.au

Foreword

With the new Victorian Energy Safety Commission (the Commission) starting on 1 January 2021, Energy Safe Victoria (ESV) reviewed its purpose and vision for what it, as Victoria's energy safety regulator, is aiming to achieve. This review was completed in May 2022.

Our purpose is to keep Victorians energy safe and ensure that energy can be used confidently. We recognise that energy and the technologies that harnesses it are essential to our quality of life. However, these technologies can be complex and powerful, and the potential for harm to the community and environment is significant. Through education, regulation and enforcement, ESV works to ensure that energy safety, supply and efficiency are a priority in Victoria and something our customers can be confident in.

While our purpose remains unchanged, we felt that our vision needed to evolve with the changing energy industry and increasing customer expectations. The new vision for ESV is:

We're powering towards a safer energy future that is sustainable for all Victorians and our climate.

We need energy safety systems that are sustainable into the future. This is not just about reducing the impacts of climate change and protecting current and future generations. Sustainability is also about ensuring that our energy systems continue to operate safely despite changes in the environment and the technologies we use. We need energy systems to be modern and reliable, so our families, towns, cities and lands are kept safe.

We aim to create a future where Victorians and the environment they live and work in can flourish because of the safe, reliable delivery of sustainable energy.

Along with our new vision, we have refreshed the values that our staff are expected to operate by in their actions, decision-making and interactions. Our values and the behaviours you can expect to see from us can be found on [ESV's website](#).

Our vision cannot be achieved by ESV alone, so we continue to build and strengthen relationships with our stakeholders. By listening to our customers, by understanding their needs and expectations and by collaborating, we will get there together.

We also have boots on the ground ensuring the risks to public safety from the networks are being appropriately managed.

ESV continues to work with government to ensure bushfire mitigation through the implementation of rapid earth fault current limiter technology. The current program is on track to be fully deployed on schedule by May 2023.

Reviews of the pole management practices of Powercor, AusNet Services and United Energy have been completed. Consultation with the community has occurred for all three and the findings are being implemented. A similar review of Jemena is currently underway.

We also continue to raise awareness of the risks posed by overhead powerlines to workers and the community. It is not acceptable that accidental contact with powerlines killed yet another worker this year and seriously injured three more individuals.



Marnie Williams
Commissioner and Chairperson
October 2022

Executive summary

Once again we sadly report that there was a fatality and three serious injuries associated with Victoria's electricity networks this year. As in previous years, these incidents predominantly occurred when workers, who do not work for the network operators, inadvertently contacted live powerlines while undertaking their daily activities. All were avoidable.

ESV continues to raise the awareness of the dangers of overhead powerlines with the community, and particularly with high-risk workers. We are working closely with farming and construction industry working groups to develop and promote innovations such as the installation of non-contact voltage-detecting equipment on vehicles and mobile plant. While this will help prevent some incidents, it won't prevent them all. We need workers and all members of the public to be aware of the dangers of operating near powerlines. So we continue to promote the message of "Look Up and Live" through our marketing campaigns across multiple media platforms, reinforcing this at community farming days, industry forums and toolbox meetings. We cannot do this alone, so we are working with the major electricity companies (and others) to ensure common messaging on this issue. We are also jointly assessing other interventions to help drive down this safety risk.

In the last twelve months, we have also seen an increase in No Go Zone breaches involving building clearances. Such breaches can pose a risk to construction workers when using scaffolding or, in the worst instances, pose a permanent threat to residents when buildings and balconies are built too close to powerlines. In addressing the immediate threat, we are being more active in issuing directions to builders to halt construction until solutions are negotiated with the network operators. We are also working with government to ensure that the proximity to powerlines is considered before issuing planning and building permits.

Multiple consecutive La Niña years have kept the ground wet over spring and summer. While this has resulted in fewer network-related ground fires,

the weather over the last few years has provided ideal conditions for rapid vegetation growth near Victoria's powerlines. The networks' systems for managing line clearances have been challenged by these conditions. When combined with reduced access (localised flooding) and reduced availability of cutting crews (fewer interstate resources and competition for local resources due to COVID-19), the networks have been required to adapt their practices. While these challenges are noted, the networks need to adapt their vegetation management programs to ensure they meet their vegetation clearance obligations. In particular, ESV has noted declining performance from AusNet Services, Powercor and United Energy and we are currently considering what enforcement actions would best rectify this situation.

We have also continued to work with local councils to help them reduce their non-compliance and implement sustainable vegetation management practices. This has seen two of the three worst performing councils halve their non-compliance in the last twelve months.

The installation of Rapid Earth Fault Current Limiters remains on track for the completion of the final tranche in May 2023.

This report provides both a broad overview of network safety performance across the state and detail on the performance of each of the network operators. I commend it to you and invite any feedback you may wish to share with ESV.



Leanne Hughson
Chief Executive Officer
October 2022

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Energy Safe Victoria (ESV) is Victoria's independent safety regulator for electricity, gas and pipelines. Our role is to ensure Victorian gas and electricity industries are safe and meet community expectations. As part of this role, we protect and assist the community by ensuring that Victoria's electricity networks operate safely and to an acceptable standard.

Each year, ESV produces the Safety Performance Report on Victorian Electricity Networks to inform the community, government and industry of how the major electricity companies have performed when delivering their electricity network safety obligations.

This report covers the 2021-2022 financial year.

Copies of previous years' reports can be found at esv.vic.gov.au/about-esv/reports/technical-reports/electrical-safety-performance-reports/

Incidents, investigations and enforcement actions

The safety of the public and energy sector workforce is ESV's highest priority, with the investigation of serious electrical incidents being a key function. Serious incidents are defined as those that cause or have the potential to cause the death or injury to a person, significant damage to property or a serious risk to public safety.

During the 2021-2022 period, there was one fatality and three serious injuries associated with Victoria's electricity network assets. The fatality and two of the injuries involved workers contacting overhead lines. All could have been avoided if regulatory clearances to overhead lines had been maintained or the No Go Zone complied with. All of the injuries could have easily resulted in a fatality rather than a serious injury.

ESV investigated each of the incidents causing serious injuries, and further details are provided below.

Incidents, investigations and ESV's ongoing audit and inspection activities may warrant specific enforcement actions to be implemented to modify unsafe behaviours. Enforcement actions undertaken during the year are discussed below.

Fatalities

Vegetation worker contact with overhead lines

On 5 February 2022 a vegetation management worker was killed while removing a tree from the front yard of a Malvern East property. While the tree being removed was clear of the powerlines, the worker was electrocuted after a pole they were using to remove branches from the tree's canopy made contact with high voltage powerlines.

ESV investigated the incident and identified the vegetation management worker was in breach of various duties and obligations of the Electricity Safety (General) Regulations 2019.

Given that the worker was self-employed and the only person or entity in breach of the regulations was the deceased, we did not undertake enforcement action. ESV did, however, issue media releases warning the community to be aware of the life-threatening dangers when working near and around powerlines. Messaging called on Victorians to ensure they only hire qualified and experienced arborists, who have the right equipment for the job when trimming and pruning trees near powerlines.

Serious injuries

Truck driver contact with overhead lines

On 20 December 2021, a truck driver loading cattle onto a two-level cattle truck at a rural property in Stony Creek, South Gippsland, was seriously injured when his head made contact with a 22 kV overhead line while working on top of the truck. After contacting the powerline, the driver collapsed onto the truck's catwalk where he was attended to. He was subsequently airlifted to the Alfred Hospital for medical attention.

ESV became aware of the incident on 24 February 2022 while undertaking an audit of AusNet Services. AusNet Services is required by law to notify ESV of any serious electrical incident which occurs in relation to its supply network.

Energy Safe Victoria continues to investigate the incident.

Drone operator contact with overhead lines

On 5 January 2022, a member of the public using a drone was seriously injured when he made contact with a 66 kV overhead powerline.

The individual accidentally flew the drone into the 66 kV overhead line where it became caught. It appears that he then tried to retrieve the drone using an elevated work platform and, in the process, made contact with the overhead powerline.

The incident investigation has been closed by ESV.

Sprayer contact with overhead SWER line

On 9 May 2022, the operator of an agricultural self-propelled sprayer at Kinypanial was seriously injured when the sprayer made contact with an overhead SWER powerline. The operator was transported to the Alfred Hospital by air ambulance.

The ESV investigation found that the sprayer operator received an electric shock when he exited the sprayer while it was still in contact with the powerline. ESV is continuing to investigate this incident.

Contact with the powerlines could have been avoided if the driver had been operating in compliance with the No Go Zone guidelines. Once contact had been made, any injuries could have been avoided by the operator remaining in the sprayer until it was safe to exit as per ESV guidance material. The installation of proximity sensors on the sprayer to provide an audible warning when in proximity to powerlines may help avoid future incidents.

Major investigations

Pole investigation

Following a detailed investigation into the Garvoc fire in south-west Victoria (the 2018 St Patrick's Day fires), ESV completed a comprehensive investigation into the wood pole management systems and practices in place at Powercor. ESV also committed to undertake a review of the wood pole management practices for other Victorian distribution businesses, with a review of AusNet Services undertaken during the 2020-2021 period. The investigations are part of ESV's work to ensure that the asset management practices of the distribution businesses will deliver sustainable safety outcomes for the community in the long term.

The review, published in February 2022, found that while AusNet Services had recorded historically low levels of wood pole failure, recent changes to its approach may pose a heightened threat to the community moving forward. ESV consequently made several recommendations to improve the systems and practices AusNet Services uses for wood pole management.

Enforcement actions

ESV has enforcement powers that are defined in the *Electricity Safety Act 1998* and subordinate regulations. In exercising these powers, ESV's approach is always to consider and select the most appropriate actions available to achieve compliance and/or deterrence, as articulated in the ESV Compliance and Enforcement Policy.

The compliance and enforcement action(s) selected in each case is guided by a series of principles in ensuring that the response is targeted, proportionate, consistent, factual, impartial, proactive and constructive. Other factors considered include the seriousness of the non-compliance, the harm or potential harm involved, the conduct and behaviour of the responsible parties, and the resulting effects or outcomes of the available actions.

The range of compliance and enforcement actions available to ESV include:

- providing education and supporting awareness of compliance obligations
- requiring particular actions to be taken to rectify a safety issue or prevent potential harmful consequences (through voluntary rectification or enforcement notices as appropriate)
- providing warnings to motivate immediate and ongoing compliance
- punitive actions such as issuing infringement notices, imposing penalties or restrictions, or taking legal prosecution in the courts.

2018 St Patricks Day fires

There were several fires in southwest Victoria on the St Patricks Day weekend in 2018. ESV laid six charges under the *Electricity Safety Act 1998* against Powercor arising out of two of the fires that occurred on 17 March 2018. Three charges were laid under section 98 for failing to meet their general duty at Terang and three charges were laid under section 98 for failing to meet their general duty at Garvoc (The Sisters).

In November 2021, Powercor pleaded guilty to one charge of failing to comply with its general duty in relation to the Terang fire, and was fined \$130,000. ESV withdrew all remaining charges. ESV appreciates the contributions of victims of that fire who, in some cases, re-lived the trauma as they read victim impact statements to the Warrnambool Magistrates' Court.

This case was the first of its kind under the Electricity Safety Act and puts the industry on notice that ESV will take enforcement action where the network operators fail to meet their obligations.

Powercor REFCL direction

In late 2020, Powercor advised ESV that it had switched part of its Camperdown network to be supplied from the neighbouring Cobden zone substation to facilitate the connection of a wind farm. This resulted in this network section no longer being REFCL-protected.

ESV determined that Powercor's action had increased the bushfire ignition risk of this network section and, on 23 December 2020, ESV directed Powercor to reinstate REFCL protection on total fire ban days throughout the 2020-2021 fire season. As a result, the wind farm would not be able to generate on these days.

Following the initial direction, Powercor presented a technical solution that would facilitate REFCL protection to be reinstated while enabling the wind farm to remain connected to the network. ESV agreed that the proposed solution would allow Powercor to comply with its general duty.

On 17 February 2022, ESV directed Powercor to reinstate REFCL protection on total fire ban days up until 30 November 2022 and then all days thereafter.

This outcome demonstrates to the industry that ESV will take action to ensure that the benefits of bushfire mitigation programs are maintained and maximised into the future.

Distribution businesses' electric line clearance performance

Since 2018-2019, ESV has observed progressively declining performance by AusNet Services, Powercor and United Energy in clearing vegetation around electric lines. This is particularly concerning in Victoria's hazardous bushfire risk areas (HBRA), where escalating vegetation non-compliance rates increases the likelihood of bushfires starting when trees touch bare powerlines.

Fortunately, Victoria has experienced mild conditions over the last three fire danger periods and this has reduced the risk of a bushfire starting. No fires occurred during 2021-2022 because of non-compliant vegetation contacting powerlines.

ESV has engaged with each of these distribution businesses to make it clear their performance has been unacceptable. ESV has also made it clear that vast improvement is needed, and a strategic approach must be taken to ensure improved and sustained management of their electric line clearance duties and obligations.

AusNet Services, Powercor and United Energy have cited common issues that have affected their performance over recent years, including:

- very high vegetation growth rates in recent years
- sub-optimal performance of principle vegetation management contractors
- limited Victorian-based cutting resource and competition for that resource
- impediments to line clearing activities, such as:
 - wet ground conditions preventing safe access for clearing crews
 - difficulties supplementing local resources due to reduced access to interstate clearing crews, partially due to COVID restrictions
 - program inefficiencies created by the combination of the points above
 - inspection cycles and vegetation classifications that did not account for the points above.

While ESV notes the difficulties the major electricity companies have faced, such matters do not absolve them from meeting their electric line clearance duties and obligations. ESV has advised these companies that they should develop strategies to ensure their vegetation management obligations can be met despite the external circumstances.

Each of the three distribution businesses has previously committed to ESV to take measures to:

- improve its electric line performance
- reduce its rates of non-compliance
- mitigate the electricity safety risk caused by trees getting too close to electric lines
- ensure sufficient resource is allocated for the above
- use contemporary vegetation management systems that provide improved oversight of their vegetation management programs
- keep ESV informed of their progress.

Despite previous assurances Powercor and United Energy have made to ESV, their performance continued to decline in 2021-2022. HBRA non-compliance rates continued to rise.

While ESV saw improved performance from AusNet Services in HBRA this year, further improvement is still needed.

During 2021-2022, ESV investigated the performance of each of these distribution businesses. Our findings will inform ongoing discussions regarding the effectiveness of strategies that these businesses have put in place to ensure they meet their duties. ESV will also review its findings to determine if enforcement action is warranted.

ESV will continue to closely monitor the performance of AusNet Services Distribution, Powercor and United Energy throughout 2022-2023 to ensure that improved compliance is achieved.

Boroondara Council failure to clear lines

In 2019-2020, ESV first conducted electric line clearance inspections in the City of Boroondara (the City). We found excessively high rates of non-compliance where the City is responsible for maintaining vegetation clearances around powerlines. ESV subsequently required the City to submit a plan that committed to actions to enable it to transition to acceptable standards of compliance.

ESV has been closely monitoring the progress of the City against the commitments it made to ESV to improve its performance. While vast improvements were observed between 2019-2020 and 2020-2021 (non-compliance dropped from 90% to 57%), the City's performance plateaued in 2021-2022 (57%). This is not unexpected as:

- most easy clearing was completed in 2019-2020 and 2020-2021
- optimal growing conditions and trees responding to heavy pruning has resulted in excessive regrowth
- administrative processes are needed to arrange for:
 - network suppressions and shutdowns to allow safe tree clearing
 - implementation of alternative compliance solutions
- the City now has to manage more customer consultation and objections.

Since 2021, the City of Boroondara has engaged with ESV about the possible development and implementation of an Alternate Compliance Mechanism (ACM) under clause 31 of the Code of Practice for Electric Line Clearance. No responsible person has previously used this provision of the Code.

The ACM would manage specified trees inside the minimum clearance space under an enhanced inspection and risk management regime. This aims to protect mature trees that, to comply with the Code, would otherwise need to be removed, heavily cleared or pruned in a manner not consistent with the Australian Standard for Amenity Tree Pruning.

In considering any responsible person using an ACM, ESV's minimum expectations would include:

- limiting any ACM application to a specific timeframe
- considering all engineering solutions available to manage the electricity safety risks caused by vegetation
- ensuring the safety of the community and vegetation management workers.

ESV will continue to engage with the City of Boroondara using all options available under the Code to help it improve its performance. ESV will also consider the enforcement options available should it not be satisfied with the progress of the City of Boroondara.

Direction issued to builder

On 17 May 2022, ESV issued a direction to a builder regarding a structure in Brunswick being built within the exclusion zone around high voltage powerlines. This is in contravention of section 141(2)(d) of the *Electricity Safety Act 1988*.

The builder was required to:

- immediately prevent anyone from accessing parts of the third level of the building that falls within the exclusion zone
- undertake, within five months, works to ensure that the structure complies with regulations 610 and 614 of the Regulations.

To achieve compliance, the rectification options could include:

- redesigning and modifying the third level of the structure to ensure it meets the minimum prescribed clearance distance from the high voltage powerlines
- removing the non-compliant structure in a safe manner, including arranging for the temporary shutdown of the high voltage powerlines
- relocating or undergrounding the high voltage powerlines, with the costs to the borne by the builder or their client.

The builder complied with the Direction within the specified timeframe.

With network strikes and encroachments being a current compliance and enforcement priority, many builders and developers will see ESV taking a more proactive approach in managing such breaches.

Other directions

In 2021-2022, ESV issued six directions to Powercor requiring Powercor to preserve evidence in relation to pole failure incidents. Powercor complied with each direction, and the directions were subsequently lifted following ESV's investigations.

On 3 November 2021, unsafe electrical wiring was identified at a property in Footscray. ESV subsequently issued a direction to Jemena so that Jemena could legally disconnect electricity supply to the property.

Keeping the public safe

Reducing bushfire risk

Understanding fire trends

There were 1061 reportable incidents involving the electricity networks this year, of which 50 per cent involved a fire. Where fires occur, 67 per cent do not result in a ground fire. The numbers of incidents resulting in a fire are shown in Figure 1, with their relative contributions to total network fires.

There were 18 fewer fires in 2021-2022 than in 2020-21, comprising 18 more asset fires and 36 fewer ground fires.

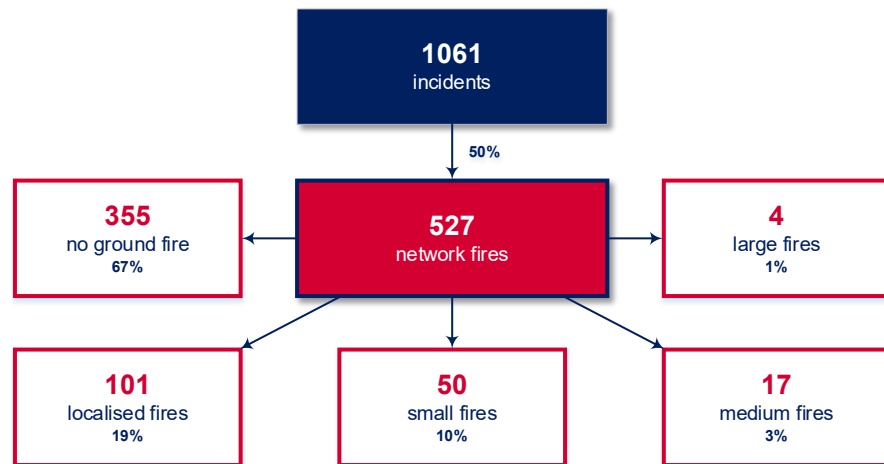


Figure 1 Breakdown of fires by size in 2021-2022¹

¹ Localised = less than 10 m², small = 10-1,000 m², medium = 1,000 m² - 10 ha and large = greater than 10 ha

There were four large fires attributable to the electricity networks in 2021-2022. All the fires were on the Powercor network, with one due to a pole failure, one due to lightning strike, one due to fencing wire across an insulator (presumably dropped by a nesting bird) and one due to a failed asset. Directions were issued to preserve evidence for subsequent investigation by ESV. The direction was complied with and was subsequently lifted. The ESV investigations of these incidents are ongoing.

In addition, there were two large fires that impacted the networks and required multiple poles to be replaced. One fire originated from a vehicle collision in South Australia, which then destroyed multiple poles when it crossed the border into the area around Langkoop, Poolajelo and Powers Creek. The other fire, which originated 50 metres from the Wimmera Highway in Ullswater, burnt an area of approximately 60 ha and destroyed three poles.

Of the 17 medium-sized fires, three were on the AusNet Services network and 14 on the Powercor network. Six were due to trees and vegetation from outside the clearance space falling or being blown onto overhead powerlines, three were due to fuse failures, three were due to birds coming into contact with electrical assets, two were due to vehicles and mobile plant contacting overhead lines, and one each was due to a pole failure, a pole fire and a lightning strike.

The averages and bounds in Figure 2 show a clear seasonal trend in ground fires due to both asset failures and contact events. Throughout most of the year, there are similar numbers of fires from asset and contact events; however, there is a more pronounced peak in asset-related ground fires in January and February.

The numbers of asset-related ground fires (red bars in Figure 2a) were within one standard deviation of the 2010-2020 average for most of the year. The exceptions were February and March, which had fewer fires than expected. The number of fires across the bushfire season (November to April) were below the long-term average for each month.

Figure 2b shows that the numbers of contact-related fires were well in excess of the historic numbers in October and January. The numbers of fires across most of the bushfire season were below the historic average, with the exception of January.

The outliers in Figure 2b are the peaks in January 2022 and October 2021 that are well above the normal band of expected fires.

Of the 31 contact-related fires in January 2022, tree contact was the cause of ten fires, eight fires were due to animal contact, five fires each were caused by lightning strike and vehicle impacts, and the remaining three were due to other contact events.

There were fifteen fires in October 2021, of which twelve were due to tree contact during a storm event on 29 October 2021. The impacts were localised, with eleven of these fires occurring on the United Energy network and one on the AusNet Services network.

Major storm events can wreak havoc that can result in the numbers of fires exceeding expectation. Such events have occurred in June 2021 (see last year's report), January 2020 (extreme winds caused the collapse of transmission towers near Cressy) and March 2018 (St Patrick's Day weekend fires in southwest Victoria). ESV is working to better understand the likely increase in the frequency of such extreme events under climate change so that we can ensure that major electricity companies manage the safety risks to and from Victoria's networks.

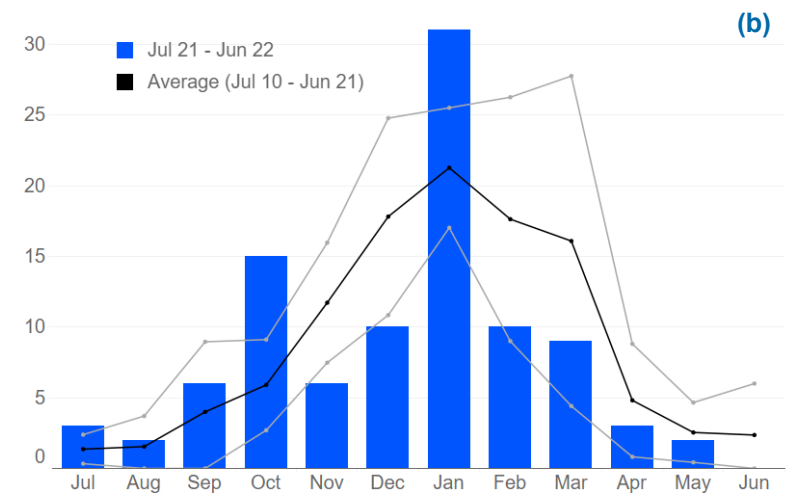
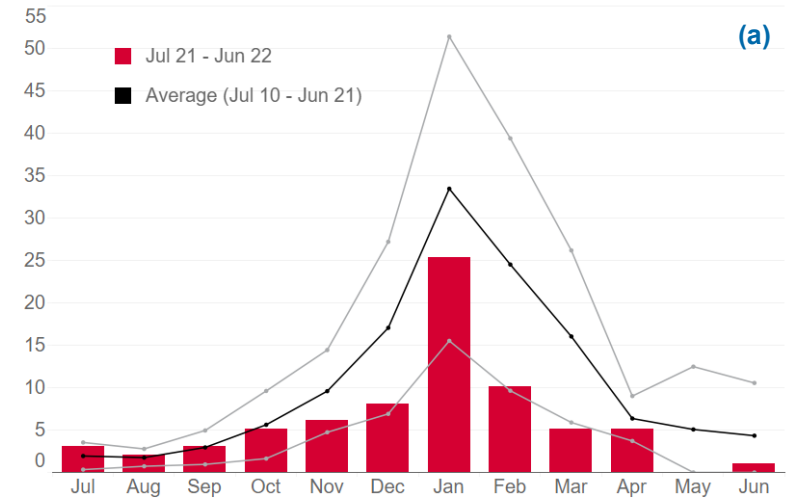


Figure 2 Ground fire incidents due to (a) asset failures and (b) contact events

The grey line is one standard deviation above and below the average

Figure 3 shows the cumulative number of ground fires throughout the fire season (October to April). While the total fires in the first nine weeks of the fire season were ahead of previous years, the numbers of fires tapered off and the total fires across the entire fire season was at the lowest level in the last seven years.

The risk of a fire occurring, and spreading once initiated, depends on a number of variables such as time of year, weather, longer-term climate (e.g. drought), and type and curing of vegetation (among others). Inter-annual variability of these factors can unduly mask or emphasise the numbers of fires involving the electricity networks. Therefore, it is important that ESV considers data from similar years in making comparisons of performance.

The CFA issues fire declarations for municipalities when ground conditions are conducive to grassfires and bushfires; we can use these declarations as an indicator of fire risk. This allows us to compare inter-annual risks and place this fire season within a historic context.

The first declarations for this year's season started later than last year, slowly rose over eight weeks and then plateaued for three weeks (Figure 4). By week 19, declarations had been issued for 81 of 82 municipalities or parts thereof and then plateaued without the entire state being declared. The CFA began slowly removing declarations in weeks 28 and 29, after which they were removed from all but one municipality for the rest of the fire season. The official fire season finished several weeks earlier than previous years.

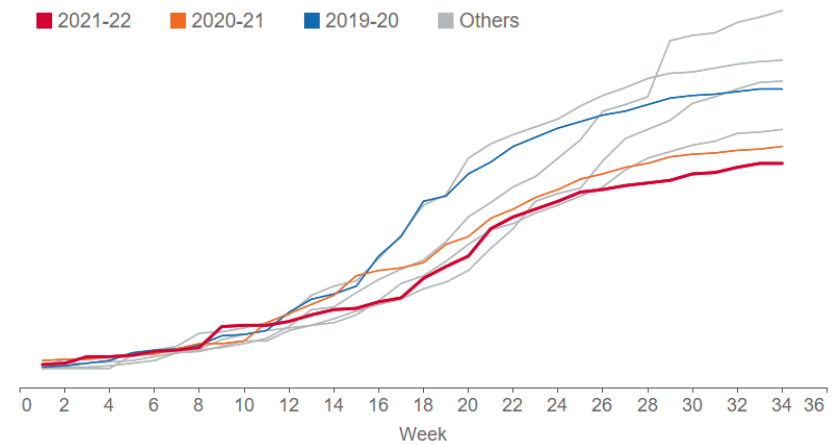


Figure 3 Cumulative fires across the fire season

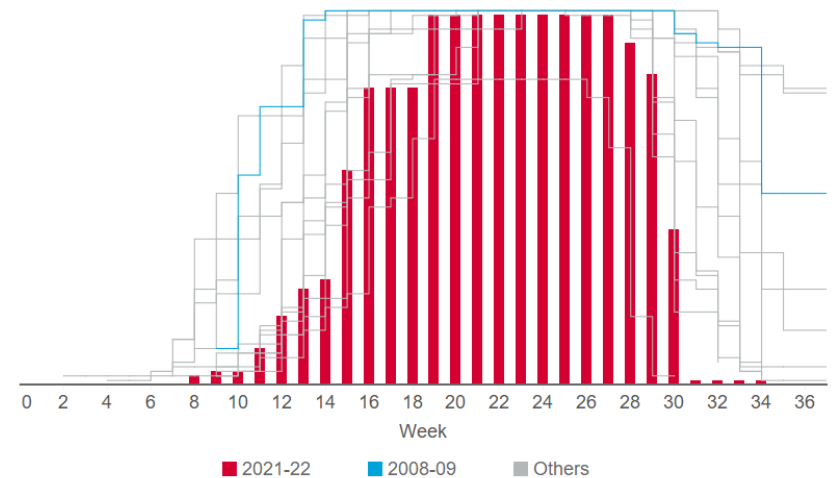


Figure 4 Summary of CFA fire declarations from 2008 to 2022

Figure 5 shows the number of ground fire events on the Victorian networks. The green arrows show the reduction from the long-term average across the 2010-2021 period (improvement), and the red arrows show the increase (decline).

The four most common causes of fires were tree contact, connection faults, animal contact, and vehicle impacts (including mobile plant and farming equipment). The same four events comprised last year's top four causes of fires.

When compared to the long-term averages across the period from January 2010 to June 2021, fire numbers in 2021-2022 are worse in two categories (connections and vehicle impacts), improved in ten categories and stable (i.e. within 5 per cent) in three.

After last year's increase, tree contact fires have fallen this year (Figure 6) to be lower than the long-term average (Figure 5).

Asset-related ground fires are lower than the long-term average across all categories apart from connection faults. While dropping slightly this year, connections fires are still 38 per cent above the long-term average.

Figure 6 shows the trend over the last twelve years for the four most common causes of ground fires. This indicates that:

- fires from tree contact have dropped this year and are now 5 per cent below the historic average, with the decrease most likely due to the wet summer
- after rising steadily from 2013-14 and 2019-2020, fires from connection faults have fallen for a second year but are still 38 per cent above the historic average
- animal contact fires dropped this year and are now 21 per cent below the historic average
- fires from vehicle and mobile plant contacts dropped this year and are 9 per cent above the historic average.

Powerline maintenance is a compliance and enforcement priority for the 2022-2023 period. Once ESV completes the current pole management reviews, we will start reviewing other asset classes, including connections.

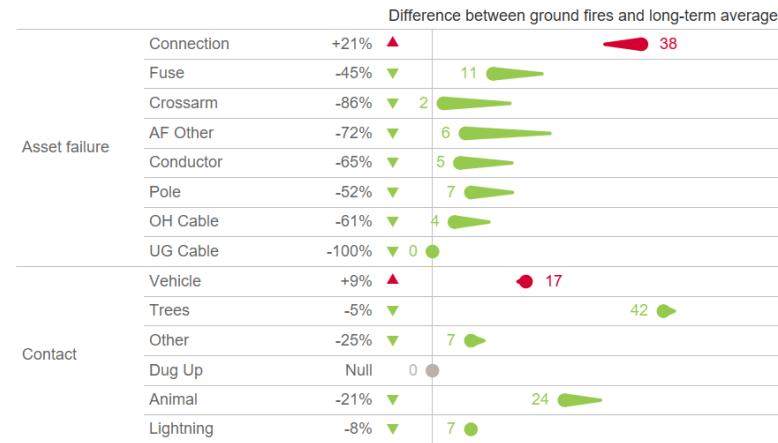


Figure 5 Ground fire-related incidents occurring on Victorian networks

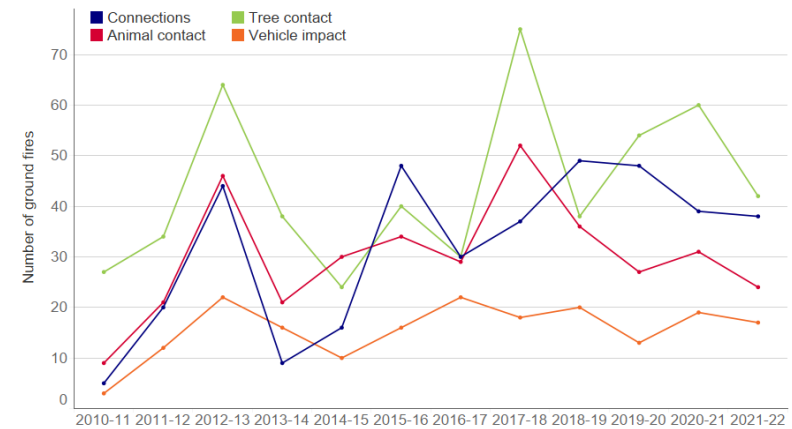


Figure 6 Historic trends for common ground fire events

Understanding how weather affects bushfire safety

ESV has used advanced analytical techniques to identify which of 22 separate meteorological factors are most influential in predicting the number of fire events originating from the electricity networks.

The analysis has considered all fires reported to ESV between 1 January 2010 and 30 June 2022, with the data models being trained on 80 per cent of the data randomly selected between 2012 and 2021. The data from 2010 and 2011 was excluded from the model training due to concerns about the completeness of reporting in the early years of ESV's data collection.

Separate models have been developed for ground fires caused by asset failures (Figure 7a), vegetation contact (Figure 7b) and other (non-vegetation) contact events (Figure 7c).

Of the 22 meteorological factors considered, the main factors affecting each type of event are:

- asset failure fires maximum daily temperature, temperature differential between days and three-day lag temperature differential
- tree contact fires maximum wind gust speed and maximum daily temperature
- other contact fires maximum daily temperature.

The purpose of undertaking this modelling is to understand how weather conditions influence network fires. This helps ESV discern how much of any change in fires reported to ESV is due to the activities of the network operators and how much is due to variability in the weather.

In Figure 7a, Figure 7b and Figure 7c, the columns are the actual numbers of fire of each type reported to ESV, and the bold line is the number of fires we expected to see based on daily weather observations from the nearest of 37 Bureau of Meteorology stations.

All three event types naturally follow a seasonal trend with peaks in summer and troughs in winter. The seasonality is most pronounced in the asset failure fires and least pronounced with the vegetation fires.

In general, the predictions reflect the shape and structure of the peaks in the incident data, and are close matches with the number of fires observed.

The major exceedances in the summer of 2012-13 (see Figure 7a) were due to an extremely hot summer across the southern half of Australia, with a new national average maximum being set on 7 January 2013 and six of the 20 hottest days in Australian records occurring in January 2013. Such events put greater stress on network assets that may have contributed to their failure. This stress can be a combination of the direct effect of high temperatures on network assets and higher electrical loads on the network as people across the state turn on their air-conditioning.

Figure 7b shows peaks in February and March 2018. These coincide with the St Patrick's Day weekend fires in March 2018, where we saw extreme storms causing vegetation fires and pole failures (and subsequent fires) in south-west Victoria (see page 8). The higher level of vegetation fires were, in part, due to extreme storm fronts that resulted in dry branches blowing and trees falling onto overhead powerlines when the vegetation is susceptible to ignition.

In 2021-2022, Figure 7a shows the actual asset-related fires were well below the number we expected based on the weather conditions. This could be due to La Niña conditions that are not being accounted for in the model, or it could be that improvements in asset management or the REFCL roll-out have reduced the numbers of asset fires.

The vegetation fires (Figure 7b) have remained low since March 2018, although there were a couple of unusual peaks over the 2021 winter. These were related to severe storms that brought down trees and branches.

Other contact incidents (Figure 7c) were also slightly reduced this year. Such fires are mainly due to random events such as animal contact, vehicle collisions and human interference that occur throughout the year. While there is a contribution from seasonal factors such as lightning strike, the seasonality is primarily because ground conditions over winter prevent most fires from igniting.

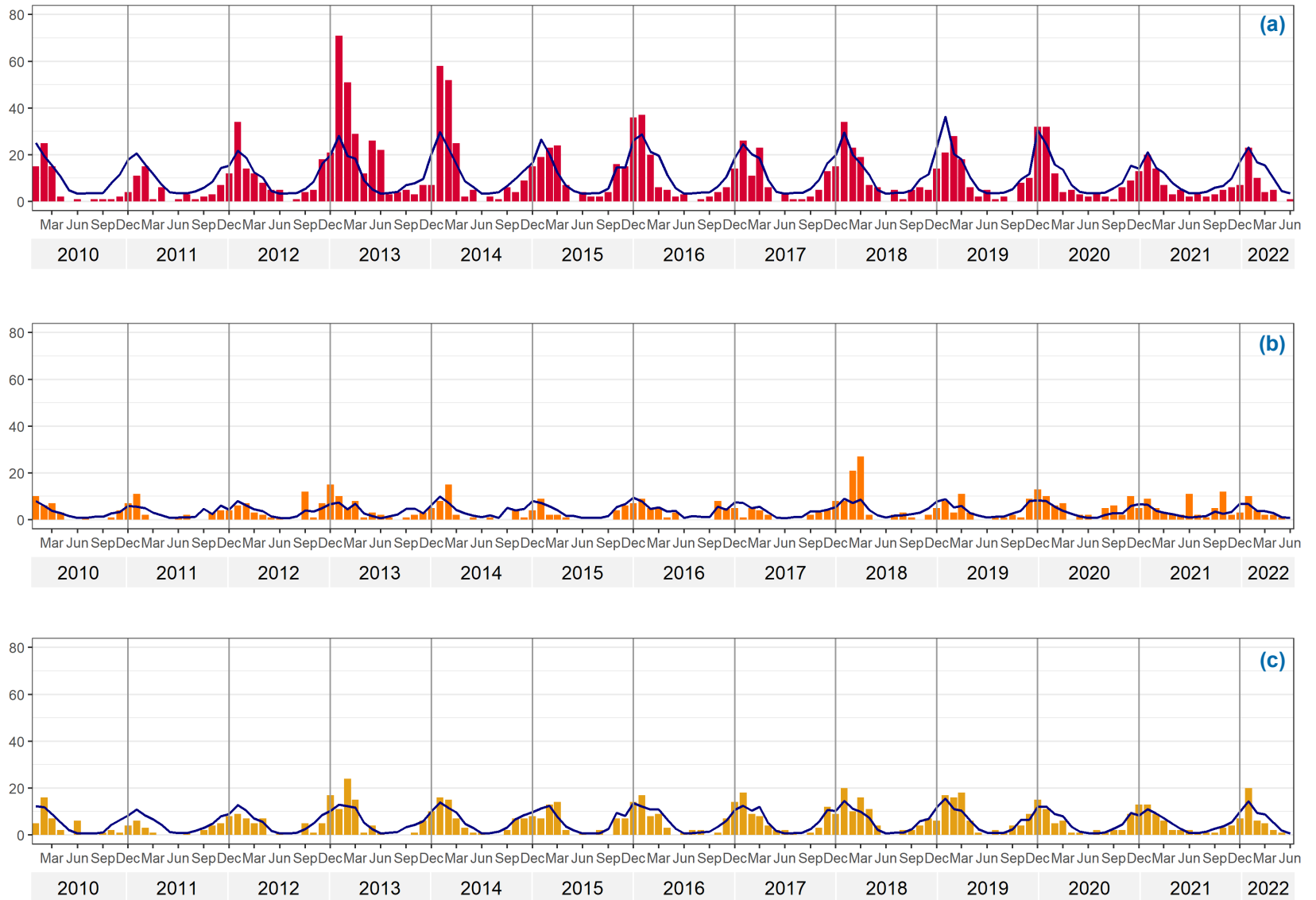


Figure 7 Influence of weather on ground fires due to (a) asset failures, (b) vegetation contact and (c) other contact events

We have also explored occurrences of fires on at-risk days (that is, those days when the networks are most susceptible to fire ignitions due to weather).

At-risk days are separately defined for asset failure fires, vegetation contact fires and other contact fires. We considered the conditions specific to each event type and identified those parameters that most contributed to a fire occurrence. An at-risk day was determined to have occurred when those conditions were met or exceeded in the meteorological records. Further details on the weather modelling and the definitions of at-risk days for each fire type can be found in Appendix K.

Figure 8 shows the numbers of at-risk days for ground fires against the number of fires per at-risk day in HBRA for the three event types. This shows that:

- the numbers of at-risk days have decreased since 2017-18 for all three event types, with the decline in the last two years potentially related to the La Niña climate phenomenon
- the rate at which ground fires occur on at-risk days has been declining for asset failures and vegetation contact events
- the rate at which ground fires occur on at-risk days has been stable for other contact events as they are largely determined by random occurrences rather than weather conditions.

While the asset failures are under control of the major electricity companies, the tree contacts comprise vegetation growing into the lines (under control) and trees and branches falling or blown onto overhead lines (outside control). The other contact fires are generally outside the control of the major electricity companies. Further analysis and data collection will help us to quantify the respective contributions from vegetation within and outside the clearance space.

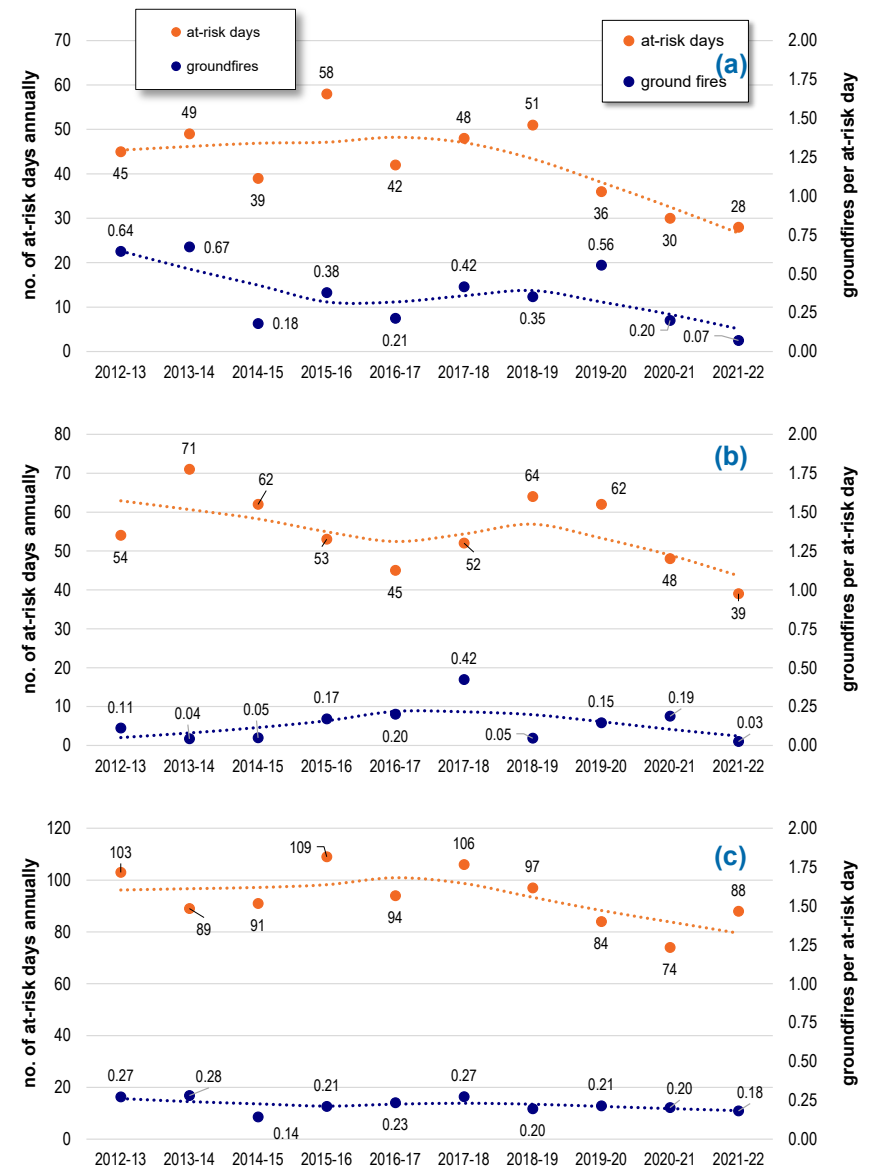


Figure 8 Numbers of ‘at risk’ days each year and the associated rate of incidents in HBRA on those days for (a) asset failures (b) vegetation contacts and (c) other contacts

Non-compliant vegetation poses a safety risk

Vegetation contact with powerlines can cause electrocution, fires and bushfires, and impact the reliability of electricity supply. These risks must be managed by major electricity companies, municipal councils and other responsible persons.

Vegetation clearance is the primary method for managing these risks, with minimum clearing requirements prescribed by the Code of Practice for Electric Line Clearance. The Code is a schedule to the Electricity Safety (Electric Line Clearance) Regulations.

In 2021-2022, ESV undertook a range of activities to ensure responsible persons adequately manage vegetation for which they are responsible, including:

- evaluation and approval of 20 electric line clearance management plans
- 32 vegetation management systems audits
- inspection of vegetation for 12,737 electricity spans.

These activities are designed to ensure that those responsible have suitable plans and systems in place to keep vegetation clear of powerlines, and thereby protect against the threat of bushfires, outages and other contact incidents.

Major electricity companies

ESV has seen the average rate of non-compliant vegetation across the networks in HBRA decrease slightly this year, although there has been an upward trend over the last five years. There have been increases on the Powercor and United Energy networks (Figure 9a). While there was a decrease on the AusNet Services network, non-compliances are still elevated. Jemena had a significant decrease in non-compliance this year.

The average rate of major non-compliances affecting the networks increased in HBRA this year. This was solely due to increased non-compliance on the Powercor network (Figure 9b). A major non-compliance is regarded as a high risk situation where vegetation is touching, or could soon touch, uninsulated conductors.

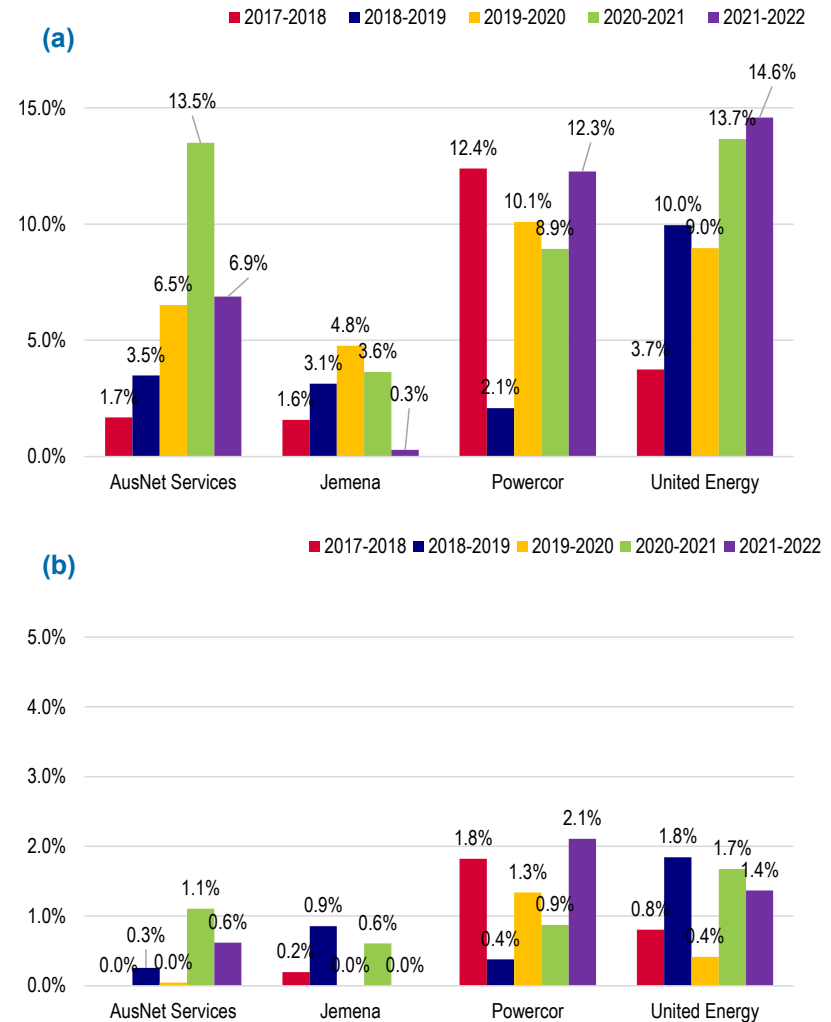


Figure 9 Non-compliance rates in HBRA
(a) all non-compliances and (b) major non-compliances

The rate of non-compliant vegetation affecting the distribution networks in LBRA remains relatively low and steady (Figure 10a). The rate of major non-compliances affecting the distribution networks in LBRA also remains low and steady (Figure 10b).

ESV issued notices to the responsible distribution businesses under section 86(1) of the Act for rectification of any non-compliance spans identified in the audits. The notices specified the timeframes within which clearing of vegetation is to be completed. All non-compliance spans (both HBRA and LBRA) were promptly cleared by the relevant network owners, resulting in the elimination of these potentially hazardous situations.

The individual performance of each major electricity company is detailed in the appendices to this report.

Factors affecting electric line clearance programs

During the year each of the major electricity companies reported observing very high vegetation growth rates due to favourable growing conditions. This was among several other reasons some of the businesses cited as impacting their ability to meet their electric line clearance obligations.

The reasons cited as a cohort, or individually, included:

- inspection cycles and vegetation classifications not adequately accounting for the growth rates experienced
- wet ground conditions preventing safe access for work crews
- limited numbers of Victorian-based cutting crews and competition for that resource
- COVIDSafe requirements delaying access to interstate crews normally used to boost local resources
- program inefficiencies created by the combination of the points above.

Note: All of the above reasons should not be attributed to all networks.

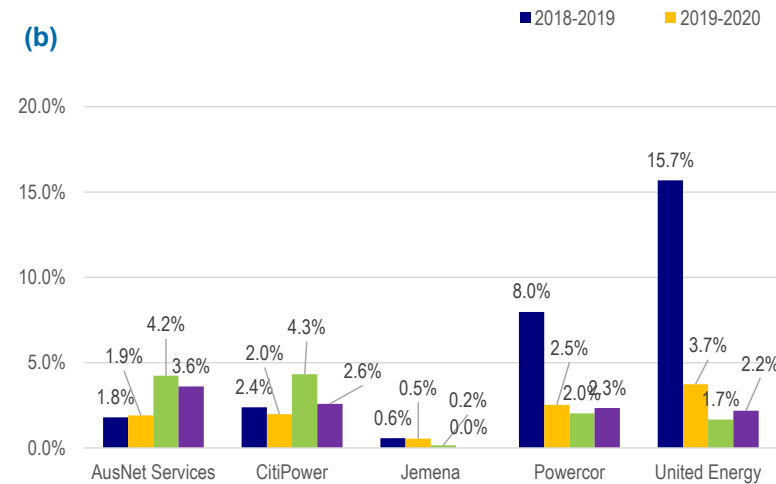
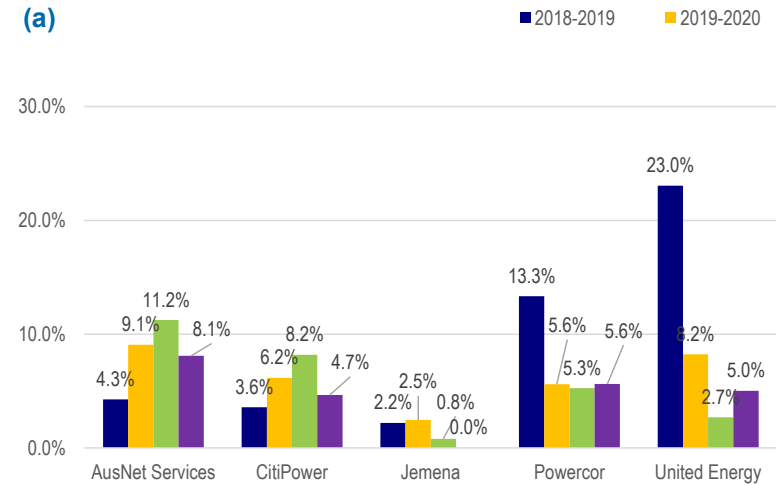


Figure 10 Non-compliance rates in LBRA (a) all non-compliances and (b) major non-compliances

While ESV notes the difficulties the major electricity companies have faced, such matters do not absolve them from meeting their electric line clearance duties and obligations. Each company should develop strategies to ensure their vegetation management programs are adaptable and resilient to the external circumstances.

ESV has seen some evidence of the major electricity companies taking action to reform historical vegetation management processes and practices to mitigate these risks. Further adaptations and innovative approaches may be needed to ensure improved and sustained standards of compliance.

Municipal councils

In 2021-2022, ESV inspected twelve municipal councils with electric line clearance responsibilities. Councils are responsible for maintaining clearance of trees located on public land managed by the council.

Figure 11 shows the non-compliance rates observed for each of the councils inspected. ESV identified the rate of non-compliance in LBRA in 2021-2022 is much higher for councils (31.3 per cent on average) than for the distribution businesses (5.7 per cent on average).

A total of 1351 non-compliant spans were identified across the twelve councils ESV inspected. All of the non-compliant spans were required to be cleared, in timeframes specified by ESV, by a notice made under section 86(1) of the Act.

ESV worked with each council throughout the year to ensure they appropriately managed these risks and cleared the identified non-compliant vegetation.

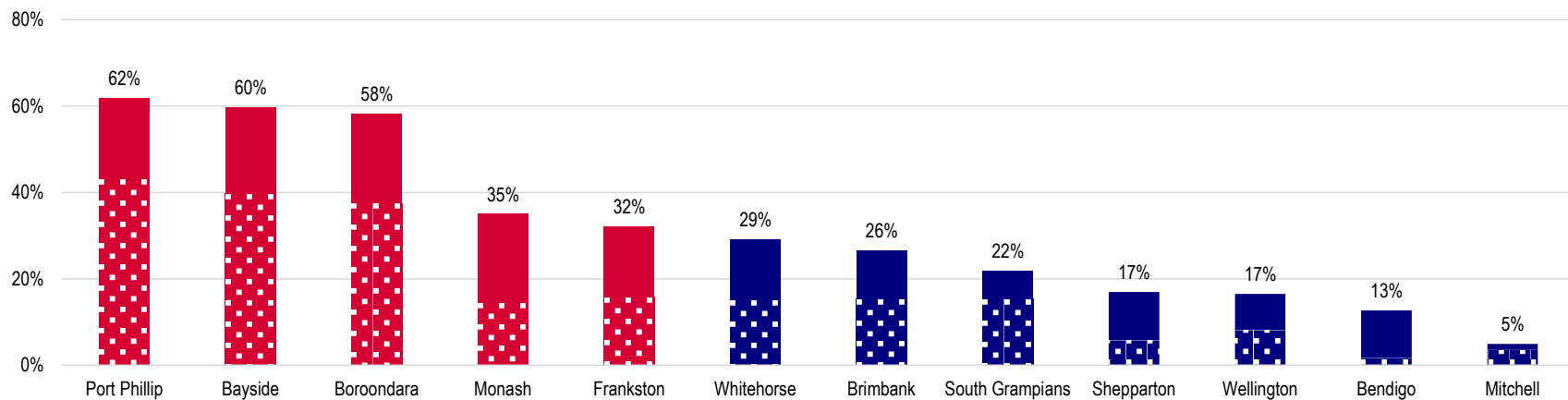


Figure 11 Non-compliance rates for councils inspected in 2021-2022

The councils shown in red had non-compliance rates in excess of the council average. The dotted area shows the levels of high risk non-compliance within the overall non-compliance rate.

The extent of council non-compliance does not create a significant bushfire risk for Victoria as councils predominantly only have electric line clearance responsibilities in LBRA. That said, non-compliant vegetation can:

- impact on the reliability of electricity supply for metropolitan Melbourne, regional cities and townships
- pose other safety risks to the community
- pose risks to vegetation management workers that need to get closer to electric lines, more often, to clear non-compliant vegetation.

When a council creates unacceptable electricity safety risks by systemically failing to comply, ESV requires the council to reform its vegetation management systems and functions. The reforms must allow the council to work toward achieving acceptable standards of compliance.

ESV monitors implementation of the reforms until it is satisfied the council is appropriately managing its electricity safety risks.

Where compliance cannot be achieved by a council within an acceptable timeframe, ESV has the power to direct the relevant distribution business to undertake any necessary clearance works.

In 2021-2022, ESV revisited the three poorest-performing councils from the 2020-2021 period — the City of Boroondara, the City of Whitehorse and the City of Greater Bendigo. This was done to monitor their electric line clearance performance and determine if they had reduced the electricity safety risks in these municipalities. Failing to demonstrate appropriate management of their electricity safety risks would have resulted in strict enforcement action.

It was pleasing to note that both the Cities of Whitehorse and Greater Bendigo had responded by showing vastly improved compliance standards; greatly improving electricity safety in these municipalities (Figure 12). While the performance of the City of Boroondara did not improve from 2020-2021 to 2021-2022, this was not unexpected for reasons previously explained in this report (see page 10).

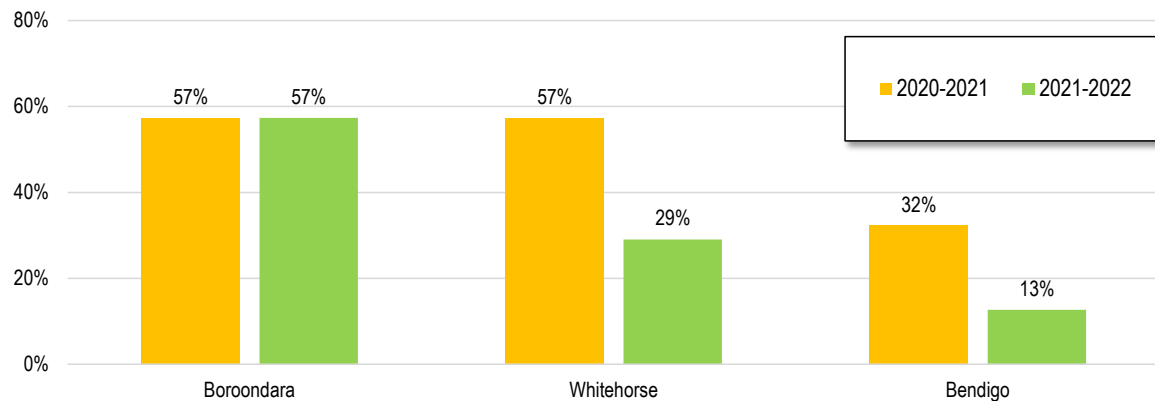


Figure 12 Changes in performance of the three worst-performing councils from 2020-2021

Adapting to changes in the environment

The Code specifies minimum clearance distances to be maintained between vegetation and electric lines in order to mitigate risks from vegetation contact. The clearance distances required in HBRA are greater than those required in LBRA due to the greater safety risks in the former, particularly the risk of bushfire.

Electrical asset inspection and maintenance cycle requirements are dependent on whether the asset is located in an HBRA or LBRA. This ensures those requirements are proportionate to the prevailing risks.

The Country Fire Authority (CFA) is responsible for assigning HBRA and LBRA boundaries across most of Victoria. The cyclical reviews undertaken by the CFA lapsed in 2013. In 2019, ESV arranged to have the reviews reinstated, including arranging for their ongoing funding.

The review program began in August 2019 with the Powercor network, which was completed before the end of 2020. Review of the Jemena and United Energy networks followed with these reviews being completed by mid-2021.

Where boundaries changed from LBRA to HBRA, increased vegetation clearance distances and more frequent pole inspection regimes apply to better manage the associated elevated risk.

The revised boundaries for Powercor, Jemena and United Energy were completed and activated in 2021-2022. Each of these major electricity companies transitioned to the increased vegetation clearance standards and increased pole inspection standards prior to the new boundary being applied.

Review of the AusNet Services network commenced in 2021-2022. While the review is now complete, the new boundaries will not become active until 2022-2023. Similar to the other major electricity companies, AusNet Services will ensure it meets any enhanced vegetation management or pole inspection standards prior to the new boundaries taking effect.

Managing hazards outside the clearance space

Most network incidents involving vegetation are due to trees, or parts of trees, falling onto electric lines from outside the minimum clearance space required by the Code. Such trees are often referred to as hazard trees.

The major electricity companies have methods, described in their ELCMPs, for managing hazard trees.

In 2019-2020, ESV initiated a project to examine if hazard trees are being managed according to the methods described in each business' plan. The project also sought to test if the methods being used provide an appropriate framework to manage the electricity safety risks caused by hazard trees.

The project commenced in 2019-2020, but progress was delayed by COVID-19 restrictions and prioritisation of other safety regulation programs, particularly HBRA inspections. Despite delays, the hazard tree inspections have now been completed for all distribution businesses.

The inspections found that each of the distribution businesses was generally managing hazard trees according to the methods described in its electric line clearance management plans. The inspections also identified opportunities to improve the way hazard trees are being managed, including improved marking methods, clearer hazard tree management instructions and processes to ensure all hazard trees (or parts thereof) affecting a span are actioned.

When ESV identified a hazard tree during its inspections that had not been appropriately managed, it required the responsible distribution business to take the necessary action to address the related risks.

Each of the distribution businesses committed to the ongoing review and amendment of their hazard tree management programs and to consider the improvement opportunities identified by ESV during its inspections.

While this commenced as a strategic project, ESV recognises the effects of hazard trees and the significant safety risk they present to the safety of the networks. Therefore, ESV will now implement an ongoing schedule of hazard tree inspections for each network. This will be done to ensure they continue to monitor and manage the risks caused by hazard trees.

Reducing the fire risk from the networks

The *Electricity Safety Act 1998* and the Electricity Safety (Bushfire Mitigation) Regulations 2013 require major electricity companies to ensure that:

- all polyphase electric lines originating from prescribed zone substations can reduce the energy delivered into phase-to-earth faults to a specified level within defined timeframes to reduce the risk of fire ignition (required capacity)
- each electric line within an Electric Line Construction Area with a nominal voltage of between 1 kV and 22 kV that is constructed, or wholly or substantially replaced, after 1 May 2016 will be a covered or underground electric line
- an Automatic Circuit Recloser is installed on each Single Wire Earth Return line in its supply network by 1 January 2021.

Installing Rapid Earth Fault Current Limiters

The affected distribution businesses are deploying Rapid Earth Fault Current Limiters (REFCLs) to achieve the required capacity. These are being rolled out in three tranches in accordance with the regulations, with the REFCL tranches operational by 1 May 2019, 1 May 2021 and 1 May 2023.

The regulations require REFCLs to be installed at 45 zone substations, with 22 in the AusNet Services network, 22 in the Powercor network and one in the Jemena network.

By 30 June 2022, ESV had accepted 14 AusNet Services zone substations and 18 Powercor zone substations as compliant. Figure 13 shows the cumulative number of compliant REFCLs installed by each major electricity company and the anticipated progress to achieving full compliance at all mandated substations. Figure 14 shows the coverage of the substations with REFCLs mandated by the regulations.

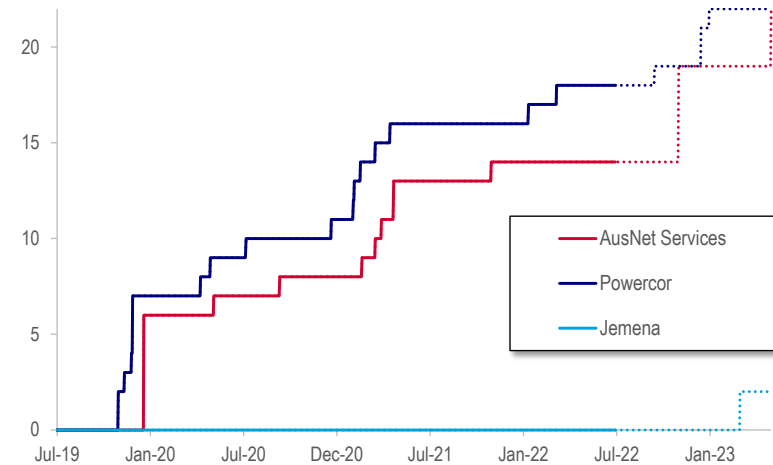


Figure 13 Compliant REFCLs installed to 30 June 2022

Dotted lines are projected delivery times

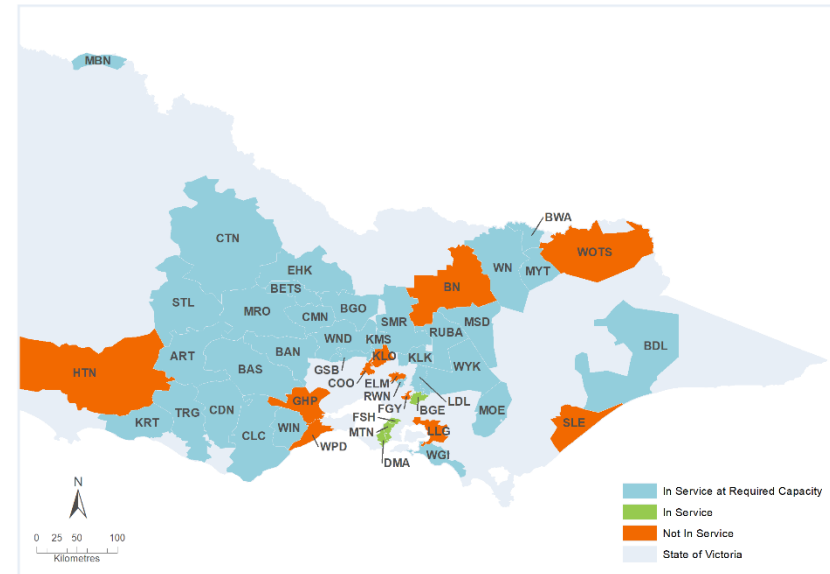


Figure 14 Mandated REFCLs and their status at 30 June 2022

In addition to the mandated REFCLs, United Energy has voluntarily installed REFCLs at Frankston South, Mornington and Dromana zone substations, and Jemena has voluntarily installed a base-level² REFCL system at the Sydenham zone substation.

In 2020, ESV engaged consultants to undertake a cost benefit analysis and functional (engineering) performance review of the REFCL program. They found that the installed REFCLs are operating as intended, did not recommend a change to the regulations or the timing of the program and are a prudent investment in mitigating future catastrophic fire damage caused by powerline failures in extreme conditions. ESV continues to work with the major electricity companies to implement the functional performance review recommendations.³

Replacing bare overhead powerlines in Electric Line Construction Areas

AusNet Services and Powercor each have approximately 1,400 km of overhead conductor within the highest-risk Electric Line Construction Areas. These bare overhead powerlines are to be progressively replaced with insulated or underground solutions.

As of 30 April 2022, AusNet Services reports that 81 per cent of polyphase electric lines in Electric Line Construction Areas within its supply network consisted of bare overhead wire. Powercor reports 70 per cent bare overhead wire remain.

AusNet Services, Powercor, United Energy and Jemena are also trialling new covered-conductor technologies to achieve a higher risk reduction at significantly lower cost than underground.

Installing Automatic Circuit Reclosers

Automatic Circuit Reclosers (ACRs) on single wire earth return (SWER) lines can be set remotely so that they turn off those powerlines quickly when faults occur and, thereby, reduce the risk of these lines starting fires.

The *Electricity Safety Act 1998* requires the distribution businesses to install a new-generation ACR on each SWER line within their distribution network by 1 January 2021. All distribution businesses have complied with this requirement and the program has now ended.

² A base-level REFCL consists of an arc suppression coil only and cannot achieve the same performance as a mandated REFCL.

³ The reports are accessible at <https://esv.vic.gov.au/about-esv/reports/technical-reports/rapid-earth-fault-current-limiter-reports/>.

Making network infrastructure safer

Understanding asset failure trends

Figure 15 shows the number of network safety incidents on the Victorian networks, including fires. The numbers of asset failure incidents and contact events are reported separately.

The historical average for the period January 2010 to June 2021 shows a seasonal trend with increased asset failures over the summer period (Figure 15a). The numbers of asset failure incidents in the last year were well below the 2010-2021 average, with seven of the 12 months being more than one standard deviation below the average. For a second year in a row, asset failure events are below expectations.

The numbers of contact events show less seasonality and a less pronounced peak occurring in March (Figure 15b). Such events are largely outside the direct control of the networks to manage.

Contact events this year also showed a high degree of variability. Two months were more than one standard deviation below the long-term average, and two months were higher than one standard deviation above the average.

The peak in October 2021 was primarily due to tree contact incidents associated with a major storm front on 28-30 October. This accounted for 46 of the 97 incidents that month. Most of these incidents were contained to the United Energy network (32 of 46 incidents).

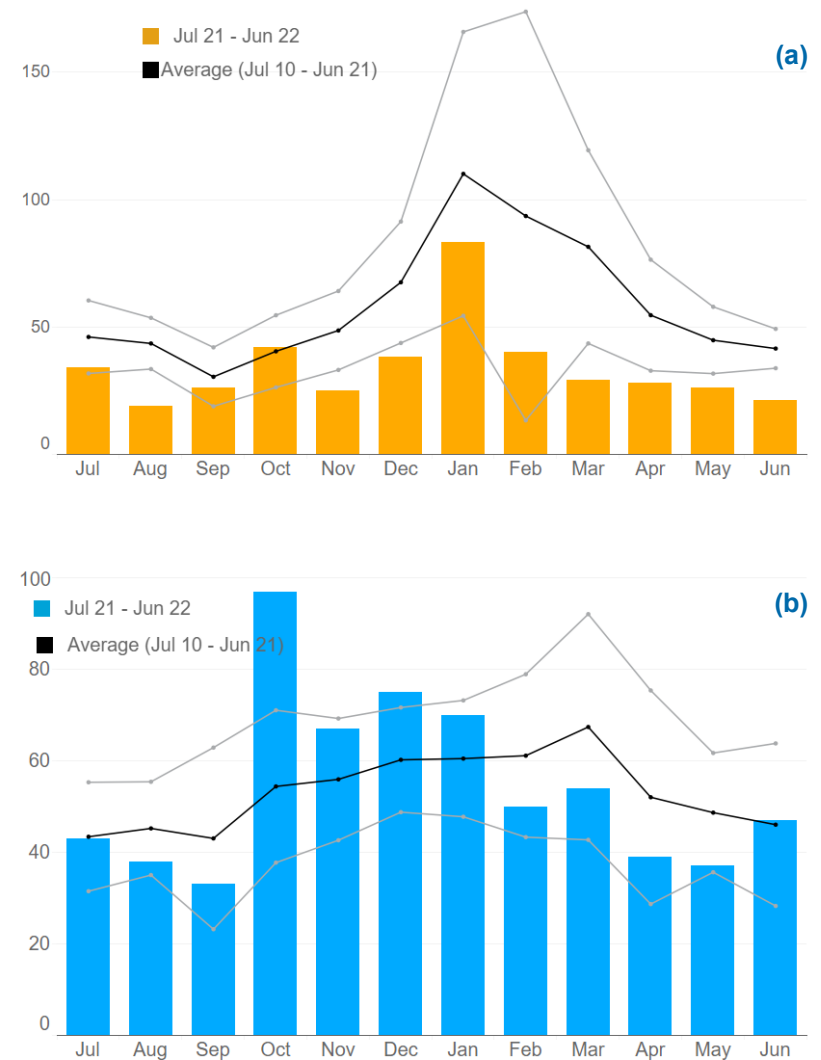


Figure 15 All incidents in the period due to (a) asset failures and (b) contact events

The grey line is one standard deviation above and below the average

Figure 16 shows the number of incidents on the Victorian electricity networks. The green arrows show the reduction from the long-term average across the 2010-2021 period (improvement), and the red arrows show the increase (decline).

The four most common incidents were vehicle impacts, tree contact, connection faults and other contact events. Two of these events are outside the direct control of the networks to manage (vehicle impacts and other contact events), one is partly in control of the networks (tree contact) and one is within their control (connection faults).

When compared to the long-term averages across the period from January 2010 to June 2021, the incidents in 2021-2022 are worse in four categories, improved in nine categories and stable (i.e. within 5 per cent) in one category.

Of particular note is that all the incidents involving asset failures are much lower than the long-term average, with the exception of underground asset faults where the numbers of incidents annually are very low. Vehicle contact with overhead powerlines (including contacts from construction and farming equipment) shows the biggest increase compared to the long-term average. Vegetation contact is also elevated. While this risk is managed by the networks where vegetation grows into the clearance space, there is also a significant contribution from trees and branches blowing in or falling into the clearance space, which is largely outside the direct control of the networks.

Figure 17 shows the trend over the last ten years for the top four events above. This indicates that:

- vehicle impacts have increased this year and are 27 per cent higher than the long-term average
- tree contacts have also dropped slightly but are still 26 per cent higher than the long-term average
- connection faults have increased slightly to be 7 per cent lower than the long-term average
- after a marked decrease last year, other contact events have increased slightly but are still 37 per cent lower than the long-term average.

Powerline maintenance is a compliance and enforcement priority for the 2022-2023 period. Once ESV completes the current pole management reviews, we will start reviewing other asset classes, including connections

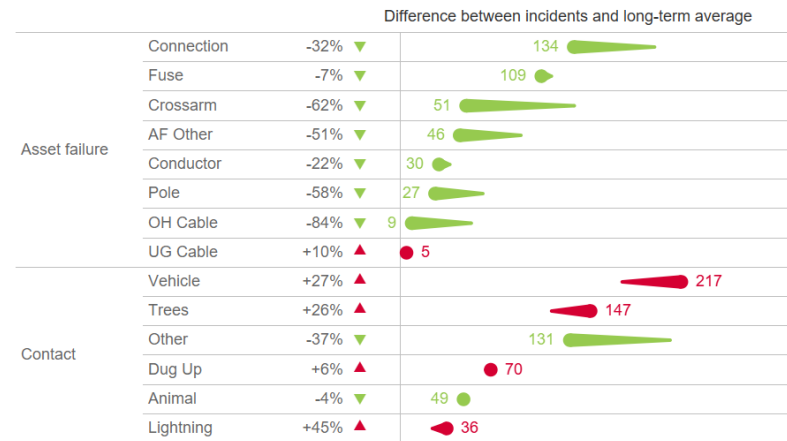


Figure 16 Incidents occurring on Victorian networks

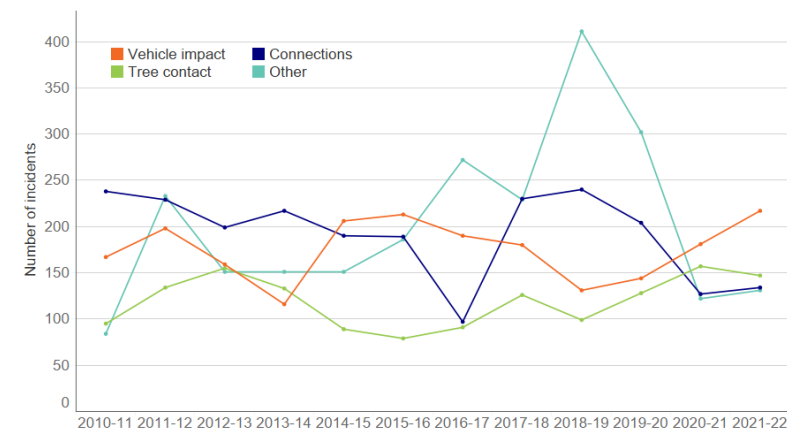


Figure 17 Historic trends for common incident events

Reviewing the performance of wood poles

ESV published the final technical report on Powercor's asset management practices relating to wood pole management in March 2020. It made thirteen recommendations to improve Powercor's wood pole management that Powercor has since begun implementing.

ESV has since undertaken a similar assessment of the capacity of AusNet Services' wood pole management practices to deliver sustainable safety outcomes for the community. A draft technical report was published in August 2021 for public consultation.

The final technical report was published in February 2022. It made ten recommendations to improve AusNet Services' wood pole management.

Recommendation 1 was delivered with AusNet Services developing a plan to address the report recommendations. Once the plan was reviewed and approved by ESV, AusNet Services established a reporting protocol for quarterly reporting on progress against the plan (Recommendation 2). AusNet Services will also be required to clearly demonstrate the alignment between objectives, strategies, performance measures, delivery, forecast intervention volumes, failure analysis and improvement initiatives (Recommendation 3).

Recommendation 4 was for AusNet Services to demonstrate how its current asset inspection approach to pole management, and frequency of pole inspection in hazardous bushfire risk areas (HBRA) meets the general duties under section 98 of the *Electricity Safety Act 1998*. In its response to this recommendation, AusNet Services presented a case for how it meets the same duties for all other pole top asset classes impacted by its revised approach. ESV's review of this response is ongoing.

In 2021-2022, ESV undertook an investigation of the United Energy program. A draft public report was released for consultation in September 2022. A final report will be published addressing the submissions on the draft report. ESV will then request United Energy to address the recommendations of the report.

ESV will complete the series of reviews with the commitment to review Jemena wood pole management practices in the 2022-2023 period. This review began in June 2022 and the findings and any recommendation will be published on the ESV website in due course.

ESV is also observing and assisting with a Victorian Electricity Supply Industry committee investigating non-destructive testing technologies for assessment of poles. The committee is undertaking a trial of wood pole testing devices that will deliver an expansion in the size, scope and investment by member businesses across Victoria.

Improving worker safety in the No Go Zone

Figure 18 shows the cumulative number of No Go Zone (NGZ) incidents over the last three years. The activities that pose the highest safety risk from breaches of the NGZ are operating mobile plant near powerlines, vehicle transit and unauthorised access. The last twelve months has also seen a step upwards in building clearance breaches.

In the past year, the NGZ Working Group (ESV and industry) has continued to develop solutions to reduce the rate of occurrence of NGZ breaches and contact incidents. It also continued its risk-based approach focusing on the key industries of farming and construction where incidents primarily occur.

The NGZ Working Group has implemented the following actions to improve NGZ safety outcomes:

- Undertaking ongoing awareness campaigns targeting farm safety, backhoe and excavator safety, and tipper truck safety.

- Initiating a revamp of the NGZ safety information and awareness campaign, in collaboration with media and corporate affairs experts from industry and WorkSafe Victoria, to ensure consistent messaging.
- Engaging with WorkSafe Victoria to develop a guideline on available technology options for installation of non-contact voltage detecting equipment on tip trucks, backhoes, excavator booms and mobile plant. This guideline is intended to be used to influence the uptake of such technological controls.

ESV has gathered and analysed further specific NGZ data from the industry to share with Government to assess the value of further proactive controls. This includes amendment of the planning and permit requirements for new buildings to ensure all new building applications demonstrate compliance to the *Electricity Safety Act 1998* and relevant Regulations in maintaining suitable offsets from overhead powerlines.

Further information on working around powerlines can be found at <https://esv.vic.gov.au/technical-information/electrical-installations-and-infrastructure/no-go-zones/>.

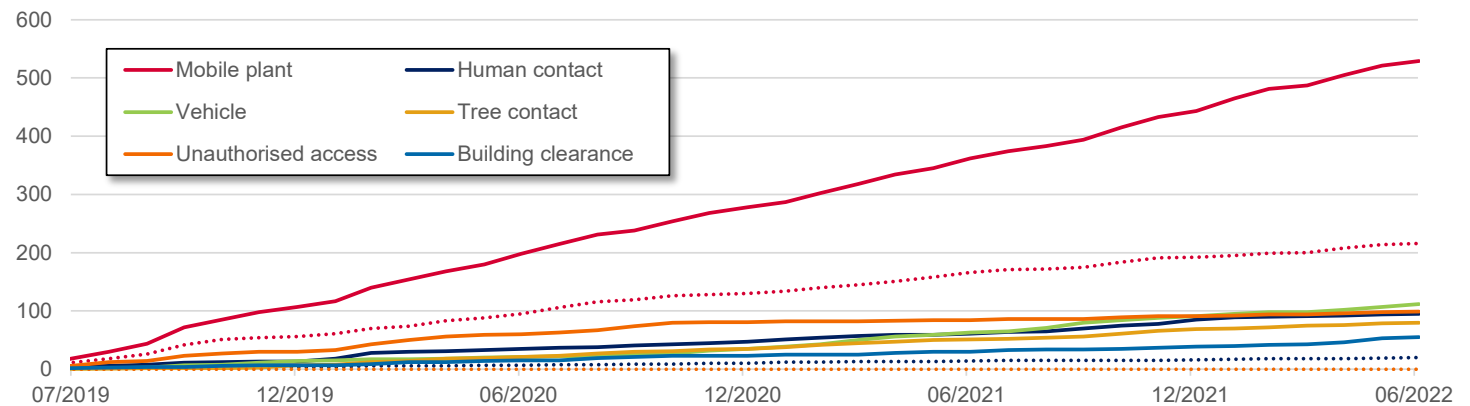


Figure 18 Cumulative trends involving NGZ incidents since 1 July 2019

solid lines = overhead assets, dotted lines = underground assets

Appendix A : Energy Safe Victoria

A1 Operational performance

A1.1 The risk management hierarchy

ESV undertakes a wide range of functions to ensure safety risks are being appropriately managed by the Victorian transmission and distribution networks. Figure 19 shows an idealised hierarchy of controls, illustrating how the *Electricity Safety Act 1998* and associated regulations flow down through the various plans into processes, and are finally deployed as practices on the ground. The blue boxes designate the levels within the hierarchy and examples of elements at each level.

As the regulator, ESV attempts to gain insight into the various levels of the hierarchy to ensure that failures at the top levels don't manifest at systemic issues at the lower levels. Examples of the tools we use to gain insight are shown as the red boxes in Figure 19.

Section A1 provides an overview of ESV's activity this year in gaining such insights, and Appendices B to J provide specific findings on each of the major electricity companies.

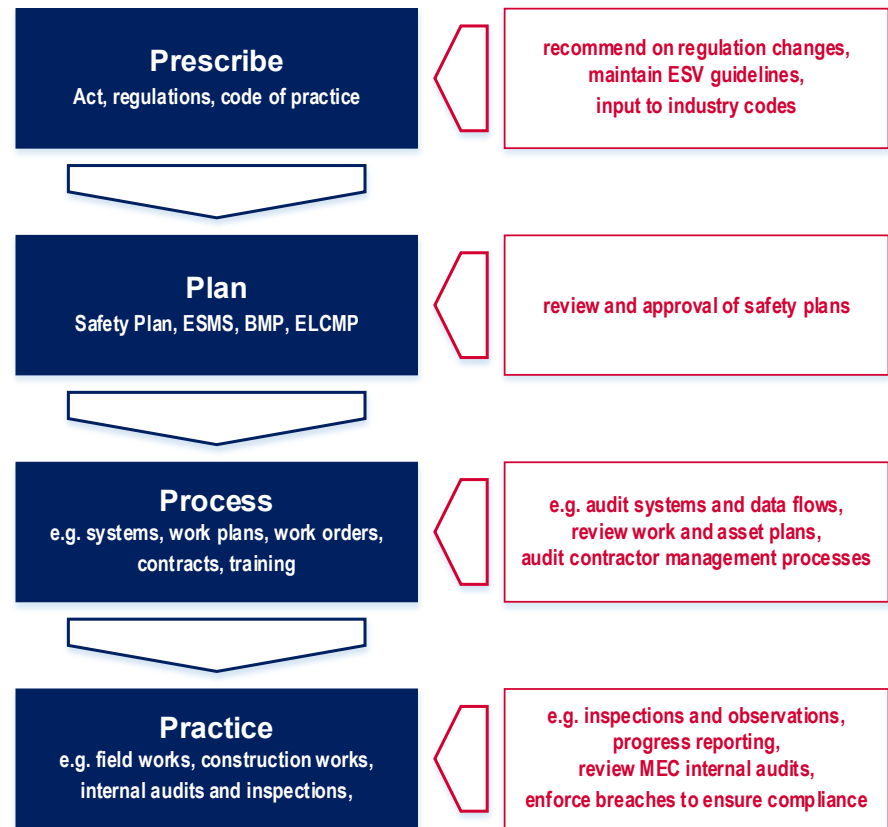


Figure 19 The regulatory hierarchy of controls

A1.2 Statutory plans

Electricity Safety Management Schemes

All major electricity companies are required to submit an Electricity Safety Management Scheme (ESMS) to ESV for acceptance every five years, or after any changes to the regulations or significant changes to company practices.

The numbers of ESMSs processed each year are shown in Figure 20.

This year, ESV focused on completing acceptance of all received ESMSs and auditing the implementation of the ESMSs in the 2021-2022 period.

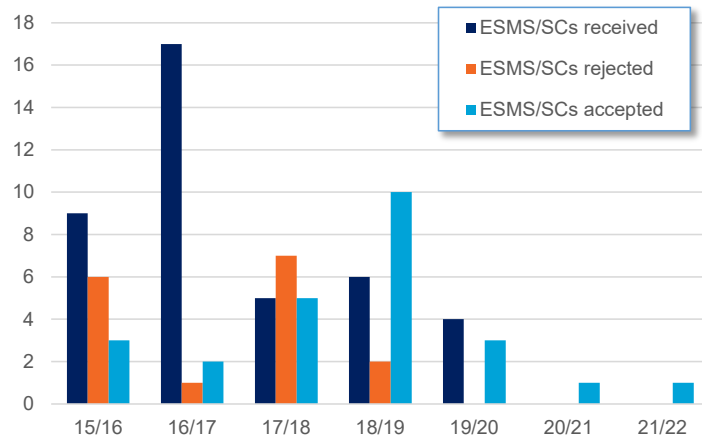


Figure 20 ESMSs and safety cases received and accepted

Bushfire Mitigation Plans

All major electricity companies are required to submit a Bushfire Mitigation Plan (BMP) to ESV for acceptance every five years, or after any changes to the regulations or significant changes to company practices.

All specified operators who own or operate a high voltage overhead line in HBRA are also required to submit a BMP to ESV for acceptance every year.

The numbers of BMPs received and approved by ESV each year are shown in Figure 21.

ESV ensures that any BMPs received are reviewed and accepted promptly, although some non-MEC BMPs from 2020-2021 were not accepted until this year.

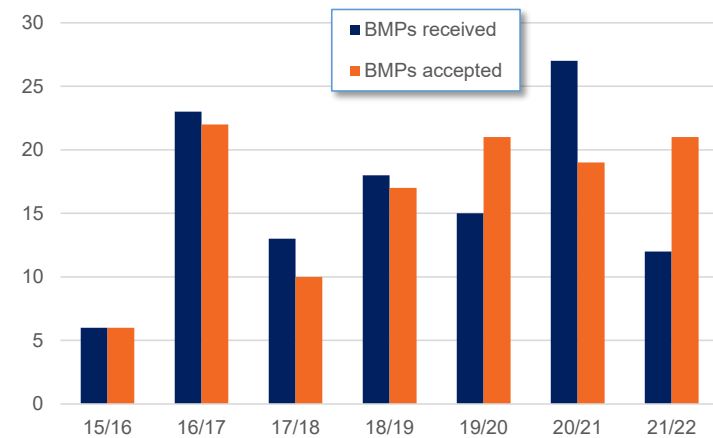


Figure 21 Bushfire Mitigation Plans received and accepted

Electric Line Clearance Management Plans

The Electricity Safety (Electric Line Clearance) Regulations 2020 now require all major electricity companies to prepare and submit an Electric Line Clearance Management Plan (ELCMP) for the five-year period from 1 July 2021 to 30 June 2026.

Previously they were required to prepare and submit an ELCMP to ESV by 31 March each year.

Each of the major electricity companies submitted their five-year ELCMPs to ESV as required and ESV later approved each plan.

Councils and other responsible persons are required to have annual ELCMPs that are to be updated by 31 March of each year. There is no requirement to submit these plans to ESV unless requested to do so.

The numbers of ELCMPs received and approved by ESV each year are shown in Figure 22.

As the major electricity companies pose the greatest risk with regard to electric line clearance, ESV prioritises evaluation and approval of their plans. During the 2021-2022 period, each of the major electricity companies were operating to an approved ELCMP.

Municipal councils and other responsible persons carry different electric line clearance risk profiles when compared to the major electricity companies. Their risk profiles are less focused on bushfires and more concerned with minimising harm and maintaining reliable electricity supply.

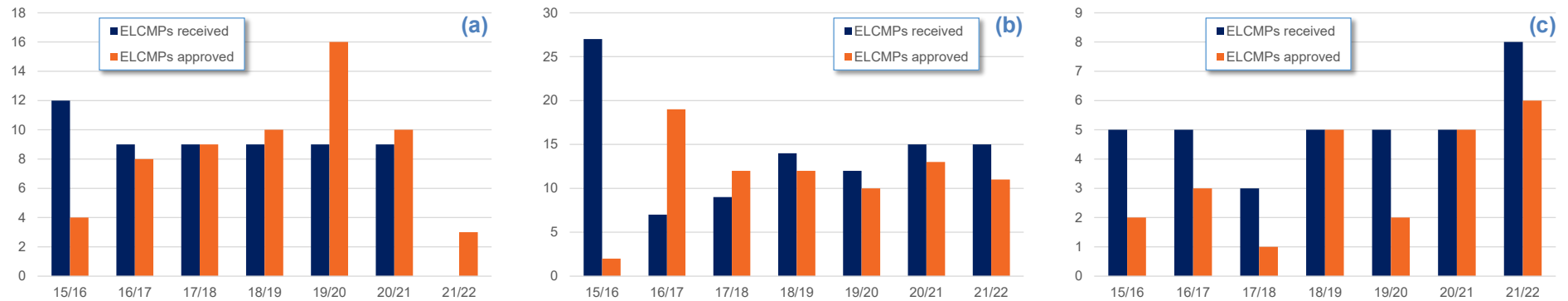


Figure 22 ELCMPs received and approved for (a) major electricity companies, (b) councils and (c) other responsible persons

A1.3 Exemptions

The process for exemptions related to the Powerline Bushfire Safety Program is that the Governor in Council, on recommendation from the Minister, has the power to grant an exemption under section 120W of the Act. ESV then has the power to grant matching exemptions to the relevant parts of the bushfire mitigation regulations under regulation 13. In practice, both exemptions are informed by ESV’s evaluation and analysis in consultation with DELWP.

No REFCL-related exemptions were granted in 2021-2022.

Further information on the REFCL program, including details on all exemptions and time extensions granted can be found on ESV’s website at <https://esv.vic.gov.au/about-esv/reports/technical-reports/victorian-refcl-program-status/>.

Non-network parties wishing to install electric lines on public lands need an exemption from section 46 of the *Electricity Safety Act 1998*. The exemption is granted under an Order in Council subject to meeting specific conditions outlined in section 47 of the Act. ESV is responsible for assessing applications to ensure the required conditions have been met.

The number of such applications has fallen dramatically from its peak in 2016-17 (Figure 24). The bulk of applications received in recent years related to the installation of the National Broadband Network (NBN). Those applications have tapered off significantly now that most of the network backbone has been deployed.

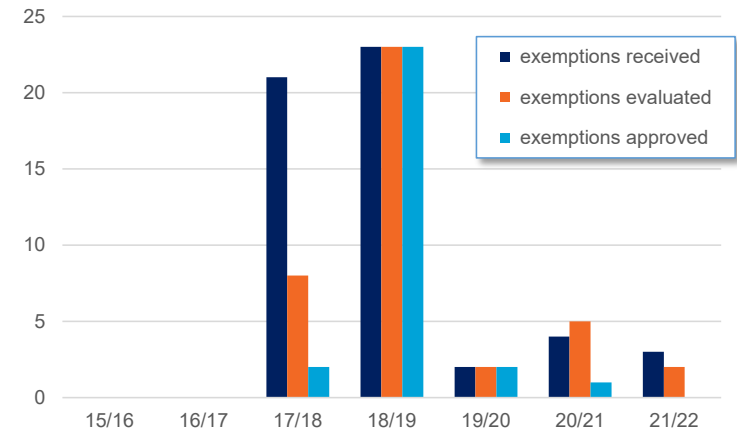


Figure 23 Bushfire Mitigation Plan exemptions

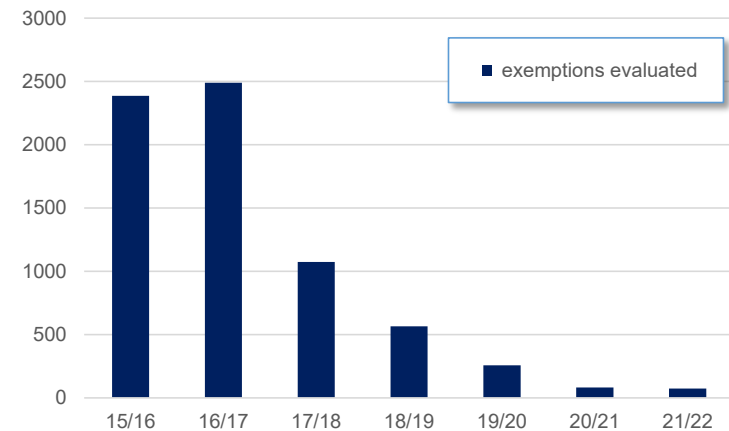


Figure 24 Electric lines on public lands exemptions

A1.4 Audits, inspections and observations

This section provides details on the works undertaken by ESV in managing the audit and inspection program. Details of the individual audits can be found in Appendices B to J.

Electricity Safety Management Scheme audits

The major electricity companies are individually required to have an accepted Electricity Safety Management Scheme (ESMS) in place. ESV regularly audits for compliance with the accepted scheme.

Figure 25 shows the numbers of ESMS audits undertaken each year.

During 2021-2022, ESV carried out ESMS system audits that reviewed the construction planning process and the following of MEC procedures.

Bushfire mitigation audits and inspections

The major electricity companies and specified operators are required to have an ESV-accepted Bushfire Mitigation Plan in place. ESV regularly audits for compliance with the accepted plan.

Figure 26 shows the numbers of bushfire mitigation audits undertaken each year. Nine of the ten major electricity companies are audited at least once each year; TransGrid was not audited this year due to the young age of its assets. The peak in 2017-2018 resulted from secondary pole audits of four of the distribution businesses due to stakeholder concerns.

ESV aims to undertake a bushfire mitigation audit of at least two specified operators each year. These businesses represent a low risk of fire ignition compared to the major electricity companies due to the small length of lines they operate. In 2021-2022, ESV performed audits on AGL Hydro and Stockyard Hill wind farm overhead powerlines.

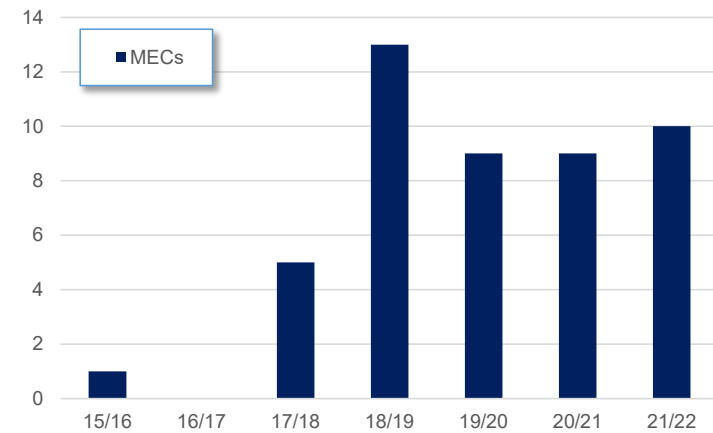


Figure 25 Numbers of ESMS audits

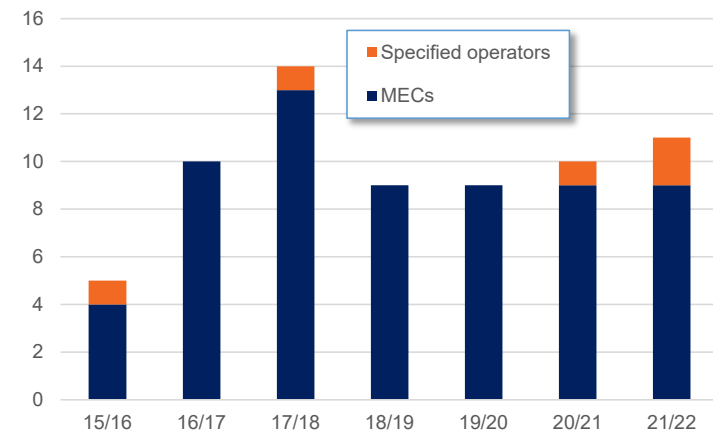


Figure 26 Numbers of bushfire mitigation audits

Electric line clearance audits and inspections

Figure 27(a) shows that the numbers of pre-summer audits have remained relatively stable over the last six years, although the number of individual audits undertaken increased in 2021-2022. Figure 27(b) shows that the volume of spans inspected by ESV has increased from 2,000-3,000 spans in 2015-16 and 2016-17 to over an average of 15,000 yearly since 2018-19.

The number of spans inspected by ESV has decreased in the last two years due to COVIDSafe requirements and other general impacts caused by the pandemic. ESV has had to manage the audit function around resourcing constraints. We prioritised inspections in HBRA to ensure that the results of our inspections were representative of the broader compliance standards for the networks.

This information allows ESV to hold responsible persons accountable for their maintenance of vegetation around the state’s powerlines, and thereby ensure that bushfire risks of HBRA are being properly managed.

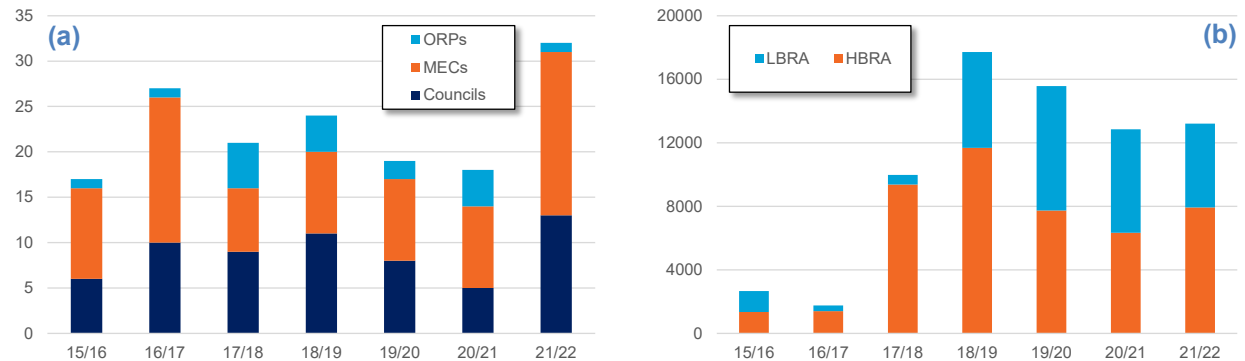


Figure 27 Electric line clearance audits and inspections showing (a) the number of pre-summer outcomes audits and (b) the volume of spans inspected during these audits and inspections

Note: The number of inspections reported last year was for the distribution businesses rather than for all major electricity companies.

Work practice observations

Work practice observations provide key insights into the ability of the major electricity companies to plan and deliver safety outcomes. Any breakdowns in the process become evident when works in the field are monitored.

ESV conducts two types of work practice observations:

- planned observations are organised with the distribution businesses, and ESV’s work practice advisers often attend the pre-work meetings before observing the work being undertaken
- opportunistic observations involve ESV’s work practice advisers identifying work locations from the distribution businesses’ websites and arriving unannounced to observe the work being undertaken.

Figure 28 shows the number of work practice observations undertaken each year. ESV’s Safety Outcomes Assurance team conducted a total of 31 field-based observations this year, including observations of asset inspectors for the first time. This work was interspersed with their education and consultation duties working with industry committees, urban and rural businesses, and other relevant organisations across the state.

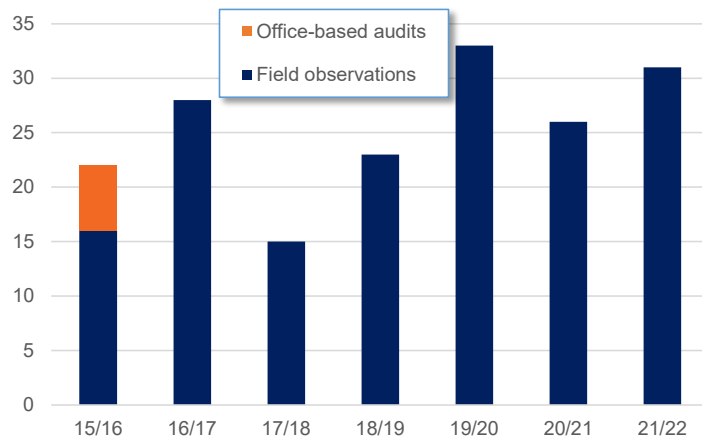


Figure 28 Numbers of works practice observations

A1.5 Investigations

ESV undertakes assessment of all complaints or incidents raised with ESV. Comprehensive investigations are then undertaken if this assessment identifies that there is a potential serious breach of legislative requirements, or where multiple recurrences indicate systemic problems with how businesses and individuals are managing a safety risk they are responsible for. These detailed investigations determine whether enforcement action is warranted and, if so, support a successful outcome.

Figure 29 shows the numbers of new investigations opened each year and the number that have been completed. Given the level of detail required to support an enforcement action, many of these investigations may extend into future years.

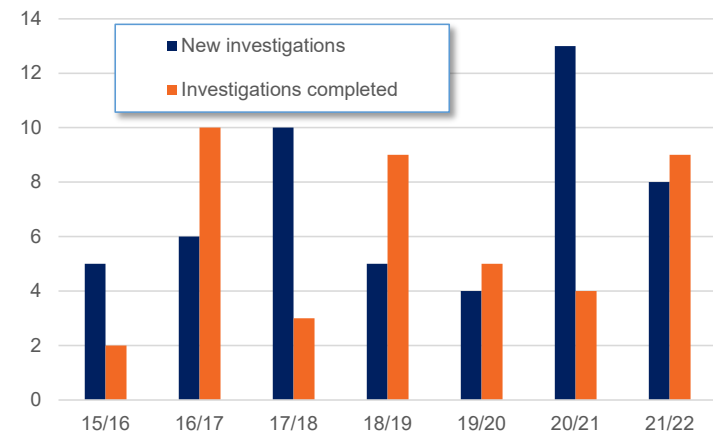


Figure 29 Numbers of new and completed investigations

Appendix B : AusNet Services

AusNet Services⁴ was previously owned by Singapore Power (32.3 per cent), State Grid of China (19.9 per cent) and 48 per cent is publicly owned. On 16 February 2022, the Australian Stock Exchange announced that AusNet Services had been acquired in its entirety by Australian Energy Holdings No. 4 Pty Ltd, a company controlled by Brookfield Asset Management.

AusNet Services has two operating electricity subsidiaries: AusNet Services Transmission (owns and operates the electricity transmission business) and AusNet Services Distribution (owns and operates the electricity distribution business). As the two subsidiaries are managed by the same CEO and Board and use similar procedures, ESV combines the two subsidiaries into a single entity for reporting purposes. Where the discussion relates to a specific area of the business, this is identified within this report.

AusNet Services is the only major electricity company in Victoria operating both transmission and distribution networks.⁵

The transmission network services all of Victoria (500kV and 220kV) and also includes interconnections with New South Wales and South Australia (330kV and 275kV respectively). It comprises approximately 6,560 km of transmission lines and 13,200 towers.

The distribution network covers an area of approximately 80,000 km², and includes Melbourne's outer-eastern suburbs and runs north to the New South Wales border and south and east to the coast (Figure 30). It comprises approximately 38,200 km of overhead line, 7,600 km of underground cable, 333,200 power poles and 97,400 public lighting poles. Most of the AusNet Services network (98 per cent) is in HBRA.

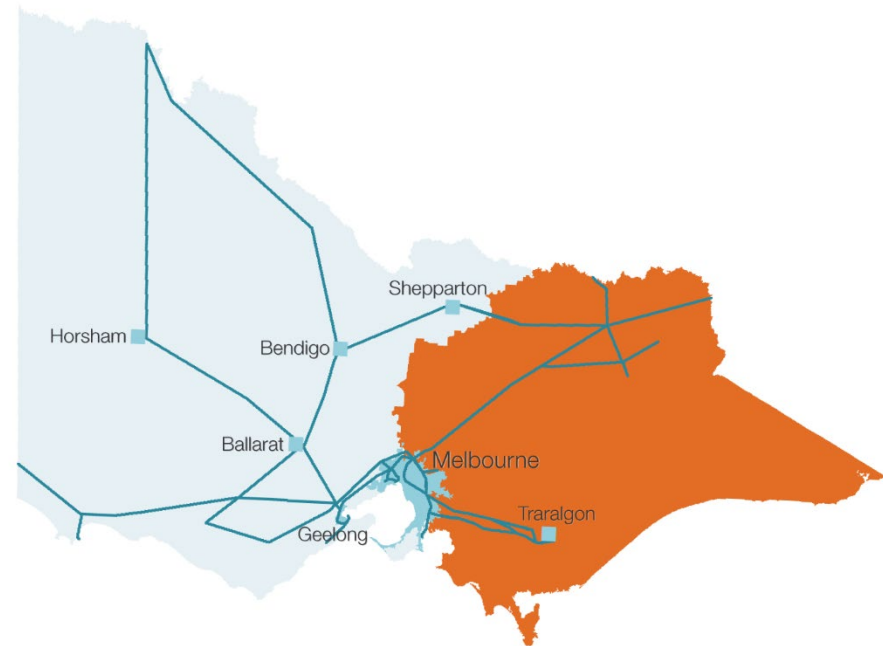


Figure 30 Service area for the AusNet Services distribution network (orange area) and transmission lines (dark blue)

⁴ AusNet Transmission Group Pty Ltd and AusNet Electricity Services Pty Ltd are the listed holders of the electricity transmission and distribution licences respectively.

⁵ While TOA and TOA2 are closely associated with CitiPower/Powercor, these have been established as separate companies. Their transmission assets are also limited in comparison to those of AusNet Services.

B1 Plans and processes

AusNet Services was scheduled to submit the following documents to ESV for review and acceptance/approval:

- a bushfire mitigation plan every five years, commencing from the date of the most recent acceptance of a bushfire mitigation plan; often revised plans have been accepted more frequently due to regular changes in the regulations or company practices
- an electric line clearance management plan for the period 1 July 2021 to 30 June 2026 by 31 March 2021.

On 22 February 2021, AusNet Services provided an updated distribution bushfire mitigation plan for ESV review. The plan was updated to include details relating to the REFCL program mandated by regulation, the protection sequence for ACRs and feeder circuit breakers, and to reflect an alternative REFCL provider. ESV reviewed the plan and provided comments regarding changes required before ESV would accept the plan. AusNet provided an updated plan that addressed ESV comments and final acceptance was granted by ESV on 28 October 2021.

AusNet Services submitted its 2021-2026 transmission and distribution electric line clearance management plans to ESV in March 2021, and both were approved in advance of the 2021-2022 fire danger period.

B2 Directions

There are currently no directions on AusNet Services.

B3 Powerline bushfire safety programs

To meet its bushfire mitigation obligations, AusNet Services must implement REFCL technology at 22 nominated zone substations in three delivery tranches.

Figure 31 shows the progress of the AusNet Services REFCL installation program as of 1 May 2019, 2020, 2021 and 2022, and its anticipated progress in the next twelve months.

By 30 June 2022, ESV had accepted 14 AusNet Services zone substations as compliant, and granted time extensions in relation to four zone substations.

AusNet Services has experienced technical challenges in achieving the required capacity on some feeders with a high proportion of single-phase spurs, feeders that have significant lengths of underground cables, feeders that are excessively long and/or feeders that experience mutual coupling effects due to proximity to transmission or sub-transmission lines. AusNet Services is undertaking modelling and has engaged global experts in this field to address the issue.

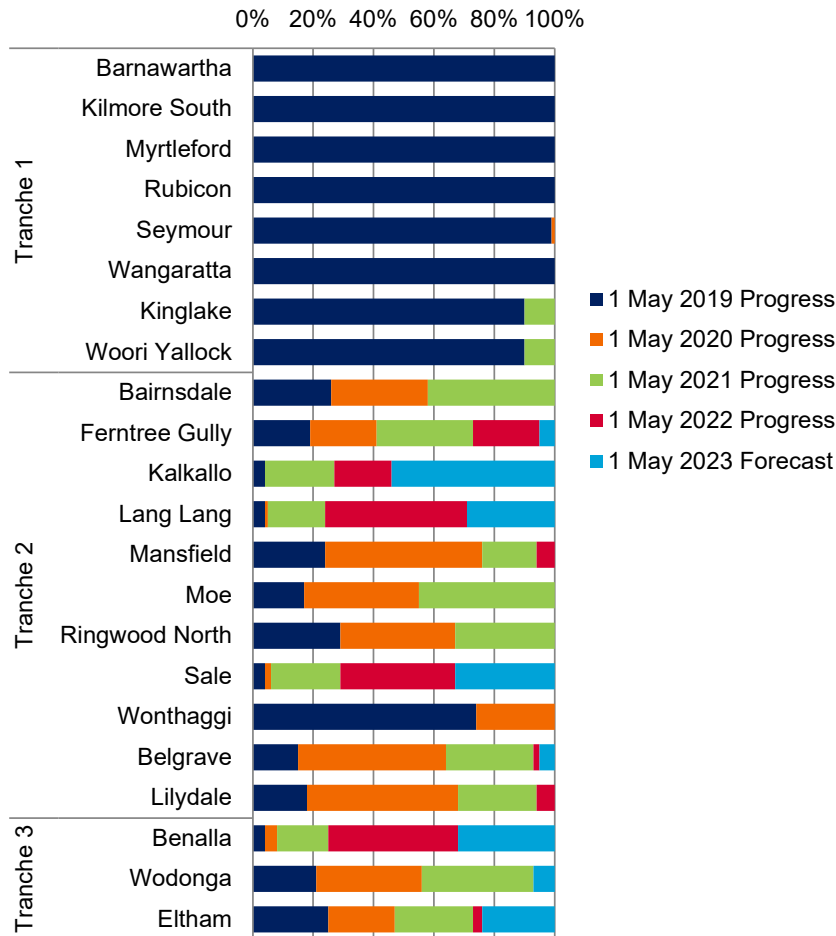


Figure 31 Status of the AusNet Services REFCL program

B4 Exemptions

On 27 April 2021, ESV granted a time extension and corresponding exemption for the AusNet Services REFCL program due to third-party delays beyond its reasonable control and unanticipated technical issues. This effectively changed AusNet Services’ regulatory deadlines to:

- 13 substations by 1 May 2021
- 14 substations by 1 November 2021
- 19 substations by 1 November 2022
- 22 substations by 1 May 2023

Where possible, AusNet Services is implementing interim solutions to deliver the risk reduction associated with REFCL protection to the affected communities ahead of formal acceptance by ESV.

ESV received exemption applications from AusNet Services in relation to the Femtree Gully and Kalkallo zone substations. The exemptions relate to replacing bare powerlines with underground or covered conductor instead of REFCL-protecting to overcome technical challenges. In each case, it is expected that the alternative solution will deliver an equivalent or better safety outcome. ESV determined that an exemption relating to the Femtree Gully zone substation was not required. The exemption request relating to the Kalkallo zone substation has been assessed and a recommendation has been provided to the Minister for consideration.

B5 Audit performance

B5.1 Electricity Safety Management Scheme (ESMS)

During July 2021, ESV audited the AusNet Services construction planning process and procedures for both transmission and distribution. This focused on the processes and procedures used by AusNet Services to plan the construction of assets. ESV found one minor non-compliance relating to the use of software to close out findings of internal audits.

During February 2022, ESV audited AusNet Services transmission and distribution focussing on the procedures used by AusNet Services to minimise electrical risks as far as practicable. ESV found four minor non-compliances relating to:

- general documents in use with overdue review dates
- engineering standards with overdue review dates
- an application for a permit to work process that was not followed
- a serious electrical incident that was not reported to ESV when AusNet Services became aware of the incident (see page 7).

AusNet Services provided a plan to address the ESV audit findings and implement changes in 2022.

B5.2 Electric line clearance

Distribution network pre fire danger period audit

Leading into the 2021-2022 fire danger period, an audit and inspection was conducted on the AusNet Services distribution network to confirm it was managing its electric line clearance responsibilities effectively in HBRA. The audit and inspection was completed with reference to the approved AusNet Services ELCMP.

The audit, which included vegetation management system data analysis, found one major non-compliance and two minor non-compliances. The non-compliances related to procedural deficiencies for vegetation inspection, clearing rectification timeframes and vegetation coding.

Through the audit and inspection process, ESV concluded that AusNet Services did not comply with three of the four elements of its approved ELCMP that were audited. Each of the identified non-compliances compromises the ability of AusNet Services to manage its electricity safety risks as far as practicable.

This is particularly important during a declared fire danger period as it increases the risks of bushfires. That said, a fire did not occur as a result of vegetation growing into electric lines on the AusNet Services network in 2021-2022.

The ESV field inspection component of the audit found the risk of non-compliant vegetation contacting the network had decreased when compared to its previous year's inspection results.

AusNet Services has committed to addressing the procedural deficiencies identified by ESV through revised procedures in its ELCMP.

ESV will review the application of these mitigation strategies as part of the 2022-2023 auditing and inspection programs. ESV will continue to closely monitor this situation and, if necessary, intervene or undertake enforcement action to ensure AusNet Services meets its electric line clearance duties and obligations.

Distribution network inspection

During the 2021-2022 period, ESV inspected 3745 spans on the AusNet Services distribution network, with 2745 being in HBRA and 1000 in LBRA.

ESV identified 270 non-compliant spans across the network — 189 in HBRA and 81 in LBRA. ESV issued section 86(1) notices to AusNet Services for all identified non-compliant spans. All were cleared by AusNet Services as a matter of priority, resulting in the elimination of these potentially hazardous situations.

In 2021-2022, ESV observed a decrease in the rate of major non-compliances affecting the AusNet Services distribution network when compared to the rates observed in 2020-2021 (Figure 32). A major non-compliance is regarded as a high risk situation where vegetation is touching, or could soon touch, uninsulated conductors.

In 2020-2021, ESV had observed a decline in the performance of AusNet Services over several years (see Figure 9 and Figure 10). ESV subsequently issued a warning to AusNet Services asking it to show cause as to why it should not be prosecuted. AusNet Services subsequently improved its performance and reduced the rates of non-compliance and major non-compliance in both HBRA and LBRA. While the noted improvement is a positive outcome, further improvement is needed.

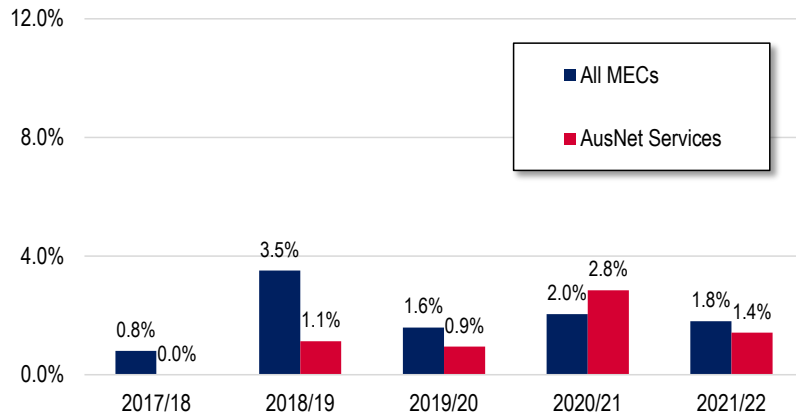


Figure 32 Rate of major non-compliances (HBRA and LBRA)

Transmission network pre fire danger period audit

ESV also completed an audit and inspection for the AusNet Services transmission network before the fire danger period and, like the distribution network audit, this audit was to confirm AusNet Services was managing its electric line clearance responsibilities effectively in HBRA. The audit and inspection was completed with reference to the approved AusNet Services ELCMP.

The audit found one major non-compliance and one minor non-compliance. As with the distribution network, the non-compliances related to procedural deficiencies for vegetation clearing rectification timeframes and vegetation coding.

ESV concluded that AusNet Services did not comply with two of the four elements of its approved ELCMP that were audited. Each of the identified non-compliances compromises the ability of AusNet Services to manage its electricity safety risks as far as practicable.

This is particularly important during a declared fire danger period as it increases the risks of bushfires. That said, the field inspection component of

the audit found there was little to no risk of fires being started by vegetation growing and contacting the network since the transmission network has large well-established clearance easements. The matters identified during the audit only came into play for vegetation that existed on the outer fringe of the required minimum clearance space.

AusNet Services has committed to addressing the procedural deficiencies identified by ESV through revised procedures in its ELCMP.

B5.3 Bushfire mitigation

Transmission network

ESV reviewed 13,622 requested asset records from transmission lines across the entire Victoria network. The review found no structures outside the inspection interval required by the Electricity Safety (Bushfire Mitigation) Regulations 2013. ESV did identify 497 structures where the compliance of the inspection timeframe was dependent upon the interpretation of the term ‘annual’. This finding has led to a clearer definition of the inspection cycle timeframes identified in the AusNet Services (transmission) bushfire mitigation plan.

ESV inspected 40 structures across AusNet Services transmission network along the powerlines from Redcliff to Horsham, Red Cliffs to Wemen terminal station and Wemen terminal station to Kerang. The inspections found no serious issues and one minor issue of a bird’s nest on a structure in proximity to a live conductor (additional instances of birds’ nests were identified in locations distant from live conductors).

The visual inspection found the transmission assets to generally be in good condition. The issue found was very minor in nature and would be rectified as part of routine inspection and maintenance activities undertaken by AusNet Services. ESV recommended that AusNet Services ensure the issue is rectified.

Distribution network

ESV reviewed 427,411 requested asset records from across the AusNet Services distribution network. The review found six structures outside the

inspection cycle timeframes identified in the AusNet Services bushfire mitigation plan. Each of the six structures was located in LBRA in a Metro Trains Melbourne rail corridor; the delays were attributed to a protracted approval process required to gain access to perform inspection on the site. ESV found this to be non-compliant and required AusNet Services to rectify the inspection of assets outside the minimum timeframes specified in the AusNet Services bushfire mitigation plan.

ESV inspected 107 structures across the AusNet Services network in the Bairnsdale and Moe areas. The inspections found no serious issues and 11 minor issues, including a missing LV spreader, deteriorated conductor and service cable and missing or displaced covers.

The issues found were minor in nature and would be expected to be identified and repaired as part of routine inspection and maintenance activities undertaken by AusNet Services. ESV required that AusNet Services rectify the identified issues in accordance with its priority maintenance practices.

B5.4 Work practices

In 2021-2022, ESV undertook seven observations of AusNet Services work practices across seven sites. Two observations were on the AusNet Services transmission network and five were on the AusNet Services distribution network. All of the distribution and transmission network observations were planned observations.

The findings of these observations were as follows:

- AusNet Services distribution network
 - major non-compliances 1
 - minor non-compliances 1
 - opportunities for improvement 6
- AusNet Services transmission network
 - major non-compliances 1
 - minor non-compliances 3
 - opportunities for improvement 3

The key areas of concern identified by these observations related to:

- use and testing of live line and operating equipment with one major non-compliance
- failure to follow procedures for general low voltage, with one major non-compliance
- electrical access permit procedure and hazard identification, both with two minor non-compliances.

ESV recommended that AusNet Services work practices specifically focus on ensuring:

- compliance to processes and procedures
- the condition of live line and operating equipment is checked before use
- hazard identification is carried out effectively and identifies all work-related hazards.

In 2021-2022, ESV also carried out two observations of asset inspections by AusNet Services. This is the first year that asset inspection observations have been carried out by ESV. One observation was planned and one was opportunistic. The findings of the observations were as follows:

- major non-compliances 0
- minor non-compliances 3
- opportunities for improvement 1

All of the findings were classified as ESMS findings. ESV recommended that AusNet Services focus on ensuring that the work practices of its asset inspectors comply with its ESMS.

B6 Safety indicators

Figure 33 shows the number of all serious electrical incidents reported to ESV via OSIRIS by AusNet Services during the 2021-2022 period. The green arrows show the reduction from the long-term average across the 2010-2021 period (improvement), and the red arrows show the increase (decline). Figure 34 shows the same for those incidents that resulted in a ground or vegetation fire.

The most common incidents on the AusNet Services network in 2021-2022 were HV fuse failures, tree contact, animal contact, connection failures and lightning strike. The numbers of all asset failure incidents were lower in 2021-2022 than the long-term average, with the exception of fuse failures (the most common event) and underground cable faults (which occur very infrequently). Contact incidents were higher than the long-term average for animal contact, lightning strike and dug-up cables.

Connection faults, tree contact, animal contact and HV fuse failures were the most common causes of network-related fires. Fires from asset failure incidents were lower in 2021-2022 than the long-term average in all categories, with the exception of connection faults (increasing) and HV fuse failures (stable). Fires from contact incidents were higher than the long-term average in two categories (vehicle impacts and lightning strike), lower in three categories (tree contact, animal contact and other contact events) and stable in one (dug-up cables).

While tree contact events are partly within the control of AusNet Services, such events are not fully within its control when they involve vegetation that has blown or fallen onto powerlines from outside the clearance space. Animal faults are also only partly within the control of AusNet Services.

Connection faults and HV fuse failures are within the control of AusNet Services to improve performance.

Powerline maintenance is a compliance and enforcement priority for the 2022-2023 period. Once ESV completes the current pole management reviews, we will start reviewing other asset classes, including connections and fuses. During its May 2022 audit, AusNet Services advised that it is exploring options to reverse the trend of increasing fuse failures.

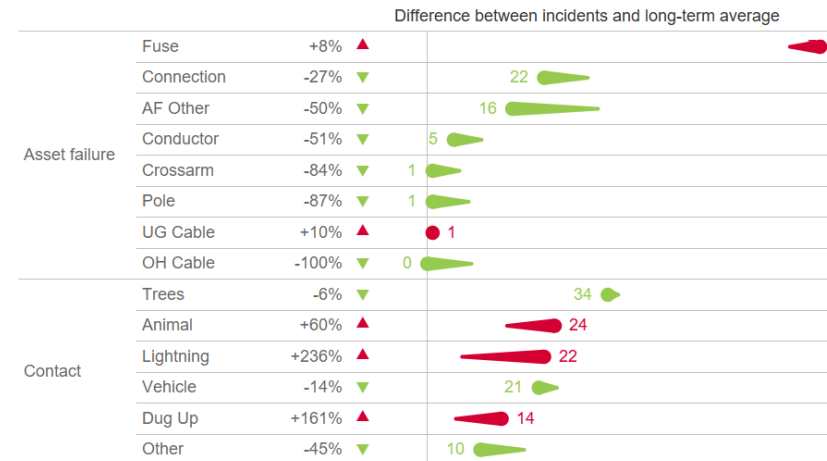


Figure 33 Incidents on the AusNet Services network

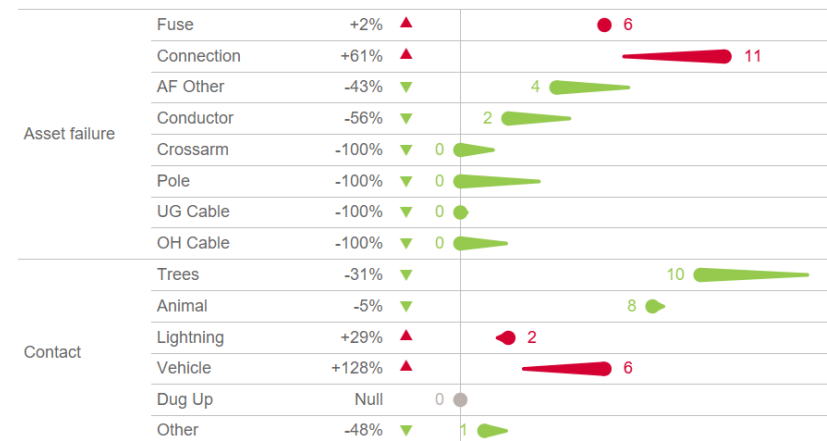


Figure 34 Incidents on the AusNet Services network resulting in ground fires

Appendix C : Basslink

Throughout 2021-2022, Basslink was owned by Keppel Infrastructure Trust, an entity listed on the Singapore stock exchange.⁶

On 12 November 2021, Basslink was placed into receivership. KPMG Australia was appointed as Receiver and Manager. ESV subsequently secured assurances from the receivers that the same management and staff would remain in place to ensure the business is operated in accordance with its accepted ESMS.

ESV will engage with the new owners once the sale has been completed.

Basslink owns and operates the HVDC interconnector between Victoria and Tasmania. In Victoria, its assets comprise the Loy Yang converter station connected to the 500kV transmission system via 3.2 km of overhead line. From the converter station, 57 km of overhead line and 6.4 km of underground cable connect to the submarine cables that cross Bass Strait to Tasmania (Figure 35). Only the onshore assets in Victoria are subject to regulation by ESV.

The Basslink asset base in Victoria is significantly smaller than that of AusNet Services Transmission; it has only one per cent of the towers that AusNet owns and maintains. Its assets are also newer, having been commissioned in April 2006.

All of the Basslink network is in HBRA.



Figure 35 Location of Basslink transmission assets (dark blue line)

⁶ Basslink is registered as a Market Network Service Provider.

C1 Plans and processes

Basslink was scheduled to submit the following documents to ESV for review and acceptance/approval:

- a bushfire mitigation plan every five years starting from the date of the most recent acceptance of a bushfire mitigation plan
- an electric line clearance management plan for the period 1 July 2021 to 30 June 2026 by 31 March 2021.

Basslink submitted its 2019-2024 Bushfire Mitigation Plan to ESV on 27 August 2019. ESV accepted the plan on 19 December 2019. The Bushfire Mitigation Plan is due for renewal in December 2024.

Basslink submitted its 2021-2026 electric line clearance management plan to ESV in March 2021, and the plan was approved ahead of the 2021-2022 fire danger period.

C2 Directions

ESV has not had cause to issue directions to Basslink.

C3 Bushfire mitigation regulations programs

There are no requirements on Basslink under the Electricity Safety (Bushfire Mitigation) Regulations 2013.

C4 Exemptions

Basslink has sought no exemptions from regulations.

C5 Audit performance

C5.1 Electricity Safety Management Scheme (ESMS)

ESV audited the Basslink construction planning process and procedures in September 2021. ESV identified one minor non-compliance, being that the Basslink ESMS contains references to old documents that have been updated.

ESV audited the performance of Basslink in adhering to procedures in December 2021. ESV found three minor non-compliance, being:

- the Basslink ESMS contains references to incorrect documents and procedures and does not accurately reference the current documents used by Basslink
- Basslink does not record a copy of the switching instructions (either electronically or in hardcopy format)
- the template used for operator switching instructions does not have provision for a formal reviewer sign-off.

Basslink provided a plan to address the audit findings and implement changes in 2022.

C5.2 Electric line clearance

Leading into the 2021-2022 fire danger period, an audit and inspection was completed for the Basslink network to confirm it was managing its electric line clearance responsibilities effectively in HBRA. The audit was completed with reference to the approved Basslink 2021-2026 ELCMP.

The audit, which included vegetation management system data analysis, found Basslink was compliant with all four elements of its approved ELCMP that were audited. No non-compliances or opportunities for improvement were identified.

ESV inspected 35 of the 142 spans on the Basslink network; all were found to be compliant. The easement was being managed to a high standard.

ESV considered this to be excellent result, particularly given this has been the case for six consecutive years.

C5.3 Bushfire mitigation

ESV reviewed 142 asset records from the 400kV DC powerlines running between the Loy Yang converter station and the coastal transition station. The review found no structures outside the inspection cycle timeframes identified in the Basslink bushfire mitigation plan.

ESV inspected 27 structures along the 400kV DC powerline and found the transmission assets to be generally in very good condition. There were no serious issues and no minor issues.

C5.4 Work practices

The Basslink transmission line operates almost continually, with scheduled detailed inspections occurring every three years and unscheduled surveillance inspections occurring monthly. Maintenance activities are determined by the severity of defects identified.

ESV did not conduct any observations of Basslink work practices this year, as there was no planned work undertaken on the Basslink transmission line in the period.

C6 Safety indicators

Transmission infrastructure generally has a low level of incidents, due to the nature of the assets and the clearances maintained around these higher voltage assets. Transmission assets are concentrated in fewer, larger and better-defined easements than distribution assets, thereby reducing exposure to environmental threats and third-party impacts. This also makes them easier to maintain.

Compared to the AusNet Services transmission network, Basslink has the further advantage of having a relatively short transmission line in Victoria.

Basslink recorded no incidents on its transmission network during the 2021-2022 period.

Appendix D : CitiPower

CitiPower/Powercor⁷ is part of the Victorian Power Networks group of companies jointly owned by a CK Infrastructure-led consortium (CKI consortium), Power Assets Holdings and Spark Infrastructure. Cheung Kong Infrastructure and Power Assets Holdings are both part of the Cheung Kong Group. They jointly own 51 per cent of CitiPower/Powercor. The remaining 49 per cent is held by Spark Infrastructure.

In May 2017, the CKI consortium purchased the DUET Group, thereby giving it majority ownership (66 per cent) of United Energy. This has resulted in some consolidation of activities and processes across the companies the CKI consortium controls. Of most relevance from a safety perspective was the introduction into United Energy of CitiPower/Powercor procedures for vegetation management.

CitiPower and Powercor are managed by a single executive management team using common procedures and systems across the two distribution businesses. As a result, the Electricity Safety Management System (Section D5.1) and the work practices observations audits (Section D5.3) have been undertaken jointly across the two businesses. The remaining sections within this appendix refer to the specific assets within the CitiPower network and have therefore been assessed independently of the Powercor assets.

The CitiPower distribution network covers an area of approximately 157 km², and includes Melbourne's central business district and inner suburbs (Figure 36). It comprises approximately 2,550 km of overhead line, 2,700 km of underground cable, 48,800 power poles and 9,000 public lighting poles. All of the CitiPower network is in LBRA.



Figure 36 Service area for the CitiPower distribution network (orange area)

Jemena and United Energy service boundaries are shown as orange lines

⁷ CitiPower Pty Ltd is the listed holder of the electricity distribution licence.

D1 Plans and processes

CitiPower was scheduled to submit the following documents to ESV for review and acceptance/approval:

- a bushfire mitigation plan every five years commencing from the date of the most recent acceptance of a bushfire mitigation plan; often revised plans have been accepted more frequently due to regular changes in the regulations or company practices
- an electric line clearance management plan for the period 1 July 2021 to 30 June 2026 by 31 March 2021.

On 2 September 2019, CitiPower submitted their 2019-24 Bushfire Mitigation Plan for ESV review. ESV accepted the plan on 20 December 2019. The plan is due for renewal in 2024.

CitiPower submitted its 2021-2026 electric line clearance management plan to ESV in March 2021, and the plan was approved in advance of the 2021-2022 fire danger period.

D2 Directions

There are currently no directions on CitiPower.

D3 Powerline bushfire safety programs

There are no requirements on CitiPower under the Electricity Safety (Bushfire Mitigation) Regulations 2013.

D4 Exemptions

There are no outstanding exemptions applicable to CitiPower.

D5 Audit performance

D5.1 Electricity Safety Management Scheme (ESMS)

ESV audited the performance of CitiPower (together with Powercor, TOA and TOA2) in adhering to procedures in November 2021. ESV found one minor non-compliance, being that the CitiPower No Go Zone procedure was incomplete.

CitiPower will provide a plan to address the ESV audit findings and implement these changes in 2022.

D5.2 Electric line clearance

Network inspection

During the 2021-2022 period, ESV inspected 580 spans on the CitiPower network and identified 27 non-compliant spans. ESV issued section 86(1) notices to CitiPower for all identified non-compliant spans; all were cleared by CitiPower as a matter of priority, resulting in the elimination of these potentially hazardous situations.

In 2021-2022, ESV observed a decrease in the rate of major non-compliances affecting the CitiPower network when compared to the previous year (Figure 37). A major non-compliance is regarded as high risk where vegetation is touching, or could soon touch, uninsulated conductors.

While ESV had been observing the performance of CitiPower to be getting progressively worse since 2017-2018 (see Figure 10), this year an improvement was observed in both non-compliance and major non-compliance in LBRA. While the noted improvement is a positive outcome, further improvement is needed.

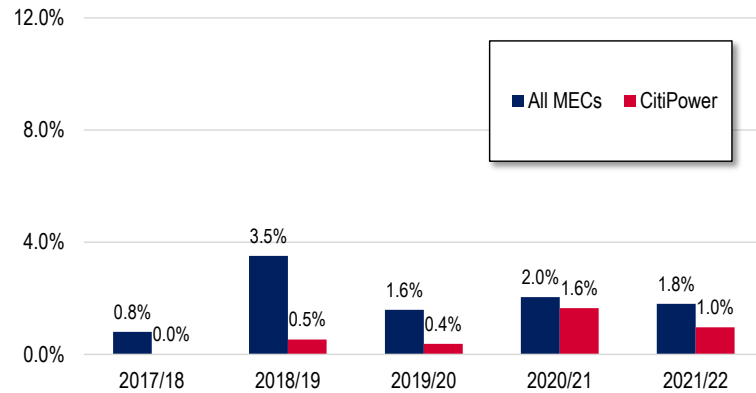


Figure 37 Rate of major non-compliances (LBRA)

D5.3 Bushfire mitigation

The CitiPower area is entirely urban and, although comprised of only low bushfire risk area, an annual bushfire mitigation audit is conducted to verify the inspection of above ground assets.

ESV reviewed 58,329 asset records from across the entire CitiPower network and found one LBRA structure outside the inspection cycle timeframes identified in the CitiPower bushfire mitigation plan. ESV recommended that CitiPower develop appropriate actions that will address this finding.

ESV inspected 109 structures from across the Fairfield and Fitzroy areas. The inspections found five issues requiring an immediate response and 73 minor issues, including loose or leaning hardware, defective overhead service terminations and deteriorated or broken strands on conductors and terminations.

The issues found were minor in nature and would be expected to be identified and repaired as part of routine inspection and maintenance activities undertaken by CitiPower. ESV required that CitiPower rectify the identified issues in accordance with its priority maintenance practices.

D5.4 Work practices

In 2021-2022, ESV undertook four observations of CitiPower work practices across four sites, with two being planned observations and two being opportunistic observations.

The findings of these observations were:

- major non-compliances 0
- minor non-compliances 2
- opportunities for improvement 6

The key areas of concern identified by these observations related to:

- ESMS (non-electrical) findings with two minor non-compliances and one opportunity for improvement
- hazard identification with three opportunities for improvement.

ESV recommended CitiPower’s work practices specifically focus on ensuring:

- ESMS findings are identified and prioritised
- hazard identification is carried out effectively identifying all work-related hazards.

In 2021-2022, ESV also carried out a planned work practices observation of asset inspections by CitiPower. This is the first year that observations of asset inspection have been carried out by ESV. The findings of the observation were as follows:

- major non-compliances 0
- minor non-compliances 2
- opportunities for improvement 1

All of the findings were classified as ESMS findings. ESV recommended that CitiPower focus on ensuring that the work practices of its asset inspectors comply with its ESMS.

D6 Safety indicators

Figure 38 shows the number of all serious electrical incidents reported to ESV via OSIRIS by CitiPower during the 2021-2022 period. The green arrows show the reduction from the long-term average across the 2010-2021 period (improvement), and the red arrows show the increase (decline). Figure 39 shows the same for those incidents that result in a ground or vegetation fire.

The most common incidents on the CitiPower network in 2021-2022 were other contact events, connection faults, other asset failures, dug-up cables and vehicle impacts. Two of these items are within the control of CitiPower (connection faults and other asset failures) and two are not.

The numbers of asset failure incidents were higher in 2021-2022 than the long-term average in four categories, lower in three categories and stable in one category. Contact incidents were higher in two categories, lower in two categories and stable (or zero) in two categories.

The most common fire incidents were due to connection and conductor failures. Fires from asset failure events were higher than the long-term average in two categories and stable (or zero) in six categories. Fires from contact events were zero in all categories.

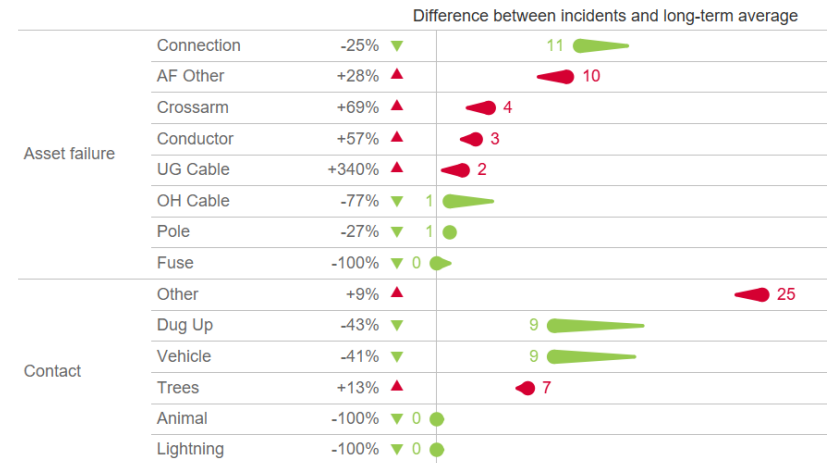


Figure 38 Incidents on the CitiPower network

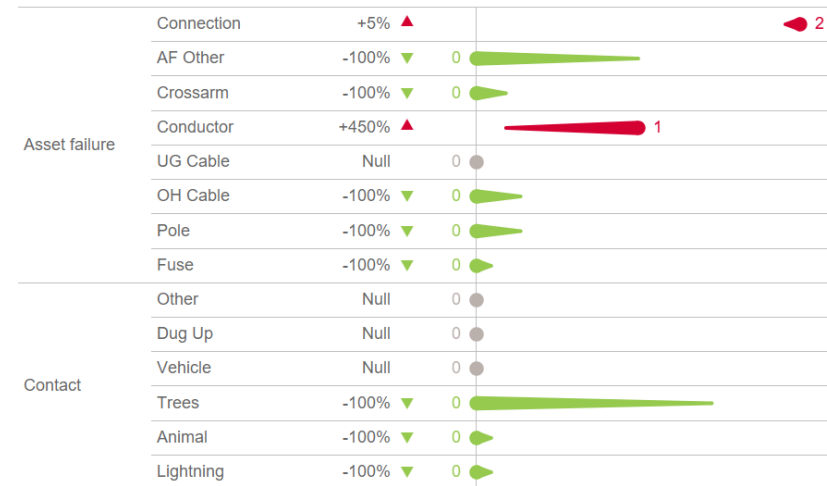


Figure 39 Incidents on the CitiPower network resulting in ground fires

Appendix E : Jemena

Jemena⁸ is one of the subsidiaries of SGSP (Australia) Assets Pty Ltd, which is jointly owned by the State Grid International Development Australia Investment Company Limited (SGIDAIC) and Singapore Power International Pte Ltd (SPI). SGIDAIC holds a 60 per cent shareholding in SGSPAA and SPI holds the remaining 40 per cent.

SGIDAIC is owned by the State Grid Corporation of China. SPI is owned by Singapore Power Limited and its ultimate holding company is Temasek Holdings (Private) Limited.

As well as 100 per cent ownership of Jemena, SGSPAA also owns a 34 per cent interest in United Energy Distribution Holdings Pty Ltd, the holding company of United Energy Distribution Pty Ltd. The two companies forming SGSPAA also own 51 per cent of AusNet Services.

The Jemena distribution network covers an area of approximately 950 km², across Melbourne's northern and western suburbs, including Melbourne International Airport (Figure 40). It comprises approximately 4,500 km of overhead line, 2,200 km of underground cable, 93,600 power poles and 28,700 public lighting poles. Most of the Jemena network (59 per cent) is in HBRA.



Figure 40 Service area for the Jemena distribution network (orange area)

CitiPower and United Energy service boundaries are shown as orange lines

⁸ Jemena Electricity Networks (Vic) Ltd is the listed holder of the electricity distribution licence.

E1 Plans and processes

Jemena was scheduled to submit the following documents to ESV for review and acceptance/approval:

- a bushfire mitigation plan every five years starting from the date of the most recent acceptance of a bushfire mitigation plan; often revised plans have been accepted more frequently due to regular changes in the regulations or company practices
- an electric line clearance management plan for the period 1 July 2021 to 30 June 2026 by 31 March 2021.

Jemena submitted a revised 2021-26 bushfire mitigation plan to ESV on 29 June 2021. ESV is currently reviewing the plan.

Jemena submitted its 2021-26 electric line clearance management plan to ESV in March 2021, and the plan was approved in advance of the 2021-2022 fire danger period.

E2 Directions

There are currently no directions on Jemena.

E3 Powerline bushfire safety programs

Figure 41 shows the progress of the Jemena REFCL installation program at 1 May 2019, 2020, 2021 and 2022, and its anticipated progress in the next 12 months.

The Sydenham base-level⁹ REFCL is not prescribed in legislation.

Jemena also owns and operates three feeders originating from the AusNet Services prescribed Kalkallo zone substation; these will either be fully underground or REFCL-protected from Coolaroo zone substation.

⁹ A base-level REFCL includes an arc suppression coil but does not include the power electronics that a complete REFCL uses for active fault compensation.

E4 Exemptions

On 2 December 2020, ESV granted an exemption for the powerlines supplied from the Coolaroo zone substation from being REFCL protected, where those powerlines are located in low bushfire risk areas of greater Melbourne (as determined by the CFA). The remaining powerlines with bushfire ignition risk will be REFCL-protected by 1 May 2023. Any new powerlines supplied from Coolaroo and in a hazardous bushfire risk area must be covered or underground.

Jemena was unable to procure the required land to deliver the proposal that supported their 2020 exemption application. Jemena have since amended their proposal and applied for new exemption relating to Coolaroo.

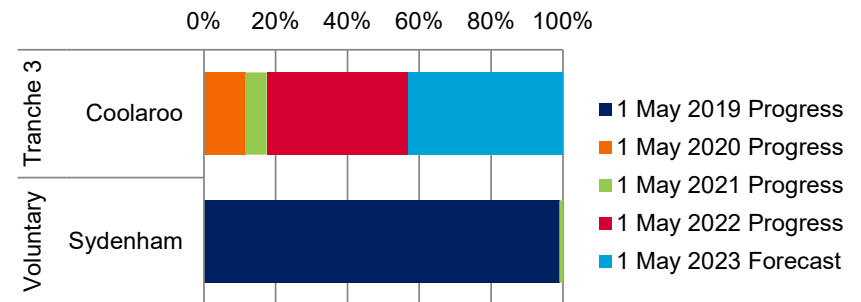


Figure 41 Status of the Jemena REFCL program

E5 Audit performance

E5.1 Electricity Safety Management Scheme (ESMS)

ESV audited Jemena on its construction planning process and procedures in July 2021. ESV identified five opportunities for improvements.

ESV audited the performance of Jemena in adhering to procedures in July 2021. ESV identified one major non-compliance and two minor non-compliances. The major non-compliance related to a construction crew that had no field access to any Jemena procedures. The two minor non-compliances were:

- an operational earth was installed on a temporary spike but a permanent earth was available nearby, which is a better earth
- a crew member was using an unapproved document 'drop box' to store and locate procedures.

Jemena provided a plan to address the ESV audit findings and implement these changes in 2022.

E5.2 Electric line clearance

Network pre fire danger period audit

Leading into the 2021-2022 fire danger period, an audit and inspection was conducted on the Jemena network to confirm it was managing its electric line clearance responsibilities effectively in HBRA.

The audit, which included vegetation management system data analysis, found one major non-compliance, one minor non-compliance and one opportunity for improvement. The non-compliances related to procedural deficiencies for vegetation inspection, clearing rectification timeframes and vegetation coding.

ESV concluded that Jemena was not strictly managing its line clearance responsibilities as required by its approved plan. This compromised its ability to comply with the Regulations and the Code and to manage its electricity safety risks as far as practicable.

This is particularly important during a declared fire danger period as it increases the risks of bushfires. That said, the field inspection component of the audit found there was not a widespread risk of fires being started by vegetation contacting the network.

The procedural deficiencies identified by ESV during the audit and inspections have been addressed by Jemena in its 2021-2026 electric line clearance management plan. ESV will review the application of the revised procedures as part of the 2022-23 auditing and inspection program.

Network inspection

During the 2021-22 period, ESV inspected 365 spans on the Jemena network, with 355 in HBRA and 10 in LBRA.

ESV identified one non-compliant spans across the network; occurring in HBRA. ESV issued section 86(1) notices to Jemena for the identified non-compliant span. It was cleared by Jemena as a matter of priority, resulting in the elimination of that potentially hazardous situations.

In 2021-2022, ESV found no major non-compliances affecting the Jemena network in HBRA. Last year's decrease in the rate of major non-compliances continued (Figure 32). A major non-compliance is regarded as a high risk situation where vegetation is touching, or could soon touch, uninsulated conductors.

The combined rate of major non-compliance on the Jemena network has been less than the average across all of the distribution networks since ESV began collecting this data in 2017. Jemena has also had the lowest rate of major non-compliances in four of the five years ESV has been recording inspection data.

The rate of non-compliant vegetation on the Jemena network had decreased in both HBRA and LBRA for a third consecutive year (Figure 9 and Figure 10). Major non-compliances also remain steady and low.

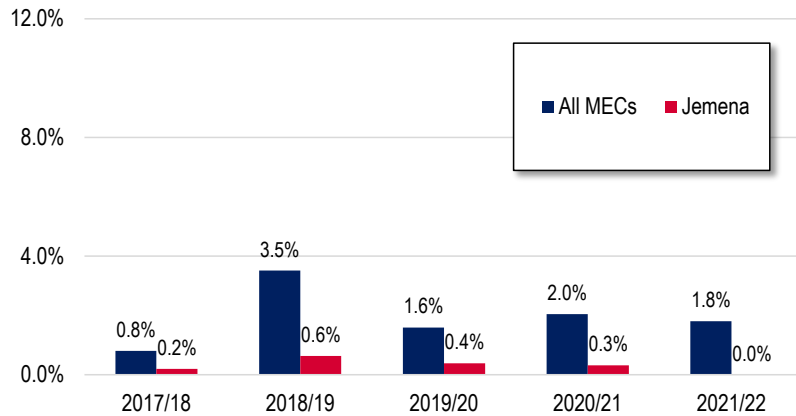


Figure 42 Rate of major non-compliances (HBRA and LBRA)

E5.3 Bushfire mitigation

ESV reviewed 110,423 asset records from across the entire Jemena network, and found seven LBRA structures outside the inspection cycle timeframes identified in the Jemena bushfire mitigation plan. Each structure was identified in Jemena’s records with a rail authority as the owner of the structure and Jemena as responsible for its inspection. Jemena has advised that the identification of Jemena as having responsibility for inspection was an error. Jemena provided email correspondence with Metro Trains Melbourne confirming the structures were the responsibility of the rail operator. Jemena has decided to retain the records of these structure within their asset systems until Metro Trains Melbourne officially acknowledge their responsibility for the asset or until these asset are removed (a level crossing removal is planned that would result in the line of structures being placed underground).

ESV inspected 99 structures across the network. The inspections found an instance of copper theft and 23 minor issues, including moisture ingress in fuses and deteriorated cable insulation.

The issues found were minor in nature and would normally be identified and repaired as part of routine inspection and maintenance activities undertaken by Jemena. ESV required that Jemena rectify the identified issues in accordance with its priority maintenance practices.

E5.4 Work practices

In 2021-2022, ESV undertook four observations of Jemena work practices. All four observations were planned. The findings of the observations were as follows:

- major non-compliances 0
- minor non-compliances 1
- opportunities for improvement 3

The key areas of concern identified by these observations related to:

- compliance with their Electricity Safety Management Scheme
- earthing of high voltage apparatus
- placing high voltage apparatus into service.

ESV recommended that Jemena’s work practices specifically focus on ensuring:

- compliance with their Electricity Safety Management Scheme
- earthing is installed correctly rather than on temporary spikes
- specific requirements are followed when placing high voltage apparatus into service.

In 2021-2022, ESV also carried out a planned work practices observation of asset inspections by Jemena. The findings of the observation were as follows:

- major non-compliances 0
- minor non-compliances 3
- opportunities for improvement 1

All of the findings were classified as ESMS findings. ESV recommended that Jemena focus on ensuring that the work practices of its asset inspectors comply with its ESMS.

E6 Safety indicators

Figure 43 shows the number of all serious electrical incidents reported to ESV via OSIRIS by Jemena during the 2021-2022 period. The green arrows show the reduction from the long-term average across the 2010-2021 period (improvement), and the red arrows show the increase (decline). Figure 44 shows the same for those incidents that result in a ground or vegetation fire.

The most common incidents on the Jemena network in 2021-2022 were other contact events, vehicle impacts, dug-up cables and conductor failures. Three of these events are outside of the direct control of Jemena and one (conductor failures) is within its control. Only dug-up cables and conductor failures were higher this year than the long-term average.

All asset failure fire events were zero in 2021-2022. The most common fire incidents were animal contacts and tree contacts. There were no fires in any other contact categories. Both categories of fires incidents are partly within the control of Jemena to manage. Only animal contact fires were greater in 2021-2022 than the long-term average.

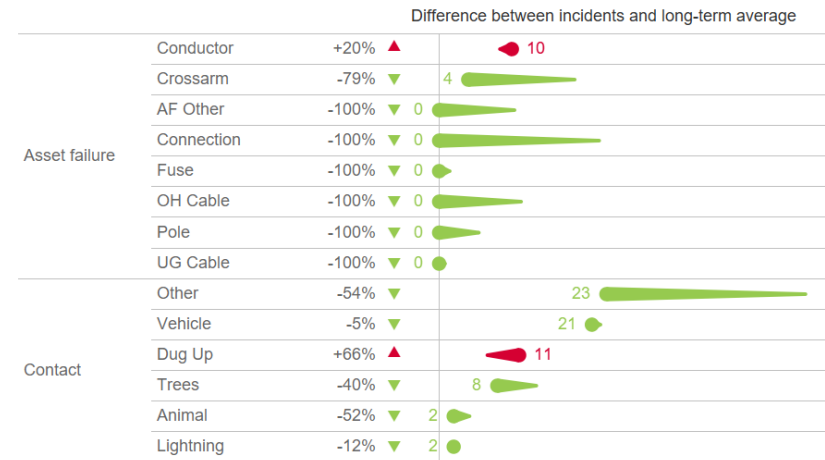


Figure 43 Incidents on the Jemena network

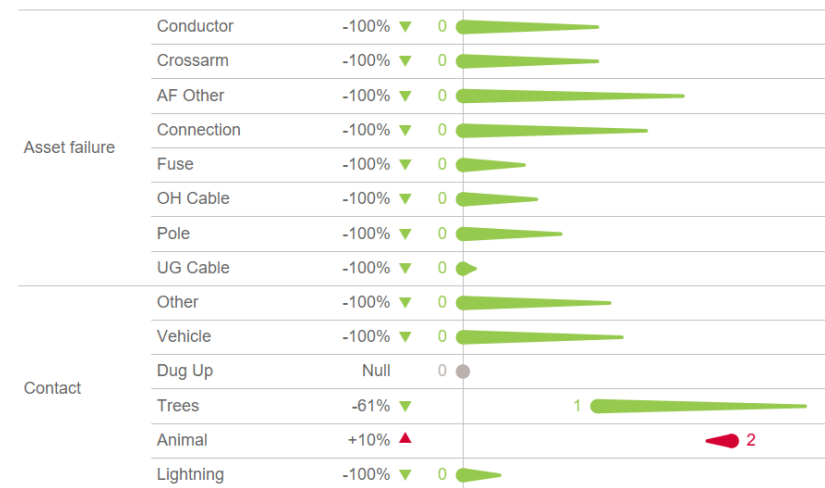


Figure 44 Incidents on the Jemena network resulting in ground fires

Appendix F : Powercor

CitiPower/Powercor¹⁰ is part of the Victorian Power Networks group of companies jointly owned by a CK Infrastructure-led consortium (CKI consortium), Power Assets Holdings and Spark Infrastructure. Cheung Kong Infrastructure and Power Assets Holdings are both part of the Cheung Kong Group. They jointly own 51 per cent of CitiPower/Powercor. The remaining 49 per cent is held by Spark Infrastructure.

In May 2017, the CKI consortium purchased the DUET Group, thereby giving it majority ownership (66 per cent) of United Energy. This has resulted in some consolidation of activities and processes across the companies the CKI consortium controls. Of most relevance from a safety perspective was the introduction into United Energy of CitiPower/Powercor procedures for vegetation management.

CitiPower and Powercor are managed by a single executive management team using common procedures and systems across the two distribution businesses. As a result, the Electricity Safety Management System (Section F5.1) and the work practices observations audits (Section F5.4) have been undertaken jointly across the two businesses. The remaining sections within this appendix refer to the specific assets within the Powercor network and have therefore been assessed independently of the CitiPower assets.

The Powercor distribution network covers any area of approximately 145,700 km², and includes Melbourne's Docklands Precinct, west from Williamstown to the South Australian border, north to the Murray and south to the coast (Figure 45). It comprises approximately 68,700 km of overhead line, 9,200 km of underground cable, 489,000 poles and 100,100 public lighting poles. Most of the Powercor network (96 per cent) is in HBRA.



Figure 45 Service area for the Powercor distribution network (orange area)

¹⁰ Powercor Australia Ltd is the listed holder of the electricity distribution licence.

F1 Plans and processes

Powercor was scheduled to submit the following documents to ESV for review and acceptance/approval:

- A bushfire mitigation plan every five years commencing from the date of the most recent acceptance of a bushfire mitigation plan; often revised plans have been accepted more frequently due to regular changes in the regulations or company practices
- an electric line clearance management plan for the period 1 July 2021 to 30 June 2026 by 31 March 2021.

On 19 April 2022, Powercor submitted a revised Bushfire Mitigation Plan. ESV is currently reviewing the plan.

Powercor submitted its 2021-2026 electric line clearance management plan to ESV in March 2021, and the plan was approved in advance of the 2021-2022 fire danger period.

F2 Directions

In late 2020, Powercor advised ESV that it had switched part of its Camperdown network to be supplied from the neighbouring Cobden zone substation to facilitate the connection of a wind farm. This resulted in this network section no longer being REFCL-protected.

ESV determined that Powercor's action had increased the bushfire ignition risk of this network section. On 23 December 2020, ESV directed Powercor to reinstate REFCL protection on total fire ban days throughout the 2020-2021 fire season and on 15 November 2021, ESV directed Powercor to reinstate REFCL protection on total fire ban days throughout the 2021-2022 fire season. As a result, the wind farm would not be able to generate on these days.

On 17 February 2022, ESV issued a direction that the REFCL protection on the affected network section must be reinstated permanently.

A further six directions were issued to Powercor throughout the year requiring Powercor to preserve evidence for further investigation by ESV.

F3 Powerline bushfire safety programs

To meet its bushfire mitigation obligations, Powercor must implement REFCL technology at 22 nominated zone substations over three delivery tranches.

Figure 46 shows the progress of the Powercor REFCL installation program at 1 May 2019, 2020, 2021 and 2022, and its anticipated progress in the next twelve months.

By 30 June 2022, ESV had accepted 18 zone substations as compliant.

F4 Exemptions

In 2019-2020, ESV granted an exemption in regard to Powercor's obligation to install REFCLs at Corio and Geelong. Instead a REFCL will be installed at the new Gheringhap zone substation, which will supply those powerlines in hazardous bushfire risk areas. This reduced the number of Powercor REFCLs from 22 to 21.

In 2020-2021, Powercor advised ESV that it would split the existing Waurn Ponds network and supply one half from a new REFCL-protected Torquay zone substation. An exemption was not required as all powerlines will be REFCL-protected. This took the total number of Powercor REFCLs back up to 22.

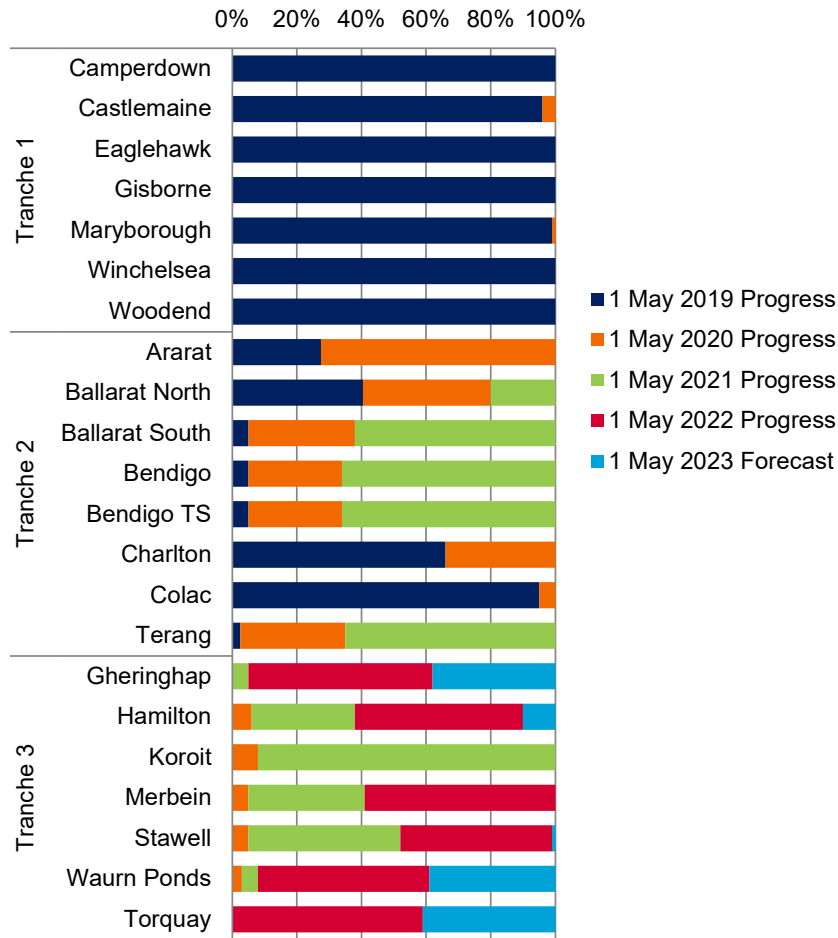


Figure 46 Status of the Powercor REFCL program

F5 Audit performance

F5.1 Electricity Safety Management Scheme (ESMS)

ESV audited the performance of Powercor (together with CitiPower, TOA and TOA2) in adhering to procedures in November 2021. ESV identified one minor non-compliance, being the Powercor No Go Zone procedure was incomplete.

Powercor will provide a plan to address the ESV audit findings and implement these changes in 2022.

F5.2 Electric line clearance

Network pre fire danger period audit

Leading into the 2021-2022 fire danger period, an audit and inspection was conducted on the Powercor network to confirm it was managing its electric line clearance responsibilities effectively in HBRA. The audit was completed with reference to the approved Powercor 2021-2026 ELCMP.

The audit, which included vegetation management system data analysis, found two major non-compliances and two minor non-compliances. The non-compliances related to procedural deficiencies for inspection timeframes, rectification timeframes and vegetation coding.

Through the audit and inspection process, ESV concluded that Powercor did not comply with three of the four elements of its approved ELCMP that were audited. Each of the identified non-compliances compromised the ability of Powercor to manage its electricity safety risks as far as practicable.

This is particularly important during a declared fire danger period as it increases the risks of bushfires. That said, a fire did not occur as a result of vegetation growing into electric lines on the Powercor network in 2021-2022.

The ESV field inspection component of the audit found the risk of non-compliant vegetation contacting the network had increased when compared to its previous year's inspection results.

Powercor has committed to addressing the procedural deficiencies identified by ESV through revised procedures in its ELCMP. In addition, it continues to seek additional resources to better enable it to manage its electric line clearance duties and obligations.

ESV will review the application of these mitigation strategies as part of the 2022-2023 auditing and inspection programs. ESV will continue to closely monitor this situation and, if necessary, intervene or undertake enforcement action to ensure Powercor meets its electric line clearance duties and obligations.

Network inspection

During the 2021-2022 period, ESV inspected 4280 spans on the Powercor network, with 2610 in HBRA and 1670 in LBRA.

ESV identified 414 non-compliant spans across the network; 320 in HBRA and 94 in LBRA. ESV issued section 86(1) notices to Powercor for all identified non-compliant spans. All were cleared by Powercor as a matter of priority, resulting in the elimination of these potentially hazardous situations.

In 2021-2022, ESV observed an increase in the rate of major non-compliance affecting the Powercor network when compared to the rates observed in 2020-21 (Figure 47). A major non-compliance is regarded as high risk where vegetation is touching, or could soon touch, uninsulated conductors.

Since 2018-2019, the overall rate of non-compliant vegetation on the Powercor network is getting progressively worse in HBRA (Figure 9) and is remaining lower and stable in LBRA (Figure 10).

Significant improvement is needed to address the increasing rates of non-compliance affecting the Powercor HBRA network. ESV is closely monitoring the performance of Powercor through its safety regulation programs.

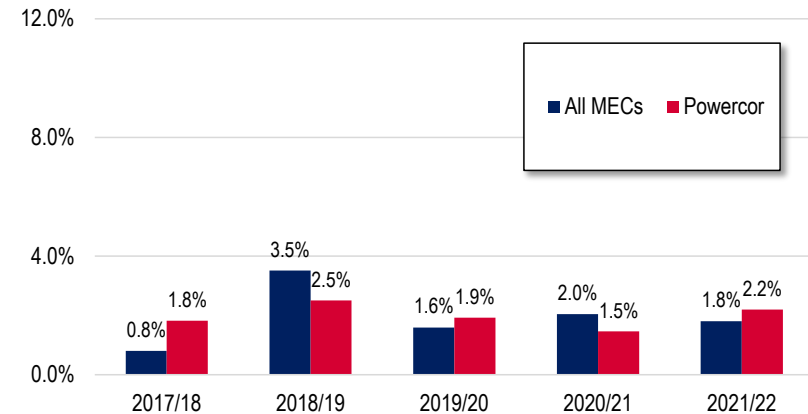


Figure 47 Rate of major non-compliances (HBRA and LBRA)

F5.3 Bushfire mitigation

ESV reviewed 592,905 asset records from across the entire Powercor network, and identified two HBRA structures outside the risk assessment procedures and inspection cycle timeframes identified in the Powercor bushfire mitigation plan. ESV recommended that these poles are inspected and that Powercor develop appropriate actions that will prevent a reoccurrence.

ESV inspected 120 structures from across the Hamilton and Koroit areas. The inspections found one major issue regarding a wood pole that had remained in-service following significant fire damage. A further 28 minor issues were also found, including corroded hardware and ties, deteriorated wood crossarms and missing LV spreaders.

The major issue identified by ESV was classified as an immediate safety risk and was replaced the following day. ESV has initiated an investigation into the action or omissions that led to an asset of this condition remaining in service.

The remaining issues found were minor in nature and would be expected to be identified and repaired as part of routine inspection and maintenance activities undertaken by Powercor. ESV required that Powercor rectify these issues in accordance with its priority maintenance practices.

F5.4 Work practices

In 2021-2022, ESV undertook five observations of Powercor work crews across five sites. Four of the observations were planned and one was opportunistic.

The findings of the observations were as follows:

- major non-compliances 0
- minor non-compliances 0
- opportunities for improvement 1

The key area of concern identified by these observations related to hazard identification.

ESV recommended that Powercor's work practices (and those of its contractors) specifically focus on ensuring hazard identification is carried out effectively and identifies all work-related hazards.

In 2021-2022, ESV also carried out two work practices observation of asset inspections by Powercor. One was planned and the other was opportunistic. The findings of the observations were as follows:

- major non-compliances 0
- minor non-compliances 2
- opportunities for improvement 0

All of the findings were classified as ESMS findings. ESV recommended that Powercor focus on ensuring that the work practices of its asset inspectors comply with its ESMS.

F6 Safety indicators

Figure 48 shows the number of all serious electrical incidents reported to ESV via OSIRIS by Powercor during the 2021-2022 period. The green arrows show the reduction from the long-term average across the 2010-2021 period (improvement), and the red arrows show the increase (decline). Figure 49 shows the same for those incidents that result in a ground or vegetation fire.

The most common incidents on the Powercor network in 2021-2022 were vehicle impacts, connection faults, other contact events, crossarm failures and tree contact. Two of these items (vehicle impacts and other contact events) are not within the control of the Powercor, two are within the direct control of Powercor (connection faults and crossarm failures) and one is partly within its control (tree contact). The numbers of incidents were lower in 2021-2022 than the long-term average in all asset failure categories. Vehicle impacts have increased, tree contact is stable and the remaining four contact categories have decreased.

Connection faults, animal contact, vehicle impacts and tree contact were the most common causes of network-related fires. One of these (connection faults) is within full control of Powercor to manage. While two are partially in its control (animal and tree contacts), the greater contribution to tree contacts is from branches blown or trees falling onto powerlines from outside the clearance space. Vehicle impacts are largely outside of Powercor's control.

The numbers of fires in the period were also stable or lower than the long-term average for all asset failure and contact categories.

Powerline maintenance is a compliance and enforcement priority for the 2022-2023 period. Once ESV completes the current pole management reviews, we will start reviewing other asset classes, including connections and crossarms.

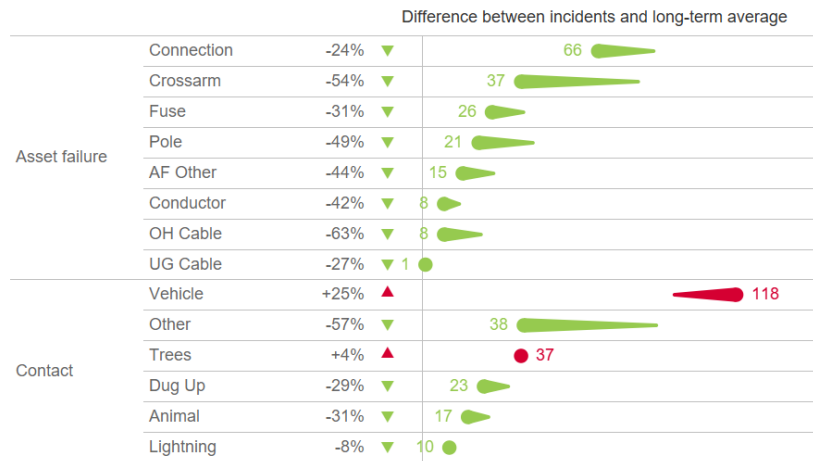


Figure 48 Incidents on the Powercor network

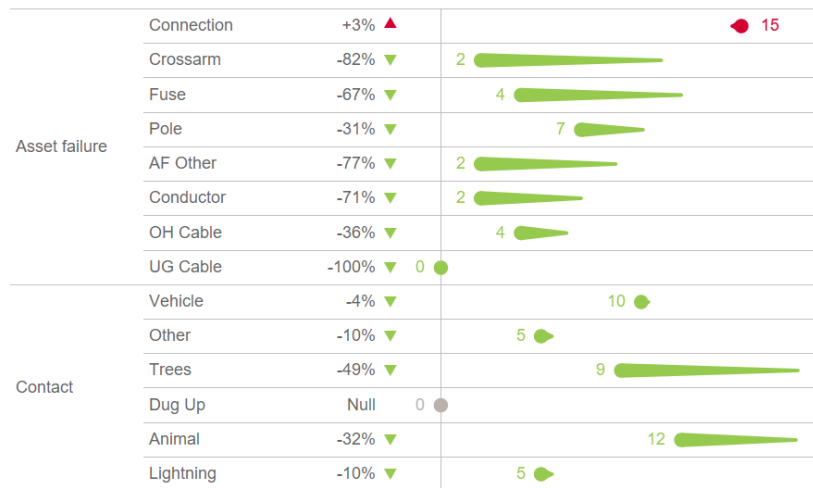


Figure 49 Incidents on the Powercor network resulting in ground fires

Appendix G : TransGrid

TransGrid¹¹ is jointly owned by Canadian pension funds CDPQ and OMERS (22.5 and 20.0 per cent respectively), Utilities Trust of Australia (22.5 per cent), Abu Dhabi investment vehicle Tawreed Investments Limited (20 per cent) and Australian infrastructure manager Spark Infrastructure (15 per cent).

TransGrid operates and manages the high voltage electricity transmission network in NSW and the ACT. Recently, TransGrid has expanded its asset base to include assets in Victoria where it is servicing specific customer projects. These assets include the Deer Park Terminal Station, the Kiamal Terminal Station and the Berrybank Terminal Station and Zone Substation. TransGrid also operates a 7.5 km 220kV overhead transmission line from Berrybank Terminal Station to Berrybank Zone Substation (Figure 50).

The Deer Park Terminal Station is in LBRA. The other TransGrid assets are in HBRA.



Figure 50 Locations of TransGrid assets (orange squares)

¹¹ TransGrid Services Pty Ltd is the listed holder of the electricity transmission licences.

G1 Plans and processes

TransGrid is scheduled to submit the following documents to ESV for review and acceptance/approval:

- a bushfire mitigation plan every five years commencing from the date of the most recent acceptance of a bushfire mitigation plan
- an electric line clearance management plan for the period 1 July 2021 to 30 June 2026 by 31 March 2021.

TransGrid submitted an updated ESMS for review in June 2020. The ESMS was updated to include details of new assets that TransGrid were constructing and for which they would be the owner/operator. The new assets were the Berrybank Terminal Station and Zone Substation, and a 7.5 km 220kV overhead transmission line from Berrybank Terminal Station to Berrybank Zone Substation. ESV reviewed the updated ESMS and accepted the ESMS on 30 July 2020. The ESMS is due for renewal in July 2025.

TransGrid submitted an updated Bushfire Mitigation Plan for review in April 2020. The plan was updated to include details of the new assets listed above. ESV reviewed the plan and accepted the revised plan on 27 May 2020. The Bushfire Mitigation Plan is due for renewal in May 2025.

TransGrid submitted its 2021-2026 electric line clearance management plan to ESV in March 2021, and the plan was approved in advance of the 2021-2022 fire danger period.

G2 Directions

ESV has not had cause to issue directions to TransGrid.

G3 Powerline bushfire safety programs

There are no requirements on TransGrid under the Electricity Safety (Bushfire Mitigation) Regulations 2013.

G4 Exemptions

TransGrid has sought no exemptions from regulations.

G5 Audit performance

G5.1 Electricity Safety Management Scheme (ESMS)

ESV audited TransGrid on its construction planning process and procedures in September 2021. ESV identified two minor non-compliances:

- the ESMS contains incorrect references to documents
- the TransGrid ESMS does not include a process to ensure that line worker licences are regularly checked.

ESV audited the performance of TransGrid in adhering to procedures in February 2022. ESV identified one major non-compliance being that the TransGrid ESMS and associated procedures do not detail the requirement for an incident investigation.

TransGrid provided a plan to address the ESV audit findings and implement these changes in 2022.

G5.2 Electric line clearance

Network pre fire danger period audit

Leading into the 2021-2022 fire danger period, an audit and inspection was conducted on the TransGrid transmission network to confirm it was managing its electric line clearance responsibilities effectively in HBRA. The report was complete with reference to the approved TransGrid 2021-2026 ELCMP.

The audit, which included vegetation management system data analysis, found one minor non-compliance that related to a procedural deficiency relating to vegetation coding.

ESV concluded that TransGrid did not comply with one of the four elements of the approved TransGrid ELCMP that were audited. The identified non-compliance compromised the ability of TransGrid to manage its electricity safety risks as far as practicable.

This is particularly important during a declared fire danger period as it increases the risks of bushfires. That said, a fire did not occur on the TransGrid network in 2021-2022 due to vegetation growing into electric lines.

The field inspection component of the audit found there was not a widespread risk of fires being started by vegetation contacting the network.

TransGrid has committed to addressing the procedural deficiencies identified by ESV through revised procedures in its ELCMP. ESV will review the application of these mitigation strategies as part of the 2022-2023 auditing and inspection programs.

Network inspection

During the 2021-2022 period, ESV inspected all 24 spans on the TransGrid transmission network, and one of those inspected was found to be non-compliant.

ESV issued a section 86(1) notice to TransGrid for the identified non-compliant span. The span was cleared by TransGrid as a matter of priority, resulting in the elimination of that potentially hazardous situation.

TransGrid is a new transmission network that has large and typically well-established clearance easements. The non-compliance identified during the inspections related to vegetation that existed on the outer fringe of the required minimum clearance space and, therefore, did not create a significant risk.

This is the second year ESV has inspected the TransGrid transmission network. Its performance has improved when compared to 2020-2021 when ESV identified two non-compliant spans.

G5.3 Bushfire mitigation

As the TransGrid assets are new station assets and require little maintenance at this early stage of their lifecycle, ESV determined there is greater merit in deploying resources to audits of the other distribution and transmission bushfire mitigation plans. TransGrid assets will be audited prior to the 2022-2023 bushfire period.

G5.4 Work practices

ESV is yet to undertake a work practice observation of TransGrid as its assets are relatively new (commissioned in 2017) requiring very little maintenance at this stage of its life cycle.

G6 Safety indicators

Transmission infrastructure generally has low levels of incidents due to the nature of the assets and the clearances maintained around these higher voltage assets. Transmission assets are concentrated in fewer, larger and better defined easements than distribution assets, thereby reducing exposure to environmental threats and third-party impacts. This also makes them easier to maintain.

The risks associated with TransGrid are reduced by it currently comprising only terminal station and zone substation assets and only having been operating for a short time. As such, TransGrid's Victorian assets also have not entered a phase of their life cycle where major maintenance is required.

TransGrid recorded no incidents involving its network assets during the 2021-2022 period.

Appendix H : Transmission Operations Australia

Transmission Operations (Australia)¹² (TOA) is jointly owned by Cheung Kong Infrastructure Holdings Ltd (50 per cent) and Power Assets Holdings Ltd (50 per cent). Both are part of the Cheung Kong Group of companies. Trading together as Australian Energy Operations, they also own Transmission Operations (Australia) 2.

Together they hold a majority ownership (51 per cent) of the CitiPower/ Powercor Group of companies, which are contracted to provide services in support of ongoing TOA operations. As of May 2017, Cheung Kong Infrastructure also holds majority ownership (66 per cent) of United Energy.

TOA owns and operates the connections from the Mt Mercer Wind Farm and from the Moorabool North and South Wind Farms to the electrical transmission network (Figure 51). The Mt Mercer transmission line is a 22km 132kV powerline and the Moorabool North and South transmission line is a 30km 132kV powerline. Both connect to the Elaine Terminal Station, which steps the voltage up from 132kV to 220kV for injection into the AusNet Services transmission network.

The TOA asset base in Victoria is significantly smaller than that of AusNet Services Transmission; it has only 2-3 per cent of the towers and poles that AusNet Services owns and maintains. Its assets are also newer, with the Mt Mercer transmission line having been commissioned in November 2013 and the Moorabool North and South transmission line being commissioned in July 2020.

All of the TOA network is in HBRA.



Figure 51 Location of TOA transmission assets (orange square)

¹² Transmission Operations (Australia) Pty Ltd is the listed holder of the electricity transmission licence.

H1 Plans and processes

TOA is scheduled to submit the following documents to ESV for review and acceptance/approval:

- a bushfire mitigation plan every five years commencing from the date of the most recent acceptance of a bushfire mitigation plan
- an electric line clearance management plan for the period 1 July 2021 to 30 June 2026 by 31 March 2021.

TOA submitted a joint TOA/TOA2 ESMS for review in May 2019. Final acceptance of the ESMS was granted by ESV on 26 October 2020. The ESMS is due for resubmission in October 2025.

TOA/TOA2 submitted an updated 2019-2024 Bushfire Mitigation plan on 23 July 2019. The plan was updated to include both TOA and TOA2 assets in the same plan. ESV accepted the revised plan on 21 May 2020. The Bushfire Mitigation plan is due for resubmission in October 2025.

TOA submitted its 2021-2026 electric line clearance management plan to ESV in March 2021, and the plan was approved in advance of the 2021-2022 fire danger period.

H2 Directions

ESV has not had cause to issue directions to TOA.

H3 Powerline bushfire safety programs

There are no requirements on TOA under the Electricity Safety (Bushfire Mitigation) Regulations 2013.

H4 Exemptions

TOA has sought no exemptions from regulations.

H5 Audit performance

H5.1 Electricity Safety Management Scheme (ESMS)

ESV audited the performance of TOA (together with CitiPower, Powercor and TOA2) in adhering to procedures in November 2021. ESV identified one minor non-compliance, being the TOA No Go Zone procedure was incomplete.

TOA will provide a plan to address the ESV audit findings and implement these changes in 2022.

H5.2 Electric line clearance

Network pre fire danger period audit

Leading into the 2021-2022 fire danger period, an audit and inspection was conducted for the TOA transmission network to confirm it was managing its electric line clearance responsibilities effectively in HBRA. The audit was completed with reference to the approved TOA ELCMP.

The audit, which included vegetation management system data analysis, found one minor non-compliance and one opportunity for improvement. The non-compliances related to procedural deficiencies for vegetation coding and the accuracy of vegetation coding.

Through the audit and inspection process, ESV concluded that TOA did not comply with one of the four elements of the approved TOA ELCMP that were audited. The identified non-compliance compromised the ability of TOA to manage its electricity safety risks as far as practicable.

This is particularly important during a declared fire danger period as it increases the risks of bushfires. That said, the field inspection component of the audit found there was little to no risk of fires being started by vegetation growing and contacting the network.

The TOA transmission network has large well-established clearance easements, and no non-compliance was identified during ESV inspections.

TOA has committed to addressing the procedural deficiency identified by ESV through revised procedures in its electric line clearance management plan. ESV will review the application of these mitigation strategies as part of the 2022-2023 auditing and inspection programs.

Network inspection

During the 2021-2022 period, ESV inspected 35 of the 262 spans on the TOA transmission network. No spans were found to be non-compliant.

In 2019-2020, ESV noted that there had been a steady increase in the rate of non-compliant vegetation affecting this network each year since 2016-2017.

In last year’s network safety performance report, we noted that the upward trend had been addressed with a reduced non-compliance rate being observed in 2020-2021. This reduction has continued into the 2021-22 period (Figure 52).

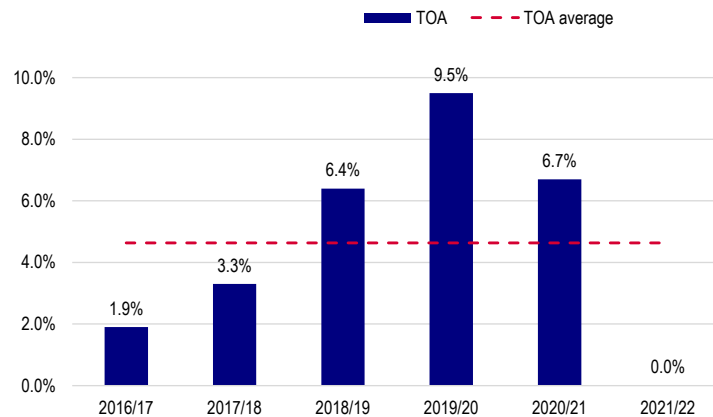


Figure 52 Non-compliance rates for TOA

H5.3 Bushfire mitigation

ESV reviewed 371 asset records for each of the TOA lines running from the Elaine Terminal Station, one to the Mt Mercer Wind Farm and the other to the Moorabool North and South wind farms.

The review found no structures outside the inspection cycle timeframes identified in the TOA bushfire mitigation plan.

ESV inspected 27 structures across the TOA lines. The inspections identified no serious issues, and two minor issues relating to broken earth connector strands. Generally the inspection found the lines to be in good condition, as would be expected given they are relatively new assets.

The issues found were minor in nature and would normally be identified and repaired as part of routine inspection and maintenance activities undertaken by TOA. ESV required that TOA rectify the identified issues in accordance with its priority maintenance practices.

H5.4 Work practices

ESV is yet to undertake a work practice observation of TOA as the transmission line is expected to be operational almost all the time. Furthermore, this is a relatively new asset (commissioned in November 2013) requiring very little maintenance at this stage of its life cycle.

H6 Safety indicators

Transmission infrastructure generally has a low level of incidents due to the nature of the assets and the clearances maintained around these higher voltage assets. Transmission assets are concentrated in fewer, larger and better defined easements than distribution assets, thereby reducing exposure to environmental threats and third-party impacts. This also makes them easier to maintain.

The risks associated with TOA are reduced by it being a short transmission line and only having been operating for a short time. Being a relatively new asset, TOA also has not entered a phase of its life cycle where major maintenance is required.

TOA recorded no incidents on its transmission network during the 2021-2022 period.

Appendix I : Transmission Operations Australia 2

Transmission Operations (Australia) 2¹³ (TOA2) is jointly owned by Cheung Kong Infrastructure Holdings Ltd (50 per cent) and Power Assets Holdings Ltd (50 per cent). Both are part of the Cheung Kong Group of companies. Trading together as Australian Energy Operations, they also own Transmission Operations (Australia).

Together they hold a majority ownership (51 per cent) of the CitiPower/ Powercor Group of companies, which are contracted to provide services in support of ongoing TOA2 operations. As of May 2017, Cheung Kong Infrastructure also holds majority ownership (66 per cent) of United Energy.

TOA2 owns and operates the connection from the Ararat Wind Farm to the electrical transmission network (Figure 53). This includes a 21 km 132kV powerline and the Ararat Terminal Station, which steps the voltage up from 132kV to 220kV for injection into the AusNet Services transmission network.

The TOA2 asset base in Victoria is significantly smaller than that of AusNet Services Transmission; it has less than one per cent of the towers and poles that AusNet Services owns and maintains. Its assets are also newer, having only been commissioned in June 2016.

All of the TOA2 network is in HBRA.



Figure 53 Location of TOA2 transmission assets (orange square)

¹³ Transmission Operations (Australia) 2 Pty Ltd is the listed holder of the electricity transmission licence.

I1 Plans and processes

TOA2 is scheduled to submit the following documents to ESV for review and acceptance/approval:

- an Electricity Safety Management Scheme (ESMS) before October 2025
- a bushfire mitigation plan every five years commencing from the date of the most recent acceptance of a bushfire mitigation plan
- an electric line clearance management plan for the period 1 July 2021 to 30 June 2026 by 31 March 2021.

TOA2 submitted a joint TOA/TOA2 ESMS for review in May 2019. Final acceptance of the ESMS was granted by ESV on 26 October 2020. The ESMS is due for resubmission in October 2025.

TOA/TOA2 submitted an updated 2019-2024 Bushfire Mitigation plan on 23 July 2019. The plan was updated to include both TOA and TOA2 assets in the same plan. ESV accepted the revised plan on 21 May 2020. The Bushfire Mitigation plan is due for resubmission in October 2025.

TOA2 submitted its 2021-2026 electric line clearance management plan to ESV in March 2021, and the plan was approved in advance of the 2021-2022 fire danger period.

I2 Directions

ESV has not had cause to issue directions to TOA2.

I3 Powerline bushfire safety programs

There are no requirements on TOA2 under the Electricity Safety (Bushfire Mitigation) Regulations 2013.

I4 Exemptions

TOA2 has sought no exemptions from regulations.

I5 Audit performance

I5.1 Electricity Safety Management Scheme (ESMS)

ESV audited the performance of TOA2 (together with CitiPower, Powercor and TOA) in adhering to procedures in November 2021. ESV identified one minor non-compliance, being the TOA2 No Go Zone procedure was incomplete.

TOA2 will provide a plan to address the ESV audit findings and implement these changes in 2022.

I5.2 Electric line clearance

Network pre fire danger period audit

Leading into the 2021-2022 fire danger period, an audit and inspection was conducted for the TOA2 transmission network to confirm it was managing its electric line clearance responsibilities effectively in HBRA. The audit was completed with reference to the approved TOA2 ELCMP.

The audit, which included vegetation management system data analysis, found one minor non-compliance and one opportunity for improvement. The non-compliance related to procedural deficiencies for vegetation coding.

Through the audit and inspection process ESV concluded that TOA2 did not comply with one of the four elements of the approved TOA2 ELCMP that were audited. The identified non-compliances compromised the ability of TOA2 to manage its electricity safety risks as far as practicable.

This is particularly important during a declared fire danger period as it increases the risks of bushfires. That said, the field inspection component of the audit found there was little to no risk of fires being started by vegetation growing and contacting the network.

The TOA2 transmission network has large well-established clearance easements and no non-compliance was identified during ESV inspections.

TOA2 has committed to addressing the procedural deficiency identified by ESV through revised procedures in its ELCMP. ESV will review the application of these mitigation strategies as part of the 2022-2023 auditing and inspection programs.

Network inspection

During the 2021-2022 period, ESV inspected 20 of the 106 spans on the TOA2 transmission network. None of those inspected was found to be non-compliant.

ESV considered this to be an excellent result, especially given the non-compliance rate for TOA2 has been zero every year since 2016-2017, with the exception of 2017-2018 when it had a non-compliance rate of 1.3 per cent.

15.3 Bushfire mitigation

ESV reviewed 107 asset records being the full TOA2 132kV line from Ararat Wind Farm to Ararat Terminal Station, which is situated entirely within hazardous bushfire risk area. The review found no assets outside the inspection cycle timeframes identified in the joint TOA/TOA2 bushfire mitigation plan.

ESV inspected 19 structures across TOA2 network from the above nominated areas. The inspections identified no serious issues, and generally found the line to be in good condition and reflective of its relatively young age (commissioned in July 2016).

15.4 Work practices

ESV is yet to undertake a work practice observation of TOA2 as the transmission line is expected to be operational almost all the time, and is a relatively new asset (commissioned in June 2016) requiring very little maintenance at this stage of its life cycle.

16 Safety indicators

Transmission infrastructure generally has low levels of incidents due to the nature of the assets and the clearances maintained around these higher voltage assets. Transmission assets are concentrated in fewer, larger and better defined easements than distribution assets, thereby reducing exposure to environmental threats and third-party impacts. This also makes them easier to maintain.

The risks associated with TOA2 are reduced by it being a short transmission line and only having been operating for a short time (one year). Being a relatively new asset, TOA2 also has not entered a phase of its life cycle where major maintenance is required.

TOA2 recorded no incidents on its transmission network during the 2021-2022 period.

Appendix J : United Energy

United Energy¹⁴ is jointly owned by a CK Infrastructure-led consortium (CKI consortium) (66 per cent) and SGSP (Australia) Assets Pty Ltd (34 per cent).

CKI consortium, together with Power Asset Holdings, also owns 51 per cent of CitiPower/Powercor and 50 per cent of Transmission Operations (Australia) and Transmission Operations (Australia) 2.

SGSP (Australia) Assets owns 100 per cent of Jemena.

The CKI consortium purchased the DUET Group in May 2017, thereby gaining majority ownership of United Energy. There followed a consolidation of activities and processes across the companies the consortium controls. Of most relevance from a safety perspective was the introduction into United Energy of CitiPower/Powercor procedures for assessing vegetation clearance at height.

United Energy has engaged Zinfra as a subcontractor to manage aspects of its operations and maintenance services. Any reference to United Energy within this section also encompasses Zinfra operations on United Energy assets.

The distribution network covers an area of approximately 1,470 km² across Melbourne's eastern and south-eastern suburbs and the Mornington Peninsula (Figure 54). It comprises approximately 9,920 km of overhead line, 4,010 km of underground cable, 168,500 poles and 35,000 public lighting poles. Half of the United Energy network (50 per cent) is in HBRA.



Figure 54 Service area for the United Energy distribution network (orange area)

Jemena and CitiPower service boundaries are shown as orange lines

¹⁴ United Energy Distribution Pty Ltd is the listed holder of the electricity distribution licence.

J1 Plans and processes

United Energy was scheduled to submit the following documents to ESV for review and acceptance/approval:

- a bushfire mitigation plan every five years starting on the date of the most recent acceptance of a bushfire mitigation plan; often revised plans have been accepted more frequently due to regular changes in the regulations or company practices
- an electric line clearance management plan for the period 1 July 2021 to 30 June 2026 by 31 March 2021.

United Energy submitted a revised bushfire mitigation plan in March 2018. ESV reviewed the revised plan and accepted the plan on 12 August 2019. The Bushfire Mitigation plan is due for resubmission in August 2024.

United Energy submitted its 2021-2026 electric line clearance management plan to ESV in March 2021, and the plan was approved in advance of the 2021-2022 fire danger period.

J2 Directions

There are currently no directions on United Energy.

J3 Powerline bushfire safety programs

United Energy has no regulatory obligation to install REFCLs at any of its zone substations. Even so, United Energy has elected to install REFCLs at Frankston South, Momington and Dromana zone substations.

The last of the three installations (Dromana) was completed in December 2019.

J4 Exemptions

There are no exemptions currently applicable to United Energy.

J5 Audit performance

J5.1 Electricity Safety Management Scheme (ESMS)

ESV audited the performance of United Energy in adhering to procedures in November 2021. ESV identified one opportunity for improvement relating to an improved form for collection of No Go Zone information.

United Energy will provide a plan to address the ESV audit findings and implement these changes in 2022.

J5.2 Electric line clearance

Network pre fire danger period audit

Leading into the 2021-2022 fire danger period, an audit and inspection was conducted on the United Energy network to confirm it was managing its electric line clearance responsibilities effectively in HBRA. The audit was completed with reference to the approved United Energy ELCMP.

The audit, which included vegetation management system data analysis, found two major and two minor non-compliance. The non-compliances related to procedural deficiencies for vegetation inspection and clearing rectification timeframes and vegetation coding.

ESV concluded that United Energy was not strictly managing its line clearance responsibilities as required by its approved ELCMP. This compromised its ability to comply with the regulations and the Code, and to manage its electricity safety risks as far as practicable.

This is particularly important during a declared fire danger period as it increases the risks of bushfires. That said, a fire did not occur as a result of vegetation growing into electric lines on the United Energy network in 2021-2022.

United Energy has committed to addressing the procedural deficiencies identified by ESV through revised procedures in its ELCMP. In addition, it continues to seek additional resources to better enable it to manage its electric line clearance duties and obligations.

ESV will review the application of these mitigation strategies as part of the 2022-2023 auditing and inspection programs. ESV will continue to closely monitor this situation and, if necessary, intervene or undertake enforcement action to ensure United Energy meets its electric line clearance duties and obligations.

Network inspection

During the 2021-2022 period, ESV inspected 3,766 spans on the United Energy network — 1,756 in HBRA and 2,010 in LBRA.

ESV identified 357 non-compliant spans across the network, with 256 in HBRA and 101 in LBRA. ESV issued section 86(1) notices to United Energy for all identified non-compliant spans. All were cleared by United Energy as a matter of priority, resulting in the elimination of these potentially hazardous situations.

In 2021-2022, ESV observed a small increase in the rate of major non-compliance affecting the United Energy network when compared to the rates observed in 2020-2021 (Figure 55). A major non-compliance is regarded as high risk where vegetation is touching, or could soon touch, uninsulated conductors.

Since 2017-2018, the overall rate of non-compliant vegetation on the United Energy distribution network has been getting progressively worse in HBRA (Figure 9). This contrasts with non-compliance in LBRA, which has decreased markedly from the major peak in 2018-2019 (Figure 10).

The rate of major non-compliances in HBRA this year was slightly better than in 2020-2021. The rate of major non-compliance in LBRA has increased since 2020-2021.

Significant improvement is needed to address the increasing and/or variable rates of non-compliance affecting the United Energy network, particularly the growth in non-compliance in HBRA.

ESV is closely monitoring the performance of United Energy through its safety regulation programs.

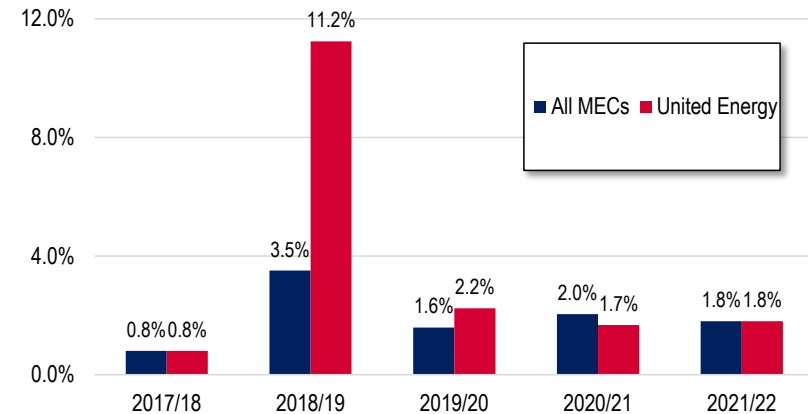


Figure 55 Rate of major non-compliances (HBRA and LBRA)

J5.3 Bushfire mitigation

ESV reviewed 168,488 asset records from across the entire United Energy network and found two HBRA structures outside the inspection cycle timeframes identified in the United Energy bushfire mitigation plan. ESV recommended that United Energy develop appropriate actions that will address these findings.

ESV inspected 131 structures across the Langwarrin and Hastings areas. The inspections identified no serious issues, and 21 minor issues relating to conductor ties with a broken strand, corroded insulator pins and loose hardware. ESV required that United Energy rectify these identified issues in accordance with its priority maintenance practices.

The issues found were minor in nature and would normally be identified and repaired as part of routine inspection and maintenance activities undertaken by United Energy. ESV required that United Energy rectify the identified issues in accordance with its priority maintenance practices.

J5.4 Work practices

In 2021-2022, ESV undertook four observations of United Energy work crews across four sites. Three of the observations were planned and one was opportunistic. The findings of these observations were as follows:

- major non-compliances 0
- minor non-compliances 0
- opportunities for improvement 1

The key area of concern identified by these observations related to hazard identification.

ESV recommended that United Energy’s work practices specifically focus on ensuring hazard identification is carried out effectively and identifies all work-related hazards.

In 2021-2022, ESV also carried out a planned work practices observation of asset inspections by United Energy. The findings of the observation were as follows:

- major non-compliances 0
- minor non-compliances 3
- opportunities for improvement 1

All of the findings were classified as ESMS findings. ESV recommended that United Energy focus on ensuring that the work practices of its asset inspectors comply with its ESMS.

J6 Safety indicators

Figure 56 shows the number of all serious electrical incidents reported to ESV via OSIRIS by United Energy during the 2021-2022 period. The green arrows show the reduction from the long-term average across the 2010-2021 period (improvement), and the red arrows show the increase (decline). Figure 57 shows the same for those incidents that result in a ground or vegetation fire.

The most common incidents on the United Energy network in 2021-2022 were tree contact, vehicle impacts, connection faults and other contact events. One of these items is within the full control of the United Energy (connection faults), tree contacts are partially within its control and the other two are outside its control.

The numbers of all asset failure incidents were lower in 2021-2022 than the long-term average, with the exception of HV fuse failures and underground cable faults. Contact events were higher in four categories and lower in two categories.

Tree contact and connection faults were the most common causes of network-related fires. One of these is within the full control of United Energy (connection faults) and the other is partly within its control (tree contact). Fires are higher than the long-term average in three categories and lower (or zero) in eleven categories. Twelve categories recorded a single fire or no fires in 2021-2022.

Powerline maintenance is a compliance and enforcement priority for the 2022-2023 period. Once ESV completes the current pole management reviews, we will start reviewing other asset classes, including connections.

This issue was raised by ESV during the May 2022 audit of United Energy. ESV will determine what specific steps should be taken to minimise this safety risk as far as practicable, in accordance with United Energy’s general duty.

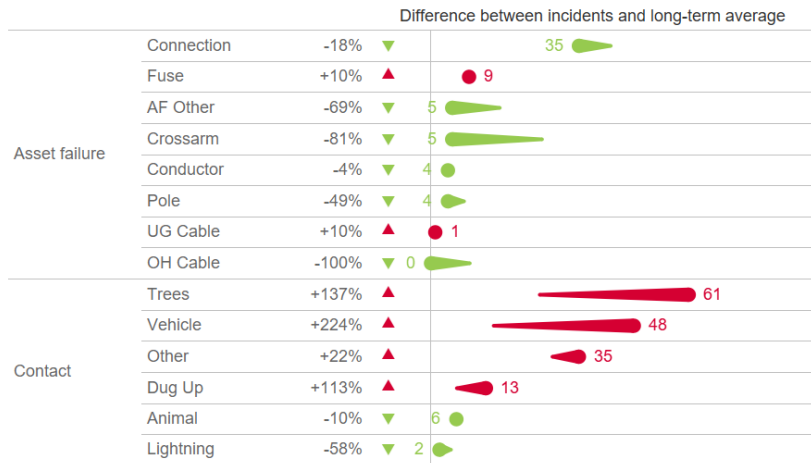


Figure 56 Incidents on the United Energy network

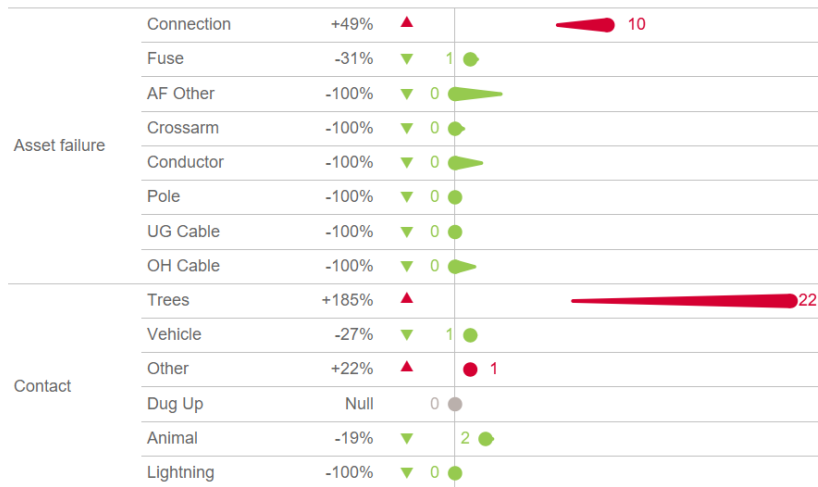


Figure 57 Incidents on the United Energy network resulting in ground fires

Appendix K : Weather modelling and ‘at risk’ days

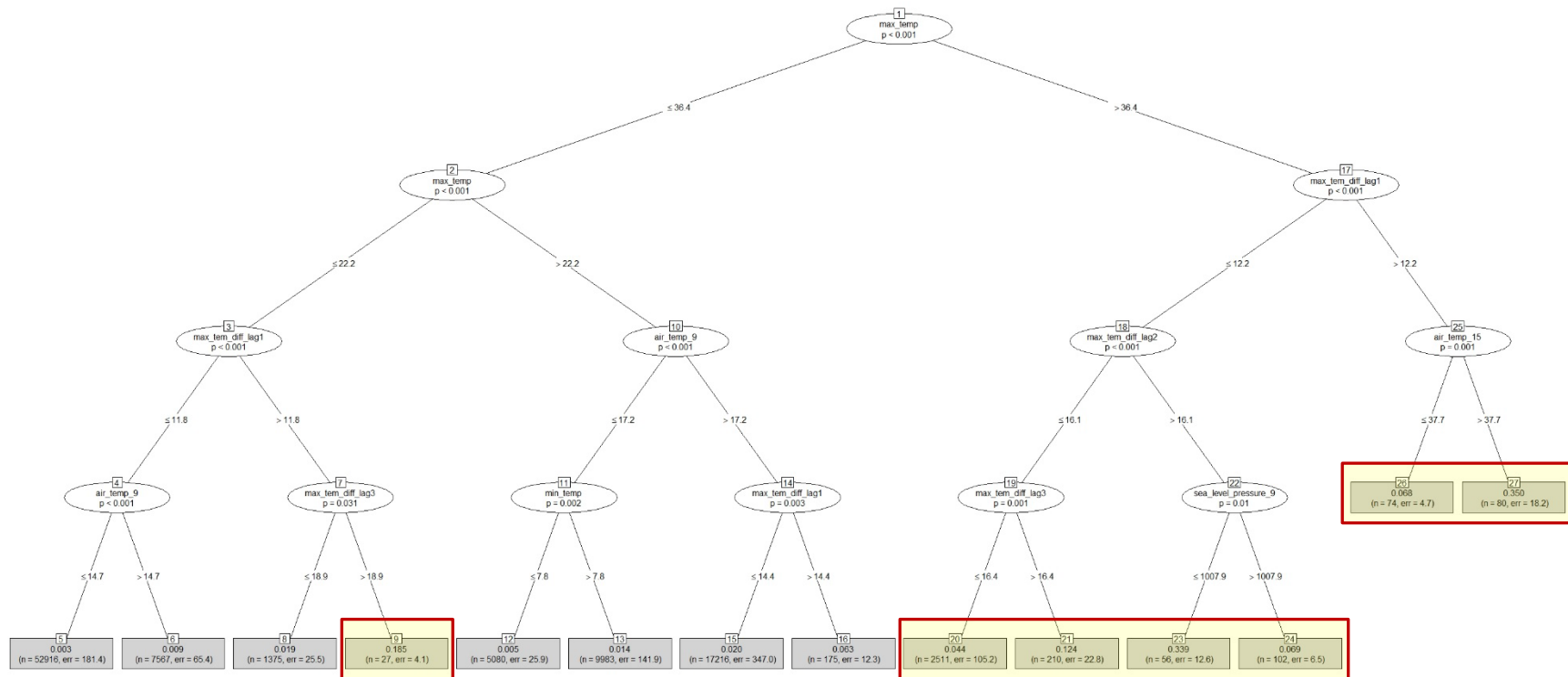


Figure 58 Partitioning of asset failure fires based on the contribution of different environmental factors

Asset failure fires

Asset failure fires were most likely to arise when the maximum daily temperature exceeded 36.4 degrees Celsius (Figure 58).

There was also contribution when the maximum temperature was less than 22.2 degrees Celsius, the temperature difference with the preceding day was more than 11.8 degrees Celsius and the difference with three days prior is more than 18.9 degrees Celsius.

The conditions that we determined would define an asset failure ‘at risk’ day comprised clusters 27, 23, 9, 21, 24, 26, and 20 in order from most to least importance. These clusters have been highlighted in Figure 58.

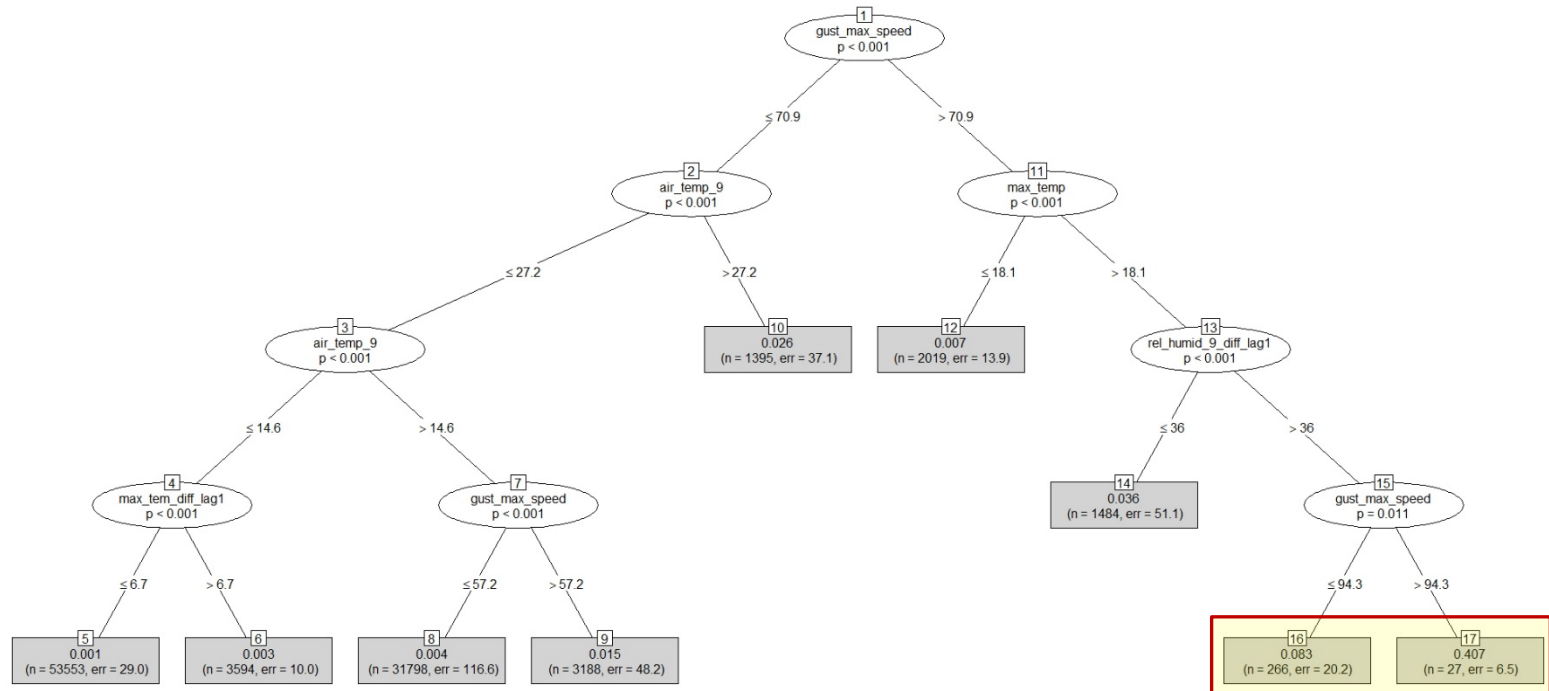


Figure 59 Partitioning of vegetation contact fires based on the contribution of different environmental factors

Vegetation contact fires

Vegetation contact fires were most likely to arise when the maximum wind gust was in excess of 70.9 km/h, the maximum temperature exceeded 18.1 degrees Celsius and the difference in morning humidity from the previous day exceeded 36 per cent (Figure 59).

The conditions that we determined would define a vegetation contact ‘at risk’ day comprised cluster 17 and 16 in order from most to least importance. These clusters have been highlighted in Figure 59.

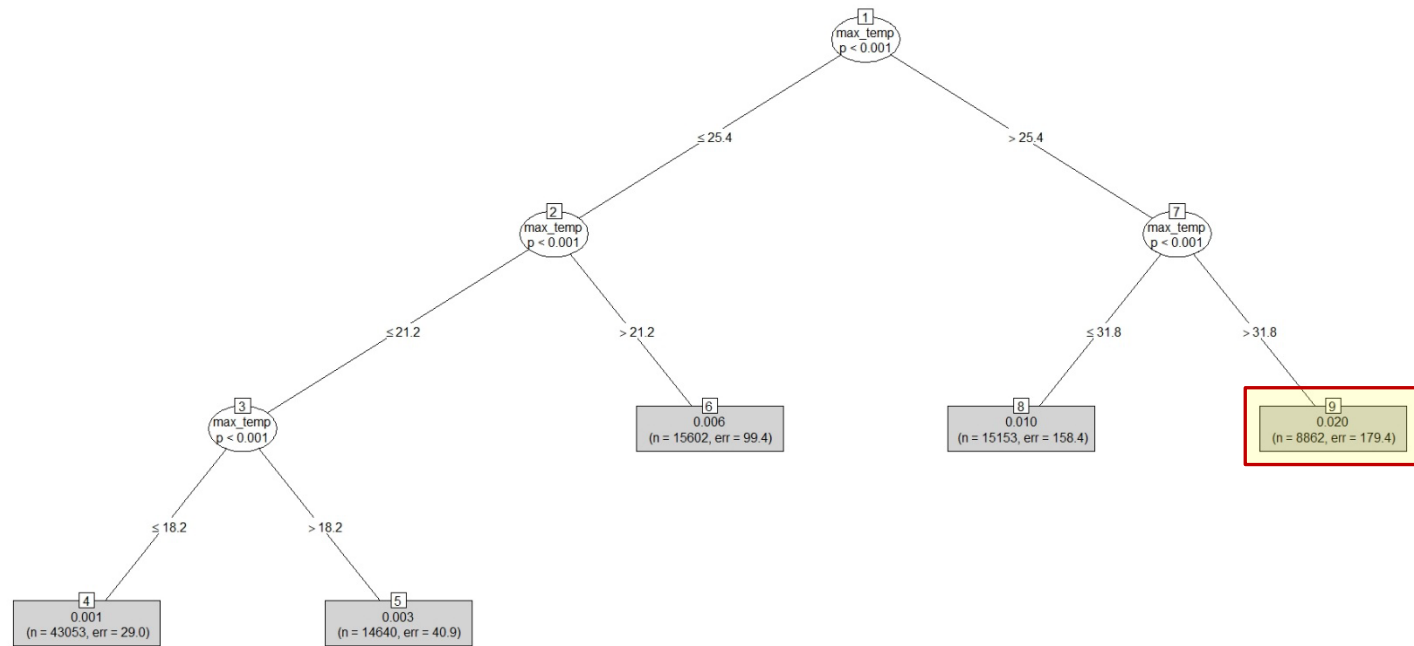


Figure 60 Partitioning of other contact fires based on the contribution of different environmental factors

Other contact fires

Other contact fires were most likely to arise when the maximum daily temperature exceeded 31.8 degrees Celsius (Figure 60).

The conditions that we determined would define an ‘at risk’ day for other contact fires comprised cluster 9. This cluster has been highlighted in Figure 60.

