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Creating a safer state with electricity and gas

Safety performance report on Victorian electricity networks

October 2020

VICTORIA State Government

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

Authorised and published by the Victorian Government
Melbourne October 2020

ISBN-13: 978-1-925838-39-8 (print)

ISBN-13: 978-1-925838-37-4 (online)

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

Foreword

This year has seen Energy Safe Victoria embark on a period of major transformation. Part of this was our continuing drive to implement the recommendations of the *Independent Review of Victoria's Electricity and Gas Network Safety Framework* and part was in response to the extraordinary events of the last twelve months.

After a decade, my predecessor Paul Fearon retired in February 2020. I subsequently took over as Director of Energy Safety and Chair Designate for the ESV Commission in March 2020. My appointment is the first step in transforming ESV from a single member statutory office into an organisation led by three Commissioners. The recruitment of the remaining two Commissioners is underway, and the new Commission structure will commence on 1 January 2021.

Our aspiration is to be a data-driven and proactive regulator that is better positioned to hold those we regulate to account. We are already adjusting our operating model and our enforcement and compliance approach to deliver this goal. Equally important, we want to ensure that we support industry participants to comply by providing good quality information on what is required to meet regulatory obligations and ensure our community safety awareness campaigns are appropriately targeted. These changes will ensure ESV remains a modern, fit for purpose regulator that can better engage with the community and regulate more effectively.

As part of this, we have been working to improve ESV's data culture and data and analytics capabilities. Operational reporting to management across the business has been improved. Our OSIRIS incident reporting system has been expanded to align it with recent changes in the regulations. We have built an external dashboard environment to share insights with those we regulate and with the Minister, DELWP and ultimately the broader community.

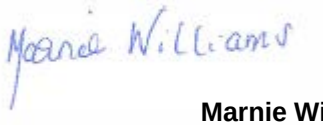
Between data we create ourselves from our audits, inspections and observations and the data we receive from others about incidents, we are developing rich datasets to provide insights into issues on the networks and with other responsible parties. This will help us better target our regulatory activities based on risk.

Tragically, there were two fatalities and three incidents involving serious injuries this year. All involved the public. All were preventable. While holding those responsible to account is important, our primary focus is on preventing such tragedies.

The simultaneous bushfires in all states along the eastern seaboard were without parallel. None of the major fires were caused by electrical assets. We need to do all we can to ensure that this continues.

Asset management should not be about keeping one step ahead of impending failure; safety outcomes need to be sustainable. Lives, property and livelihoods depend on this. We are therefore ramping up our oversight of the networks' asset management practices. The rapid earth fault current limiter program for bushfire prevention and changes to wooden pole maintenance and inspection practices have already begun to yield improved safety outcomes.

Then, as soon as the bushfires abated coronavirus (COVID-19) was upon us. The lights stayed on, the networks kept operating and the safety risks remained. Our field staff observed health directions and kept working without placing themselves or the community at risk. Our entire staff moved to working from home and implemented new systems and ways of working remotely to ensure continuity of operations. We fundamentally changed the way we do business, and did so rapidly, efficiently and without fuss. I was greatly impressed by the dedication, the determination and the cooperation of ESV's people during this period.



Marnie Williams
Director of Energy Safety

Executive summary

This report addresses the financial year from July 2019 to June 2020. The report reviews the performance of the major electricity companies and analyses their performance over time, while looking for common themes and issues the industry faces.

Sadly, there were again two fatalities this year that were associated with electrical network infrastructure.

In November 2019, a worker received a shock when his metal tape measure contacted a high voltage powerline causing him to fall from the scaffolding on which he was working. He subsequently died from his multiple injuries. ESV supported Worksafe Victoria, the lead agency for this incident, in its investigations and reporting to the Coroner.

In April 2020, a trespasser in a CitiPower substation was electrocuted while allegedly stealing copper. ESV has produced an incident report for Victoria Police.

There were also two incidents involving electricity distribution assets that resulted in serious injuries. Both occurred in February 2020. Both involved plumbers working on roofs coming into contact with live assets. One involved contact with a service cable that had deteriorated insulation; the other involved metal battens being manually lifted contacting a high voltage powerline. The worker fatality and these two injuries stress the need for ESV to continue and enhance our ongoing industry awareness campaigns.

The Electricity Safety (Bushfire Mitigation) Regulations require the distribution businesses to reduce the bushfire risk presented by the lines emanating from 45 zone substations. This is being achieved through the deployment of rapid earth fault current limiters (REFCL) and the replacement of bare conductors with underground cables or covered conductors in specified areas.

As of 30 June 2020, all except two Tranche 1 sites (due 1 May 2019) were accepted as achieving the required capacity as stipulated in the regulations. The two exceptions are the AusNet Services REFCL at Kinglake and Woori Yallock zone substations, where conditional acceptance was granted; these have been granted time extensions to resolve some technical issues impacting full compliance. Nonetheless, both REFCLs are in service. The distribution businesses are required to deliver required capacity at the Tranche 2 substations by May 2021. Two of these 17 substations, were accepted as having delivered the required capacity as of 30 June 2020. The program remains a challenge to deliver, but the businesses are making good progress; all of the substantive technical issues have been overcome.

As well as continuing to work closely with the Australian Energy Regulator (AER) in validating the F-Factor fire start reports produced by the distribution businesses, ESV also continues to work closely with the AER as the businesses come closer to finalising their electricity distribution price review submissions.

We have completed our assessment of the Electrical Safety Management Schemes of all distribution and transmission businesses. We have completed major investigations into the condition of poles in southwest Victoria and into the broader pole management practices of Powercor. These reports are available on our website. The reports concluded there was no immediate risk of systemic failure. We also made several recommendations about Powercor's pole management practices to ensure a systemic problem does not materialise in the future. ESV has now begun a similar investigation into the pole management practices of AusNet Services; we anticipate reporting the results of that investigation in December 2020. Our previously reported investigations into the Garvoc and Terang fires of St Patrick's Day 2018 are complete and, as a consequence, charges have been laid and the matter is now before the courts.

Our focus on the vegetation management practices of the distribution businesses has delivered improved community safety. High risk noncompliance from vegetation in close proximity to high voltage conductors is being reduced across the distribution networks. A 'by-product' of this reduction in high risk noncompliance has been an increase in

technical noncompliance; that is vegetation that is beginning to encroach the clearance space, but not yet presenting a threat. Clearly, this will remain a focus for both ESV and the distribution businesses as we drive them towards full compliance with the regulations.

We have continued to focus on the performance of local councils, where we found compliance to be seriously poor in some cases. Often this is the result of unfamiliarity with the requirements and/or the tension between the maintenance of visual amenity and electrical safety. It is unfortunate that if a local council fails to comply for long periods of time, it only exacerbates the impact on visual amenity when large limbs have to be removed from trees to achieve compliance.

ESV is engaging with local councils as their most senior levels to bring attention to these issues that impact supply reliability and community safety. Our strategy is to direct them to clear unsafe vegetation as a matter of urgency, get them on agreed trajectories to achieve full compliance, track their progress and take enforcement action if they fail to deliver as agreed. To date, local councils are understanding their responsibilities and responding appropriately.

Generally, network fault performance is improving, save for two areas; connection faults and ‘other contact’ events. The increase in connection faults (joints and terminations) beyond historical norms is disconcerting and warrants further discussions with the distribution business to better understand the nature and cause of these faults. The generic category of ‘other contact’ failures refers to a collection of less frequent issues including inadvertent third party interference through no go zone infringements and deliberate interference through theft. ESV is working closely with the distribution businesses, WorkSafe Victoria and Dial Before You Dig to influence third party interference.

This report contains further and improved analysis of the contributory factors to fires in general and fires on the greatest at-risk days. This analysis shows that the number of at -risk days for asset-related fires is decreasing while the frequency of fires on these days is increasing slightly. The trend for vegetation contact fires is that the numbers of at-risk days are increasing and, while the frequency of fires on these days is also increasing, the increase is at a lower rate. We will do more work to establish whether this is attributable to improving vegetation management practice or there is some other variable at play.

As foreshadowed in the previous report, we have further developed our oversight of the distribution businesses as we delve into their asset management practice. We have now established a specialist asset management team tasked with testing the plans and practices of the distribution and transmission businesses. This will ensure these businesses are acting in the best interests of the community in delivering sustainable safety outcomes into the future. This is essentially a new regulatory position where we are looking to ensure the long to medium term future is better assured as opposed to the more established position of looking to the present and the immediate future.

I cannot let this report pass without making reference to the impact of coronavirus on ESV and our regulatory activities. Our approach has been to continue with as much of our work as possible. We have maintained our presence in the field and continued our oversight of the network businesses unabated. Our vegetation and asset inspectors have remained in the field so we may ensure there is no let-up in network preparation for the coming fire season. Stopping our field work was not an option while trees keep growing and networks keep operating. We made this call in the knowledge that our people have all the necessary protective equipment, and we could undertake our work without compromising regional communities. We have been conscious of striking a balance between the current threat posed by the virus and the future threat posed by bushfires.

Ian Burgwin
General Manager
Electrical Safety and Technical Regulation

Contents

Energy Safe Victoria (ESV) is the independent technical regulator responsible for electricity, gas and pipeline safety in Victoria. 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 2019-2020 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 the highest priority for ESV, and therefore the investigation of serious electrical incidents is a key function of ESV. 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.

Two fatalities and three serious injuries occurred during the 2019-2020 period that were associated with Victoria's network assets. There was also a major incident involving the failure of transmission towers near Cressy during a storm event. ESV investigated all these events, 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

St Leonards fatality

On 25 November 2019, a 37 year old construction worker was reported to have received a serious injury after making contact with a powerline. ESV immediately attended the site together with representatives from Victoria Police and WorkSafe Victoria.

The incident occurred at a suburban building site where construction was being undertaken on a partially built house. Metal scaffolding was in place around the building. This scaffolding was also adjacent to overhead power lines operating at high and low voltages.

The worker had received life threatening injuries after contacting a high voltage line with a metal tape measure and falling from the scaffolding. The injured worker was airlifted to the Alfred Hospital and later passed away.

While complying with regulation 313 of the Electricity Safety (Installations) Regulations 2009 (*Minimum distances between parts of buildings, structures, scaffolding and posts and aerial lines*), the scaffolding did not comply with the ESV scaffolding guideline.

The actions of the worker did not comply with regulation 318 of the Electricity Safety (Installations) Regulations 2009 (*Minimum distances between persons and aerial lines*).

ESV did not take any enforcement actions directly as a result of the incident. Instead, we provided our investigation report to WorkSafe Victoria who, as the lead investigator for this incident, is considering enforcement action.

Attempted copper theft from substation

On 16 April 2020, a 31 year old male was allegedly removing copper from a CitiPower substation. It appears that he attempted to disconnect a live conductor from a neutral bar with an uninsulated shifting spanner, and was electrocuted in the process.

Representatives from ESV attended the site and began investigations into the incident that evening.

The fatality was attributed solely to the direct actions of the deceased man and, therefore, no enforcement action was taken as a result of this incident.

Serious injuries

Electrical shock to plumbing apprentice

On 28 February 2020 ESV was notified that a plumber had received an electric shock while working on the roof of a commercial premise in Preston. ESV attended the incident that evening.

A second year apprentice plumber was repairing the roof of an awning at the premises when he inadvertently made contact with an electrical cable and received an electric shock. He was taken to hospital and kept overnight to monitor his condition.

The investigation found that the cable insulation was in a deteriorated condition, and that bare exposed sections were alive at 230 volts. In undertaking their repairs, the workers failed to identify the presence of the cables on the roof and the hazard posed by the cables.

ESV has not taken any enforcement action as a result of this incident, but has provided information to WorkSafe Victoria to support their investigation.

As a result of the incident, ESV produced a Safety Gram that was communicated directly to all appropriate parties and also appeared in the BCM for Tradies magazine and the Master Electricians e-News.

The investigation raised questions about the asset inspection practices of the distribution business relating to façade mounted assets, as there was low voltage Aerial Bundled Cable lying in the gutter along the building. ESV reviewed the asset inspection practices for facade mounted assets from all the distribution businesses, and has identified opportunities for improvement for all businesses.

Working within the No Go Zone

On 28 February 2020, a labourer working in Tarwin Lower received an electric shock from a 12.7kV SWER line and sustained injuries from a fall from height while working on the roof of a stable.

The worker received the shock when he contacted the powerline with a light-weight 7.5m long metal batten he was lifting onto the roof of the stable.

The ESV investigation found that the work team failed to identify the presence of the HV overhead line and the hazard posed as part of their site safety assessment. There was also no consideration or prompting from their safety processes to cause them to consider the hazards of overhead electric lines.

The investigation also considered electrical protection records from AusNet Services and these, together with signs of electrical discharge at the stables and the injuries to the worker, provided reasonable evidence that an electrical event had occurred at the site.

The investigation identified that there was a breach of regulation 618 (2) of the Electricity Safety (General) Regulations. ESV has not taken any enforcement action directly as a result of this incident. Instead, ESV has provided its investigation report to WorkSafe Victoria, and is supporting its investigation and any enforcement action that WorkSafe Victoria decides to take as a result of the incident.

Vegetation worker contact with high voltage line

On 4 March 2020 ESV responded to a serious electrical incident involving a vegetation worker. The worker was aloft in a tree when he cut a branch in an uncontrolled manner allowing it to fall and make contact with a high voltage electric line. The worker subsequently received multiple electric shocks, but refused to seek medical attention despite recommendations by the Ambulance Victoria officers who attended the scene.

A member of the public responded to the worker’s cries for help, and also received an electric shock while attempting to assist the worker out of the

tree. The member of the public was admitted to hospital for overnight observation and was later released.

The ESV investigation identified breaches of the electricity safety regulations by the vegetation worker and will seek to put the matter before the courts.

ESV is preparing education material for issue to the public regarding the dangers of working on trees near powerlines, and how such work should be safely undertaken. The material will also highlight the risks of using untrained workers to complete this type of work.

Major investigations

Cressy transmission tower failures

On 31 January 2020 an incident occurred on the AusNet Services Transmission 500kV double circuit lines running between Moorabool and Tarrone and between Moorabool and Mortlake. The incident involved the collapse of six transmission towers (138 to 143) and damage to two towers (137 and 144) near Cressy.

As a result of the tower collapse, supply to Alcoa's Portland Aluminium Smelter was interrupted and the Heywood interconnector between Victoria and South Australia was shut down, causing South Australia to be disconnected from the National Electricity Market.

On 6 February 2020 ESV requested AusNet Services to provide information and documentation in relation to the incident, and this information was promptly supplied as requested.

By March 2020 AusNet Services had restored both transmission lines using emergency structures designed for this purpose.

The towers that collapsed had originally been installed by the SECV and built to the SECV design code applicable at the time. The historical SECV design code did not consider the potential impacts of convective downdraft wind gusts (or high intensity winds) generated by severe thunderstorms.

ESV's investigation concluded that such an event was the cause of the failures.

AusNet Services has confirmed that the replacement towers are being designed to the latest version of AS/NZ 7000 *Overhead line design* that considers the effect of convective downdraft winds and higher wind speed than the original SECV design code.

AusNet Services continues to update ESV on a fortnightly basis regarding the progress of construction works for the replacement towers. As of 30 June 2020, the transmission lines are on schedule to be fully reinstated and energised by 6 November 2020.

Enforcement actions

ESV has enforcement powers that are defined in the Electricity Safety Act and subordinate regulations. In exercising these powers, ESV's approach is always to consider and select the most appropriate enforcement tool available to achieve compliance, as articulated in the ESV compliance strategy, policy and manuals.

The enforcement action selected in each case will follow the principles of being effective, proportionate, targeted, transparent, and consistently applied. It will also consider the actual or potential for harm, the conduct and behaviour of the parties involved, the effectiveness and efficiency of the available tools to achieve compliance, as well as ESV acting in accordance with the law, the Victorian Public Service Code of Conduct and ESV values.

Considering these factors, the selected approach may include the use of one or more of the following tools:

- providing education and seeking voluntary rectification and future compliance
- directing particular actions to be taken to rectify a safety issue or prevent potential harmful consequences
- issuing infringement notices and imposing penalties or restrictions through legal prosecution in the courts.

2018 St Patricks Day fires

The fires on the St Patricks Day weekend resulted in ESV laying six charges against Powercor for two of the fires that occurred on 17 March 2018, comprising:

- three charges against Section 98 of the Electricity Safety Act for the Terang fire
- three charges against Section 98 of the Electricity Safety Act for The Sisters fire.

The first mention hearing was held in the Warrnambool Magistrates court, with the contest mention in May 2020 postponed until November 2020.

United Energy electric line clearance performance

ESV identified unacceptably high rates of noncompliant vegetation during electric line clearance inspections of the United Energy network in 2018-2019. This occurred in both hazardous bushfire risk area (HBRA) and low bushfire risk area (LBRA), and constituted multiple breaches of Section 90 of the *Electricity Safety Act 1998*.

ESV subsequently required United Energy to 'show cause' as to why it should not be prosecuted for the identified breaches. In its response to ESV, United Energy acknowledged its failure to comply and committed to a range of actions intended to improve its performance.

ESV accepted the United Energy response, with this being provisional on United Energy meeting the commitments it made to ESV: United Energy would need to demonstrate that these commitments actually deliver improved compliance and electricity safety standards.

Throughout 2019-2020 ESV has closely monitored the actions and performance of United Energy. At the conclusion of the 2019-2020 inspections ESV commenced assessment of United Energy's performance to determine whether it had improved. The assessment is considering the inspection findings and United Energy's reporting and general consultations. The assessment had not been finalised by 30 June 2020, however, ESV can confirm that United Energy has so far met its commitments to ESV.

Most importantly, United Energy has reduced the number of high risk noncompliant spans and, hence, the extent of noncompliant vegetation that presents a material threat to electricity safety.

ESV will continue to closely monitor United Energy's performance throughout 2020-2021.

Powercor electric line clearance performance

ESV commenced its 2019-2020 HBRA inspection of the Powercor network in the Woodend and Mount Macedon regions. The initial results of the inspections revealed a very high rate of noncompliance; some of the observed noncompliances were particularly unsafe. ESV subsequently deployed all of its field officers to these regions to establish if this was a widespread problem or a localised phenomenon.

ESV required Powercor to urgently clear the unsafe vegetation it had found, and Powercor cleared each site within 24 hours of notification. Powercor was also required to interrogate its vegetation management systems to identify why the noncompliance rate was so high in these regions, and if it was indicative of a widespread or a localised problem.

Powercor's initial response was to deploy additional resources to identify and clear any unsafe vegetation that existed more broadly in these regions. In parallel, it conducted a review of its vegetation management systems that revealed errors in growth rate estimates and data transfers between two systems used to inform its vegetation clearing program. The error meant that approximately 2,500 spans had been omitted from its 2019-2020 pre-fire danger period clearing program – these were subsequently added to the program and cleared by Powercor as its immediate priority.

The observations made by ESV and intervention that followed directly resulted in the clearing of the offending spans. Without this intervention Victoria may have been exposed to an unmanaged bushfire risk for each of these spans for the duration of the fire danger period. Powercor took action throughout the remainder of the fire danger period to account for this system deficiency and currently have a program underway to replace their vegetation management system.

ESV then continued its inspection of the remaining parts of the Powercor network in HBRA. While the sample increased and the observed noncompliance rate decreased, the noncompliance rate remained unacceptably high.

Powercor sought to address some of its problems by:

- immediately taking action on all ESV identified noncompliances
- substantially increasing and sustaining its resource allocation
- improving transparency and reporting
- immediately starting development of improved vegetation management systems.

Despite these actions, the poor performance displayed by Powercor has prompted ESV to start an investigation. This will include analysis of the 2019-2020 inspection results for Powercor, comparing them to its previous performance and those of the other major electricity companies. The outcomes of the investigation and data analysis will be used by ESV to develop an appropriate compliance strategy.

ESV will continue to closely monitor Powercor's performance throughout 2020-2021.

Boroondara Council failure to clear lines

During 2019-2020, CitiPower notified ESV of approximately 140 spans in the City of Boroondara where the extent of noncompliant vegetation present was potentially jeopardising electricity safety and network reliability. CitiPower identified the City of Boroondara as responsible for managing the noncompliant vegetation, and requested that ESV use its powers to resolve the matter. An ESV inspection confirmed the vegetation was unsafe, as CitiPower had described.

As part of its urban LBRA inspection program, and further to this matter, ESV identified an excessively high noncompliance rate relating to vegetation where the City of Boroondara is responsible for maintaining clearance around overhead powerlines (see page 20).

ESV subsequently directed CitiPower to clear some of the highest risk noncompliances that had been identified. CitiPower later recovered its costs for this clearing from the City of Boroondara in accordance with relevant legislation.

In addressing the broader noncompliance issues, ESV required the City of Boroondara to submit a plan that commits it to actions that will enable its transition to acceptable standards of compliance. ESV required the City Boroondara to incorporate the transition plan into its electric line clearance management plan, thereby making the plan enforceable.

Throughout 2019-2020, ESV has been closely monitoring the progress of the City of Boroondara against the transition plan. ESV has noted positive action by the City of Boroondara and a commitment to improving its compliance standards; however, further significant improvement is needed to meet ESV's expectations.

ESV has scheduled reinspection of the City of Boroondara for January 2021. ESV will consider the appropriate enforcement action to take should the City of Boroondara fail to maintain its progress toward meeting ESV's compliance expectations; this may include prosecution if necessary.

Keeping the public safe

Reducing bushfire risk

Understanding fire trends

There were 1,422 reportable incidents involving the electricity networks this year, of which 46 per cent involved a fire. Where fires occur, 65 per cent do not result in a ground fire. The numbers of incidents resulting in a ground fire are shown in Figure 1, with their relative contributions to total network fires.

Figure 1 Breakdown of fires by size in 2019-2020[1]

Of the four large fires, three were on the Powercor network and one was on the AusNet Services network. Only one of the four large fires was directly attributable to network assets; the other five resulted from environmental impacts on the network. The details of these fires are as follows:

- 21 November 2019: A 16.5 ha fire on a SWER line near Buckrabanyule attributed to overheated low voltage leads on the pole-mounted substation.
- 29 November 2019: Fire near Benalla attributed to bird contact with overhead high voltage conductors.
- 29 December 2019: A 30-40 ha fire near Manangatang attributed to a lightning strike on a pole.
- 4 January 2020: Fire near Huntly due to a tree coming down across a SWER line.

In addition, there was a large fire near Murchison on 4 January 2020; however, this was attributed to a blown low voltage fuse on a privately-owned electric line. There were also two large fires reported on 14 January and 15 January 2020 that, upon investigation, were found not to be caused by network assets. Both were suspected to be caused by lightning strikes, and the fires then impacted network assets.

Despite the extremely high numbers of bushfires in Victoria, New South Wales and Queensland this summer, none of the major bushfires in Victoria were caused by network assets.

[1] Localised = less than 10 m^2, small = 10-1,000 m^2, medium = 1,000 m^2 - 10 ha and large = greater than 10 ha

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 2010-2019 average for most of the year. The exceptions were September and March, which had fewer events, and a higher number of ground fires in December. The peak in December and January reflects the early start to summer that saw extreme bushfire conditions along the entire eastern seaboard of Australia last summer.

Figure 2b shows that the numbers of contact-related fires were well in excess of the historic numbers in July, November and December, with the latter two months also potentially related to the early summer start.

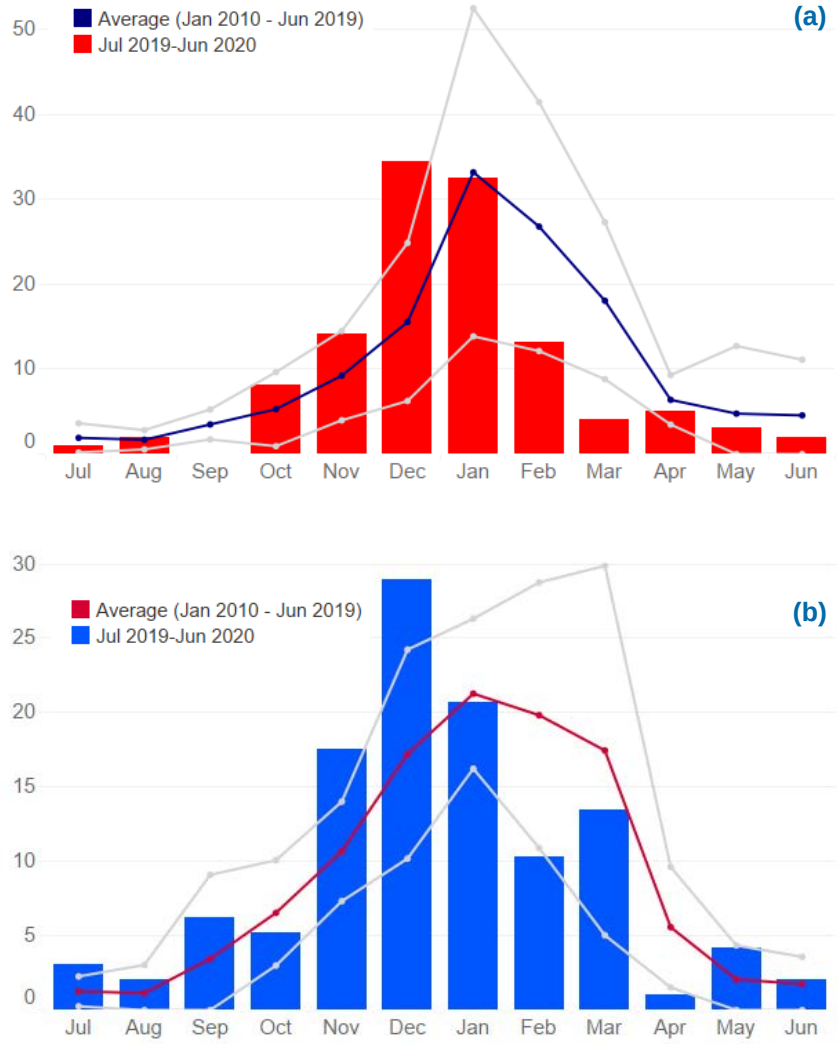


Figure 2 Ground fire incidents due to (a) asset failures and (b) contact events

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 climbed to a level slightly lower than in 2018-2019, there were many more fires early in the fire season.

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 two weeks later than last year, but still weeks earlier than most previous seasons (Figure 4). While the declarations experienced an early jump, the escalation of declarations was much slower than for the Black Saturday fire season (2008-2009). Full declaration was achieved two weeks later than the Black Saturday season, and declarations started coming off and at a faster rate than for the Black Saturday season.

The indications at the start of the fire season were that 2019-2020 would be a normal fire season. We then had major outbreaks across the eastern seaboard before the early easing of the season.

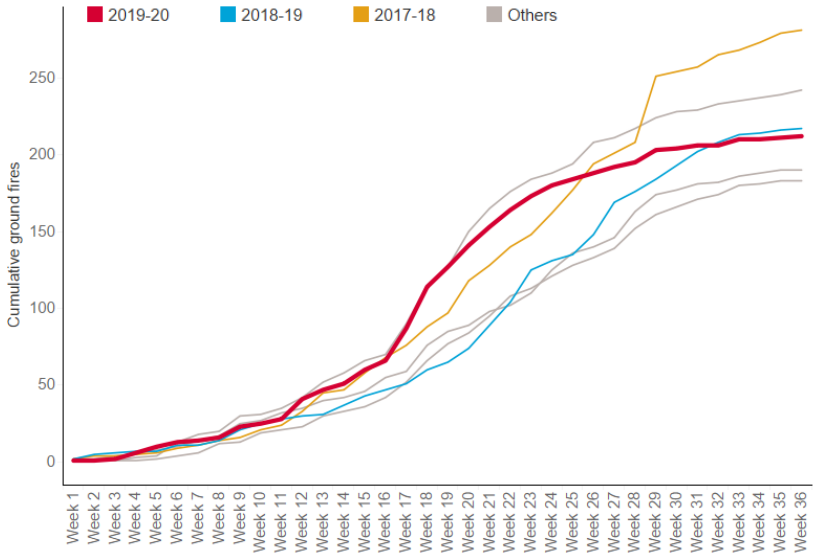


Figure 3 Cumulative fires across the fire season

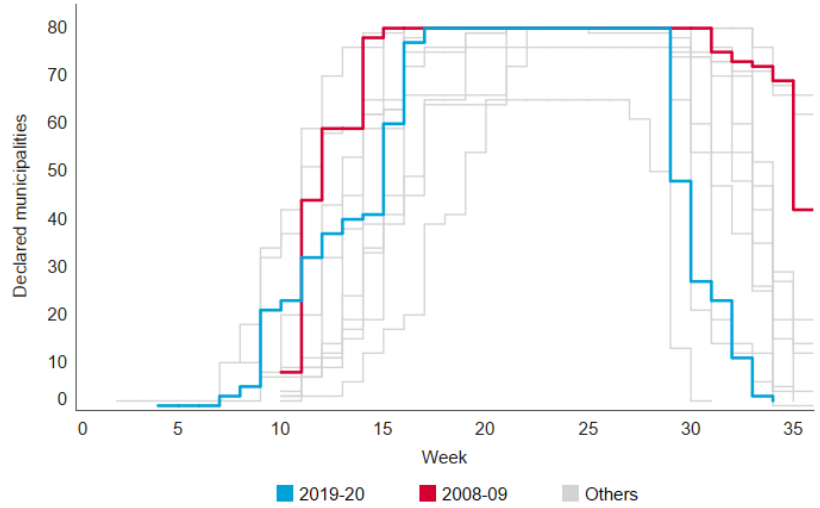


Figure 4 Summary of CFA fire declarations from 2008 to 2020

Figure 5 shows the number of ground fire events on the Victorian networks from most common to least common (blue bars) relative to the long-term average for the 2010-2018 period (orange bars).

The four most common causes of fires were tree contact, connection faults,[2] animal contact, and other asset failures. The same four events were comprised last year's top four, except that tree contact and connections have swapped places in the order.

When compared to the long-term averages across the period from January 2010 to June 2019, fire numbers in 2019-2020 are elevated in two categories, reduced in nine and stable (i.e. within 5 per cent) in two.

Tree contact returned to being the most common source of fires this year, with a 50 per cent increase over last year (Figure 6).

Of particular note is that asset-related ground fires have fallen, or are stable, across all categories apart from connection faults. The numbers of connections fires dropped this year, but are still 67 per cent above the long-term average (Figure 6).

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

- fires from tree contact have increased markedly this year, are now 37 per cent above the historic average and require further assessment to determine whether this is due to vegetation within or outside the clearance space
- fires from connection faults have been rising steadily since 2013-2014, are now well above the historic average (67 per cent higher) and also require further attention as to the causes
- animal contact fires decreased this year and are 16 per cent below the historic average
- fires due to other asset failures are stable and three per cent below the historic average.

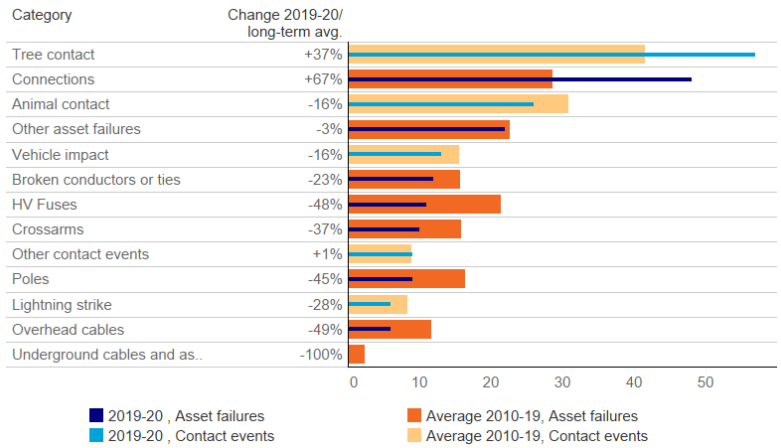


Figure 5 Ground fire-related incidents occurring on Victorian networks

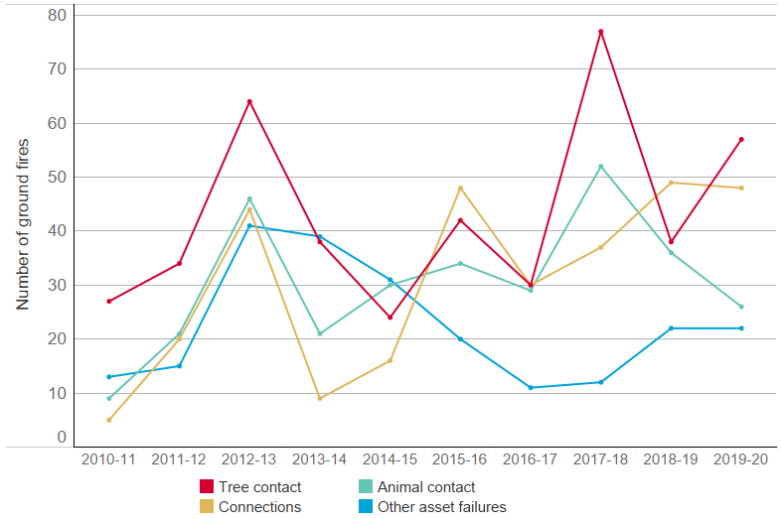


Figure 6 Historic trends for common ground fire events

[2] Connection faults include all faults attributed by the electricity companies to all high and low voltage connections, terminations and joints when they report the incidents to ESV via our OSIRIS portal.

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 on the electricity networks.

The analysis has considered all fires reported to ESV between 1 January 2010 and 30 June 2020, with the data models being trained on 80 per cent of the data randomly selected between 2012 and 2020. 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 due to asset failures (Figure 7a), vegetation contact (Figure 7b) and other (non-vegetation) contact events (Figure 7c). The models predict the number of each type of incident based on daily weather observations from the nearest of 20 Bureau of Meteorology stations. The actual numbers of ground fires are then aggregated by month and shown as coloured bars in each of the figures; the prediction is shown as a blue line. The blue line also differs between the two figures due to variations in the mix of weather factors driving each model's prediction.

In order of impact, the main factors affecting each type of event are:

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

These findings can help us understand the physics underpinning such events. For example, the major contribution of wind gust to tree contact fires could indicate that such fires are driven more by blown branches and fallen trees than by direct contact. Further analysis of existing data is needed to confirm or refute the hypothesis. This will be supplemented with data from ESV's new inspection program targeting vegetation outside of the clearance space (see page 23).

The models, and hence the predictions of fires, have changed from last year's report due to:

- removal of an error in the data inputs that was double-counting some incidents between 2015 and 2019
- improved weather station mapping of historic data for 2010-2015 to the nearest weather station
- partitioning of contact events into vegetation contacts and other contacts
- improved model accuracy due to the above changes.

All three event types naturally follow a seasonal trend with peaks in summer and troughs in winter.

The major exceedances in the summer of 2012-2013 (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. This not only raised the potential for bushfires, but also put greater stress on network assets that may have contributed to their failure, particularly when combined with higher electrical demand (from air-conditioning, for instance).

Similarly, Figure 7b shows peaks in February and March 2018. These may be due to:

- extreme storm fronts that resulted in dry branches blowing and trees falling onto overhead powerlines when they are susceptible to ignition
- the practices of the distribution businesses
- causes other than direct weather influences.

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

Our focus moving forward with this modelling is to limit further updates of the models and to observe how they correlate with future events. If we continue to see strong correlations between the models and observations, we may explore using deviations from the predictions as an indicator of aberrant and positive network behaviours. These models can also help ESV explore the implications of future climate change on network safety.

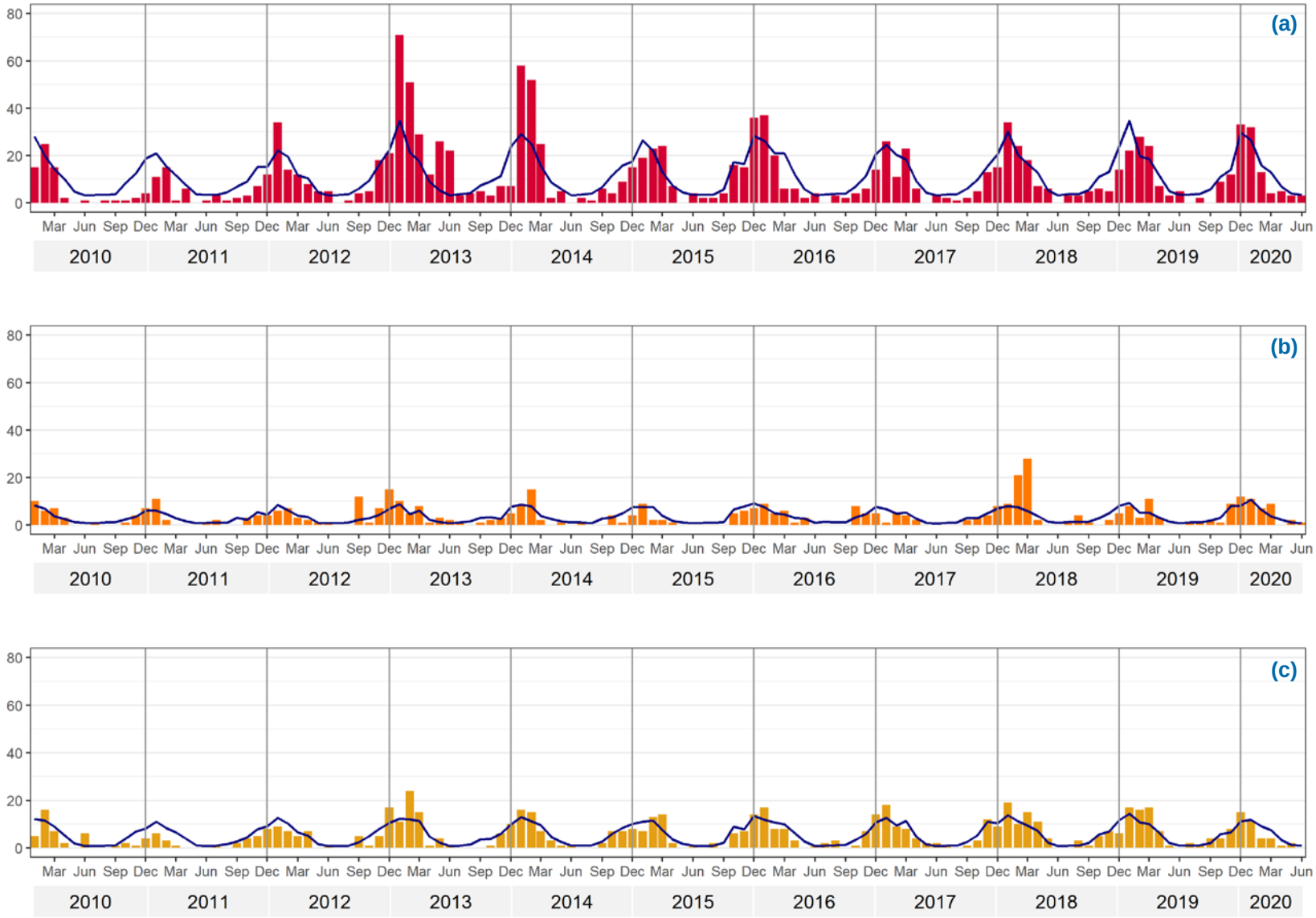


Figure 7 Influence of weather on ground fires due to (a) asset failures, (b) vegetation contact and (c) other contact events

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 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 has been slowly decreasing for asset failures and other contact events, while the at-risk days for vegetation contact fires has been increasing
- the rate of fire occurrence on at-risk days has been increasing for asset failures and vegetation contacts, and is stable for other contact fires
- there are more than twice the number of at-risk days each year for other contact fires as there are for vegetation contact fires, and more than four time as many days than for asset failure fires.

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.

The increasing risk from asset failure and vegetation contact is being addressed by the expansion of ESV capabilities in the asset management area and in the increased focus on management of hazard trees outside of the clearance space (see page 23).

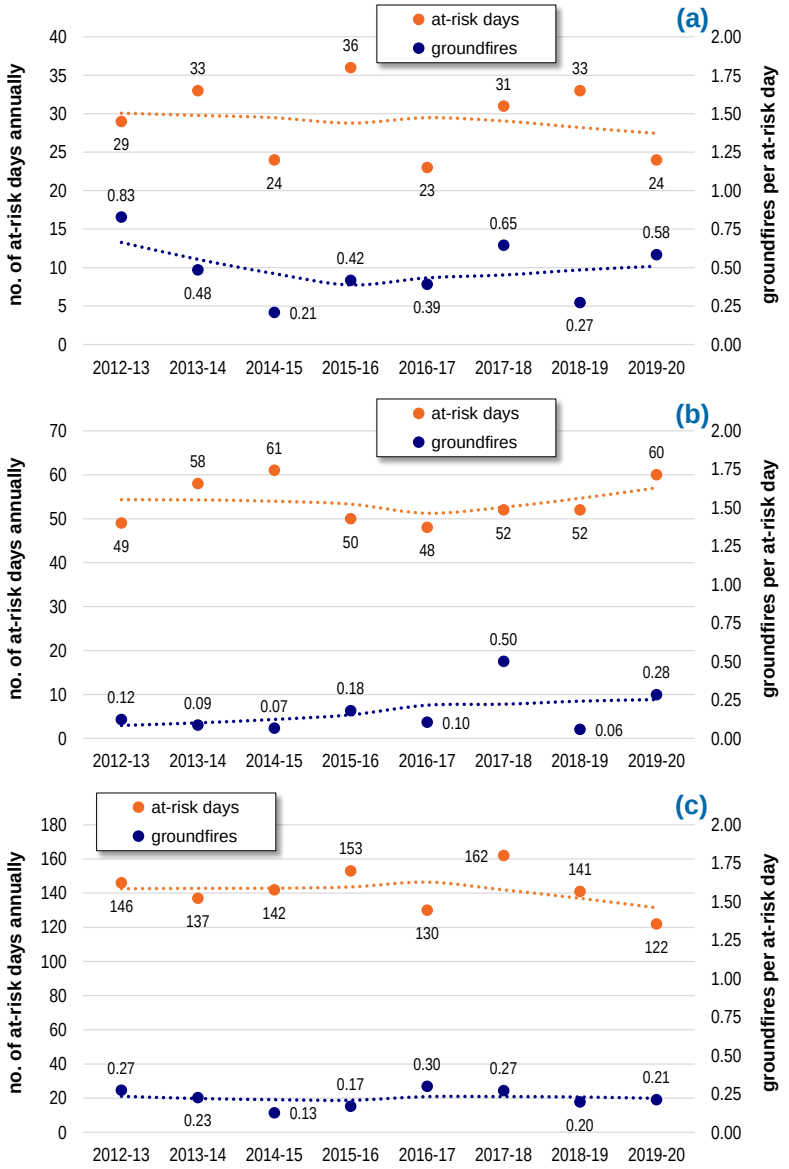


Figure 8 Numbers of 'at risk' days each year and the associated rate of incidents in HBRA on those days for (a) asset failures (b) vegetation contacts and (c) other contacts

We have also sought to determine not just whether there is a greater risk of ignition on at-risk days, but also whether the size of the resulting fire changes depending on whether or not it is an at-risk day.

Figure 9 shows the fire size profiles for the three event types comparing fire sizes on at-risk days with that on days not designated as at-risk. This is based on data collected between 1 October 2015 and 30 June 2020.

Fires from asset failures on non-risk days primarily result in localised fires (56 per cent) and small fires (34 per cent). Medium fires only occur in 9 per cent of cases, and large fires in 0.7 per cent of cases. On at-risk days, the proportion of small fires reduces and the proportion of medium and large fires increases. There is also a small increase in localised fires.

With fires originating from vegetation contact, localised and small fires are most common on non-risk days — localised fires contribute 50 per cent; and small fires contribute 33 per cent. Medium and large fires make up 16 per cent and 1.6 per cent respectively. On at-risk days, the numbers of localised fires decreases significantly and small and large fires increase. The change in medium fires is only small (less than one per cent). The proportion of large fires is greatest on vegetation contact at-risk days; 13.3 per cent of all vegetation contact fires result in a large fire. Fortunately vegetation contact fires are less common than fires from asset failures or other contact events on at-risk days (see Figure 7).

Localised and small fires are the most common fires resulting from other contact events on non-risk days at 64 per cent and 30 per cent respectively. Medium fires account for the remaining six per cent; there were no large fires on non-risk days. On at-risk days, there is a significant reduction in localised fires and increases primarily in small and medium fires, and a small increase in large fires.

Better knowledge of the conditions driving fires (both when and how large) will help us understand the dynamic risk profile of the networks in the future.

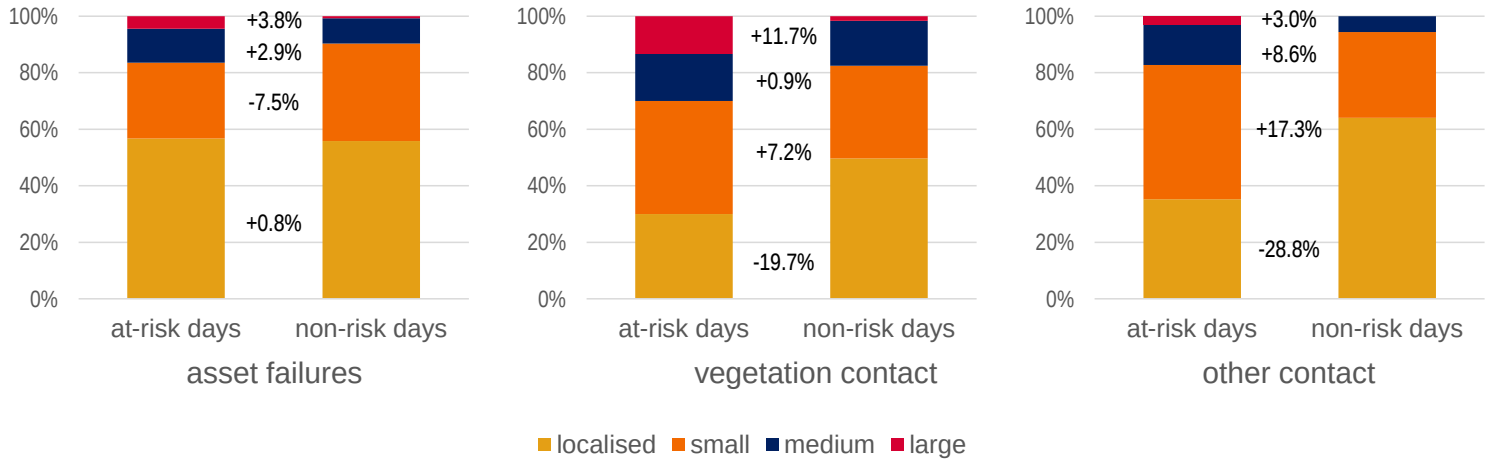


Figure 9 Fire size profiles on at-risk days compared to all ground fire records

The percentages listed are the changes in contribution from the non-risk days profile

Keeping vegetation away from powerlines

Vegetation contact with powerlines can cause electrocution, fires, 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). The code is a schedule to the Electricity Safety (Electric Line Clearance) Regulations.

A review of the code and regulations commenced in 2019 and new versions came into operation on 27 June 2020. The main changes involved:

- providing duty holders with more options to manage the tension between tree amenity and electricity safety standards
- reducing administrative burden in the areas of notification and electric line clearance management plan preparation
- providing ESV with additional enforcement options to keep responsible persons accountable.

None of these changes materially reduce electricity safety standards.

Noncompliant vegetation poses a safety risk

In 2019-2020 ESV undertook a range of activities to ensure responsible persons adequately manage vegetation for which they are responsible. These responsible persons included the nine major electricity companies (five distribution businesses and four transmission businesses), 67 municipal councils and a variety of other owner-operators of electric lines. The activities included:

- evaluation and approval of 28 electric line clearance management plans
- 17 vegetation management systems audits
- inspection of vegetation for 15,743 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 bushfire threats and network failures.

Major electricity companies

ESV has seen an increase in the rates of noncompliant vegetation across HBRA this year when compared to the previous two years (Figure 10a). While much of this was due to Powercor (see also page 10), there were also contributions from AusNet Services and Jemena. Conversely, there was a decrease in rates of noncompliance in LBRA since last year, primarily due to United Energy and Powercor (Figure 11a).

Most importantly it is worth noting that high risk noncompliances (that is, incidences where vegetation was at imminent risk of contact with powerlines) declined this year, except for Powercor HBRA (Figure 10b and Figure 11b).

All the noncompliant spans identified by ESV were promptly cleared by the relevant network owner, 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.

Municipal councils

In March 2019 ESV initiated a program for comprehensive inspection of municipal councils that have electric line clearance responsibilities. Prior to this, ESV had focused primarily on the major electricity companies.

Councils are only responsible for keeping trees clear of electric lines where those trees are located on public land managed by the councils.

ESV's inspection found that the rate of noncompliance for councils (38 per cent on average) was much higher than for the distribution businesses (8.5 per cent on average). In fact, all 19 councils had individual noncompliance rates higher than the average for distribution businesses.

In total ESV identified 2,676 noncompliant spans across the 19 councils it inspected in 2019-2020. When ESV identifies noncompliant vegetation, the council must urgently clear the vegetation to make it compliant and safe. ESV worked with each council throughout the year to ensure they appropriately managed these risks and cleared the identified noncompliant vegetation.

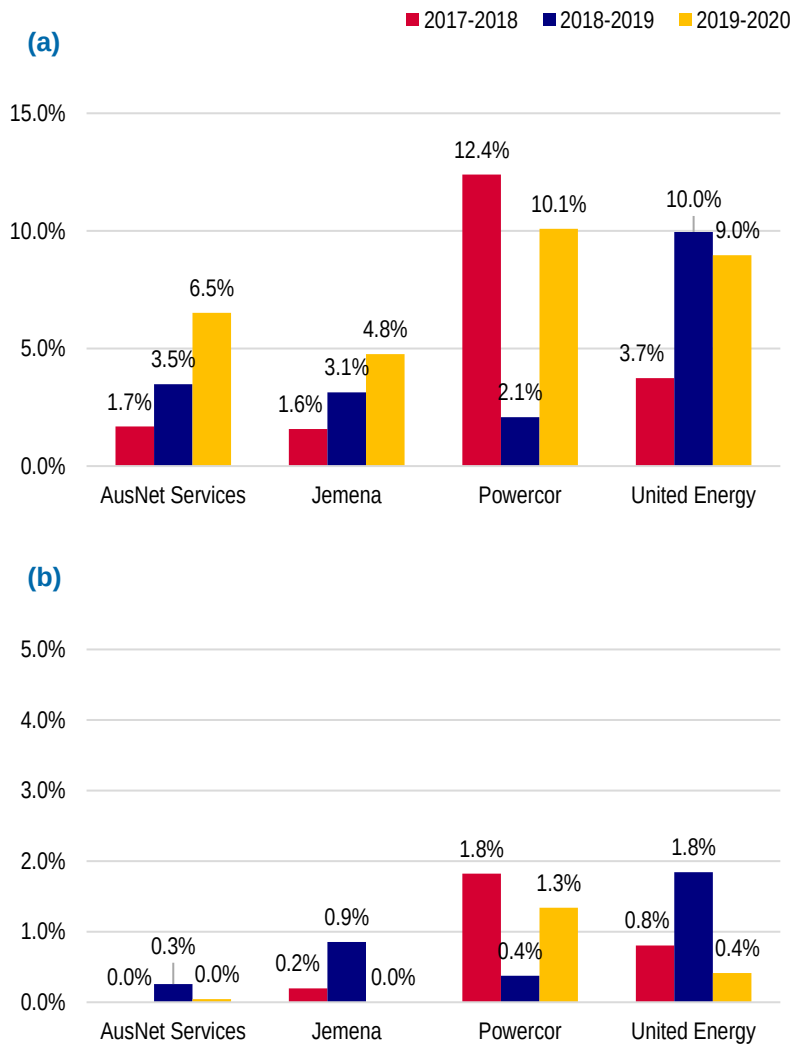


Figure 10 Noncompliance rates in HBRA
(a) all noncompliances and (b) high risk noncompliances

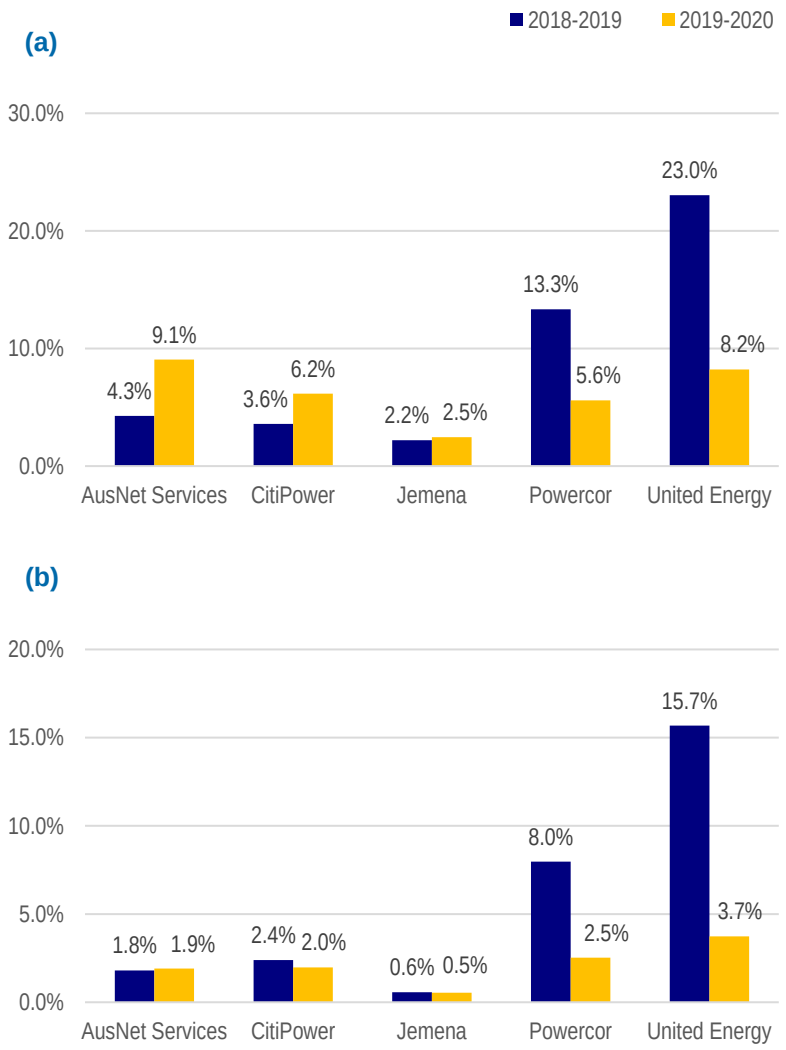


Figure 11 Noncompliance rates in LBRA
(a) all noncompliances and (b) high risk noncompliances

As councils predominantly only have electric line clearance responsibilities in low bushfire risk areas, the extent of council noncompliance does not create a significant bushfire risk for Victoria. It can, however, impact on the reliability of electricity supply for metropolitan Melbourne, regional cities and townships.

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 the council. ESV has the power to direct the relevant distribution business to undertake any necessary clearance works (see page 11).

In 2020-21, ESV will revisit the three poorest-performing councils to ensure they have improved their electric line clearance performance to reduce the electricity safety risks in these municipalities. Failing to demonstrate improved performance will result in strict enforcement action.

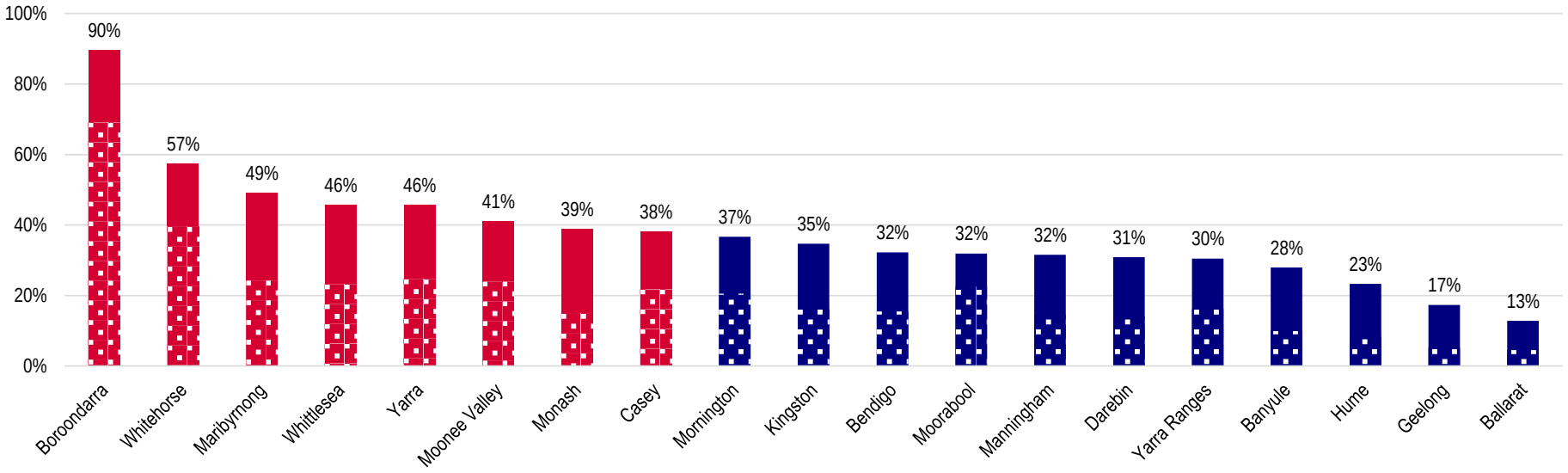


Figure 12 Noncompliance rates for councils inspected in 2019-2020

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

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 clearances 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 cycles are also dependant on whether the asset is located in an HBRA or LBRA – to ensure those cycles 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 historically lapsed in 2013, and the boundaries have not been reviewed since.

Given changing risk profiles due to revegetation of some areas, changing environmental conditions and urban development in others, ESV facilitated the reinstatement of cyclical reviews of the boundaries by the CFA.

In August 2019 the review program began with the Powercor network, and is due for completion before the end of 2020. Powercor has started planning for the increased levels of maintenance that will arise as parts of its network transition from LBRA to HBRA. This may include upgrading asset infrastructure or creating greater vegetation clearance distances. It intends to complete any required works before the new boundaries are gazetted so that it will be compliant as the new boundaries come into effect.

The review program will consider the Jemena and United Energy networks in 2020-2021 and the AusNet Services network in 2021-2022.

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 electric line clearance management plans, 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 February 2020 with the inspection of 121 spans that United Energy had identified as being affected by hazard trees. In March 2020, the project then inspected 362 spans that AusNet Services had identified were similarly affected in its network.

The inspections found that United Energy and AusNet Services were generally managing hazard trees according to the methods described in their plans. Even so, ESV identified opportunities for both businesses to improve their management of hazard trees.

The ESV inspection identified three hazard trees on the United Energy network and 49 on the AusNet Services network that the networks had not identified. ESV has since required that these trees be managed so that the risks posed are addressed.

ESV hazard tree inspections will be conducted on the Powercor, Jemena and CitiPower networks throughout 2020. ESV will include hazard tree inspection as an ongoing annual electricity safety program to continue to track the performance of each business.

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:

- the voltage on all polyphase electric lines originating from prescribed zone substations can be dropped to specified levels within defined timeframes following a phase-to-earth fault in order to reduce the risk of fire ignition
- each electric line within an Electric Line Construction Area defined in the regulations 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

- each distribution business has installed an Automatic Circuit Recloser on each SWER 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 performance targets for phase-to-ground faults. 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 required REFCLs to be installed on 45 zone substations, with 22 in the AusNet Services network, 22 in the Powercor network and one in the Jemena network.

On 12 July 2019, ESV granted a time extension for AusNet Services to achieve full technical compliance for the Woori Yallock and Kinglake zone substations by 1 November 2020 and 29 April 2021 respectively. The REFCLs at both substations are operational and will provide partial protection for the 2020-2021 bushfire season.

On 5 June 2020, ESV granted an exemption in relation to Corio and Geelong zone substations whereby REFCL protection will not be provided for powerlines located within the City of Geelong, where there is low bushfire risk. Powerlines located in areas with high bushfire risk will be supplied from a new REFCL-protected zone substation at Gheringhap. This reduced the number of Powercor zone substations requiring REFCLs from 22 to 21.

By 30 June 2020, ESV had accepted seven AusNet Services and nine Powercor zone substations as compliant. Figure 13 shows the cumulative number of compliant REFCLs installed by each distribution business 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.

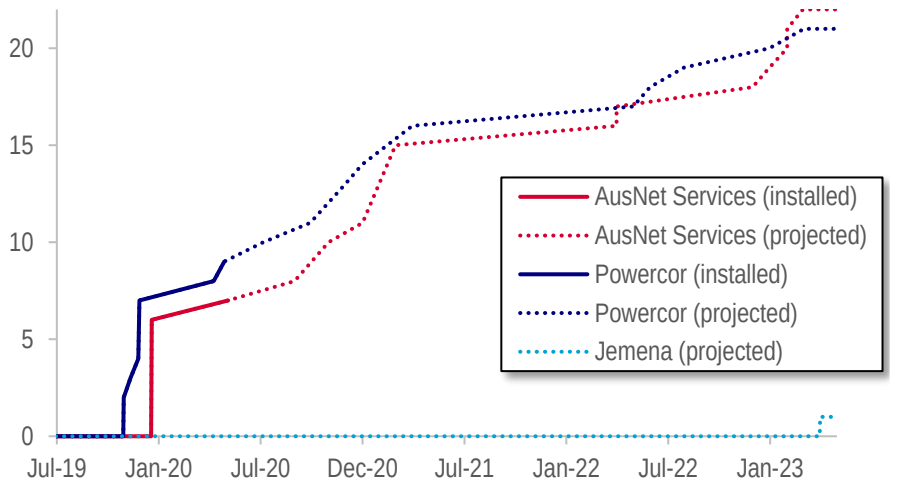


Figure 13 Compliant REFCLs installed to 30 June 2020

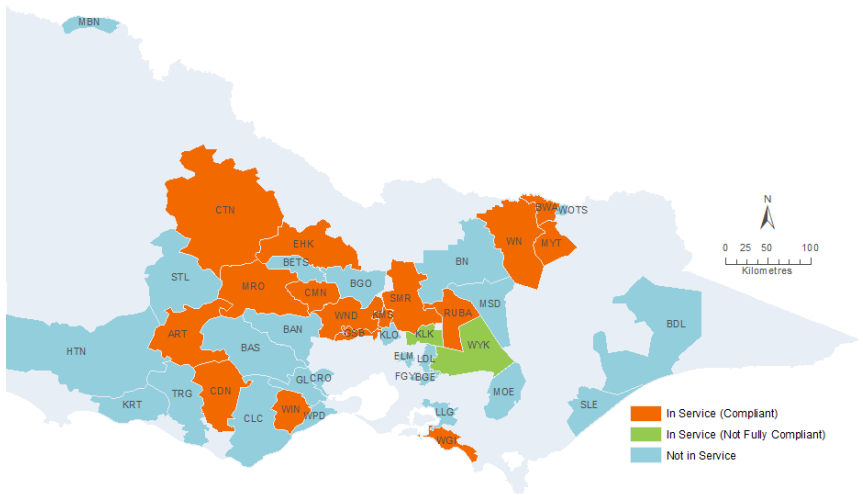


Figure 14 Mandated REFCLs and their status at 30 June 2020

The location of the Jemena REFCL is not shown.

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-level[3] REFCL system at the Sydenham zone substation.

When a REFCL responds to a single phase-to-earth fault, the voltage on the remaining two healthy phases rises. Equipment that is not rated for the resulting voltage increases must be upgraded in a process known as hardening. HV customers connected to REFCL-protected networks also need their assets to be hardened or isolated from these effects.

Delivery at four AusNet Services tranche 2 sites is impacted by hardening works on railway sites. These works are protracted due to the heavy load associated with these sites and the need to maintain train services. Wherever possible, temporary solutions have been identified to deliver the risk reduction associated with REFCL protection to the affected communities ahead of formal acceptance by ESV.

AusNet Services and Powercor have sought multiple exemptions over the 2019-2020 period in relation to HV customers and fully-insulated cable network sections supplied from REFCL-protected substations. Further details on these exemptions can be found in Appendix B and Appendix F.

In 2020 ESV engaged consultants to undertake a cost benefit analysis and functional (engineering) performance review of the REFCL program. The review is expected to be completed by October 2020. The outcomes of the review will feed into a wider review of the Powerline Bushfire Safety Program being undertaken by the Department of Environment Land Water and Planning (DELWP).

Replacing bare overhead powerlines in Electric Line Construction Areas

AusNet Services and Powercor each have approximately 1,600 km of overhead conductor within Electric Line Construction Areas. These bare overhead powerlines are to be progressively replaced with insulated or underground solutions.

As of 30 April 2020, AusNet Services reports that 81 per cent of polyphase electric lines in Electric Line Construction Areas within its network consisted of bare overhead wire. Currently, AusNet Services has no plans to proactively reduce this further before 30 April 2021. Powercor reports 70 per cent bare overhead wire remaining, and that this is expected to reduce to 61 per cent by 30 April 2021.

AusNet Services, United Energy and Powercor are also trialling new covered-conductor technologies to achieve the same safety outcomes as underground lines at a lower cost.

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 single wire earth return (SWER) line within their distribution network by 1 January 2021. With the exception of Powercor, all businesses have met this obligation.

ESV has previously approved the use of FuseSavers as an acceptable alternative to ACRs.

Powercor plans to install 1,062 FuseSavers on its network. At 30 June 2020, Powercor had installed 1,050 FuseSavers on its network. ESV expects that Powercor will complete its ACR installation program before the 2021 deadline.

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

Making network infrastructure safer

Understanding asset failure trends

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

The historical average for the period January 2010 to June 2019 shows a seasonal trend with increased asset failures over the summer period (Figure 15a). In general, the numbers of asset failures in the last year were within one standard deviation of the 2010-2019 average for most of the year; the exceptions being December and June. The annual peak that normally occurs in January and February instead occurred in December and January due to the early summer.

The numbers of contact events show less seasonality and a less pronounced peak occurring in March (Figure 15b). Contact events this year also showed a high degree of variability, with the contact incidents in the first half of the year well above the historical average. Such events are largely outside the direct control of the networks.

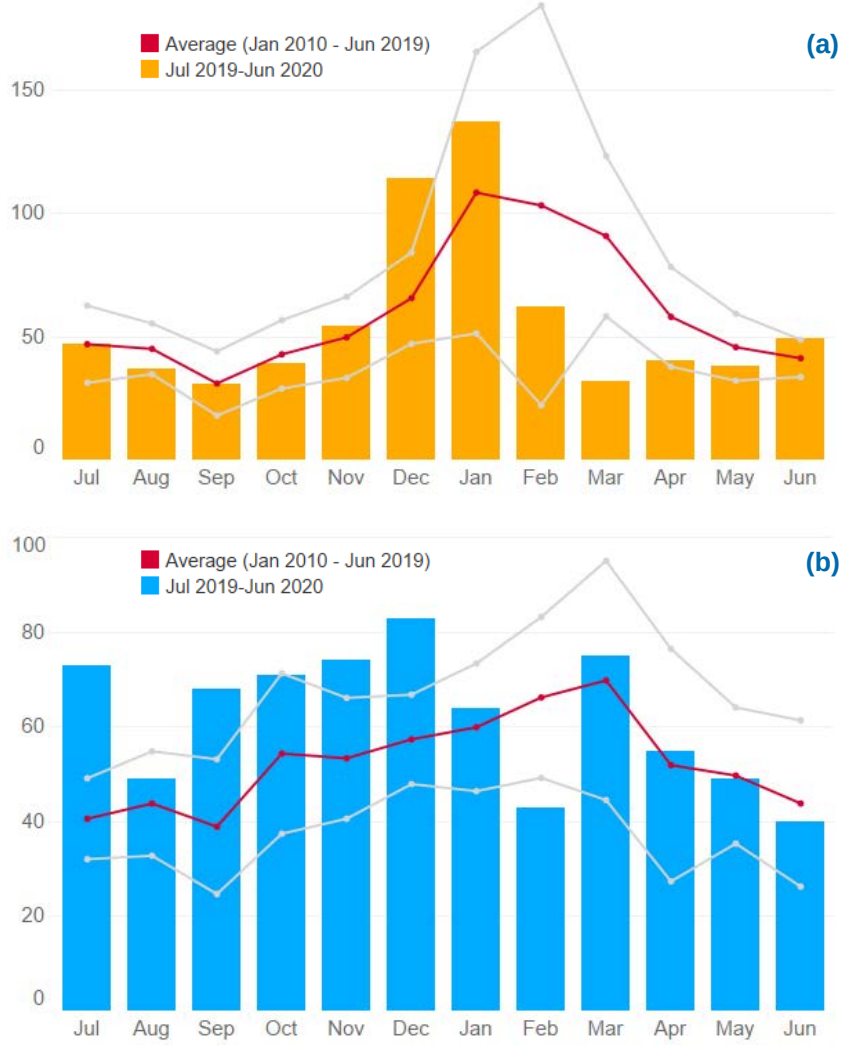


Figure 15 All incidents in the period due to (a) asset failures and (b) contact events

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

Figure 16 shows the number of incidents on the Victorian networks from most common to least common (blue bars) relative to the long-term average for the 2010-2019 period (orange bars).

The four most common incidents were other contact events, connection faults, crossarm faults and vehicle impacts. Two of these events are outside the direct control of the networks to manage — other contact events and vehicle impacts. The other two events were within the control of the networks, namely connection and crossarm faults.

When compared to the long-term averages across the period from January 2010 to June 2019, the incidents in 2019-2020 are elevated in three categories, stable in four categories and lower in seven categories.

Of particular note is that the events where numbers exceed the long-term average are largely outside the direct control of the networks — other contact incidents (includes intrusion into the No Go Zone and copper theft), and dug up cables and assets. Tree contacts are partly managed by the networks where vegetation grows into the clearance space, but also included trees and branches blowing in or falling into the clearance space, outside direct control of the networks.

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

- other contact events have decreased markedly this year
- connection faults have decreased from last year's peak
- vehicle impacts[4] on overhead lines and poles have increased slightly
- crossarm failures have increased for the third consecutive year but are well below their historical peak.

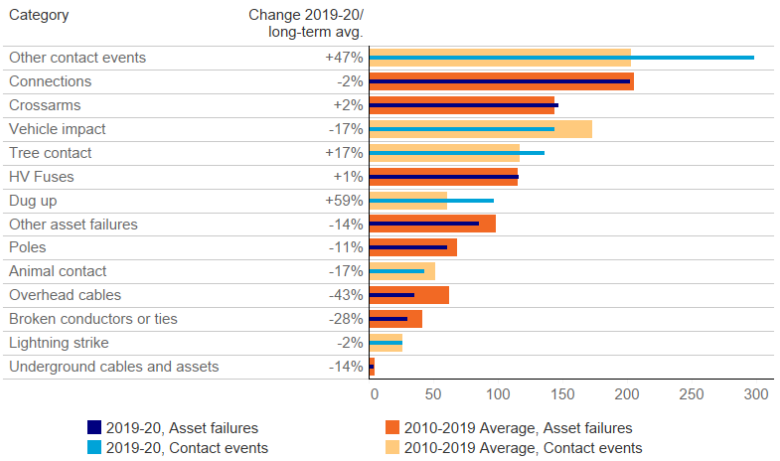


Figure 16 Incidents occurring on Victorian networks

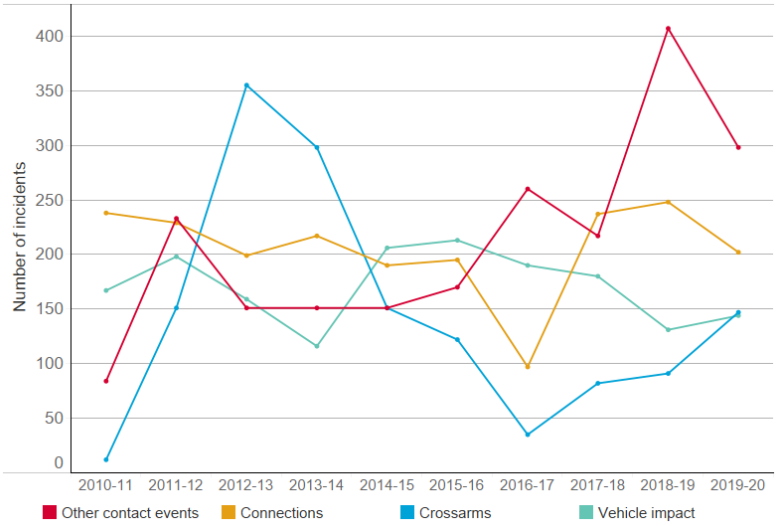


Figure 17 Historic trends for common incident events

[4] Vehicle impacts include collisions with poles and damage to overhead powerlines from road transport and farming and construction equipment.

Reviewing the performance of wood poles

On the St Patrick's Day weekend in 2018 (17-18 March), there were six large network-related fires that occurred in southwest Victoria associated with high winds through the region — four involving trees falling onto lines from outside the regulatory clearance space and two directly caused by assets.

One of the asset-caused fires was ignited by a broken pole, and during the subsequent investigation of that incident, the community raised concerns about the potential for further fires from pole failures.

ESV worked with Powercor, the community and independent experts to determine whether there is an immediate risk of further pole failures in the region. Powercor's pole inspection and maintenance process was reviewed and as an outcome of the investigation, as stated in the ESV report released in July 2019, Powercor changed its processes to increase the frequency of inspections and apply greater conservatism when deciding whether to replace a pole.

ESV also completed a further assessment of Powercor's asset management practices relating to wood pole management, and its capacity to deliver sustainable safety outcomes for the community. A draft technical report was published in December 2019 for public consultation.

The December 2019 report found that:

- The wood pole management system in place at the time of The Sisters fire at Garvoc would not deliver sustainable safety outcomes for the future.
- Since March 2018, Powercor has improved its wood pole management system, increasing the volume of wood pole replacements and reinforcements; however, these changes alone will not deliver sustainable wood pole safety outcomes for the future.
- Powercor is progressing further improvements will, as far as practicable, deliver sustainable safety outcomes for the community when fully implemented.

The ESV report also made ten recommendations to ensure that Powercor diligently implements its proposed improvements to its wood pole management regime. A further three recommendations require ESV to establish reporting protocols and performance measures, and to closely monitor Powercor's progress of the wood pole management improvement plan.

The report was finalised and published with a response to public submissions, and ESV is holding Powercor to account for the delivery of the plan. ESV is ensuring assessment and transparent reporting for delivery of the plan occurs, which is currently on track.

While initiated by incidents on the Powercor network, ESV also committed to review the sustainability of pole management practices in all other Victorian distribution businesses. ESV plans to review the AusNet Services program in 2020-2021 and the United Energy and Jemena programs in 2021.

Improving worker safety in the No Go Zone

As an outcome from the ESV General Manager Forum in 2018, a joint industry and ESV working group was formed to explore the causes of No Go Zone (NGZ) breaches and contact incidents, and develop solutions to reduce the rate of occurrence. This would seek to understand the causes of incidents that cost the network money to repair, and that simultaneously pose a risk to the Victorian public.

The NGZ Working Group consolidated all NGZ breach and incident data from all distribution businesses for the last five years, and conducted an analysis to determine the key causal factors and focus areas to inform the improvement strategy.

Figure 18 shows the growth in NGZ incidents since October 2015. Mobile plant is the main cause for such incidents whether it be intrusion into the NGZ for overhead or underground assets. Vehicles (including rubbish collection trucks or oversized loads) were the next major contributor for most of the period, but an increase in unauthorised access events since 2018 has made this the next biggest contributor.

The NGZ Working Group has met regularly and implemented actions to improve NGZ safety outcomes, including development of:

- public educational and guidance material for farm safety, backhoe and excavator safety, and abolishment of supply
- an inventory of all existing NGZ documents and guidance material to ensure consistent messaging by all parties.
- a public industry paper on available technology options for installation of non-contact voltage detecting equipment on tip trucks, backhoes, excavator booms and mobile plant.

ESV is also pursuing the amendment of planning and permit requirements for new buildings to add a planning check to ensure all new building applications demonstrate compliance to the Electricity Safety Act and relevant Regulations.

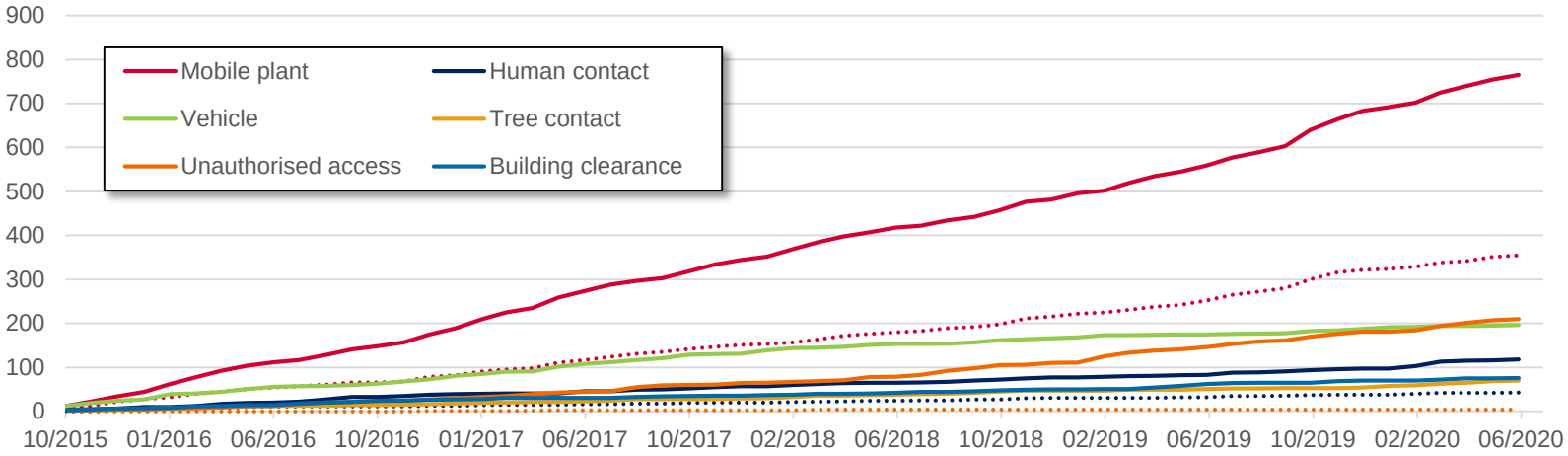


Figure 18 Cumulative trends involving NGZ incidents

solid lines = overhead assets, dotted lines = underground assets

Preparing for the future

Over the last year ESV has progressed work on its Future Energy Strategy to address the question of:

> What roles will ESV need to play, and which capabilities will it need to develop, to effectively address the safety risks of the future Victorian energy landscape?

This program of work was developed in response to the Review of Victoria's Electricity and Gas Network Safety Framework. It will also provide a valuable input to discussions with the Future Trends Advisory Committee that will be established in the coming year.

The Future Energy Strategy considers the emerging technical, socio-economic, demographic and environmental risks that will potentially impact the industries ESV regulates. We used a scenario planning approach to consider the range of credible extreme cases within which any emergent futures may lie (Figure 19). This allows ESV to begin planning responses to risks ahead of time and, through ongoing monitoring, we can implement a response before the risk emerges. The strategy provides ESV with a long-term plan to deal with uncertainty of the future energy market over the next 15 years.

In a rapidly transforming world, this approach will allow ESV to be more proactive in preparing for change rather than reacting to change after it has occurred.

ESV will regularly review the scenarios and strategies, with the Future Trends Advisory Committee, to identify which scenarios are emerging, the responses we need to start implementing, and any additional unforeseen risks that need to be considered.

The Stage 1 outcomes report is available on ESV website at esv.vic.gov.au/pdfs/future-energy-strategy-2020

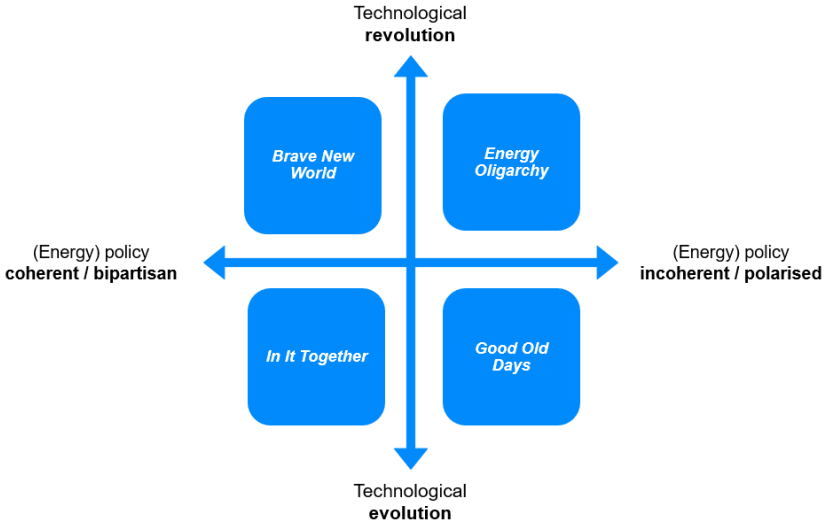


Figure 19 The scenarios defining the future energy landscape

The scenarios were developed out of consideration of two key drivers — energy policy and the rate of technological change

Appendix A : Energy Safe Victoria

A1 Moving ESV to a commission structure

In 2017, Dr Paul Grimes headed an *Independent Review of Victoria's Electricity and Gas Network Safety Framework* (the Review). The main objective of the Review was to ensure the effectiveness of the framework in delivering desired safety outcomes for Victorians.

One of the key recommendations of the Review was to strengthen ESV's regulatory governance by formally establishing it as a three-person commission.

The first step of this process has been achieved with the appointment of Marnie Williams as Director of Energy Safety, following the retirement of Paul Fearon in February 2020. Marnie is also Chair delegate of the new commission.

Marnie has extensive regulatory experience and organisational transformation experience, overseeing significant reform at the Taxi Service Commission and WorkSafe Victoria.

The recruitment of the part-time commissioners is well under way and on track to be completed this year.

The Commission will be supported by a number of committees, including a Technical Advisory Committee and a Future Trends Advisory Committee; these will also be reliant upon research and data provided through the data and analytics function. Work is already underway to identify and appoint candidates for these committees.

The transformation of ESV has already started under Marnie's leadership. ESV is already adopting a more robust approach to regulation and the holding to account of those entities that fail to deliver on their obligations.

We are moving to further enhance our position as a modern regulator through greater use of data and analytics to meaningfully inform our regulatory focus. This will be complemented by enhancing our legal capabilities through the planned engagement of a General Counsel.

ESV is clear that its decision making, regulatory activities and enforcement activities must be informed by data and hard evidence. We are also aware of the need to utilise similar skills to report transparently on our performance and the outcomes that result for the community.

The commissioners will require access to hard factual data to inform their decisions and their assessment of the performance of the electrical networks (the focus of this report) as well the wider electricity industry, the gas and pipelines industry and indeed that of ESV itself.

A2 Managing network safety under coronavirus (COVID-19)

ESV quickly responded to Victorian Government public health restrictions assessing operations to determine how to best perform our regulatory functions in the new environment. This resulted in working from home arrangements for all staff.

Recognising that ESV still needs to ensure the safety of Victoria's electricity networks, we have developed policies and procedures to protect our staff and the community while we are working in the field. These include:

- providing personal protective equipment (face masks, gloves, sanitiser)
- providing training to staff on the correct use and disposal of face masks and PPE, and on good hygiene practices
- developing protocols on managing the exchange of pool cars between ESV staff, and regular cleaning of pool cars between use

- establishing protocols to assist with contact tracing for field-based activities
- managing staff movements to minimise exposure and eliminate large gatherings, including; not attending company depots, staying outside of work zones, and using mobile phones to communicate with company staff while on site (to maintain social distancing during inspections)
- targeting and limiting field works to the most critical audits and inspections.

While operating with public health restrictions, the bushfire hazard mapping review for HBRA and LBRA in Powercor's area is on track to be completed this year. ESV will then work with Powercor to transition any affected poles and spans and bring them into compliance with the changed classifications. The HBRA and LBRA boundaries for other networks will be reviewed in future years (see page 23).

The global pandemic has impacted the delivery of the REFCL program, as distribution businesses have experienced delays in the importation of essential equipment from Asian and European manufacturers. Due to national and international travel restrictions, their engineers have also been unable to witness factory acceptance testing of REFCL units and other major plant items prior to shipping. Where possible, this is now being done via teleconference.

High voltage customers needing to interface with REFCL networks have also seen on-premises works delayed due to restrictions and financial hardship.

ESV has been able to continue its observation of the REFCL program compliance testing in a modified format. More broadly, ESV has been able to successfully modify its audit, inspection and observation practices to continue oversight with the appropriate diligence and rigor. This has been made possible in consultation with the distribution businesses. Even so, some less critical works and inspections, particularly in remote areas, have been rescheduled for when restrictions allow.

A3 Building our data capability

The ability for ESV to leverage and analyse data, to become a truly evidence-based regulator was a key focus of the Review. Our Data and Analytics group is progressively responding to the Review's recommendations on data and analytics.

Substantial progress has been made in improving ESV's data culture, laying the foundation for the development of ESV's data and analytics capabilities and delivering a number of successful projects and initiatives.

We have exposed the data underpinning the ESV Complaints and Investigations Management System (CIMS), so we can provide improved operational reporting to management and DELWP on the quantity and outcome of complaints, events and investigations.

Recently, we have undertaken an upgrade of our OSIRIS incident reporting system to align it with changes to the regulations. We also plan to undertake further upgrades in 2021 to support reporting of network faults so that we can better understand the performance of operating REFCLs (see page 24).

To support better network regulation, we have undertaken a number of analyses including:

- an analysis of a range of environment factors and condition monitoring test results to determine whether electric poles are being, and can continue to be, replaced ahead of their degradation
- development of our understanding of the influence of weather conditions on fire starts using machine learning approaches (see page 16).

In other areas of the business, we have piloted the use of artificial intelligence techniques to identify noncompliant electrical goods for sale online. Based on the learning from this pilot we are now collaborating with Monash University to develop the first stage of an effective tool that can more accurately identify a broader spectrum of non-compliant electrical products and their sellers in online markets using cloud-based text and image classification technologies. This tool can support the reduction of

unapproved and unregistered products being sold in Australia and, hence, improve the safety of electrical equipment sold online.

ESV is also developing an external dashboard environment that will enable sharing of data and analytics insights with the distribution businesses, the Minister of Energy, Environment and Climate Change, and DELWP.
We developed an online version of our weekly fire report for the Minister and DELWP to provide more thorough and timely analysis of network fire incident data during the 2020-2021 fire season.

Lastly, we continue to collaborate with external partners (CSIRO, BOM, VCDI, MFB/CFA, AER and DHHS) to secure access to third-party datasets, advice and expertise.

A4 Managing risk through regulation

ESV undertakes a wide range of functions to ensure safety risks are being appropriately managed by the Victorian transmission and distribution networks. Figure 20 shows an idealised hierarchy of controls, illustrating how the Electricity Safety Act 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 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 20.

Section A5 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.

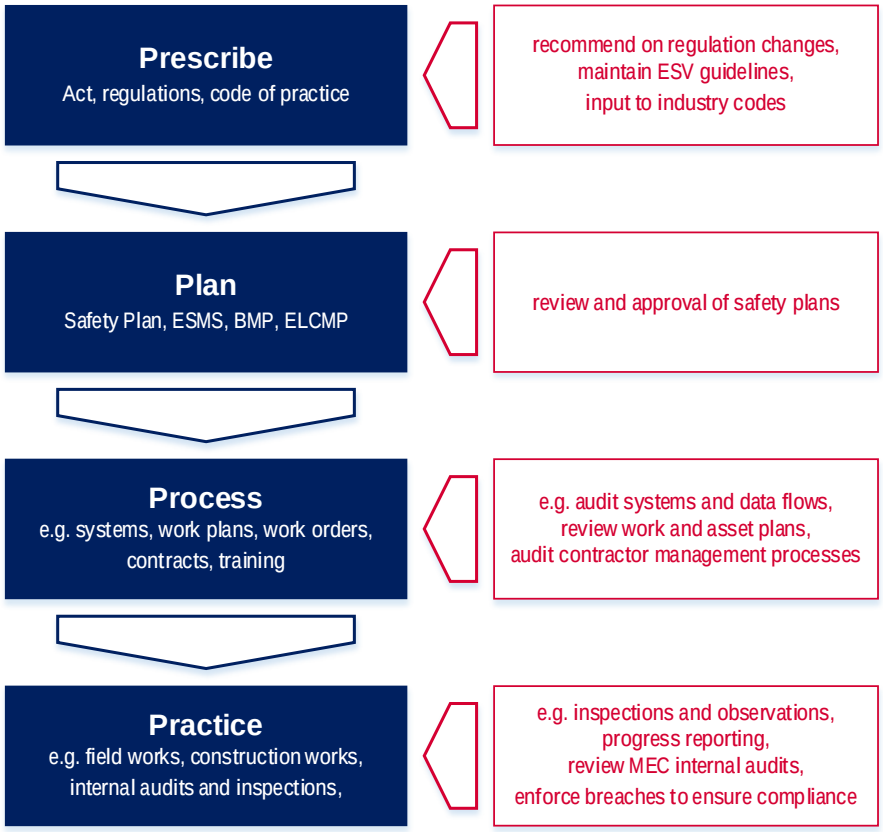


Figure 20 The regulatory hierarchy of controls

A5 Operational performance

A5.1 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 21.

Having accepted ESMSs for all the distribution businesses during 2018-2019, ESV focused on reviewing the ESMSs for the transmission businesses this year. During 2019-2020 ESV reviewed and accepted the ESMS for AusNet Services Transmission, Basslink and TransGrid. Currently, the TOA/TOA2 ESMS is ready for acceptance and will be presented to the ESV governance committee for final review in late 2020.

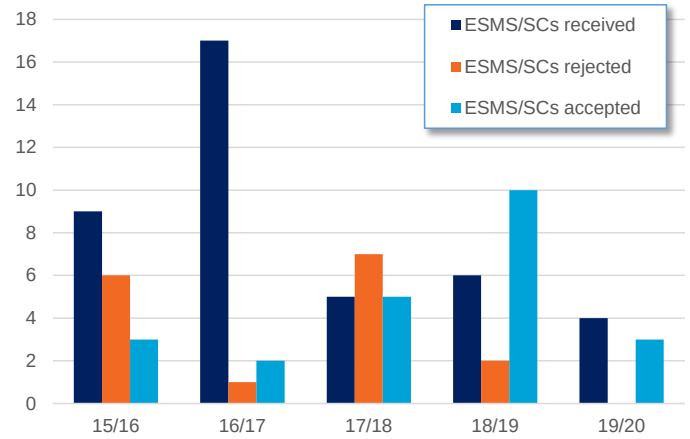


Figure 21 ESMSs and safety cases received and accepted

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, or after any similar changes.

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

ESV has ensured that any BMPs received are reviewed and accepted promptly.

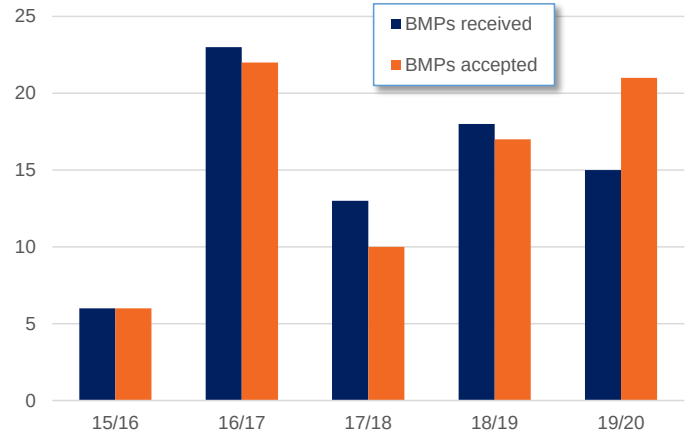


Figure 22 Bushfire Mitigation Plans received and accepted

Electric Line Clearance Management Plans

All major electricity companies are required to submit an Electric Line Clearance Management Plan (ELCMP) to ESV by 31 March each year. Councils and other responsible parties are required to have updated their plans by 31 March, but 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 23.

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 2019-2020 period, plans from all of the major electricity companies were evaluated and approved.

Municipal councils and other operators of electric lines 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 electric shock and maintaining reliable electricity supply.

Council and other operators of electric lines have less knowledge of these risks and, as a result, their plans are less mature than those of the major electricity companies. Typically, they are poor at identifying their electric line clearance risks and articulating how they intend to manage those risks.

As such additional effort is required by ESV to educate these duty holders on what comprises a quality plan, their line clearance responsibilities and the levels of compliance expected by ESV.

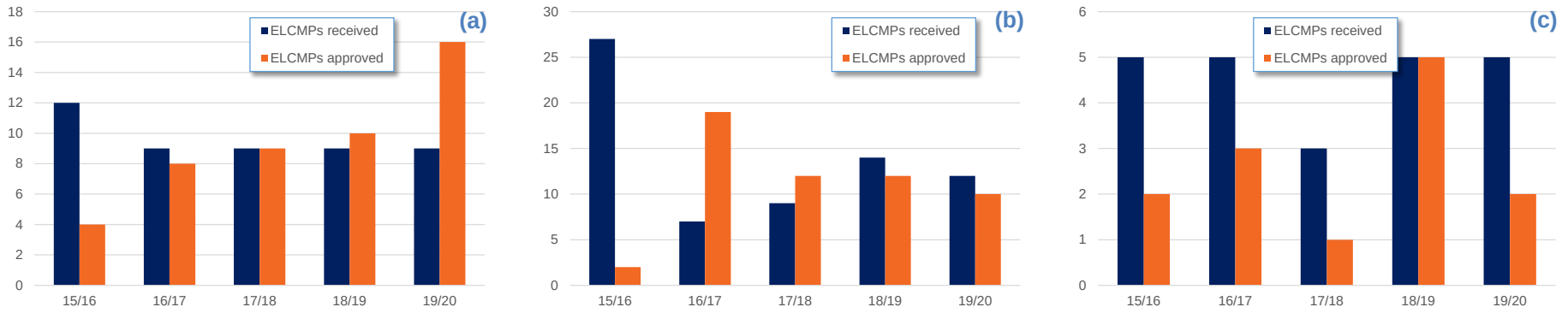


Figure 23 ELCMPs received and approved for (a) major electricity companies, (b) councils and (c) other responsible parties

A5.2 Exemptions

The process for exemptions related to the powerline bushfire safety programs is that the Governor in Council is required to approve the exemption under section 120W of the Act, based on ESV's evaluation and analysis. ESV then grants matching exemptions to the relevant parts of the regulations under regulation 13.

In 2019-2020, ESV received one exemption request related to powerline bushfire safety programs from Jemena (Figure 24). This related to its REFCL installation at Coolaroo, which was granted subject to conditions.

On 12 July 2019, ESV granted a time extension as part of the REFCL program for AusNet Services to achieve compliance at the Woori Yallock and Kinglake zone substations by 1 November 2020 and 29 April 2021 respectively. While these REFCL zone substations are currently available for service in providing a level of bushfire mitigation, the extension has allowed AusNet Services additional time to resolve technical issues to meet strict compliance requirements. Time extensions are granted by the Director of Energy Safety, following consultation with the Minister of Energy, Environment and Climate Change.

Details of the requests can be found in Sections B4 and E4.

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 2016-2017 (Figure 25). The bulk of applications received in recent years relate to the installation of the National Broadband Network (NBN); the applications have therefore tapered off as much of the network backbone has now been rolled out.

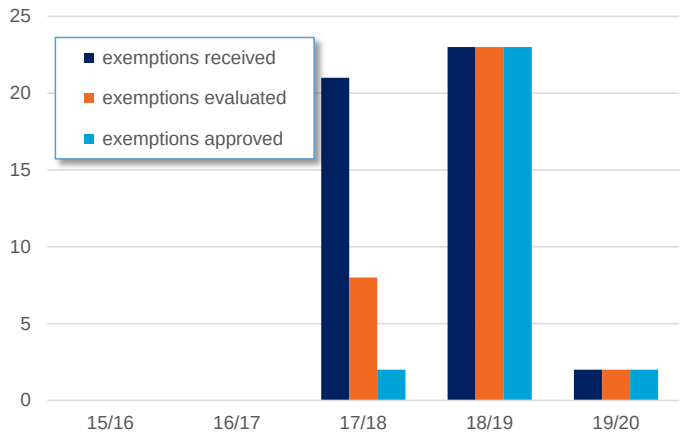


Figure 24 Bushfire Mitigation Plan exemptions

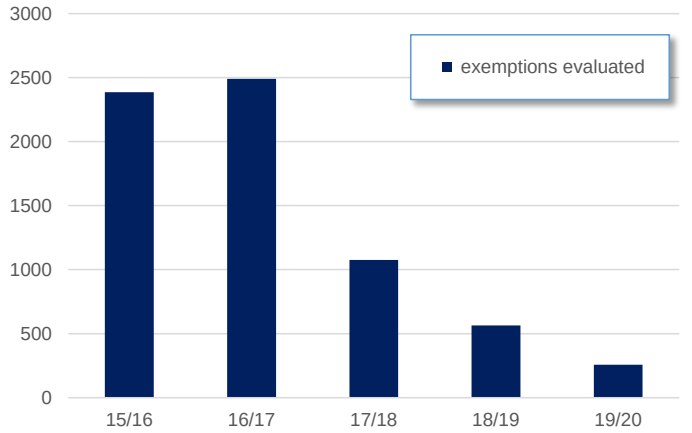


Figure 25 Electric lines on public lands exemptions

A5.3 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

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

Figure 26 shows the numbers of ESMS audits undertaken each year.

During 2019-2020 ESV carried out ESMS system audits that reviewed the process and procedures of asset management for AusNet Services and Basslink, and reviewed the audit process and procedures of all major electricity companies.

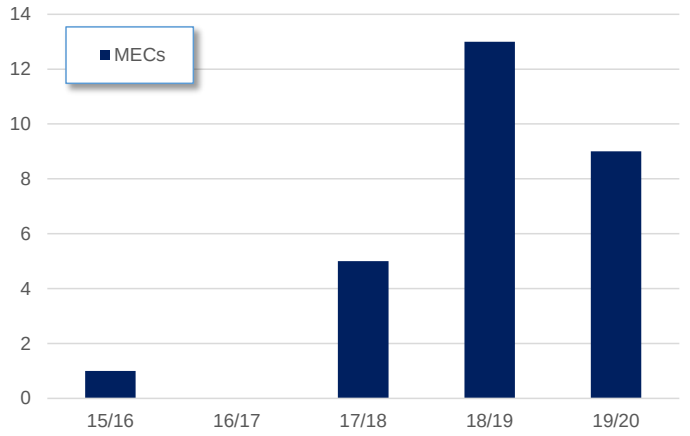


Figure 26 Numbers of ESMS audits

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 27 shows the numbers of bushfire mitigation audits undertaken each year. Each of the nine major electricity companies (MEC) are audited at least once each year. The peak in 2017-2018 resulted from secondary pole audits of four of the distribution businesses due to stakeholder concerns.

ESV has only undertaken two audits of specified operators in the last four years, as these businesses are primarily regulated as an installation within the regulations. To reduce the regulatory burden on these businesses, ESV does not undertake separate bushfire mitigation audits, but instead covers the elements of bushfire mitigation within broader audits of their specific installations.

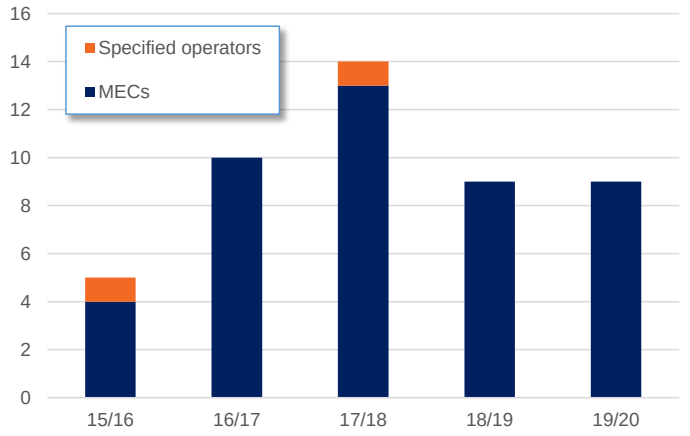


Figure 27 Numbers of bushfire mitigation audits

Electric line clearance audits and inspections

Figure 28(a) shows that the numbers of pre-summer audits have remained relatively stable over the last five years. Figure 28(b) shows these audits have been complemented by the comprehensive inspection programs introduced in 2017-2018. These were made possible through the recruitment of field officers dedicated to the task of field testing vegetation clearance standards.

The volume of spans inspected by ESV has increased from 2,000-3,000 spans in 2015-2016 and 2016-2017 to close to 16,000 spans since the appointment of the additional resources.

ESV is now equipped to conduct inspection sampling that provides 95 per cent assurance our inspection results are representative of the broader compliance standards for the networks. This, in turn, provides us with more information to ensure that the state's powerlines are maintained free of vegetation, and that bushfire risk is being properly managed.

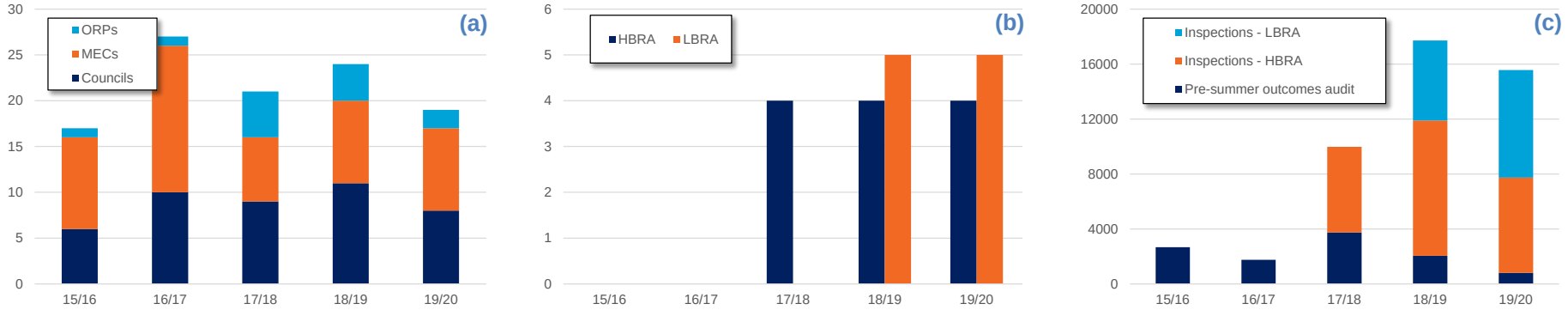


Figure 28 Electric line clearance audits and inspections showing (a) the number of pre-summer outcomes audits, (b) the number of inspections and (c) the volume of spans inspected during these audits and inspections

Works practice observations

Works 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 works practice observations:

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

Figure 29 shows the number of works practice observations undertaken each year. ESV's three works practice advisors conducted a total of 33 field-based observations this year, with 27 on the distribution businesses and six on the rail and tram companies. 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.

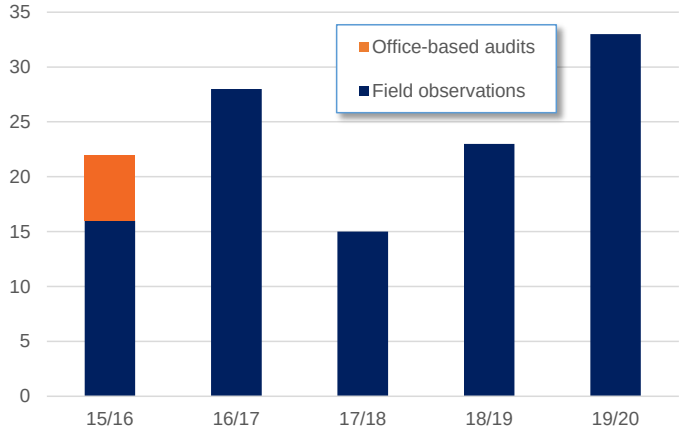


Figure 29 Numbers of works practice observations

A5.4 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 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 30 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.

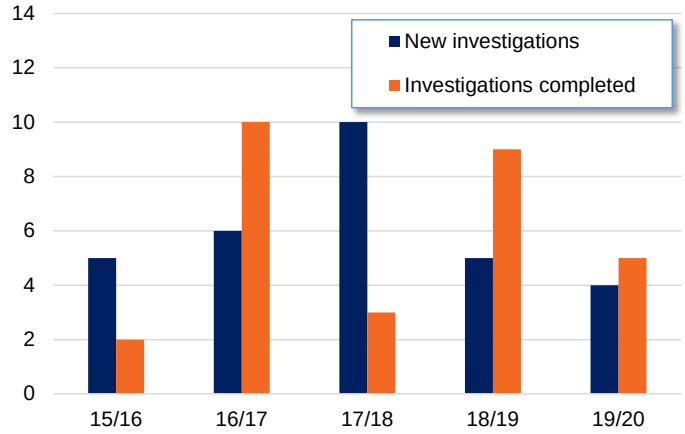


Figure 30 Numbers of new and completed investigations

Appendix B : AusNet Services

AusNet Services[5] has two shareholders with a significant investment and board representation, being Singapore Power (31.1 per cent) and State Grid of China (19.9 per cent). The remaining 49 per cent is publicly owned. The two major shareholders of AusNet Services also own 100 per cent of Jemena and 34 per cent of United Energy.

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.[6]

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 13,300 towers.

The distribution network covers an area of approximately 80,000 km^2, and includes Melbourne's outer-eastern suburbs and runs north to the New South Wales border and south and east to the coast (Figure 31). It comprises approximately 38,200 km of overhead line, 6,900 km of underground cable, 334,400 power poles and 90,500 public lighting poles. Most of this network (93 per cent) is in rural areas.

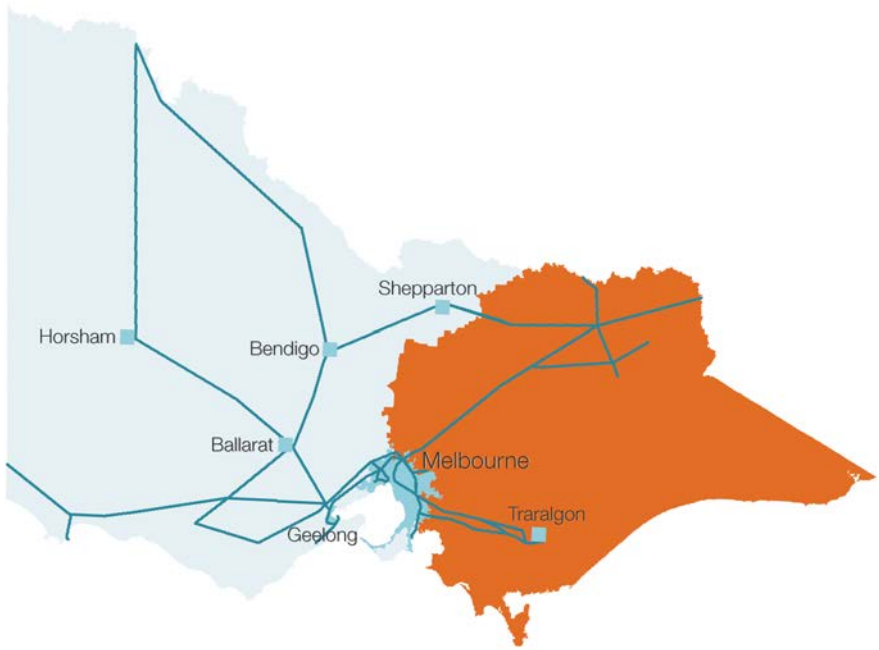


Figure 31 Service area for the AusNet Services distribution network (orange area) and transmission lines (dark blue)

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

[6] 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 by 31 March each year.

AusNet Services submitted its full transmission safety case in July 2017 and, after two iterations, the safety case was accepted by ESV in November 2018. Subsequent to the safety case acceptance, AusNet Services Transmission submitted an ESMS for review in November 2018. ESV reviewed the draft ESMS in April 2019 and, after assessment and validation, AusNet submitted a final ESMS in August 2019. The final ESMS was reviewed and accepted by ESV on 18 November 2019.

On 10 May 2019, AusNet Services submitted an updated transmission bushfire mitigation plan for ESV review. The plan was updated as the tower inspection program changed from a three-yearly tower climb inspection to an annual ground line and easement inspection. ESV reviewed the amended plan and accepted the plan on 18 September 2019.

In April 2018, 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. ESV reviewed the plan and provided conditional approval to AusNet Services on 28 November 2018. Conditions to be met included the requirement for an update plan to be accepted by October 2019. The conditions were:

- AusNet Services is required to demonstrate how its proposed design solutions for insulated cable and covered conductor construction meet the requirements of regulation 7(1)(hc) of the Regulations.
- AusNet Services is required to demonstrate its REFCL operating modes, and their application in REFCL operations, over the 2018-2019 summer
- AusNet Services is required to demonstrate the appropriateness of its Annual Validation Test Strategy following initial compliance testing, with the testing to be repeated annually until such time as it is agreed that it can be reduced.

On 4 October 2019, AusNet Services updated the distribution bushfire mitigation plan, and provided evidence that it had met the conditions of the provisional acceptance outline on 28 November 2018. ESV reviewed the updated plan and evidence and accepted the updated bushfire mitigation plan on 6 January 2020.

AusNet Services submitted its 2019-2020 transmission and distribution electric line clearance management plans to ESV in March 2019. The distribution plan was approved in advance of the fire danger period; however, ESV found a technical deficiency in the transmission plan that prevented it being approved. Despite working with AusNet Services throughout the year to resolve the deficiency, it remained unapproved. This did not cause a significant risk as the previous years' plan continued to apply.

AusNet Services submitted its 2020-2021 transmission and distribution electric line clearance management plans to ESV in March 2020 and both have been approved in advance of the upcoming fire danger period.

B2 Directions

Two directions to AusNet Services are due to be completed by 1 November 2020. These are to:

- install armour rods and vibration dampers in low risk areas within hazardous bushfire risk areas (HBRA) and in low bushfire risk areas (LBRA)
- install spacers on high voltage (HV) lines and spreaders on low voltage (LV) lines in LBRA.[7]

In April 2017, AusNet Services approached ESV to amend its armour rods and vibration dampers plan for HBRA and LBRA. The proposal was based on Australian Standard AS/NZS 7000 *Overhead line design*, which allows for an engineering assessment to determine if vibration dampers are effective in a given location. ESV previously reviewed the methodology behind the proposal and the amended installation plan and accepted both. The AusNet Services program for the installation of armour rods and vibration dampers is ahead of schedule with 96 per cent complete against a target of 90 per cent. ESV anticipates that these works will be completed on schedule.

The direction to install spacers and spreaders in LBRA was completed ahead of time.

B3 Powerline bushfire safety programs

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

Figure 32 shows the progress of the AusNet Services REFCL installation program as of 30 April 2020 and its anticipated progress in the next twelve months.

By 30 June 2020, ESV had granted AusNet Services conditional acceptance for seven zone substations, and granted a time extension for compliance for two zone substations (Kinglake and Woori Yallock).

A number of technical issues are still to be solved, most of them involving equipment capabilities. Those issues are currently being addressed by Swedish Neutral.

AusNet Services is proposing to establish a new zone substation in the Kalkallo area, it is expected that the existing feeders supplied from the prescribed substation at Kalkallo will be transferred to the new zone substation. These feeders are mandated and, therefore, the new zone substation needs to be REFCL-capable by the date the feeders were mandated, if they are to be transferred.

ESV continues its engagement with AusNet Services to develop a consistent compliance testing methodology to ensure that regulatory requirements are achieved, and that its REFCL program delivers the mandated required capacity and safety outcomes.

[7] The installation of armour rods and vibration dampers in high risk areas within HBRA and spacers and spreaders in HBRA was completed by 1 November 2015.

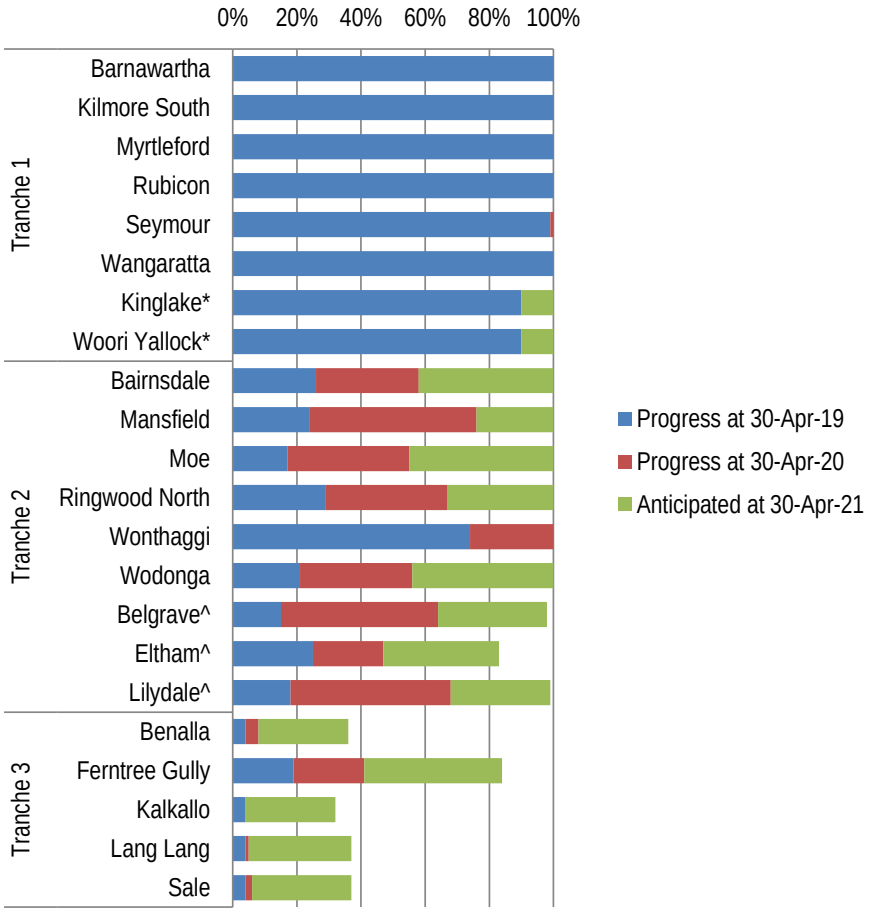


Figure 32 Status of the AusNet Services REFCL program

* denotes where a time extension has been granted
^ denotes where a time extension is expected to be received

B4 Exemptions

On 12 July 2019, ESV granted a time extension for AusNet Services to achieve compliance of the REFCL installations at the Woori Yallock and Kinglake zone substations. Delivery has been extended to 1 November 2020 and 29 April 2021 respectively. This will provide AusNet Services additional time to resolve technical issues. Time extensions are granted by the Director of Energy Safety, following consultation with the Minister for Energy, Environment and Climate Change.

These REFCLs are still operational and will provide partial protection for the 2020-2021 bushfire season.

ESV expects to receive exemption applications from AusNet Services for the Kinglake, Woori Yallock, Moe, Ferntree Gully and Kalkallo REFCLs. The exemptions predominantly relate to isolating network sections consisting of underground cable from REFCL protection. This will reduce the capacitance of these networks so that the *required capacity* performance standard can be achieved.

B5 Audit performance

B5.1 Electricity Safety Management Scheme (ESMS)

During June 2019, ESV audited the AusNet Services transmission and distribution asset management systems. The ESMS was found to adequately describe asset management processes and procedures and be compliant in this area.

During the first half of 2020, ESV audited the AusNet Services internal auditing process and procedures for both transmission and distribution. This focused on the process and procedures used when undertaking internal audits of asset inspection, construction and high voltage operating field staff. The ESMS was found to adequately describe the audit processes and procedures and be compliant in this area.

There were three opportunities where ESV considered AusNet Services could improve its process and procedures:

- auditor teams could have regular meetings to explore continuous improvement opportunities and share experiences
- auditor teams could use a photo of records, not only for findings, but also as evidence of audits being performed and as a reference for other audits
- auditors should have access to 'Pegasus' so that they can check training dates while on-site during the observations.

AusNet Services provided a plan to address the ESV audit findings and implement changes in 2020.

B5.2 Electric line clearance

Distribution network pre fire danger period audit

Leading into the 2019-2020 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 found one noncompliance, one minor noncompliance and two opportunities for improvement. The findings related to the application of procedures for inspection timeframes, rectification timeframes and vegetation coding.

ESV found that AusNet Services was not strictly managing the network according to its approved plan. This related to technical procedural deficiencies that were not impacting priority clearing responsibilities, so ESV did not consider this as a major safety concern. The field inspection component of the audit confirmed that there was not an imminent risk.

The procedural deficiencies identified by ESV have been addressed by AusNet Services in its 2020-2021 electric line clearance management plan. ESV will review the application of the revised procedures as part of the 2020-2021 auditing and inspection program.

Distribution network inspection

During the 2019-2020 period ESV inspected 4236 spans on the AusNet Services distribution network, with 2195 in HBRA and 2041 in LBRA.

ESV identified 328 noncompliant spans across the network (143 in HBRA and 185 in LBRA). All the noncompliant spans were cleared by AusNet Services as a matter of priority, resulting in the elimination of these potentially hazardous situations.

The rate of noncompliant vegetation on the AusNet Services distribution network has been increasing over the last three years in both HBRA and LBRA (see Figure 10 and Figure 11 respectively).

Despite the increased rate of noncompliance, the nature of the noncompliant vegetation presented less of a threat to electricity safety across the network when compared to last year. Noncompliances are regarded as high risk where vegetation is touching, or could soon touch, uninsulated conductors. This contrasts with technical noncompliance where vegetation is in the clearance space but there is no immediate risk of contact with electric lines. In each of the last three years, the rates of high risk noncompliance on the AusNet Services network were less than the average across all distribution networks (Figure 33).

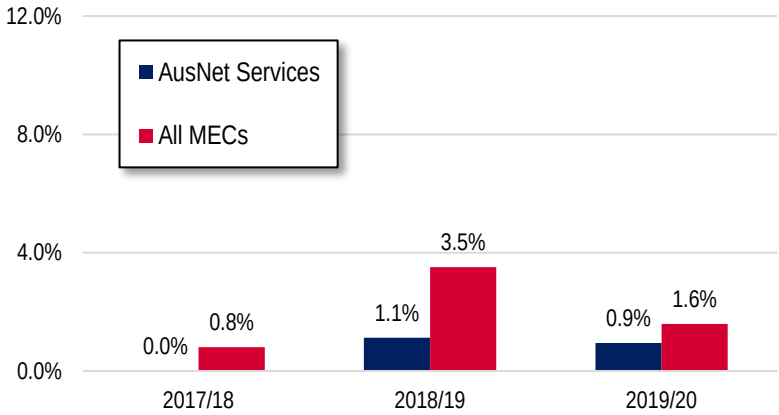


Figure 33 Rate of high risk noncompliances

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 found two noncompliances and one opportunities for improvement. The noncompliances related to the application of procedures in the areas of inspection timeframes and vegetation coding.

Similar to the result for the distribution network, the audit found that AusNet Services was not strictly managing the transmission network according to its approved plan. Again, ESV did not see this as a major safety concern, as it related to technical procedural deficiencies rather than an inability to manage its priority clearing responsibilities.

The transmission network has large well-established clearance easements, and the matters identified during the audit only came into play for vegetation that existed on the outer fringe of the required minimum clearance space. The field inspection component of the audit confirmed this to be the case.

The procedural deficiencies identified by ESV have been addressed by AusNet Services in its 2020-2021 electric line clearance management plan. ESV will review the application of the revised procedures as part of the 2020-2021 auditing and inspection program.

B5.3 Bushfire mitigation

Transmission network

ESV reviewed 1,504 requested asset records from nominated transmission lines in north-east Victoria. The review found no structures outside the inspection cycle timeframes identified in the AusNet Services bushfire mitigation plan. ESV inspected 24 structures across AusNet Services transmission network from the nominated lines between South Morang and the Mount Beauty area via Dederang.

The inspections found no serious issues and seven minor issues, including three birds' nests on towers, three flashover damaged insulators and a loose insulator nut.

The visual inspection found the transmission assets to be generally in very good condition. The issues found were very minor in nature and would be identified and repaired as part of routine inspection and maintenance activities undertaken by AusNet Services. ESV recommended that AusNet Services ensures these issues are addressed.

Distribution network

ESV reviewed 52,175 requested asset records from the Leongatha, Traralgon, Warragul, Wonthaggi, Barnawartha and Kinglake areas. The review found no structures outside the inspection cycle timeframes identified in the AusNet Services bushfire mitigation plan.

ESV inspected 114 structures across AusNet Services network from the above nominated areas. The inspections found no serious issues and 45 minor issues, including loose and unsecured hardware, rusting conductor ties, and missing and incorrectly fitted 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 recommended that AusNet Services rectify the identified issues in accordance with its priority maintenance practices.

B5.4 Work practices

In 2019-2020, ESV undertook twelve observations of AusNet Services work practices across thirteen sites. Three observations were on the AusNet Services transmission network and nine were on AusNet Services distribution network. Five of the distribution network observations were opportunistic observations.

The findings of these observations were as follows:

- AusNet Services distribution network
  - noncompliances 2
  - minor noncompliances 5
  - opportunities for improvement 5
- AusNet Services transmission network
  - noncompliances 0
  - minor noncompliances 0
  - opportunities for improvement 3

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

- compliance with approved earthing processes
- management of instructed people on site
- communications of job safety assessments and safe work method statements
- checking of all equipment to ensure it is within test date before use
- operating and access permit issuing practices.

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

- earthing and short circuiting are installed according to company procedures
- workers have a detailed understanding of the job safety assessment process and know the contents of relevant safe work method statements
- instructed people are effectively managed while on site
- the condition of personal protective equipment and other equipment is checked before use
- workers are involved in the permit issuing process and:
  - confirm all permit documents are completed to standard
  - ensure those involved in the work understand the permit they are signing onto
  - ensure the permit issuing process is to standard with appropriate communication and with strong, effective site leadership.

B6 Safety indicators

Figure 34 shows the number of all serious electrical incidents reported to ESV via OSIRIS by AusNet Services during the 2019-2020 period, with the blue bars showing the numbers for 2019-2020 and the orange bars showing the long-term average from 1 October 2010 to 30 June 2019. Figure 35 shows the same for those incidents that resulted in a ground or vegetation fire.

The most common incidents on the AusNet Services network in 2019-2020 were HV fuse failures, tree contact, other asset failures and connection faults. The numbers of all incidents were lower in 2019-2020 than the long-term average, with the exception of HV fuse failures, tree contacts and broken conductor and ties. Tree contact is partially within the control of the AusNet Services when it involves vegetation growing into the clearance space; blown and fallen vegetation is largely outside of its control.

Tree contact, animal contact, other asset failures and connection faults were the most common causes of network-related fires. Fires from tree contact, other asset failures and vehicle contact were higher than the long-term average.

Other asset failures and connection faults are within the control of AusNet Services, and tree and animal contacts are partially within its control.

Of the 52 ground fires on the AusNet Services network this year, 45 were smaller than 1,000 m^2 (87 per cent), six were between 1,000 m^2 and 10 hectares (11 per cent) and one was larger than 10 hectares (2 per cent). A further 117 fires were contained to the network assets and did not result in a ground fire.

Tree contacts were higher this year than last year. Such events are not fully within the control of AusNet Services when they involve vegetation that has blown or fallen onto powerlines from outside the clearance space.

ESV will increase its focus on management of hazard trees and other vegetation outside the clearance space (see page 23), and seek to better understand the influence of weather on such incidents (see page 16), and look at ways to work with the major electricity companies to improve performance in this area.

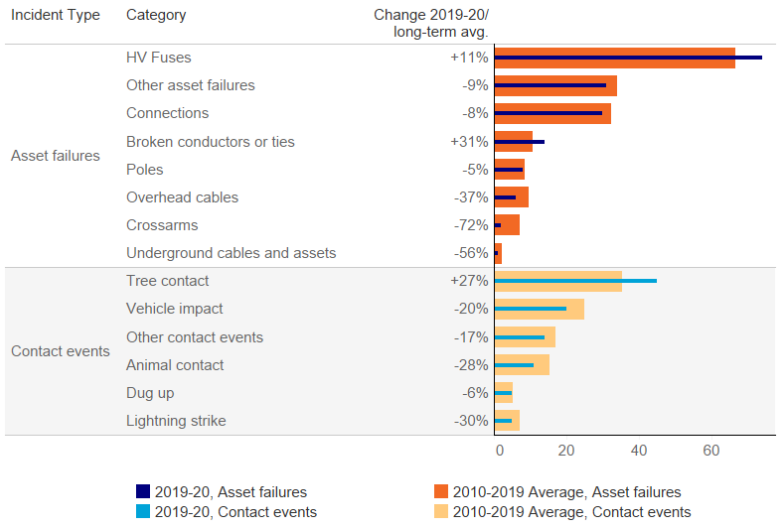


Figure 34 Incidents on the AusNet Services network

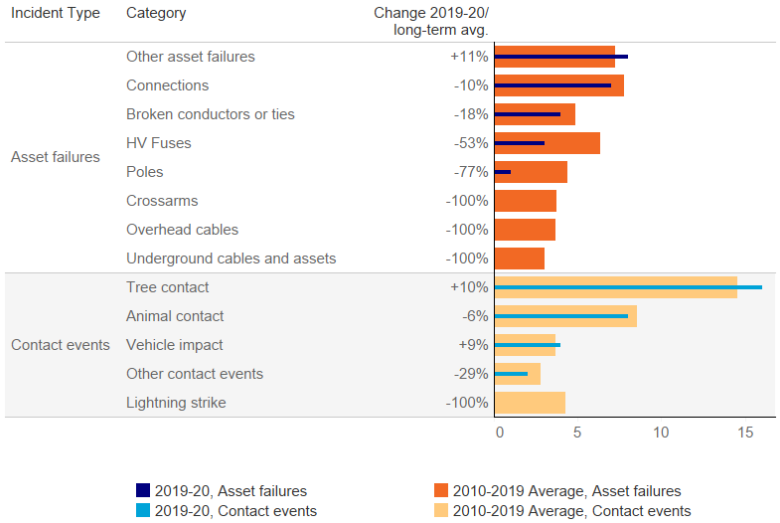


Figure 35 Incidents on the AusNet Services network resulting in ground fires

Appendix C : Basslink

Basslink is owned by Keppel Infrastructure Trust, an entity listed on the Singapore stock exchange. Basslink is registered as a Market Network Service Provider.

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 36). 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 only been commissioned in April 2006.

Figure 36 Location of Basslink transmission assets (dark blue line)

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 by 31 March each year.

Basslink submitted its full safety case to ESV in July 2017 and, after a detailed review, ESV accepted the full safety case in October 2018. Basslink provided an ESMS in March 2019 and ESV accepted the ESMS on 21 January 2020.

Basslink submitted its 2019-2024 Bushfire Mitigation Plan to ESV on 27 August 2019. ESV reviewed the plan and, after Basslink made changes to address ESV comments, ESV accepted the plan on 19 December 2019.

Basslink submitted its 2020-2021 electric line clearance management plan to ESV in March 2020, and the plan was approved ahead of the 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)

As part of the process to establish an accepted ESMS, ESV carried out an extensive system validation of Basslink's ESMS during July 2019. Basslink reviewed ESV's findings and updated the ESMS for ESV's final review. The ESMS was accepted on 21 January 2020.

ESV audited the Basslink asset management system in July 2019. ESV found that the ESMS adequately described the Basslink asset management process and procedures. ESV identified two opportunities for improvement, being:

- Basslink needs to complete the development of asset class level strategies
- Basslink should consider inclusion of a process to manage "end of life" or obsolescent assets.

Basslink provided a plan to address the ESV audit findings and implement changes in 2020. ESV will also monitor progress in developing asset class level strategies.

C5.2 Electric line clearance

Leading into the 2019-2020 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 found Basslink was managing the network strictly according to its approved plan, and there were no network safety risks being caused by vegetation.

ESV inspected 24 of the network's 142 spans and every span inspected was found to be compliant. The easement was being managed to prevent future encroachment of vegetation into the minimum clearance space.

ESV considered this to be excellent result, particularly given this has been the case for four years in a row. No recommendations were made as a result of the audit.

C5.3 Bushfire mitigation

ESV reviewed 142 asset records from the 400kV DC powerlines running between the Loy Yang convertor 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 20 structures along the 400kV DC powerline and found no serious issues and five minor issues, including three birds' nests on towers, minor structural damage on a tower caused by a slasher, and a wombat hole at the base of a concrete footing.

The issues found were minor in nature and would be expected to be identified and repaired as part of Basslink's routine inspection and maintenance activities.

C5.4 Work practices

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

ESV did not conduct any observations of Basslink works 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.

Also being a relatively new asset, Basslink has not entered a phase of its life cycle where major maintenance is required.

It is therefore not unexpected that Basslink recorded no incidents on its transmission network during the 2019-2020 period.

Appendix D : CitiPower

CitiPower/Powercor[8] is jointly owned by Cheung Kong Infrastructure, Power Assets Holdings and Spark Infrastructure. Cheung Kong Infrastructure and Power Assets Holdings are both part of the Cheung Kong Group of companies. They jointly own 51 per cent of CitiPower/Powercor, with the remaining 49 per cent held by Spark Infrastructure.

In May 2017, Cheung Kong Infrastructure 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 Cheung Kong Infrastructure 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 km^2, and includes Melbourne's central business district and inner suburbs (Figure 37). It comprises approximately 2,560 km of overhead line, 2,670 km of underground cable, 49,000 power poles and 9,100 public lighting poles. Most of this network (75 per cent) is in the central business district.

Figure 37 Service area for the CitiPower distribution network (orange area)

Jemena and United Energy service boundaries are shown as orange lines

[8] 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:

- 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
- Electric line clearance management plan by 31 March each year.

On 2 September 2019 CitiPower submitted their 2019-2024 Bushfire Mitigation Plan for ESV review. ESV's initial review found a number of issues that were reverted back to CitiPower. A revised plan was provided by CitiPower and ESV accepted the revised plan on 20 December 2019.

CitiPower submitted its 2020-2021 electric line clearance management plan to ESV in March 2020, and the plan was approved in advance of the fire danger period.

D2 Directions

There are two directions to CitiPower due to be completed by 1 November 2020:

- install armour rods and vibration dampers in low bushfire risk areas (LBRA)
- install spacers on high voltage (HV) lines and spreaders on low voltage (LV) lines in LBRA.

We reported last year that CitiPower had completed the installation of armour rods and vibration dampers in LBRA well ahead of schedule.

CitiPower plans to install spacers and spreaders on 434 spans by November 2020. Most of this work will be completed in 2020-2021; however, CitiPower has advised that its works are expected to be completed on time.

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)

During the latter half of 2019, ESV audited CitiPower on its internal auditing process and procedures. This focused on the process and procedures used when undertaking internal audits of asset inspection, construction and high voltage operating field staff. The ESMS was found to adequately describe the audit processes and procedures and be compliant in this area.

That said, ESV found one minor noncompliance and eight opportunities for improvement. The minor noncompliance related to audits of the asset inspection service provider being performed by its own internal staff. The opportunities for improvement related to:

- using software to flag noncompliances and trend audit findings
- improving review procedures to flag serious findings for follow-up report
- selecting auditors to ensure impartiality
- considering the deeper (possibly systemic) root causes of noncompliance, and not just relying on retraining of staff
- providing background evidence to support the number of audits required
- including the audit and post-audit analysis processes in the ESMS
- finalising the draft document 'Field Services – Audit and Inspection'
- including training records as an item on field observation checklists.

CitiPower provided a plan to address the ESV audit findings and implement changes in 2020.

D5.2 Electric line clearance

Network pre fire danger period audit

Since the CitiPower network lies entirely within the Greater Melbourne area, this network does not pose a bushfire risk. Even so, ESV conducted an audit and inspection on the CitiPower network leading into the 2019/2020 fire danger period to confirm it was managing its electric line clearance responsibilities.

The audit found one noncompliance, one minor noncompliance and two opportunities for improvement. The findings related to the application of procedures for rectification timeframes and vegetation coding.

ESV found that CitiPower was not strictly managing the network according to its approved plan. The problem related to technical procedural deficiencies that were not impacting priority clearing responsibilities. Since it did not result in a short-term risk of trees contacting powerlines, ESV did not see this as a major safety concern. The field inspection component of the audit confirmed that there was no imminent risk.

The procedural deficiencies identified by ESV have been addressed by CitiPower in its 2020/2021 electric line clearance management plan. ESV will review the application of the revised procedures as part of the 2020-2021 auditing and inspection program.

Network inspection

During the 2019-2020 period ESV inspected 455 spans on the CitiPower network and identified 28 noncompliant spans. All the noncompliant spans were cleared by CitiPower as a matter of priority, resulting in the elimination of these potentially hazardous situations.

The rate of noncompliant vegetation has increased since last year (see Figure 11).

Despite the increased rate of noncompliance, the nature of the noncompliant vegetation presented less of a threat to electricity safety across the network when compared to last year. Noncompliances are regarded as high risk where vegetation is touching, or could soon touch, uninsulated conductors. This contrasts with technical noncompliance where vegetation is in the clearance space but there is no immediate risk of contact with electric lines. Figure 38 shows the rate of high risk noncompliances on the CitiPower network.

The rates of high risk noncompliance on the CitiPower network are less than the average across all distribution networks in each of the last three years.

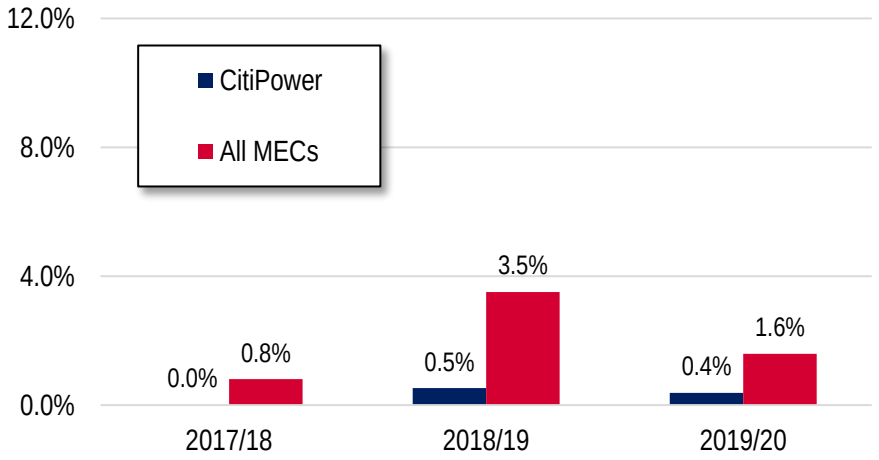


Figure 38 Rate of high risk noncompliances

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 5,572 asset records from the Brunswick, Fairfield, Glen Iris and Prahran areas. The review found no structures outside the inspection cycle timeframes identified in the CitiPower bushfire mitigation plan.

ESV inspected 108 structures across CitiPower's network from the nominated areas listed above. The inspections found no serious issues and 39 minor issues, including loose and unsecured hardware, defective overhead services and damaged insulators and ties.

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 recommended that CitiPower rectify the identified issues in accordance with its priority maintenance practices.

D5.4 Work practices

In 2019-2020, ESV undertook three observations of CitiPower work practices across three sites. The findings of these observations were:

- noncompliances 0
- minor noncompliances 1
- opportunities for improvement 7

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

- checking and use of appropriate personal protective equipment, tools and other equipment
- identification of second points of contact and the use of covers
- management of apprentices
- implementation of approved testing procedures.

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

- appropriate protective measures are taken
- compliance with approved procedures at all times, especially testing procedures
- apprentices are effectively managed at all times
- the condition of personal protective equipment is checked before use, and that equipment is confirmed to be within test dates.

D6 Safety indicators

Figure 39 shows the number of all serious electrical incidents reported to ESV via OSIRIS by CitiPower during the 2019-2020 period, with the blue bars showing the numbers for 2019-2020 and the orange bars showing the long-term average from 1 October 2010 to 30 June 2019. Figure 40 shows the same for those incidents that result in a ground or vegetation fire.

The most common incidents on the CitiPower network in 2019-2020 were other contact events, connection faults, dug-up cables and vehicle impacts. Apart from connection faults, all these items are not within the control of the CitiPower. The numbers of incidents were higher in 2019-2020 than the long-term average for connections faults, overhead cable failures, cross arm failures and tree contacts.

Connection faults, tree contact and overhead cable faults were the cause of all ground fires on the CitiPower network this year. The numbers of the first two were higher than the long-term average; the numbers of fires from overhead cable faults are stable compared to the long-term average.

Of the eight ground fires on the CitiPower network this year, all eight were smaller than 1,000 m^2 (100 per cent); none were larger than 1000 m^2.
A further 16 fires were contained to the network assets and did not result in a ground fire.

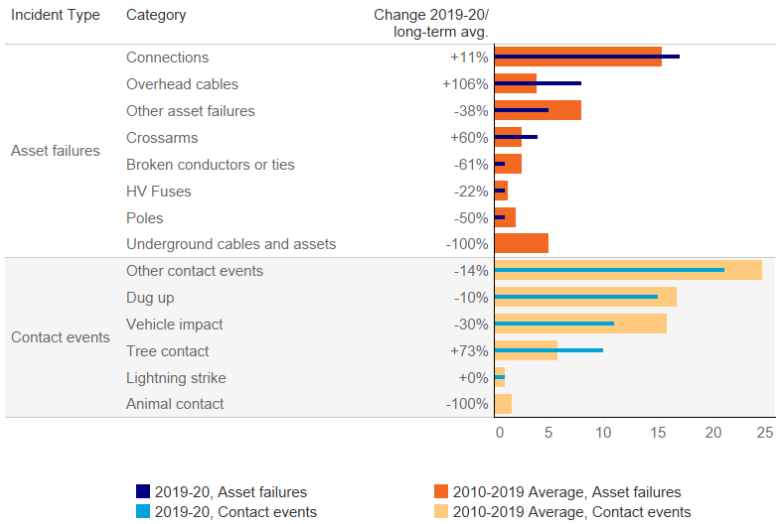


Figure 39 Incidents on the CitiPower network

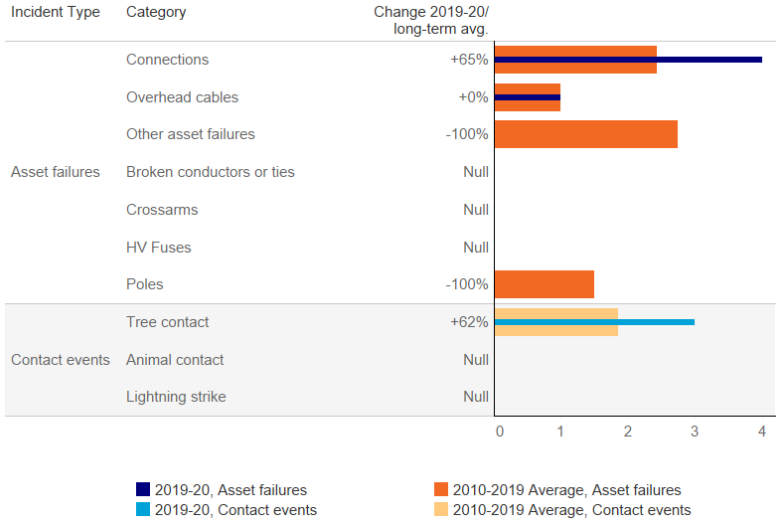


Figure 40 Incidents on the CitiPower network resulting in ground fires

Appendix E : Jemena

Jemena[9] 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 AC distribution network covers an area of approximately 950 km^2, across Melbourne's northern and western suburbs, including Melbourne International Airport (Figure 41). It comprises approximately 4,500 km of overhead line, 2,080 km of underground cable, 91,400 power poles and 26,800 public lighting poles. Most of this network (74 per cent) is in urban areas.

Figure 41 Service area for the Jemena distribution network (orange area)

CitiPower and United Energy service boundaries are shown as orange lines

[9] 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 by 31 March each year.

Jemena submitted a revised 2019-2024 bushfire mitigation plan to ESV on 29 June 2019. The plan was updated to include information on their REFCL commitments in accordance with the regulations. ESV reviewed the plan and accepted the revised plan on 11 July 2019.

Jemena submitted its 2020-2021 electric line clearance management plan to ESV in March 2020, and the plan was approved in advance of the fire danger period.

E2 Directions

There are two directions to Jemena due to be completed by December 2020:

- install armour rods and vibration dampers in low bushfire risk areas (LBRA)
- install spacers on high voltage (HV) lines and spreaders on low voltage (LV) lines in LBRA.[10]

Jemena is installing armour rods, vibration dampers, spacers and spreaders in the LBRA as part of its routine maintenance program.

Jemena plans to complete retrofitting of vibration dampers and armour rods to 271 spans by November 2020, with 135 spans to be completed in 2019 and 136 spans in 2020. As of 30 June 2020, Jemena has installed rods and dampers on 91 spans. Jemena has appointed a subcontractor to undertake the install on the remaining 180 spans, and expects this work to be completed by the end of October 2020.

E3 Powerline bushfire safety programs

Figure 46 shows the progress of the Jemena REFCL installation program at 30 April 2020, and its anticipated progress in the next twelve months.

ESV has received an exemption application for Coolaroo that involves establishing a new REFCL-protected zone substation in the Greenvale area. The Sydenham base-level[11] REFCL is not prescribed in legislation.

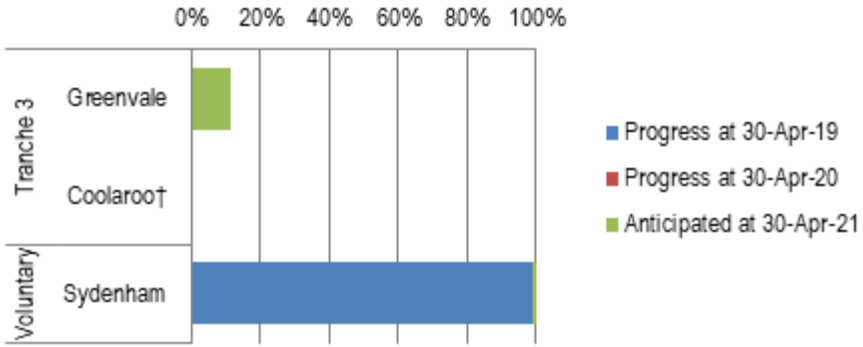


Figure 42 Status of the Jemena REFCL program

† denotes where an exemption request has been received

[10] The installation of armour rods, vibration dampers, spacers and spreaders in HBRA was completed by 1 November 2015.

[11] 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 21 May 2020 ESV received a complex exemption application from Jemena in relation to the Coolaroo REFCL. ESV has worked with Jemena to refine the application. As of 30 June 2020 ESV was still reviewing the application. ESV expects to receive a similar exemption application in relation to Kalkallo in late 2020 following the joint planning exercises of Jemena and AusNet Services.

E5 Audit performance

E5.1 Electricity Safety Management Scheme (ESMS)

During the December 2019, ESV audited Jemena on its internal auditing process and procedures. This focused on the process and procedures used when undertaking internal audits of asset inspection, construction and high voltage operating field staff. The ESMS was found to adequately describe the audit processes and procedures and be compliant in this area.

That said, ESV found one minor noncompliance and seven opportunities for improvement. The minor noncompliance related to a failure to provide the auditor with a walk-through of alterations to a zone substation control room. Such walk-throughs should also be conducted with substation operators at regular intervals or at critical stages, particularly where not all controls have been transferred from an old control room.

The opportunities for improvement related to:

- reviewing field observation methods and providing guidance to internal auditors regarding process and documentation requirements
- investigating the use of an electronic system of recording observations
- selecting auditors to ensure impartiality
- ensuring auditors have access to systems for checking training dates while on-site
- providing appropriate audit training to their field observation staff
- maintaining the currency of documentation
- updating the ESMS to reflect current practice regarding the frequency of assessment of key controls.

Jemena addressed all the ESV audit findings and implemented changes to its systems in June 2020.

E5.2 Electric line clearance

Network pre fire danger period audit

Leading into the 2019-2020 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 found two noncompliances related to the application of procedures for rectification timeframes and vegetation coding.

ESV found that Jemena was not strictly managing the network according to its approved plan. The problem related to how it was assigning vegetation clearing priorities; however, this deficiency did not impact assignment of its highest priority clearing responsibilities. Since it did not result in a short-term risk of trees contacting powerlines, ESV did not see this as a major safety concern. The field inspection component of the audit confirmed that there was no imminent risk.

The procedural deficiencies identified by ESV have been addressed by Jemena in its 2020-2021 electric line clearance management plan. ESV will review the application of the revised procedures as part of the 2020-2021 auditing and inspection program.

Network inspection

During the 2019-2020 period ESV inspected 1,049 spans on the Jemena network, with 315 in HBRA and 734 in LBRA.

ESV identified 33 noncompliant spans across the network (15 in HBRA and 18 in LBRA). All the noncompliant spans were cleared by Jemena as a matter of priority, resulting in the elimination of these potentially hazardous situations.

The rate of noncompliant vegetation on the Jemena network has been increasing for the last three years in HBRA and has been relatively stable in LBRA (see Figure 10 and Figure 11 respectively).

Despite the increased rate of noncompliance, the nature of the noncompliant vegetation posing a threat to electricity safety across the network is stable over the last three years. Noncompliances are regarded as high risk where vegetation is touching, or could soon touch, uninsulated conductors. This contrasts with technical noncompliance where vegetation is in the clearance space but there is no immediate risk of contact with electric lines. Figure 43 shows the rate of high risk noncompliances on the Jemena network.

The rates of high risk noncompliance on the Jemena network are less than the average across all distribution networks in each of the last three years.

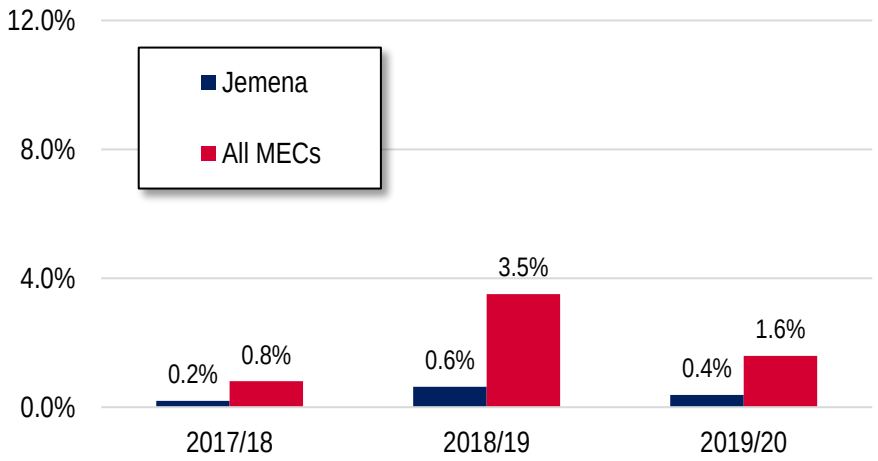


Figure 43 Rate of high risk noncompliances

E5.3 Bushfire mitigation

ESV reviewed 28,931 asset records from the Airport West, Coolaroo, Somerton and Sunbury areas. The review found no assets outside the inspection cycle timeframes identified in the Jemena bushfire mitigation plan. It did, however, identify a data integrity issue between two separate referenced databases and the absence of guidance in the Jemena asset inspection manual for an observed asset condition.

ESV inspected 46 structures across Jemena network from the nominated areas listed above. The inspections found no serious issues and nine minor issues, including loose pole-top hardware, fuse unit moisture ingress, armour rod issues, and a missing bird cover.

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 recommended that Jemena rectify the identified issues in accordance with its priority maintenance practices.

E5.4 Work practices

In 2019-2020, ESV undertook three observations of Jemena work practices on Jemena work crews. The findings of the observation were as follows:

- noncompliances 0
- minor noncompliances 4
- opportunities for improvement 3

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

- checking and use of appropriate personal protective equipment
- the earthing of vehicles
- compliance with approved procedures when pole testing
- job planning.

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

- the condition of personal protective equipment is checked before use, and then used properly
- vehicles are properly earthed
- asset inspectors comply with approved procedures
- work planning processes ensure that adequate pre-site job planning is undertaken.

E6 Safety indicators

Figure 44 shows the number of all serious electrical incidents reported to ESV via OSIRIS by Jemena during the 2019-2020 period, with the blue bars showing the numbers for 2019-2020 and the orange bars showing the long-term average from 1 October 2010 to 30 June 2019. Figure 45 shows the same for those incidents that result in a ground or vegetation fire.

The most common incidents on the Jemena network in 2019-2020 were other contact events, vehicle impacts, crossarm failures and dug-up cables. Crossarm failures are the only one of these events within the control of Jemena. Other contact events, vehicle impacts and dug-up cables were higher this year than the long-term average, although outside of Jemena control. The numbers of crossarm and pole failures were also higher than the average and are within Jemena control, although the numbers of each are low.

Six separate causes were responsible for the six fires on the Jemena network this year. Five were lower than the long-term average and one was equal with the long-term average. Four of the causes were largely or partly within the control of the Jemena to manage.

Of the six ground fires on the Jemena network this year, five were smaller than 1,000 m^2 (83 per cent) and one was between 1,000 m^2 and 10 hectares; none was larger than 10 hectares. A further 38 fires were contained to the network assets and did not result in a ground fire.

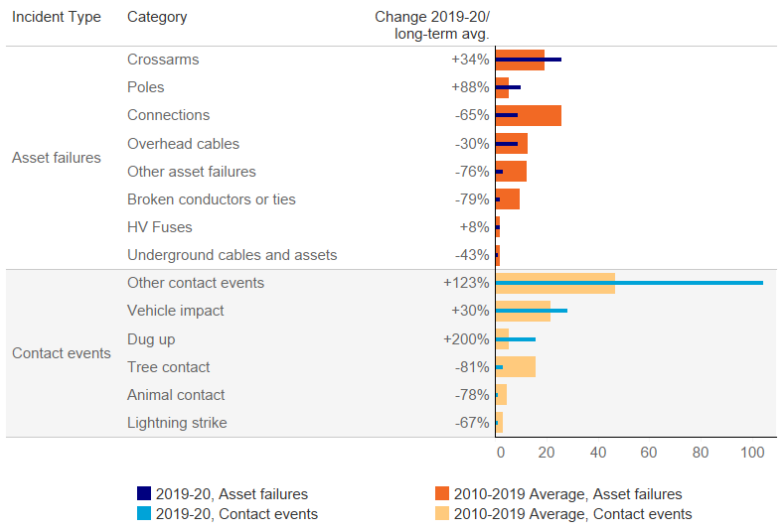


Figure 44 Incidents on the Jemena network

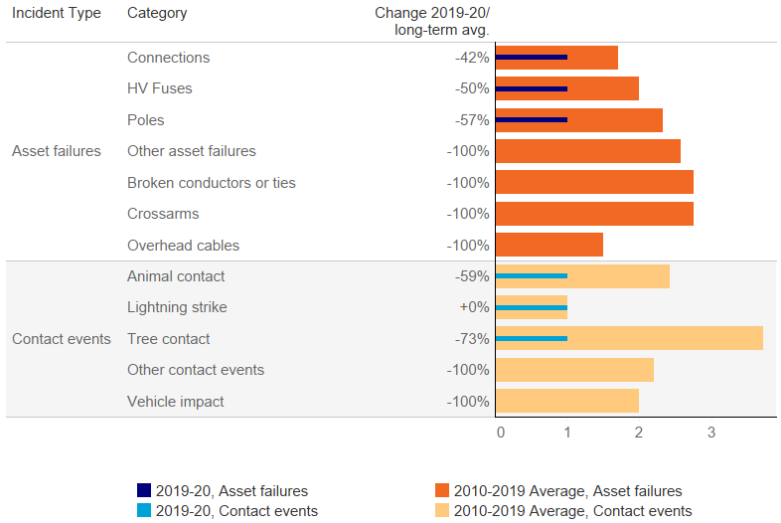


Figure 45 Incidents on the Jemena network resulting in ground fires

Appendix F : Powercor

CitiPower/Powercor[12] is jointly owned by Cheung Kong Infrastructure, Power Assets Holdings and Spark Infrastructure. Cheung Kong Infrastructure and Power Assets Holdings are both part of the Cheung Kong Group of companies. They jointly own 51 per cent of CitiPower/Powercor, with the remaining 49 per cent held by Spark Infrastructure.

In May 2017, Cheung Kong Infrastructure 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 Cheung Kong Infrastructure 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 km^2, and includes Melbourne's Docklands Precinct, west from Williamstown to the South Australian border, north to the Murray and south to the coast (Figure 46). It comprises approximately 68,800 km of overhead line, 8,070 km of underground cable, 489,700 poles and 87,700 public lighting poles. Most of this network (92 per cent) is in rural areas.

Figure 46 Service area for the Powercor distribution network (orange area)

[12] 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:

- 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
- electric line clearance management plan by 31 March each year.

On 15 April 2020 Powercor submitted a revised Bushfire Mitigation Plan. The plan was updated to include information on REFCL operating modes, trial installation of insulated overhead HV conductors, its stay improvement plan and other minor amendments. ESV reviewed the amendments and found that some clarification was required. After further amendment ESV accepted the plan on 18 June 2020.

Powercor submitted its 2020-2021 electric line clearance management plan to ESV in March 2020, and the plan was approved in advance of the fire danger period.

F2 Directions

Three directions to Powercor are due to be completed by 1 November 2020:

- install armour rods and vibration dampers in low bushfire risk areas (LBRA)
- install spacers on high voltage (HV) lines and spreaders on low voltage (LV) lines in LBRA[13]
- ensure that all SWER ACRs have protection settings and reclose functions that can be controlled by Powercor's SCADA system.

We reported last year that the installation of armour rods and vibration dampers in LBRA areas had been completed well ahead of schedule.

Powercor plans to install spacers and spreaders on 265 spans by November 2020. By 30 June 2020, Powercor had installed 79 spacers. The remaining works will be completed in 2020-2021. Powercor has advised that its works are expected to be completed on time.

For the ACR direction, ESV had previously approved the use of FuseSavers as an alternative solution. Powercor plans to install 1,062 FuseSavers on its network by 2020. This work is on schedule, with Powercor installing FuseSavers at 1,050 sites as of 30 June 2020.

F3 Powerline bushfire safety programs

To meet its bushfire mitigation obligations, Powercor plans to implement REFCL technology at 21 nominated zone substations over three delivery tranches. This has been reduced from the 22 REFCLs mandated in the regulations due to an exemption (see page 67).

Figure 47 shows the progress of the Powercor REFCL installation program at 30 April 2020 and its anticipated progress in the next twelve months.

By 30 June 2020 ESV had accepted nine zone substations as compliant.

A number of technical issues are still to be solved, most of them involving equipment capabilities. Those issues are currently being addressed by Powercor with support from Swedish Neutral.

ESV continues its engagement with Powercor to understand and develop pragmatic solutions to the technical challenges being encountered that will provide the greatest bushfire risk reduction to Victorians.

[13] The installation of armour rods, vibration dampers, spacers and spreaders in HBRA was completed by 1 November 2015.

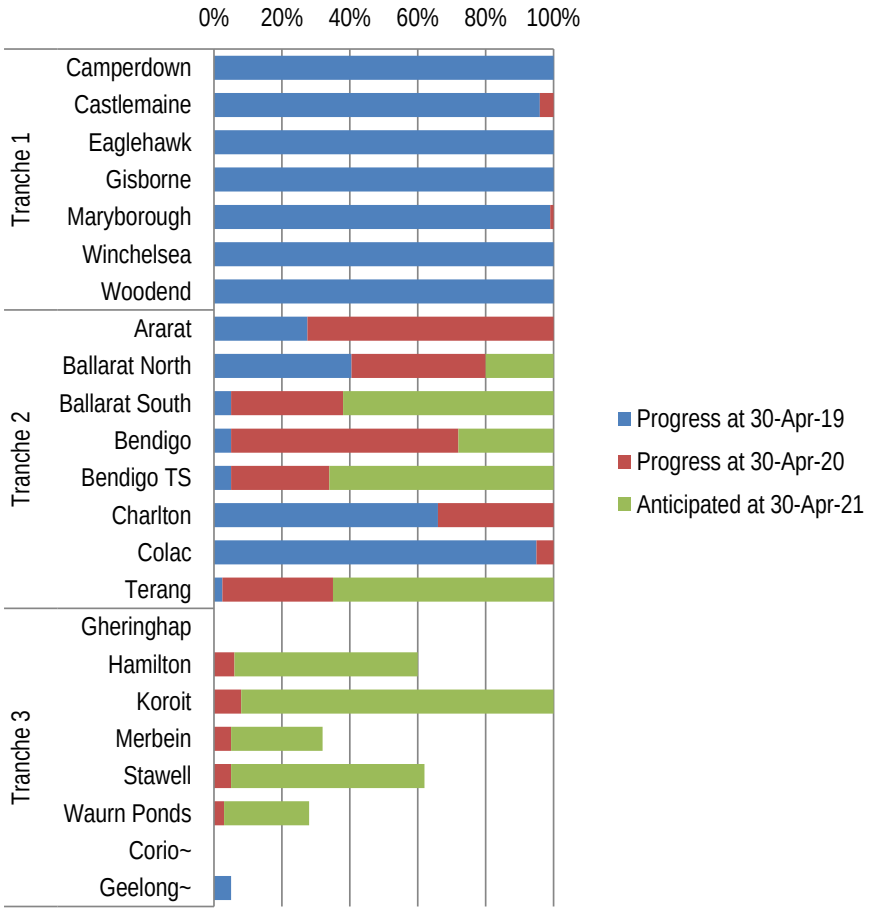


Figure 47 Status of the Powercor REFCL program

~ denotes where an exemption request has been granted

Powercor's total SWER ACR numbers were revised down by ten since last year's report as a result of network changes. At 30 June 2020, Powercor had completed all but two installations. One of the remaining SWER lines is comprised entirely of underground cable. Powercor contends that an ACR will not provide any reduction in powerline bushfire ignition risk, and will be submitting an exemption request for this ACR.

F4 Exemptions

On 5 June 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 areas with bushfire risk. This exemption reduced the number of Powercor zone substations requiring REFCLs from 22 to 21.

Powercor has advised ESV that it expects to apply for a similar exemption for a new zone substation it intends to construct at Torquay, which will take load away from the prescribed Waurn Ponds (WPD) zone substation.

F5 Audit performance

F5.1 Electricity Safety Management Scheme (ESMS)

During the latter half of 2019, ESV audited the Powercor internal audit process and procedures. This focused on the process and procedures used when undertaking internal audits of asset inspection, construction and high voltage operating field staff. The ESMS was found to adequately describe the audit processes and procedures and be compliant in this area.

That said, ESV found one minor noncompliance and eight opportunities for improvement. The minor noncompliance related to audits of the asset inspection service provider being performed by its own internal staff. The opportunities for improvement related to:

- using software to flag noncompliances and trend audit findings
- improving review procedures to flag serious findings for follow-up report
- selecting auditors to ensure impartiality

- considering the deeper root causes of noncompliance and not just relying on retraining of staff
- providing background evidence on quantifying the numbers of audits required
- including the audit and post-audit analysis processes in the ESMS
- finalising the draft document 'Field Services – Audit and Inspection'
- including training records as an item on field observation checklists.

Powercor provided a plan to address the ESV audit findings and implement changes in 2020.

F5.2 Electric line clearance

Network pre fire danger period audit

Leading into the 2019-2020 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 found one noncompliance, two minor noncompliances and two opportunities for improvement. The findings related to the application of procedures for inspection timeframes, rectification timeframes and vegetation coding.

ESV found that Powercor was not strictly managing the network according to its approved plan. The procedural deficiencies found during the audit are directly relatable to the Powercor performance issues ESV identified during this year's HBRA inspections (see page 10).

The procedural deficiencies identified by ESV have been addressed by Powercor in its 2020-2021 electric line clearance management plan.

Powercor also commissioned an independent review of its vegetation management program in 2018. Since the completion of the review, Powercor has committed to ESV to adopt the recommendations of the review and to implement a range of actions designed to improve its performance. This is to occur by the end of 2020.

ESV has closely monitored implementation of the Powercor reforms and investigated its performance throughout the year. ESV will review the application of the revised procedures as part of the 2020-2021 audit and inspection program, and continue to monitor the implementation of Powercor's reforms.

Network inspection

During the 2019-2020 period ESV inspected 6,339 spans on the Powercor network, with 3,211 in HBRA and 3,128 in LBRA.

ESV identified 499 noncompliant spans across the network (324 in HBRA and 175 in LBRA). All the noncompliant spans were cleared by Powercor as a matter of priority, resulting in the elimination of these potentially hazardous situations.

The rate of noncompliant vegetation in HBRA on the Powercor network has increased markedly since last year; however, it is less than the rate observed in HBRA for this network two years ago (see Figure 10). The rate of noncompliance in LBRA has reduced in the last year (see Figure 11).

Despite the increased rate of noncompliance, the nature of the noncompliant vegetation presented less of a threat to electricity safety across the network when compared to last year. Noncompliances are regarded as high risk where vegetation is touching, or could soon touch, uninsulated conductors. This contrasts with technical noncompliance where vegetation is in the clearance space but there is no immediate risk of contact with electric lines. Figure 48 shows the rate of high risk noncompliances on the Powercor network.

The rates of high risk noncompliance on the Powercor network are more than the average across all distribution networks in two of the last three years, including 2019-2020.

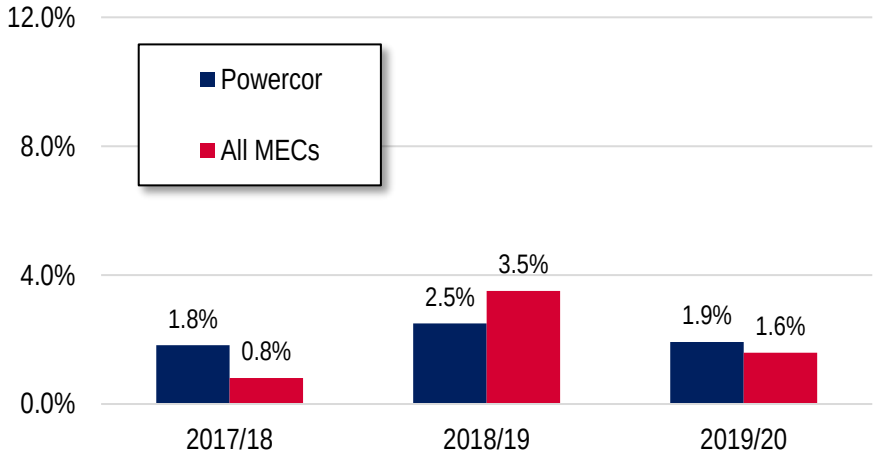


Figure 48 Rate of high risk noncompliances

F5.3 Bushfire mitigation

ESV reviewed 22,962 asset records from the Nhill, Stanhope, Bendigo, Terang and Cobden areas. The review found 96 pole records outside of the inspection cycle timeframes identified in the Powercor bushfire mitigation plan.

ESV inspected 167 structures across Powercor network from the nominated areas listed above. The inspections found no serious issues and 38 minor issues, including loose pole-top hardware, deteriorated service lines and missing 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 Powercor. ESV recommended that Powercor rectify the identified issues in accordance with its priority maintenance practices.

F5.4 Work practices

In 2019-2020, ESV undertook four observations of Powercor's work crews across four sites. Two of these observations were opportunistic. The findings of these observations were as follows:

- noncompliances 4
- minor noncompliances 8
- opportunities for improvement 1

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

- failure to apply earthing and short-circuiting according to approved procedures
- failure to comply with approved procedures when undertaking asset inspections
- conflicts in documentation.

ESV recommended that Powercor's work practices (and those of its contractors) specifically focus on ensuring:

- compliance with approved procedures for applying earthing and short circuits
- compliance with approved procedures for asset inspection
- conflicts in documentation are identified and resolved
- workers are involved in the permit issuing process and:
  - confirm all permit documents are completed to standard
  - ensure those involved in the work understand the permit they are signing onto
  - ensure the permit issuing process is to standard with appropriate communication, with strong, effective site leadership.

F6 Safety indicators

Figure 49 shows the number of all serious electrical incidents reported to ESV via OSIRIS by Powercor during the 2019-2020 period, with the blue bars showing the numbers for 2019-2020 and the orange bars showing the long-term average from 1 October 2010 to 30 June 2019. Figure 50 shows the same for those incidents that result in a ground or vegetation fire.

The most common incidents on the Powercor network in 2019-2020 were other contact events, connection faults, crossarms and vehicle impacts. Two of these items are not within the control of the Powercor. The numbers of incidents were lower in 2019-2020 than the long-term average in six categories, stable in one category and higher in seven categories.

Tree contact, connection faults, animal contact and other asset failures were the most common causes of network-related fires. Two of these are within full control of Powercor to manage and two are partially in its control. In relation to tree contacts, further analysis is needed to quantify the contributions from vegetation within and outside the clearance space (see page 16). The numbers of fires in the period were also lower than the long-term average in eight categories and higher in five categories.

It is concerning that fires from tree contact have increased this year and are higher than the long-term average. Continued vigilance in vegetation clearance and the management of hazard trees is needed to minimise opportunities for contact events that result in fires. Powercor needs to ensure that the recent issues in managing its electric line clearance responsibilities do not recur.

Of the 133 ground fires on the Powercor network this year, 111 were smaller than 1,000 m^2 (84 per cent), 19 were between 1,000 m^2 and 10 hectares (14 per cent) and three were larger than 10 hectares (2 per cent). A further 172 fires were contained to the network assets or vegetation at height, and did not result in a ground fire.

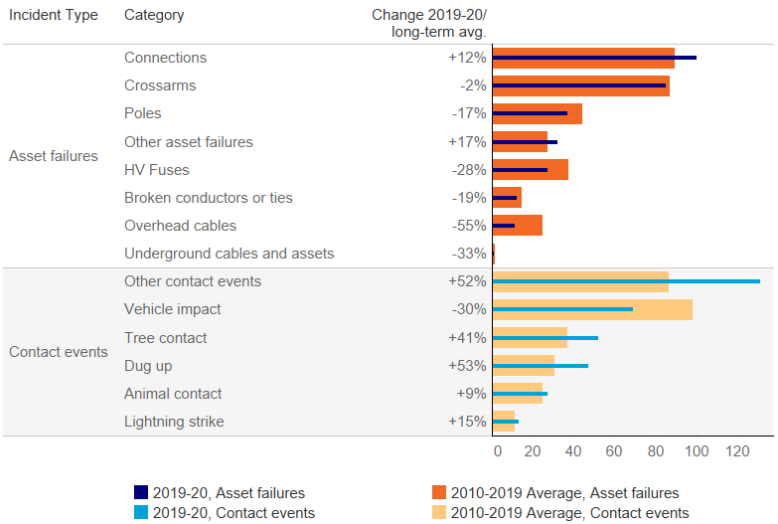


Figure 49 Incidents on the Powercor network

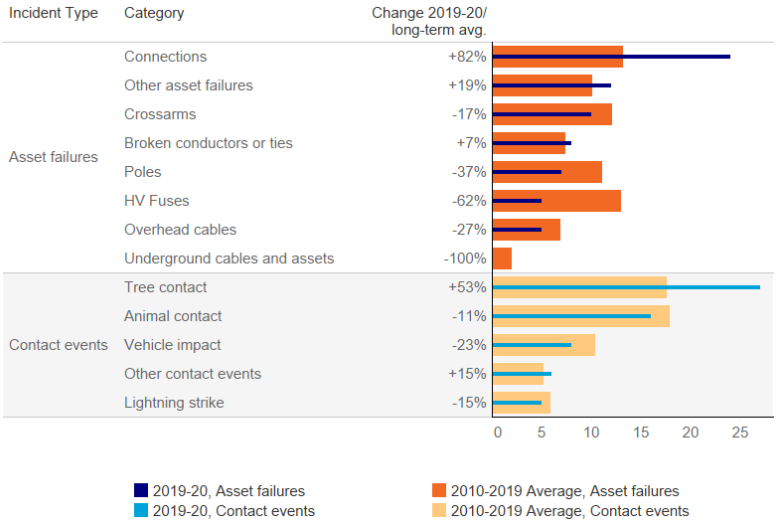


Figure 50 Incidents on the Powercor network resulting in ground fires

Appendix G : TransGrid

TransGrid[14] is jointly owned by Canadian pension fund CDPQ (25 per cent), Utilities Trust of Australia (20 per cent), investment vehicles Tawreed Investments Limited and Wren House Infrastructure (20 per cent each) and Australian infrastructure manager Spark Infrastructure (15 per cent). Tawreed Investments Limited is a wholly-owned subsidiary of the Abu Dhabi Investment Authority, and Wren House Infrastructure is a wholly-owned subsidiary of the Kuwait Investment Authority.

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 is constructing a 7.5 km 220kV overhead transmission line from Berrybank Terminal Station to Berrybank Zone Substation, which is due to be commissioned in November 2020 (Figure 51).

Figure 51 Locations of TransGrid assets (orange squares)

[14] 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 by 31 March each year.

Transgrid submitted an updated ESMS for review in July 2019. The ESMS was updated to include details of new assets that were recently constructed and are under the ownership of the TransGrid group. The new assets are the Kiamal Terminal Station, 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.

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.

TransGrid submitted its 2020-2021 electric line clearance management plan to ESV in March 2020, and the plan was approved in advance of the 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)

As the TransGrid assets are new and require little maintenance at this early stage of their lifecycle, ESV determined there was greater merit in deploying resources to audits of the other distribution and transmission ESMSs this year (particularly given the constraints imposed by COVID-19).

G5.2 Electric line clearance

The TransGrid network is not due to be commission the first of its powerlines until November 2020. As such, it has not been subject to any ESV electric line clearance audit or inspection regimes this year.

G5.3 Bushfire mitigation

As the TransGrid assets are new station assets only (no lines over burnable vegetation) 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.

G5.4 Work practices

ESV is yet to undertake a work practice observation of TransGrid as it 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 its life cycle where major maintenance is required.

It is, therefore, not unexpected that TransGrid only recorded a single incident at the Deer Park zone substation during the 2019-2020 period, being the failure of a 220kV underground cable.

Appendix H : Transmission Operations Australia

Transmission Operations (Australia)[15] (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. 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 connection from the Mt Mercer Wind Farm to the electrical transmission network (Figure 52). This includes a 22km 132kV powerline and 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 1.2 per cent of the towers and poles that AusNet Services owns and maintains. Its assets are also newer having only been commissioned in November 2013.

Figure 52 Location of TOA transmission assets (orange square)

[15] 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:

- an Electricity Safety Management Scheme (ESMS) before 2 October 2018
- 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 by 31 March each year.

TOA submitted a joint TOA/TOA2 ESMS for review in May 2019. ESV performed a validation audit during June 2020 on the joint ESMS. The ESMS was updated based on the findings of ESV's audit, with final acceptance to occur later in 2020 after review from ESV's governance committee.

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's initial review found a number of issues that were reverted back to TOA/TOA2. A revised plan was provided by TOA/TOA2 and ESV accepted the revised plan on 21 May 2020.

TOA submitted its 2020-2021 electric line clearance management plan to ESV in March 2020, and the plan was approved in advance of the 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)

During the latter half of 2019, ESV audited TOA on its internal auditing process and procedures. This focused on the process and procedures used when undertaking internal audits of asset inspection, construction and high voltage operating field staff. The ESMS was found to adequately describe the audit processes and procedures and be compliant in this area.

Given that the audit was conducted in conjunction with the audit of CitiPower and Powercor, the findings related to these businesses also apply to TOA.

H5.2 Electric line clearance

Network pre-fire danger period audit

Leading into the 2019-2020 fire danger period, an audit and inspection was conducted on the TOA network to confirm it was managing its electric line clearance responsibilities effectively in HBRA.

The audit found one noncompliance and one opportunity for improvement. The noncompliance related to the application of procedures for inspection timeframes and vegetation coding.

ESV found that TOA, while not strictly managing the network according to its approved plan, had comprehensive processes and procedures in place to assist it to manage its electric line clearance risks. The problem related to technical procedural deficiencies that were not impacting priority clearing responsibilities. Since it did not result in a short-term risk of trees contacting powerlines, ESV did not see this as a major safety concern. This was confirmed by the field inspection component of the audit.

Network inspection

During the 2019-2020 period ESV inspected 21 of the 262 spans on the TOA transmission network, and two of those inspected were found to be noncompliant.

TOA is a relatively new network that has large, and typically well-established clearance easements. The matters identified during the audit only related to vegetation that existed on the outer fringe of the required minimum clearance space and, therefore, did not create a significant risk. The field inspection component of the audit confirmed this to be the case.

Despite this, ESV has noted a steady increase in the rate of noncompliant vegetation on this network since 2016-2017 (Figure 53). Noting that the 2019-2020 inspection results were based on a limited sample size, ESV will complete a more comprehensive inspection of the network before the 2020-2021 fire danger period to determine if this is a continuing trend that requires ESV intervention.

The procedural deficiencies identified by ESV have been addressed by TOA in its 2020-2021 electric line clearance management plan. ESV will review the application of the revised procedures as part of the 2020-2021 auditing and inspection program.

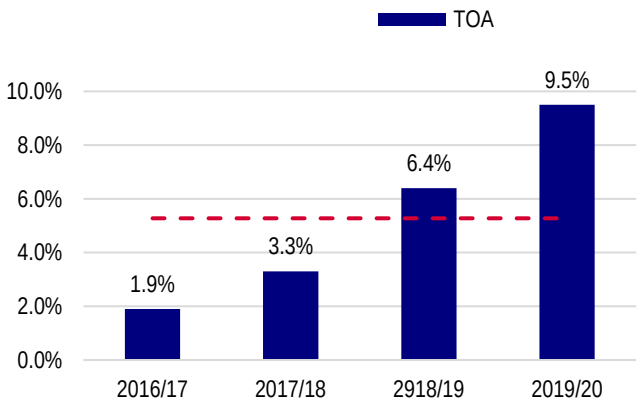


Figure 53 Noncompliance rates for TOA

H5.3 Bushfire mitigation

ESV reviewed 161 asset records being the full TOA 132kV line from Mt Mercer Wind Farm to Elaine 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 48 structures across TOA network from the nominated areas listed above. The inspections identified no serious issues, and generally found the line to be in good condition, as would be expected for a relatively new asset (commissioned in November 2013). That said, one minor issue was identified regarding a defect at the base of a ground guy.

The issue was minor in nature and would be expected to be identified and repaired as part of routine inspection and maintenance activities undertaken by TOA. ESV recommended that TOA rectify the identified issue 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.

It is, therefore, not unexpected that TOA only recorded one incident on its transmission network during the 2019-2020 period, being the theft of equipment from the Elaine Terminal Station.

Appendix I : Transmission Operations Australia 2

Transmission Operations (Australia) 2[16] (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.

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 54). 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.

Figure 54 Location of TOA2 transmission assets (orange square)

[16] 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:

- 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 by 31 March each year.

While TOA2 was not due to resubmit its ESMS to ESV until June 2021, TOA submitted a joint TOA/TOA2 ESMS for review in May 2019. ESV performed a validation audit during June 2020 on the joint ESMS. The ESMS was updated based on the findings of ESV's audit, with final acceptance to occur later in 2020 after review from ESV's governance committee.

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's initial review found a number of issues that were reverted back to TOA/TOA2. A revised plan was provided by TOA/TOA2 and ESV accepted the revised plan on 21 May 2020.

TOA2 submitted its 2020-2021 electric line clearance management plan to ESV in March 2020, and the plan was approved in advance of the 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 TOA 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)

During the latter half of 2019, ESV audited TOA2 on its internal auditing process and procedures. This focused on the process and procedures used when undertaking internal audits of asset inspection, construction and high voltage operating field staff. The ESMS was found to adequately describe the audit processes and procedures and be compliant in this area.

Given that the audit was conducted in conjunction with the audit of CitiPower and Powercor, the findings related to these businesses also apply to TOA2.

I5.2 Electric line clearance

Network pre fire danger period audit

Leading into the 2019-2020 fire danger period, an audit and inspection was conducted on the TOA2 network to confirm it was managing its electric line clearance responsibilities effectively in HBRA.

The audit found no noncompliances and one opportunity for improvement, related to the application of procedures for inspection timeframes.

As a result of the audit, ESV found that TOA2 is predominantly managing the network according to its approved plan, and had comprehensive processes and procedures that allowed it to manage its electric line clearance risks.

Network inspection

During the 2019-2020 period ESV inspected 23 of the 106 spans on the TOA2 transmission network, and none of those inspected was found to be noncompliant. Being a relatively new transmission network, TOA2 was found to have large and typically well-established clearance easements.

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

No recommendations were made as a result of the audit.

I5.3 Bushfire mitigation

ESV reviewed 160 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 25 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). That said, one minor issue was identified relating to the top phase split pin.

The issue was minor in nature and would be expected to be identified and repaired as part of routine inspection and maintenance activities undertaken by TOA2. ESV recommended that TOA2 rectify the identified issue in accordance with its priority maintenance practices.

I5.4 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.

I6 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.

It is therefore not unexpected that TOA2 recorded no incidents on its transmission network during the 2019-2020 period.

Appendix J : United Energy

United Energy[17] is jointly owned by Cheung Kong Infrastructure (66 per cent) and SGSP (Australia) Assets Pty Ltd (34 per cent).

Cheung Kong Infrastructure, 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 two companies forming SGSP (Australia) Assets Pty Ltd also own 51 per cent of AusNet Services.

Cheung Kong Infrastructure 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 Cheung Kong Infrastructure controls. Of most relevance from a safety perspective was the introduction into United Energy of CitiPower/Powercor procedures for assessing vegetation clearance at height.

Historically, United Energy engaged EDI Downer and Zinfra as subcontractors to manage aspects of its operations and maintenance services. United Energy consolidated all of these services with Zinfra in January 2018. 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 km^2 across Melbourne's eastern and south-eastern suburbs and the Mornington Peninsula (Figure 55). It comprises approximately 9,930 km of overhead line, 3,920 km of underground cable, 168,800 poles and 34,700 public lighting poles. Most of the network is urban and semi-rural (68 per cent).

Figure 55 Service area for the United Energy distribution network (orange area)

Jemena and CitiPower service boundaries are shown as orange lines

[17] 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 by 31 March each year.

United Energy submitted a revised bushfire mitigation plan in March 2018. ESV reviewed the revised plan and accepted the plan on 12 August 2019.

United Energy submitted its 2020-2021 electric line clearance management plan to ESV in March 2020, and the plan was approved in advance of the fire danger period.

J2 Directions

Two directions to United Energy are due to be completed in 2020. These are to:

- install armour rods and vibration dampers in low bushfire risk areas (LBRA)
- install spacers on high voltage (HV) lines and spreaders on low voltage (LV) lines in LBRA.[18]

United Energy plans to install vibration dampers and armour rods on 495 spans by December 2020. As of 30 June 2020, United Energy has installed armour rods and vibration dampers on 34 spans, and expects to complete the installation works by December 2020.

United Energy also planned to install spacers and spreaders on 10 spans to prevent conductor clashing in LBRA by December 2020. These works were completed by 30 June 2020.

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, Mornington and Dromana zone substations.

Figure 56 shows the progress of the United Energy REFCL installation program at 30 April 2020.

The Frankston South REFCL was installed as part of a trial that assisted in the development of the amended regulations. It has been in service for several years at a reduced level of sensitivity. This REFCL is an earlier model, and United Energy has advised ESV of its intention to upgrade this REFCL in the future.

The Mornington and Dromana REFCLs are of a similar version as those being installed by AusNet Services and Powercor. Due to the size of the Mornington and Dromana networks, it is unlikely that the capacity specified in the regulations will be achieved; however, the capacity specification does not apply since REFCLs are not mandated at these substations. That said, United Energy is making its best endeavours to achieve the highest practicable performance and, thus, bushfire risk reduction. United Energy completed the installation of the Mornington and Dromana REFCLs in January and December 2019 respectively.

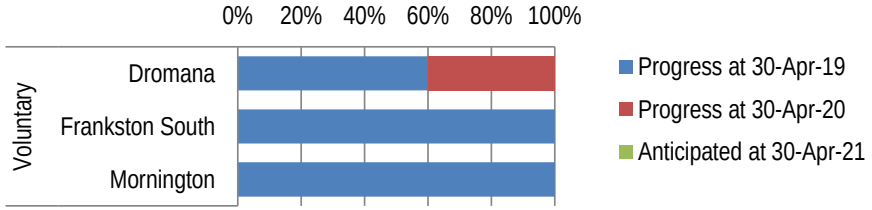


Figure 56 Status of the United Energy REFCL program

[18] The installation of armour rods, vibration dampers, spacers and spreaders in HBRA was completed by 31 December 2015.

J4 Exemptions

There are no exemptions currently applicable to United Energy.

J5 Audit performance

J5.1 Electricity Safety Management Scheme (ESMS)

In October 2019, ESV audited United Energy on its internal auditing process and procedures. This focused on the process and procedures used when undertaking internal audits of asset inspection, construction and high voltage operating field staff. The ESMS was found to adequately describe the audit processes and procedures and be compliant in this area.

That said, ESV found one minor noncompliance and three opportunities for improvement. The minor noncompliance related to relying solely on contractors to undertake audits of their own works. The opportunities for improvement related to:

- reviewing audit record sheets for relevance
- having the connections policy officer undertake live line awareness training to improve understanding of appropriate live line works practices
- finalising the draft document 'Consolidated Audit Program Procedure' as a priority given it is a key document in the auditing process.

United Energy provided a plan to address the ESV audit findings and implement changes in 2020.

J5.2 Electric line clearance

Network pre fire danger period audit

Leading into the 2019-2020 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 found two noncompliances and three opportunities for improvement. The findings related to the application of procedures for inspection timeframes, rectification timeframes, vegetation coding and site voltage details.

ESV found that United Energy was not strictly managing the network according to its approved plan. The procedural deficiencies found during the audit are directly relatable to the United Energy performance issues ESV identified during the 2018-2019 inspections (see page 10).

The procedural deficiencies identified by ESV have been addressed by United Energy in its 2020-2021 electric line clearance management plan.

In response to the enforcement action ESV undertook against United Energy due to its previous poor performance in 2018-2019, United Energy commissioned an independent review of its vegetation management systems and programs. United Energy committed to ESV to adopt the recommendations of the review and to implement a range of actions designed to improve its performance. This is to occur by the end of 2020, and should also address the deficiencies identified in the 2019-2020 audit.

ESV has closely monitored implementation of the United Energy reforms and investigated its performance throughout the year. Most importantly ESV has observed a reduction in the number of noncompliant spans affecting the network.

ESV will continue to closely monitor the application of the revised procedures throughout 2020-2021 to ensure that United Energy continues its trajectory of improved performance.

Network inspection

During the 2019-2020 period ESV inspected 2,677 spans on the United Energy network, with 1,205 in HBRA and 1,472 in LBRA.

ESV identified 229 noncompliant spans across the network (108 in HBRA and 121 in LBRA). All the noncompliant spans were cleared by United Energy as a matter of priority, resulting in the elimination of these potentially hazardous situations.

The rate of noncompliant vegetation on the United Energy network has decreased since last year in HBRA, but is still much higher than in 2017-2018 (see Figure 10). The rate of noncompliant vegetation has also dropped markedly in LBRA (see Figure 11).

Along with the decreases in noncompliances in HBRA and LBRA, there has also been a decrease in high risk noncompliances across the network. Noncompliances are regarded as high risk where vegetation is touching, or could soon touch, uninsulated conductors. This contrasts with technical noncompliance, where vegetation is in the clearance space but there is no immediate risk of contact with electric lines. Figure 57 shows the rate of high risk noncompliances on the United Energy network.

While rates of high risk noncompliance on the United Energy network are higher than the average across all distribution networks in two of the last three years, the rate in 2019-2020 was becoming comparable to the other distribution businesses.

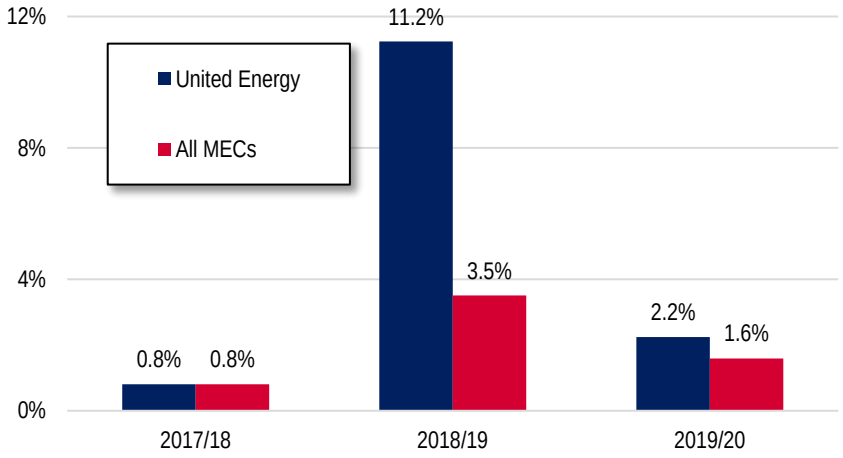


Figure 57 Rate of high risk noncompliances

J5.3 Bushfire mitigation

ESV reviewed 3,092 asset records from the Frankston South, Rosebud, Dromana, Bulleen and Hastings areas. The review found no structures outside the inspection cycle timeframes identified in the United Energy bushfire mitigation plan.

ESV inspected 58 structures across the United Energy network from the nominated areas listed above. The inspections found no serious issues and twelve minor issues, including a missing low voltage spreader in a hazardous bushfire risk area and loose pole-top hardware.

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 United Energy. ESV recommended that United Energy rectify the identified issues in accordance with its priority maintenance practices.

J5.4 Work practices

In 2019-2020, ESV undertook five observations of United Energy's work crews across five sites. Three of these observations were opportunistic. The findings of these observations were as follows:

- noncompliances 0
- minor noncompliances 2
- opportunities for improvement 2

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

- failure to apply earthing and short-circuiting according to approved procedures
- confirmation that equipment is within test dates before use.

ESV recommended that United Energy's work practices specifically focus on ensuring:

- compliance with approved procedures for applying earthing and short circuits
- equipment is checked prior to use to confirm it is within test date.

J6 Safety indicators

Figure 58 shows the number of all serious electrical incidents reported to ESV via OSIRIS by United Energy during the 2019-2020 period, with the blue bars showing the numbers for 2019-2020 and the orange bars showing the long-term average from 1 October 2010 to 30 June 2019. Figure 59 shows the same for those incidents that result in a ground or vegetation fire.

The most common incidents on the United Energy network in 2019-2020 were connection faults, crossarm failures, other contact events and tree contact. Two of these items are within the full control of the United Energy, tree contacts are partially within its control and other contact events are outside its control. The numbers of incidents were lower in 2019-2020 than the long-term average in seven categories, stable in one category and higher in six categories.

Connection faults, tree contact, other asset failures and HV fuse failures were the most common causes of network-related fires. Three of these are within the full control of United Energy, and tree contact is partially within its control. Fires from connection faults and tree contact are well above the long-term average. The numbers of fires this year across most of the other categories were lower than the long-term average; the exception being ground fires from HV fuse failures.

Of the 29 ground fires on the United Energy network this year, all were smaller than 1,000 m^2 (100 per cent); none were larger than 1000 m^2. A further 81 fires were contained to the network assets or vegetation at height and did not result in a ground fire.

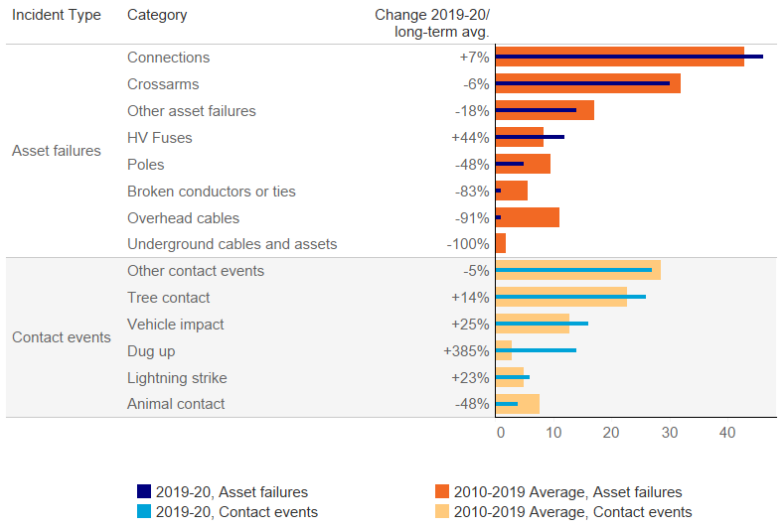


Figure 58 Incidents on the United Energy network

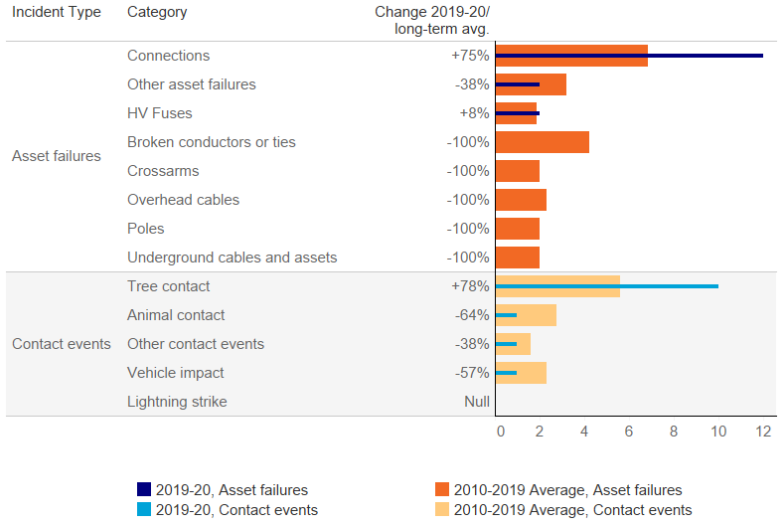


Figure 59 Incidents on the United Energy network resulting in ground fires

Appendix K : Weather modelling and ‘at risk’ days

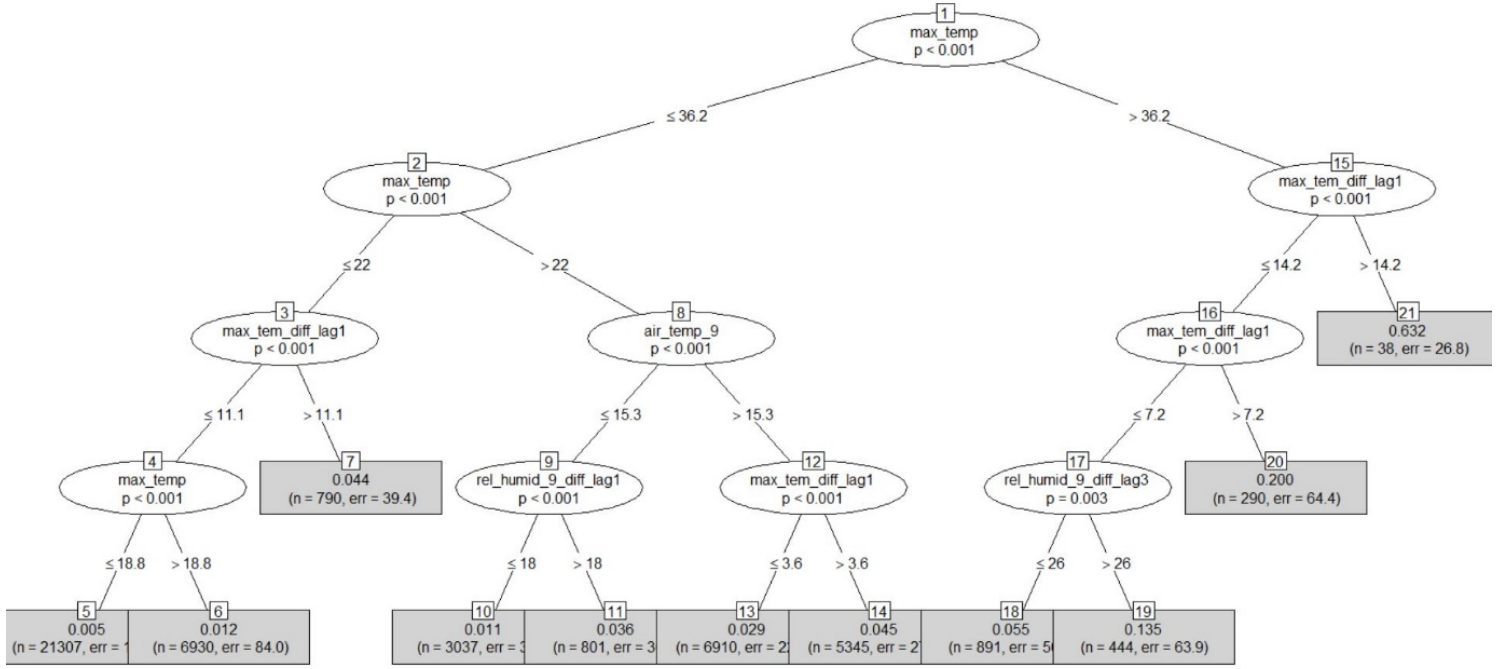


Figure 60 Partitioning of asset failure fires based on the contribution of different environmental factors

Asset failure fires

Asset failure fires were most likely to arise when the maximum daily temperature exceeded 36.2 degrees Celsius, and the maximum temperature difference between the present day and the previous day was greater than 14.2 degrees Celsius (Figure 60).

There was also a significant influence when there was a temperature difference between days of less than 14.2 degrees Celsius combined with a morning humidity difference between the present day and three days prior.

The conditions that we determined would define an asset failure ‘at risk’ day comprised clusters 21, 20 and 19 in order from most to least importance.

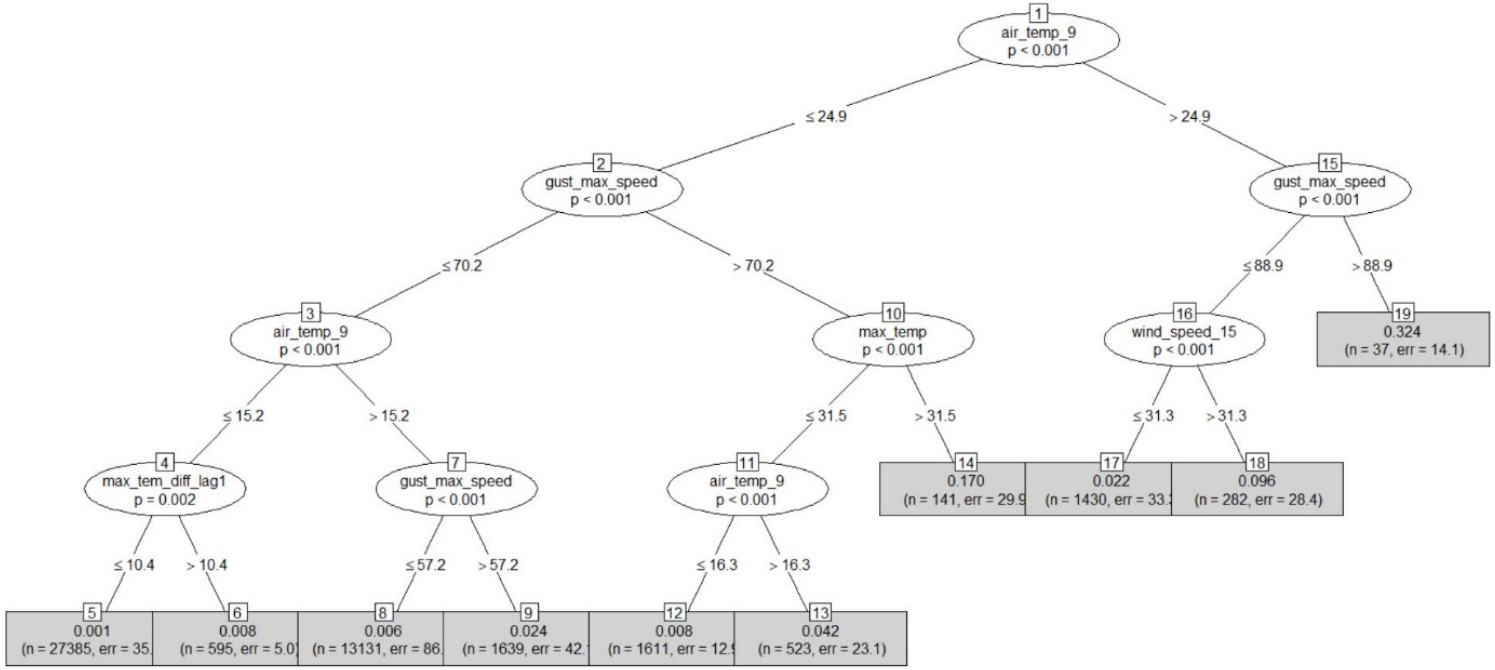


Figure 61 Partitioning of vegetation contact fires based on the contribution of different environmental factors

Vegetation contact fires

Vegetation contact fires were most likely to arise when the morning air temperature exceeded 24.9 degrees Celsius, and the maximum wind gust was in excess of 88.9 km/h (Figure 61). We also identified other combinations of meteorological conditions that also contributed to a high rate of fires.

The conditions that we determined would define a vegetation contact 'at risk' day comprised cluster 19, 14, 18 and 13 in order from most to least importance.

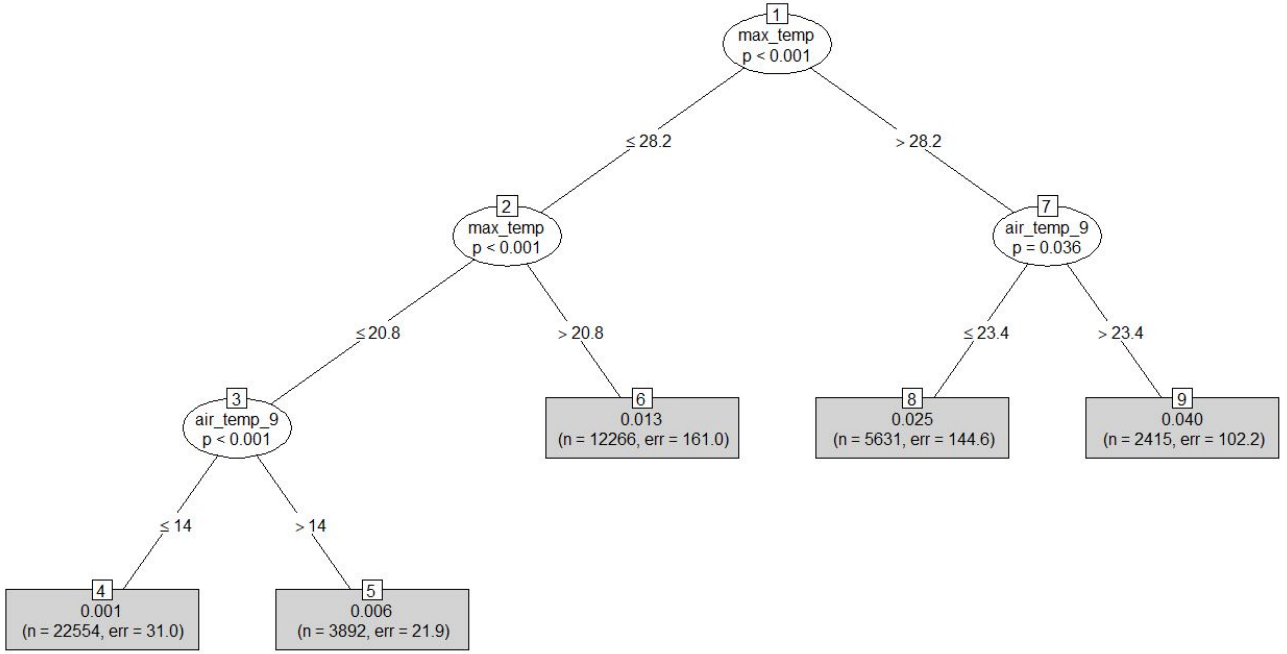


Figure 62 Partitioning of other contact fires based on the contribution of different environmental factors

Other contact fires

Other contact fires were most likely to arise when the maximum daily temperature exceeded 28.2 degrees Celsius (Figure 62).

The conditions that we determined would define an other contact ‘at risk’ day comprised cluster 7 (combination of clusters 8 and 9).

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