Bushfire and Flood

Business Case

17 January 2024

ERGON ENERGY NETWORK
Part of Energy Queensland

CONTENTS

List of Tables

List of Figures

DOCUMENT VERSION

Version Number	Change Detail	Date	Updated by
1	Initial Version	17/02/2023	Manager Distribution Planning
2	Updated document with graphs, figures	26/06/2023	Principal Distribution Planning Engineer
3	Updated Table 7	10/11/2023	Principal Distribution Planning Engineer
4	Updated with AMCL's Feedback	6/12/2023	Principal Distribution Planning Engineer
5	Updated sensitivity table	7/12/2023	Principal Distribution Planning Engineer
6	Approved	20/12/2023	General Manager Grid Planning

RELATED DOCUMENTS

Document Date	Document Name	Document Type
03/10/2019	Distribution Authority No. D01/99, Ergon Energy Corporation Limited	PDF

1 SUMMARY

<table>
<tr><th>Title</th><th>Bushfire and Flood</th></tr>
<tr><td>DNSP</td><td>Ergon</td></tr>
<tr><td>Expenditure category</td><td>☐ Replacement ☒ Augmentation ☐ Connections ☐ Tools and Equipment
☐ ICT ☐ Property ☐ Fleet</td></tr>
<tr><td>Identified need
(select all applicable)</td><td>☒ Legislation ☐ Regulatory compliance
☒ Reliability ☐ CECV ☒ Safety ☐ Environment ☐ Financial
Augment the Distribution Network (11kV, 22kV, 33kV, LV and SWER) as required to meet customer expectations in terms of network reliability.</td></tr>
<tr><td>Summary of preferred option</td><td>Ergon Energy has approximately 2,510km of line and an estimated 27,000 poles in high bushfire risk areas. Similarly, approximately 3,630km of line is in flood prone areas. This dedicated capital program has been established to specifically address bushfire and flood risks regarding asset exposure in these areas.</td></tr>
<tr><td>Expenditure</td><td>
<table>
<tr><th>Year</th><th>Previous period</th><th>2025-26</th><th>2026-27</th><th>2027-28</th><th>2028-29</th><th>2029-30</th><th>2025-30</th></tr>
<tr><td>$m, direct 2022-23</td><td>7.8 (approx.)</td><td>2.77</td><td>2.77</td><td>2.77</td><td>2.77</td><td>2.77</td><td>$13.85</td></tr>
</table>
</td></tr>
<tr><td>Benefits</td><td>Less damage to Ergon Energy Assets during bushfires and floods
Better reliability outcomes for Ergon Energy Customers during these events
Decreased risk of Ergon Energy assets inadvertently triggering bushfires</td></tr>
<tr><td>Consumer engagement</td><td>This Business case is based on the AER Value of customer reliability guidelines and reliability justification as detailed in those guidelines which included extensive customer engagement.</td></tr>
</table>

2 PURPOSE AND SCOPE

In recent years, there has been a noticeable rise in severe weather events throughout Queensland. This increase has brought attention to vulnerabilities in the resilience of the Ergon network. The impact of extreme weather and natural disasters on electrical infrastructure poses a direct risk to the public and the environment.

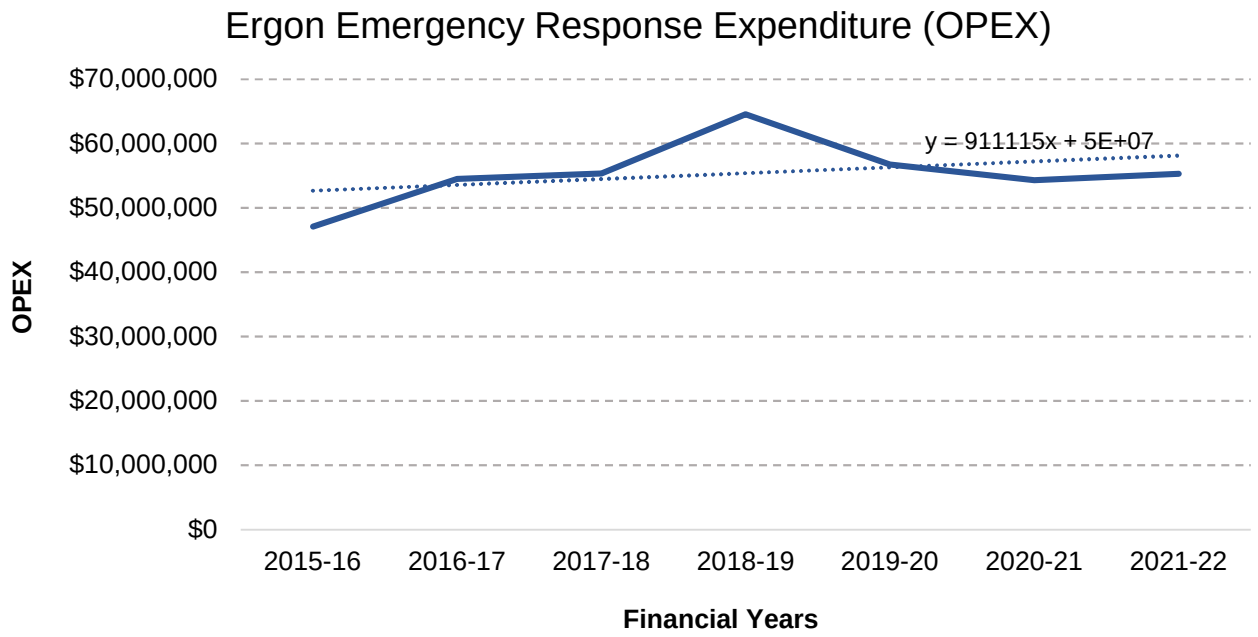
Latest data from the Climate Council of Australia[1] indicates there is an expected increase in unprecedented and increasingly destructive weather events across Australia. Following the rising incidence of heavy rain and flooding in recent years resulting from the multi-year La Nina, the Climate Council and Emergency Leaders for Climate Action (ELCA) have warned of an increased potential of large-scale grassfires across the country. In a statement from Greg Mullins, former Commissioner of Fire and Rescue NSW and founder of Emergency Leaders for Climate Action, he has stated that *"Excessive rainfall in recent years has caused prolific vegetation growth in Australia, which is now drying and turning into fire fuel as we experience hotter, drier conditions."* The AER's guidance note 'Network resilience – A Note on key issues (2022)[2] highlights that the AER do acknowledge climate change and the increasing risks associated with these changes. They also acknowledge the important role that Distribution Network Service Providers (DNSPs) play in responding and working with communities during severe weather events.

To minimise risks to both the general public and network personnel, it is crucial to transition networks safely, prudently, and effectively before, during, and after disruptive events. Consequently, additional safety risks are likely to be considered. Resilience is defined in the AER's guidance note as "the ability to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard". Ergon Energy spends more than $50 million per year in Operational Expenditure (OPEX) alone to manage severe weather events as shown in Figure 1.

Due to the increased frequency and severity of natural hazards and extreme weather events, there is a clear need for a proportional increase in related expenditures for effective management. According to CSIRO modelling, the number of dangerous fire weather days has already significantly increased and is expected to rise further. Similar observations apply to flooding-related events. This business case focuses on Distribution Augmentation Bushfire and Flood Mitigation. Its purpose is not only to enhance the resilience of Ergon Energy Assets to bushfires and floods, decrease restorations and outages but also to implement preventative measures that reduce the risk of Ergon Energy Assets causing bushfires.

[1] Hitting Home: The Compounding Costs of Climate Inaction | Climate Council 2021
[2] Essential Energy - 6.02.01 Network Resilience 2022 Collaboration Paper - 2022 - Public.pdf (aer.gov.au)

Figure 1 - Ergon Emergency OPEX Expenditure



3 BACKGROUND

Ergon Energy operates medium voltage distribution networks at 11kV, 22kV and 33kV as well as a range of 12.7kV and 19.1kV SWER systems. Our network is characterised by relatively small customer numbers, extensive network distances, a vast geographical reach, and consequently, lower network densities. The distribution network is made up of approximately 120,000km of overhead powerline and 9,000km of underground cable, with about 1,000,000 power poles and close to 100,000 distribution transformers. With approximately 8% of the total NEM customer base, Ergon Energy's network area is approximately 44% of the total area covered by the networks that form part of the NEM. Ergon Energy operates one of the lowest density networks in Australia which has a large impact on how the network is designed, managed, and operated.

This business case seeks to continue to deliver sustainable outcomes for customers and the business, with no compromise to safety and legislative compliance. The objective is to provide an affordable, safe, resilient, reliable, and secure quality of supply to meet the dynamic challenges climate change is presenting. Ergon Energy has obligations under the Electrical Safety Act 2002 (Qld) to inspect, test and maintain works, and a duty to ensure that its works are electrically safe and are operated in a way that is electrically safe. Under the Work Health and Safety Act 2011 (Qld), Ergon Energy must ensure, so far as is reasonably practicable, that the fixtures, fittings, and plant are without risks to the health and safety of any person. Ensuring the safety of our staff, customers and communities is our foremost priority. Ergon Energy therefore has a clear obligation to ensure the network architecture and procedures are adequately equipped for all possible weather conditions.

Ergon Energy has approximately 2,510km of line and an estimated 27,000 poles in high bushfire risk areas. Similarly, approximately 3,630km of line is in flood-prone areas. Subsequently, climate events have the potential to present various risks to the network. In the AERs guidance note on Network resilience, multiple common climate risks were highlighted. In relation to floods and heavy rain specifically they highlight the following:

- Damage to network assets including indirect damage to underground equipment and overhead wires.
- Reduction in clearance to overhead lines during flooding events.
- Delayed restoration.
- Impact to overhead lines from vegetation growth.

In the case of high heat and bushfire events the potential impacts are as follows:

- Increase in electricity demand during peaks.
- Reduction in efficiency and capacity of overhead lines and equipment.
- Elevated potential of overhead line sag.
- Damage to assets.
- Delayed restoration.

Given these associated risks and the increasing potential of these events a dedicated capital program has been developed to propose potential mitigation strategies.

4 IDENTIFIED NEED

Various components of this investment have different drivers. Some are directly driven by regulatory requirements, and some others are based on fulfilling customer expectations regarding network performance and are justified by a positive cost/benefit analysis. Table 1 details the drivers of each component that make up this distribution augmentation business case.

Table 1 Distribution Bushfire and Flood Justification Matrix

Program	Sub Program	Justification	Justification Detail
Distribution Augmentation – Bushfire and Flood	Bushfire and Flood Mitigation Program	Cost Benefit Analysis	Value of Customer Reliability (VCR) Financial – Avoided OPEX and CAPEX Environmental Safety

4.1 Problem Statement

The increase of severe weather events has denoted the need for a focus on measures to increase network resilience. With a large amount of Ergon Energy's assets exposed to weather events, an approach to increase network resilience presents the opportunity to minimise the monetary burden of such events to customers and the community. Additionally, as a DNSP with 120,000km of overhead network and approximately 1,000,000 poles, Ergon Energy has an obligation that these assets do not cause bushfires.

This dedicated capital program has been established to specifically address:

- Bush fire mitigation requirements on overhead assets in the vicinity of "High Risk" bushfire areas across Ergon. This includes preventative solutions which focus on minimising the risk of Ergon Assets creating a bushfire as well as resilience solutions which minimise the risk of Ergon assets being damaged by bushfires and resulting impacts on communities. Some typical solutions include:
    - Installation of mesh wraps on poles with a high probability of being fire damaged and subsequently needing to be replaced.
    - Installation of Covered Conductors Type (CCT) cable in highly vegetated areas where there is a risk of fire ignition due to tree branches falling on the line.
    - Increase conductor separation to avoid conductor clashing and associated risks of fire ignition.
- Flood mitigation requirements to designated assets in flood and storm surge affected areas across Ergon. The solutions developed as part of this part of the program are typically resilience focused. Solutions often involve:
    - Relocating assets or floodproofing existing assets by increasing the height above flood level. Typical assets involve pillars, padmount transformers and RMUs.
    - Installing network switches or ties to allow supply to be maintained to customers that are not flood effected.
    - Replacing flood impacted ground mount plant with pole mount equipment (e.g. replacing a padmount transformer with a pole mounted transformer).

This business case explores these Opportunities where and clear NPV positive outcome can be achieved. The funding requested in this business case is very conservative when considering the changes that are occurring and the exposure to Ergon's network.

4.2 Compliance

The justification for the bushfire and flood program is based on legislative compliance and the value of customer reliability. The program is based on preventing and protecting assets from being damaged by bushfire and flood and minimising risk of assets creating fires, all where it can be economically justified to do so. Bushfire and flood investments follows a value stream/cost benefit analysis methodology that is further detailed in Section 5 of this report.

4.3 Discussions with Customers

On 18 December 2019, the AER released its final decision on the Value of Customer Reliability (VCR) with the aim of establishing an investment framework to ensure "consumers pay no more than necessary for safe and reliably energy, helping energy businesses identify the right level of investment to deliver reliable energy services to customers". In order to determine this investment methodology, the AER engaged with over 9000 residential, small business and industrial energy customers. Components of this business case applies the Value of Customer Methodology as detailed by the AER which was determined through extensive consultation and was updated further in 2021 and 2022. In addition, this business case seeks to reduce the escalation of operation and capital expenditure associated with climate change by proactively "protecting" Ergon Energy's most climate change vulnerable assets. By taking this approach, long term benefits will be delivered to customers.

4.4 Counterfactual Analysis (Base case)

4.4.1 Summary

Figure 2 – Value Streams for Investment

Ergon Energy broadly considers five value streams for investment. These are shown in Figure 2.

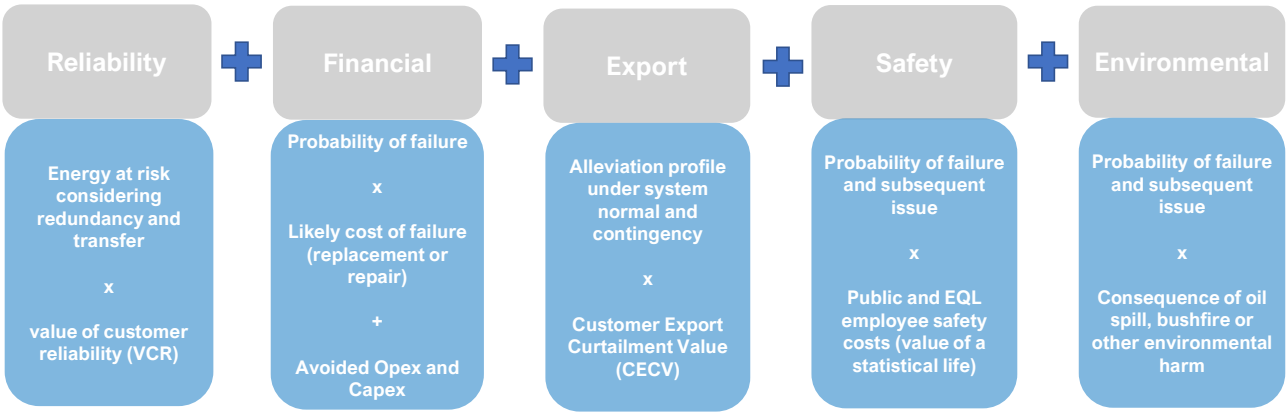


Table 2 details the value streams that are applicable to the relevant sub-programs of this business case as *Reliability, Export, and Financial*.

Table 2 Program and Value Stream Relationship

Program	Sub Program	Value Stream
Distribution Augmentation	Bushfire and Flood Mitigation Program	Reliability - Value of Customer Reliability (VCR) Export - Customer Export Curtailment Value (CECV) Financial - Avoided OPEX and CAPEX

It should be noted that there are also Environmental and Safety Value streams, but they have not been valued for the purpose of this business case, however, will provide additional justification.

The counterfactual arrangement is to not do this network reliability/resilience program. By doing nothing, Ergon Energy will fail to meet its obligations to the community to balance the reliability performance of the network with customer expectations. It would also fail to address safety and environmental issues which this program aims to address.

4.4.2 Assumptions/Evidence

The counterfactual arrangement is to continue to spend at previous levels and use OPEX to repair the network when it is damaged. This however is not a practical solution given climate change outlook, trends, and low historical spend levels for Ergon Energy in this category. Climate scientists have conclusively determined that human activity has warmed the planet's atmosphere and oceans. Several weather and climatic patterns on the planet are already being impacted by human-induced climate change. Australia had its warmest year on record in 2019, and all plausible scenarios for emissions growth predict that the country will continue to warm as shown in Figure 3. Australia has experienced an increase in extreme events in recent years, coinciding with a rise in temperature as depicted in Figure 4. Bushfires, floods, droughts, sea level rise, and low-pressure storms along the east coast were among the extreme weather and natural disasters that Australia faced in 2019–2020.

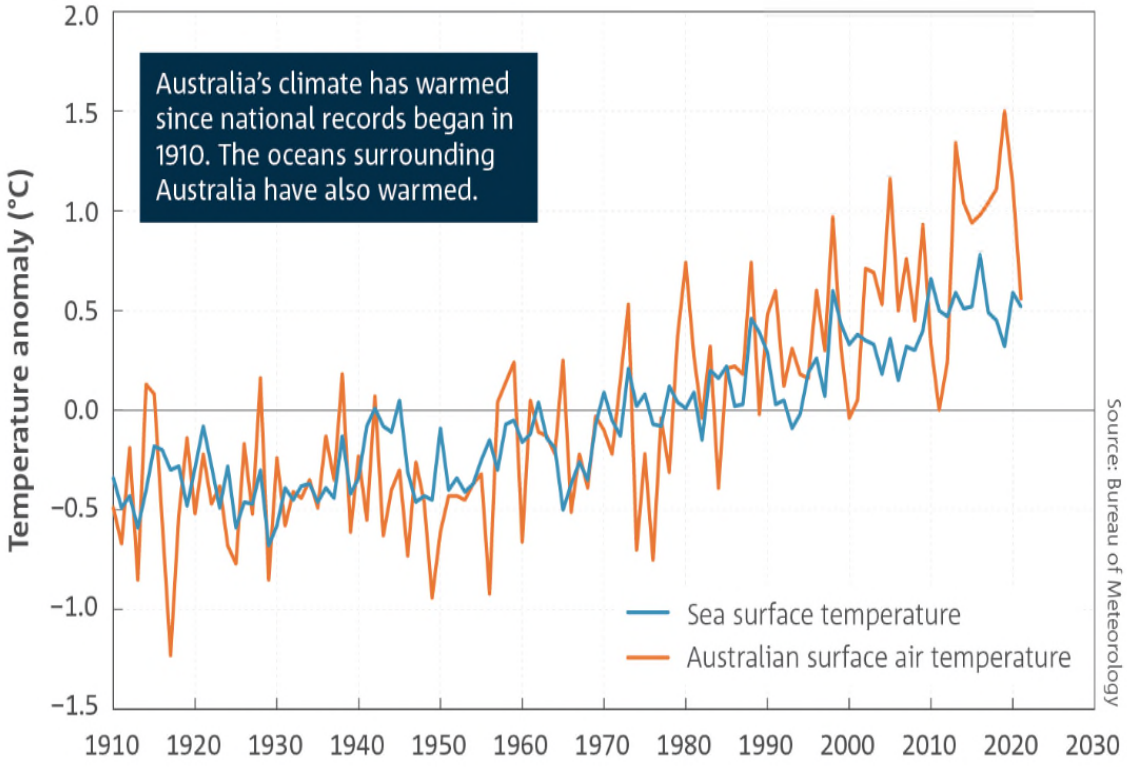


Figure 3 - Australian Sea and Air Temperature
(Source: http://www.bom.gov.au/state-of-the-climate/index.shtml)

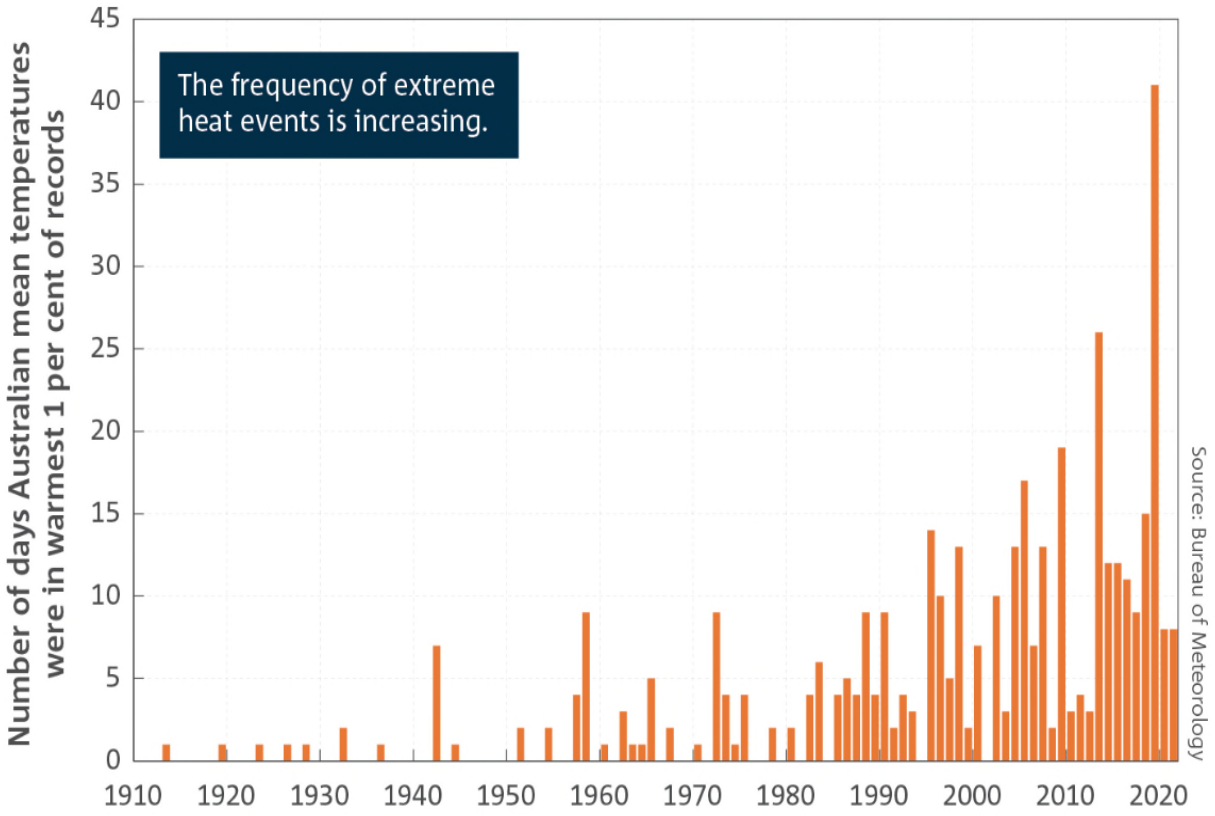


Figure 4 - Frequency of Extreme Heat Events

(Source: http://www.bom.gov.au/state-of-the-climate/index.shtml)

Queensland's electricity networks faced significant challenges between 2018 and 2023 as shown in Figure 5 due to the recurrent occurrences of floods and bushfires. The floods in 2019 disrupted power infrastructure, causing outages, and necessitating extensive repairs. Subsequently, the heightened frequency and intensity of bushfires, particularly during the 2019-2020 season, posed a severe threat to Ergon Energy's electricity network. The fires damaged power lines, substations, and other critical infrastructure, leading to operational challenges for Ergon Energy. The events underscored the vulnerability of the state's electricity networks to the impacts of climate change. In response, Ergon Energy is working to enhance resilience, invest in advanced technologies, and implement strategic planning to better withstand and recover from future natural disasters. These efforts aimed not only at securing the reliability of electricity supply but also at building a more resilient and sustainable energy infrastructure in the face of evolving environmental risks.

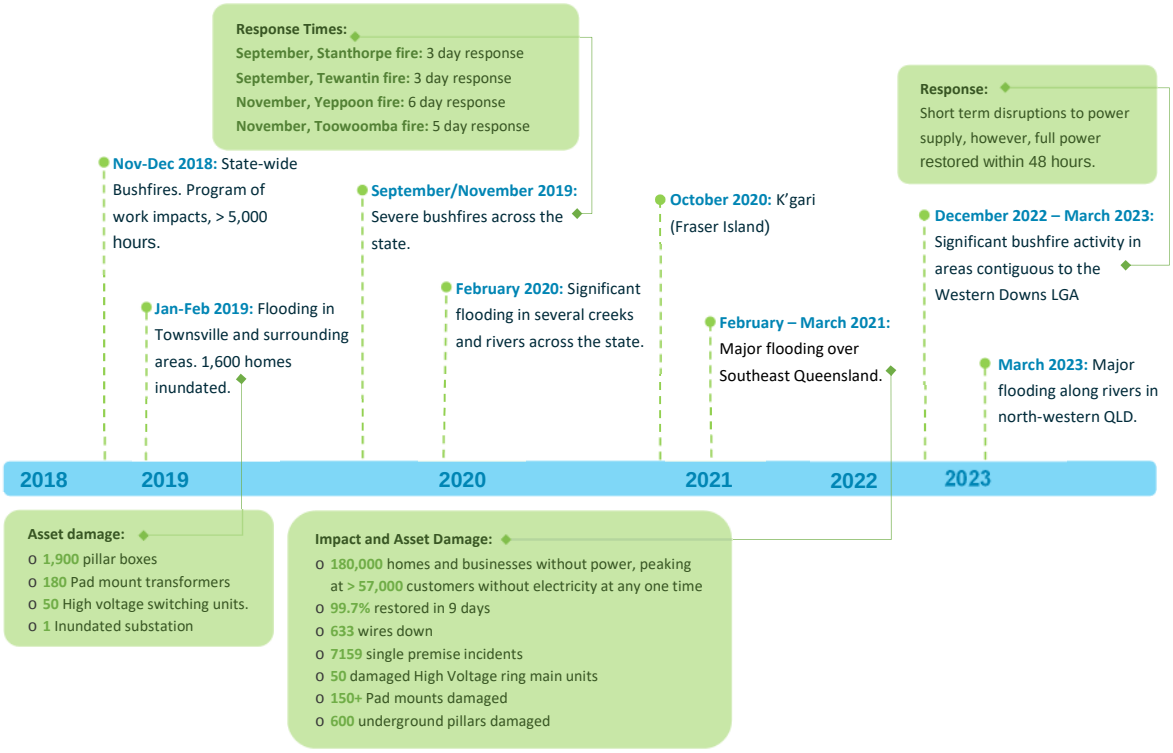


Figure 5 - Queensland Major Bushfire and Flood Events

Over the previous ten years, the cost of natural hazard events in Australia has increased by more than double, reaching $35 billion3. Without considerable investments in resilience and mitigation, it is predicted that the overall financial cost of natural catastrophes will range from $73 to 94 billion annually by 2060[4].

If network investments are made without taking into consideration the effects of climate change, there is a chance that higher prices and more risk will be locked in for the customers the network will be serving during its 50-year lifespan. Currently, the choices and design standards made by Ergon Energy during 1970s and 1980s determine how resilient the assets that provide our current energy supply will be. Customers who will be using the Ergon Energy network in 2065 will have to deal with the risk and expense implications of our current investment choices. Therefore, it is imperative that Ergon Energy analyse how our environment may change over the next 40–50 years, and not just the short term.

The Australian Actuaries Climate Index (AACI) measures changes in extreme weather events. This index is used to help assess the financial consequences of risk by organisations such as insurers, banks, and investment institutions. As shown in Figure 6, there is a significant worsening of extreme

[3] Website://www.climatecouncil.org.au/resources/hitting-home-compounding-costs-climate-inaction
[4] Australian Business Roundtable for Disaster Resilience & Safer Communities 2021

weather risks as measured by the Australian Actuaries Climate Index (AACI). When considering the worsening risk on the network, these changes need to be addressed where justifiable.

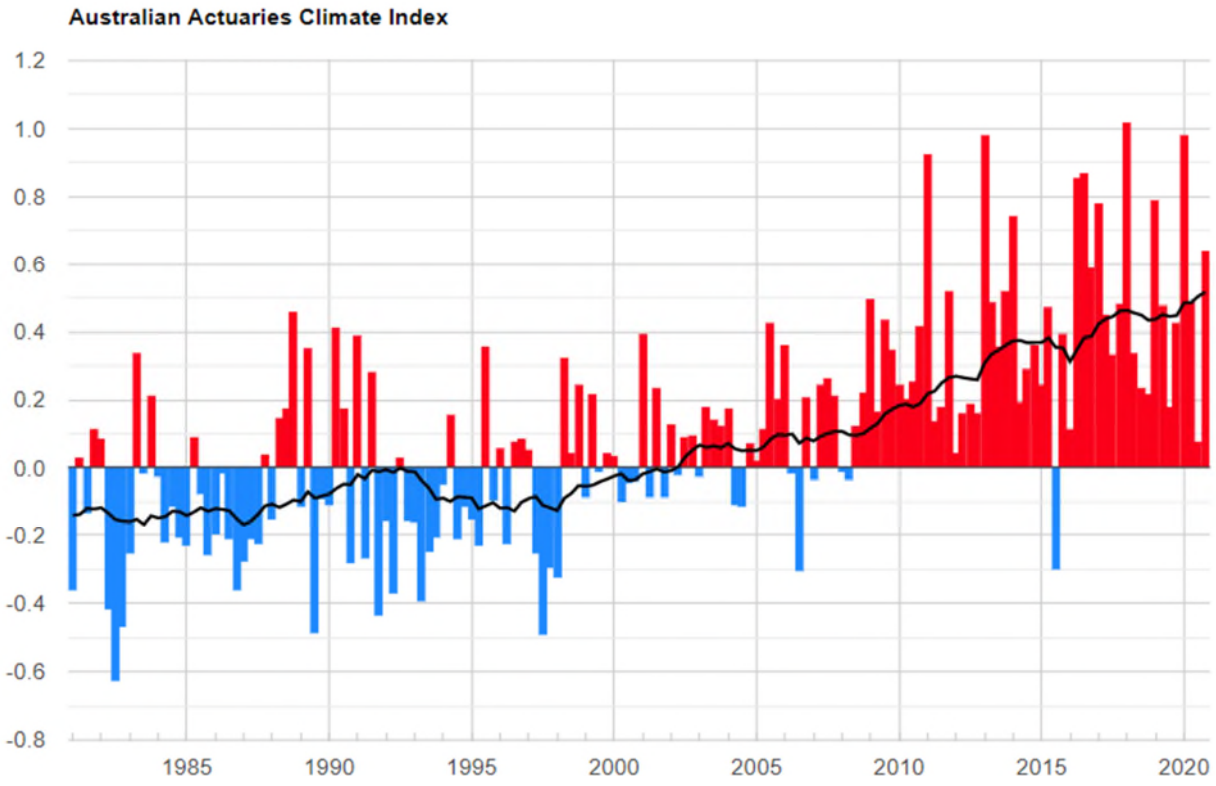


Figure 6 - Australian Actuaries Climate Index

(Source: Actuaries Institute, Australian Actuaries Climate Index website)

The 2020 Royal Commission into National Natural Disaster Arrangement (RCNNDA) report stated that “Australia’s disaster outlook is alarming” and that “Climate and disaster risks are growing across Australia. This is due to intensifying natural hazards under a changing climate and increasing exposure and vulnerability of people, assets, and socio-economic activities in expanding hazard areas”. The report also details that climate change is exacerbating likelihood of bushfires, extreme rainfall and flooding which are the target of this program.

As per the CSIRO’s Climate and Disaster Resilience Technical Report, the Flood events and Flash floodings are expected to continue to increase. The report states “As the climate warms, heavy rainfall is expected to become more intense, based on the physical relationship between temperature and the water holding capacity of the atmosphere. For heavy rain days, total rainfall is expected to increase by around seven percent per degree of warming as a general rule. For short-duration, hourly, extreme rainfall events, observations in Australia generally show a larger than seven percent increase (Guerreiro et al. 2018), and this is projected to continue.” This report also clearly details a projected increase in dangerous bushfire weather in Eastern Australian and an expected increase in extreme bushfire days. The report further details the confidence in this outcome as high. Additionally, the report also details that bushfire risk is expected to increase with warmer and drier weather combined with possible higher ignition through lightning strikes.

The CSIRO's and the Bureau of Meteorology's report "State of the Climate 2020" details a significant in extreme fire weather and the lengthening of the fire season. As detailed in Figure 7, the number of dangerous fire days has increased significantly. Of particular concern are the changes observed in eastern Queensland. This not only increases the risk that assets may be damaged by bushfire events, but also increases the risk of assets causing bushfires which pose a threat to the community.

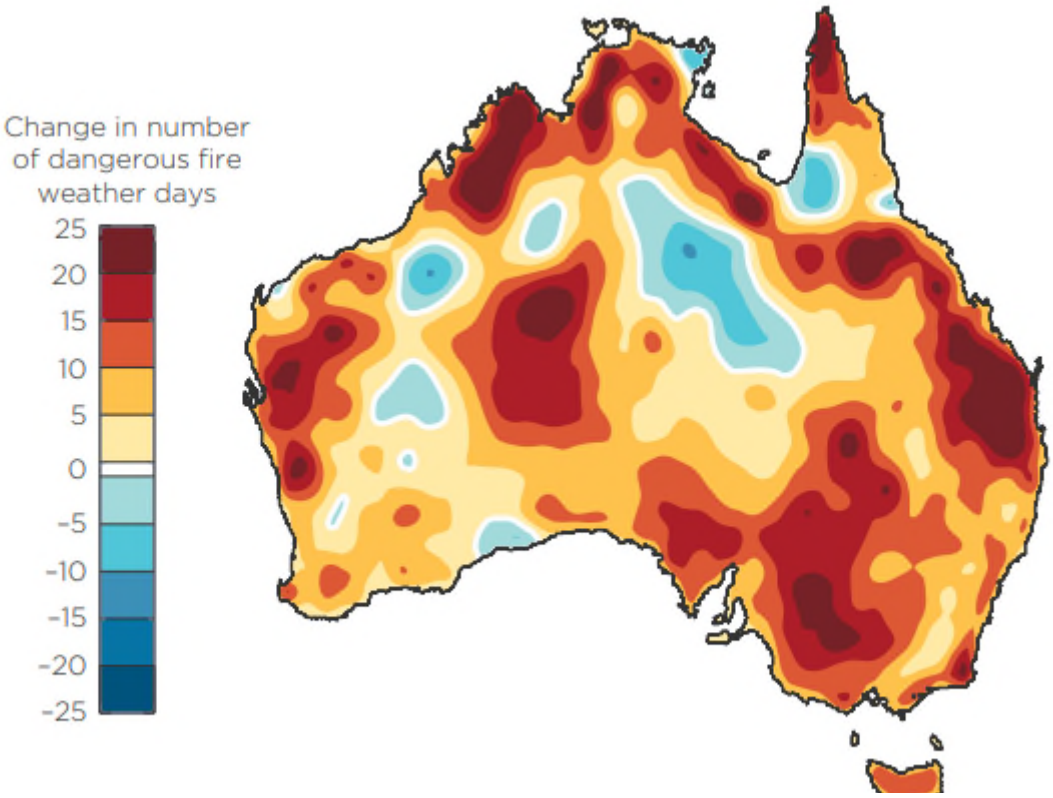


Figure 7 - Change in the Annual Number of Days Between 1950–85 and 1985–2020 that the Forest Fire Danger Index Exceeds its 90th Percentile (Considered Dangerous Fire Weather)

(CSIRO and Bureau of Meteorology (2020). State of the Climate 2020)

CSIRO research has detailed that in the last 32 years, the average annual forest burned area in Australia has increased by 350% and when including 2019 that figure increases to 800%[5]. Researchers detail that this rise is consistent with increasingly more dangerous fire weather conditions, and increased risk factors associated with pyroconvection (including fire-generated thunderstorms). This linkage provides evidence that Ergon Energy should actively ensure that its network is more resilient to these increasing risks where there is suitable justification to do so in a prudent and efficient manner.

[5] CSIRO News Release : New research links Australia's forest fires to climate change - CSIRO

4.4.3 Opportunity and Solutions

Historically, prior to the 2020-2025 period, Ergon Energy has not had a specific network investment program targeted for bushfire and flood risk mitigation. The program for the 2025-2030 regulatory period is aimed to ensure efficient network and customer outcomes by investing in areas of the network that primarily improve customer reliability during extreme weather events or defer future capital and operating expenditure by making assets in high bushfire or flood prone areas more resilient to such events. Work that makes up the bushfire and flood risk mitigation program is typically justified though the following mechanisms:

Reliability – Value of Customer Reliability. Some typical examples include:

- Flood related works where the network asset was to be switched off due to being below flow levels - leaving customers connected to that asset without supply. By relocating the asset or the height of assets, these supply interruptions can be avoided.
- Poles that have historically and semi-regularly been impacted with fires has resulted in loss of supply to customers and communities. By installing fire resistant pole wraps in targeted areas, the risk of future lost supply events during fires is significantly reduced.
- Replacement of open wire mains where tree branches regularly fall on lines not only reduces the risk of Ergon's asset creating a fire and the potential associated financial implications, but also improves the reliability of the network.
- Installing additional switching and tie points on feeders allows supply to be maintained to customers not impacted by floods.

Financial – Avoided OPEX or CAPEX. Some typical examples include:

- By relocating flood impacted assets, asset life is increased, and maintenance and replacement costs associated with future flooding is avoided.
- By installing fire resistant pole wraps in targeted areas, the risk of poles being damaged and needing to be replaced during future fire events is significantly reduced.

4.4.4 Risks

By not implementing the recommended program, Ergon Energy will fail to meet its obligations to the community to balance the reliability performance of the network with customer expectations. This will result in a significant economic cost to the community based on measures detailed in the AER's Value of Customer reliability guidelines. It will also result in increasing operational costs associated with a less resilient network, and the need to continue to replace and repair damaged assets during flood and bushfire events.

5 OPTIONS ANALYSIS

As part of this analysis only one option has been explored which involves creating a program to address the risks in the most NPV positive resilience areas on the network as determined through VCR analysis and avoided OPEX and CAPEX.

5.1 Economic Analysis

5.1.1 Cost Summary 2025-30

A summary of the total proposed planned Distribution Augmentation Bushfire and Flood expenditure is provided in Table 3.

Table 3 Planned Distribution Augmentation Bushfire and Flood Expenditure (in 2022-23 $m)

Option	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30
Bushfire Expenditure	**$1.80**	**$1.80**	**$1.80**	**$1.80**	**$1.80**	**$9.00**
Flood Expenditure	**$0.97**	**$0.97**	**$0.97**	**$0.97**	**$0.97**	**$4.86**
Total Planned Augmentation	**$2.77**	**$2.77**	**$2.77**	**$2.77**	**$2.77**	**$13.85**

5.1.2 Fire Investment NPV Analysis

5.1.2.1 Preventative Fire Solutions

The main component of Preventive Fire solutions is to replaced open wire mains in high fire risk areas with covered conductor. Covered conductor greatly reduces the risk assets will cause fires if tree branches make contact or fall on the lines. It prevents lines clashing together due to tree branch or animal contact which can then cause sparking and fires. It also prevents tree branches sitting across the lines and starting a fire. In addition to reduction of fire risk, covered conductors provide a practical and cost-effective solution to vegetation management challenges in the high fire risk areas. By creating a protective barrier, these conductors contribute to reduced vegetation encroachment, lower maintenance requirements, and enhanced system reliability, all of which ultimately will lead to significant cost savings for Ergon Energy over the long term.

The solution is justified by selecting opportunities on the network where:

- Areas are a high fire risk.
- There are records of branches making contact with the power line resulting in outages.
- There is enough load through the section of power line such that during outages there is sufficient lost energy to provide a VCR contribution such that and overall positive NPV can be achieved.

5.1.2.2 Resilience Fire Solutions

Resilience solutions aim to enhance the reliability and durability of the network in the face of fires. The primary advantage of this approach is the preservation of assets, ensuring they remain intact and unharmed, thereby contributing to improved reliability for our customers. Ergon Energy's key focus lies in deploying pole wraps as a cost-effective alternative to the replacement of concrete poles, which, on average, incurs a projected cost of $18,000 per pole. The implementation of pole wraps emerges as a more practical and economical choice.

Pole wraps are specifically designed to shield poles from fire damage at their base. Ergon Energy has approximately 27,000 poles installed in high bushfire risk areas. In recent years the company is losing approximately 220 poles per annum to due to bushfire damage. While the exact proportion is unknown, it is believed that a percentage of these losses occur during controlled burn activities conducted to manage bushfire risk in these vulnerable regions.

It is important to note that the mentioned figure of 220 poles represents those incidents known to Ergon Energy, and it is likely that additional poles are being damaged but only identified during the company's periodic pole inspection program. The tracking of pole failures attributed to bushfires by the company began in the 2018/19 financial year, with most years since experiencing La Niña conditions. As weather patterns shift towards El Niño, it is anticipated that bushfire damage rates will increase.

Figure 8 - Install Pole Wrap

The pole wrap solution is justified based on avoided OPEX and CAPEX costs associated with a pole failing due to fire as well as VCR and CECV benefits that arise due to a more resilient network. Targeted locations for pole wraps that provide a positive NPV outcome include a combination of the following:

- Areas that are high risk of bushfires and/or have previously lost poles and present a high potential in losing them again in the future.
- Feeders where the loss of a pole will provide a significant reliability and resultant VCR and CECV impact.

5.1.2.3 NPV Analysis

Table 4 Bushfire Capex (in $M)

$M	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30
Cover Conductor	**$0.54**	**$0.54**	**$0.54**	**$0.54**	**$0.54**	**$2.70**
Pole Wapping	**$1.26**	**$1.26**	**$1.26**	**$1.26**	**$1.26**	**$6.30**
Bushfire Capex	**$1.80**	**$1.80**	**$1.80**	**$1.80**	**$1.80**	**$9.00**

Bushfire NPV Summary

Pole Wrapping	+$1,422,220
Covered Conductor	+$1,691,324
Total Bushfire NPV	**+$3,113,544**

Sensitivity analysis have been undertaken and the results are in Appendix 3.

5.1.3 Flood Expenditure NPV Analysis

All flood expenditure is resilience based, with the goal of making the network more reliability during flooding events whilst also avoiding damage to Ergon Energy Assets. The two main solutions are relocating assets above flood level and installing switching and tie points on the network.

5.1.3.1 Asset Relocations

Asset relocations are justified by VCR and avoided OPEX and CAPEX. Some solutions include raising pad mount transformer heights, replacing pad mount transformers with pole mount transformers (where there is an overhead network in place), installing flood pillars to increase height above flood level, relocating transformers and RMUs outside of flood impacted areas. Targeted locations for these solutions which provide a positive NPV outcome include a combination of the following:

- Locations that are more frequently impacted by flood events. E.g., 1 in 10 years
- Areas where significant numbers of customers and load were required to be disconnected due to flood impacted assets. This provides a significant VCR and CECV potential to support the investment.
- Areas where floods are likely to result in equipment damage or operational complexities (e.g., access issues).

5.1.3.2 Ties and Additional Switching Points

Ensuring the presence of effective ties and switching points is crucial in managing flooding events. Placing these elements strategically in locations allows for the continued supply to customers unaffected by floods. For instance, the proposed isolation point on the left in Figure 9 prevents the need for a complete feeder outage to isolate the supply to the flooded area. Moreover, the inclusion of additional isolation points and a tie on the right side of Figure 9 enables the maintenance of supply to two additional transformers that remain unaffected by the floods.

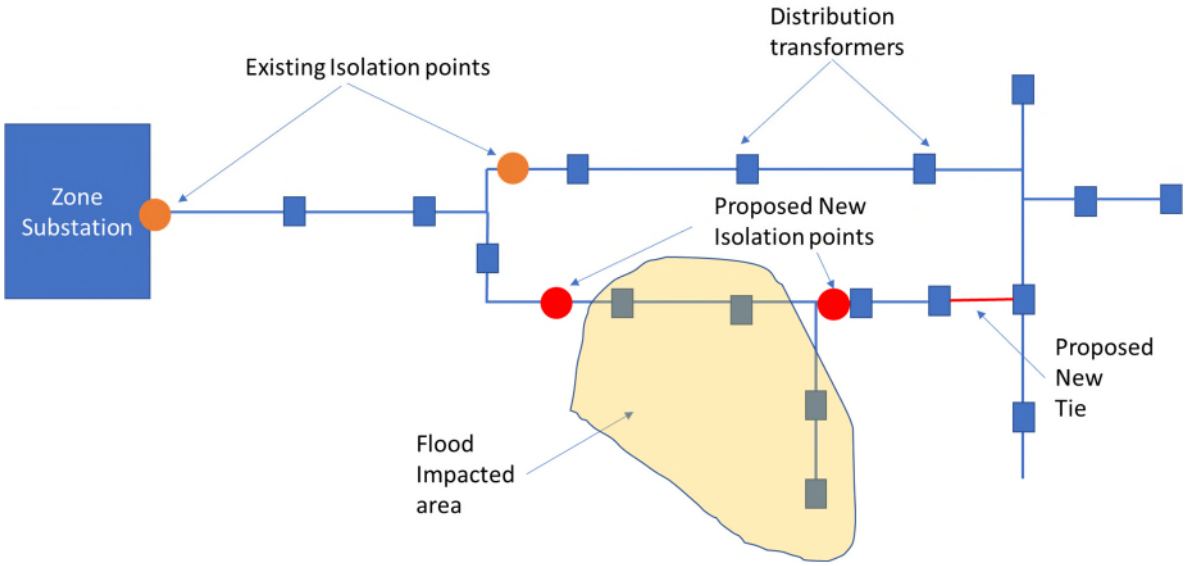


Figure 9 - Example of the Importance of Ties on Switches to Isolate Flood Impacted Customers and Network

Targeted locations for these solutions which provide a positive NPV outcome include a combination of the following:

- Locations that are more frequently impacted by flood events. E.g., 1 in 10 years
- Areas where significant numbers of customers and load needs to be disconnected due to lack of switching points or ties. This provides a significant VCR potential to help justify the investment.

Table 5 Flood Capex (in 2022-23 $m)

$M	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30
Padmount	$0.24	$0.24	$0.24	$0.24	$0.24	$1.22
Pillars	$0.17	$0.17	$0.17	$0.17	$0.17	$0.84
RMU	$0.24	$0.24	$0.24	$0.24	$0.24	$1.20
Flood Switching	$0.32	$0.32	$0.32	$0.32	$0.32	$1.60
Total	**$0.97**	**$0.97**	**$0.97**	**$0.97**	**$0.97**	**$4.86**

Flood NPV Summary

Padmount	+$1,161,002
Pillars	+$235,986
RMU	+$503,214
Switching	+$2,249,778
Total Flood NPV	**+$4,149,980**

Sensitivity analysis has been undertaken and the results are in Appendix 3.

5.2 Optimal Timing

The Bushfire and Flood program is proactive program and directed expenditure is planned to either reduce future maintenance and capital costs or addresses reliability performance issues associated with bushfires and floods.

The programs of work presented in this business case are formed by a number of smaller projects. A prudent level of investment is assured by prioritising the timing and need for projects that make up this program based on risks, ensuring a range of viable alternative options are considered to minimise the cost and optimise the timing of any investments made within the network. Each individual investment that forms part of this program will be approved via an individual stand-alone business case and financial delegate approval before funding is released.

6 RECOMMENDATION

It is recommended to establish the program or work, and breakdown as detailed in this business case. Table 6 summarises the key components of this program.

Table 6 Options Analysis Scorecard

Criteria	Detail
Net Present Value	**Total NPV = +$7.26M**
Investment cost (TCO)	**$13.85M**
Investment Risk	Medium
Benefits	Meet legislative obligations in terms of Distribution Authority requirement. Meet customer reliability expectations. Improved community safety by minimising the risk of network initiated bushfires.
Delivery time	This business based is for a rolling program made up of individual projects that typically have a life cycle of 12 months.
Detailed analysis – Benefits	By implementing this business case Ergon Energy will be able to meet its legislative requirements in terms of reliability and safety performance of the network.
Detailed analysis – Risks	Conservative assumptions have been applied to the analysis in this business case and hence the funding requested is low in comparison to the amount that could otherwise be justified.
Detailed analysis - Advantages	This expenditure allows Ergon to address Bushfire and Flood risks through NPV positive investments where network reliability performance does not deteriorate in compliance with regulatory obligations and is justified by cost benefit analysis.

APPENDIX 1: ALIGNMENT WITH THE NATIONAL ELECTRICITY RULES

Table 7 Recommended Option's Alignment with the National Electricity Rules

NER capital expenditure objectives	Rationale
A building block proposal must include the total forecast capital expenditure which the DNSP considers is required in order to achieve each of the following (the capital expenditure objectives):	
6.5.7 (a) (1) meet or manage the expected demand for standard control services over that period	3 Background
6.5.7 (a) (2) comply with all applicable regulatory obligations or requirements associated with the provision of standard control services;	4 Identified Need
6.5.7 (a) (3) to the extent that there is no applicable regulatory obligation or requirement in relation to: (i) the quality, reliability or security of supply of standard control services; or (ii) the reliability or security of the distribution system through the supply of standard control services, to the relevant extent: (iii) maintain the quality, reliability and security of supply of standard control services; and (iv) maintain the reliability and security of the distribution system through the supply of standard control services	3 Background
6.5.7 (a) (4) maintain the safety of the distribution system through the supply of standard control services.	4.4.4 Risks
NER capital expenditure criteria	**Rationale**
The AER must be satisfied that the forecast capital expenditure reflects each of the following:	
6.5.7 (c) (1) (i) the efficient costs of achieving the capital expenditure objectives	5 Option Analysis
6.5.7 (c) (1) (ii) the costs that a prudent operator would require to achieve the capital expenditure objectives	5 Option Analysis
6.5.7 (c) (1) (iii) a realistic expectation of the demand forecast and cost inputs required to achieve the capital expenditure objectives	5 Option Analysis

APPENDIX 2: RECONCILIATION TABLE

Table 8 Reconciliation

Expenditure	DNSP	2025-26	2026-27	2027-28	2028-29	2029-30	2025-30
Expenditure in business case $m, direct 2022-23, aligns with the input sheet in the AER's Standardised Capex Model	Ergon Energy	$2.77	$2.77	$2.77	$2.77	$2.77	**$13.85**

APPENDIX 3: SENSITIVITY ANALYSIS

Table 9: Pole Wrapping NPV Sensitivity Analysis

Fire Improvement Due to Wrapped	Bush Fire Damage Rate										
	5.5%	5.0%	4.5%	4.0%	3.5%	3.0%	2.5%	2.0%	1.5%	1.0%	0.5%
5.0%	$47,221,674	$43,023,750	$38,825,825	$34,627,901	$30,429,977	$26,232,053	$22,034,129	$17,836,205	$13,638,281	$9,440,357	$5,242,433
4.5%	$46,584,971	$42,387,047	$38,189,123	$33,991,199	$29,793,275	$25,595,351	$21,397,427	$17,199,503	$13,001,579	$8,803,655	$4,605,731
4.0%	$45,948,269	$41,750,345	$37,552,421	$33,354,497	$29,156,573	$24,958,649	$20,760,725	$16,562,801	$12,364,877	$8,166,953	$3,969,029
3.5%	$45,311,567	$41,113,643	$36,915,719	$32,717,795	$28,519,871	$24,321,947	$20,124,023	$15,926,099	$11,728,175	$7,530,251	$3,332,327
3.0%	$44,674,865	$40,476,941	$36,279,017	$32,081,093	$27,883,169	$23,685,245	$19,487,321	$15,289,397	$11,091,473	$6,893,549	$2,695,625
2.5%	$44,038,163	$39,840,239	$35,642,315	$31,444,391	$27,246,467	$23,048,543	$18,850,619	$14,652,695	$10,454,771	$6,256,847	$2,058,923
2.0%	$43,401,461	$39,203,537	$35,005,613	$30,807,689	$26,609,765	$22,411,841	$18,213,916	$14,015,992	$9,818,068	$5,620,144	$1,422,220
1.5%	$42,764,758	$38,566,834	$34,368,910	$30,170,986	$25,973,062	$21,775,138	$17,577,214	$13,379,290	$9,181,366	$4,983,442	$785,518
1.0%	$42,128,056	$37,930,132	$33,732,208	$29,534,284	$25,336,360	$21,138,436	$16,940,512	$12,742,588	$8,544,664	$4,346,740	$148,816
0.5%	$41,491,354	$37,293,430	$33,095,506	$28,897,582	$24,699,658	$20,501,734	$16,303,810	$12,105,886	$7,907,962	$3,710,038	-$487,886
0.0%	$40,854,652	$36,656,728	$32,458,804	$28,260,880	$24,062,956	$19,865,032	$15,667,108	$11,469,184	$7,271,260	$3,073,336	-$1,124,588

Table 10: Covered Conductor NPV Sensitivity Analysis

Benefit Year	Effectiveness Rate										
	90.0%	85.0%	80.0%	75.0%	70.0%	65.0%	60.0%	55.0%	50.0%	45.0%	40.0%
20	$11,623,495	$10,914,054	$10,204,614	$9,495,173	$8,785,732	$8,076,291	$7,366,850	$6,657,410	$5,947,969	$5,238,528	$4,529,087
19	$11,519,516	$10,815,852	$10,112,188	$9,408,524	$8,704,859	$8,001,195	$7,297,531	$6,593,867	$5,890,203	$5,186,539	$4,482,874
18	$11,307,919	$10,616,010	$9,924,101	$9,232,193	$8,540,284	$7,848,375	$7,156,466	$6,464,557	$5,772,649	$5,080,740	$4,388,831
17	$10,984,937	$10,310,971	$9,637,006	$8,963,041	$8,289,075	$7,615,110	$6,941,145	$6,267,179	$5,593,214	$4,919,249	$4,245,283
16	$10,546,671	$9,897,054	$9,247,436	$8,597,819	$7,948,202	$7,298,585	$6,648,968	$5,999,350	$5,349,733	$4,700,116	$4,050,499
15	$9,989,087	$9,370,447	$8,751,806	$8,133,166	$7,514,526	$6,895,885	$6,277,245	$5,658,605	$5,039,964	$4,421,324	$3,802,684
14	$9,411,988	$8,825,408	$8,238,829	$7,652,250	$7,065,671	$6,479,091	$5,892,512	$5,305,933	$4,719,353	$4,132,774	$3,546,195
13	$8,814,690	$8,261,294	$7,707,898	$7,154,502	$6,601,105	$6,047,709	$5,494,313	$4,940,917	$4,387,521	$3,834,125	$3,280,729
12	$8,196,486	$7,677,435	$7,158,384	$6,639,332	$6,120,281	$5,601,229	$5,082,178	$4,563,126	$4,044,075	$3,525,024	$3,005,972
11	$7,556,646	$7,073,141	$6,589,636	$6,106,132	$5,622,627	$5,139,122	$4,655,618	$4,172,113	$3,688,608	$3,205,103	$2,721,599
10	$6,894,411	$6,447,697	$6,000,983	$5,554,269	$5,107,555	$4,660,842	$4,214,128	$3,767,414	$3,320,700	$2,873,986	$2,427,272

Table 11: Padmount NPV Sensitivity Analysis

Padmount		NPV (Base Case)	$1,161,002	Base Case)							
		Effectiveness Rate									
		60.0%	55.0%	50.0%	45.0%	40.0%	35.0%	30.0%	25.0%	20.0%	15.0%	10.0%
Benefit Year	25	$6,591,129	$5,956,079	$5,321,029	$4,685,978	$4,050,928	$3,415,878	$2,780,828	$2,145,777	$1,510,727	$875,677	$240,627
	24	$6,395,478	$5,776,732	$5,157,986	$4,539,240	$3,920,494	$3,301,748	$2,683,002	$2,064,256	$1,445,510	$826,764	$208,018
	23	$6,192,978	$5,591,107	$4,989,236	$4,387,365	$3,785,494	$3,183,623	$2,581,752	$1,979,881	$1,378,010	$776,139	$174,268
	22	$5,983,391	$5,398,986	$4,814,580	$4,230,175	$3,645,770	$3,061,364	$2,476,959	$1,892,553	$1,308,148	$723,743	$139,337
	21	$5,766,469	$5,200,140	$4,633,812	$4,067,483	$3,501,155	$2,934,826	$2,368,498	$1,802,169	$1,235,840	$669,512	$103,183
	20	$5,541,954	$4,994,335	$4,446,716	$3,899,097	$3,351,478	$2,803,859	$2,256,240	$1,708,621	$1,161,002	$613,383	$65,764
	19	$5,309,581	$4,781,327	$4,253,072	$3,724,817	$3,196,563	$2,668,308	$2,140,054	$1,611,799	$1,083,545	$555,290	$27,035
	18	$5,069,075	$4,560,863	$4,052,651	$3,544,438	$3,036,226	$2,528,013	$2,019,801	$1,511,588	$1,003,376	$495,164	-$13,049
	17	$4,820,152	$4,332,683	$3,845,214	$3,357,745	$2,870,277	$2,382,808	$1,895,339	$1,407,870	$920,402	$432,933	-$54,536
	16	$4,562,516	$4,096,517	$3,630,518	$3,164,519	$2,698,519	$2,232,520	$1,766,521	$1,300,522	$834,523	$368,524	-$97,475
	15	$4,295,863	$3,852,085	$3,408,307	$2,964,529	$2,520,751	$2,076,973	$1,633,195	$1,189,417	$745,639	$301,860	-$141,918

Table 12: Pillars NPV Sensitivity Analysis

Pillars		NPV (Base Case)	$235,986	Base Case)							
		Effectiveness Rate									
		60.0%	55.0%	50.0%	45.0%	40.0%	35.0%	30.0%	25.0%	20.0%	15.0%	10.0%
Benefit Year	25	$2,637,773	$2,356,886	$2,075,998	$1,795,110	$1,514,223	$1,233,335	$952,448	$671,560	$390,672	$109,785	-$171,103
	24	$2,551,235	$2,277,559	$2,003,883	$1,730,207	$1,456,531	$1,182,855	$909,178	$635,502	$361,826	$88,150	-$185,526
	23	$2,461,668	$2,195,456	$1,929,244	$1,663,031	$1,396,819	$1,130,607	$864,395	$598,183	$331,971	$65,758	-$200,454
	22	$2,368,966	$2,110,479	$1,851,992	$1,593,505	$1,335,018	$1,076,531	$818,044	$559,557	$301,070	$42,583	-$215,904
	21	$2,273,020	$2,022,528	$1,772,037	$1,521,545	$1,271,054	$1,020,562	$770,071	$519,579	$269,088	$18,596	-$231,895
	20	$2,173,715	$1,931,499	$1,689,283	$1,447,067	$1,204,851	$962,635	$720,418	$478,202	$235,986	-$6,230	-$248,446
	19	$2,070,935	$1,837,284	$1,603,633	$1,369,981	$1,136,330	$902,679	$669,028	$435,377	$201,726	-$31,925	-$265,576
	18	$1,964,557	$1,739,771	$1,514,985	$1,290,198	$1,065,412	$840,626	$615,840	$391,053	$166,267	-$58,519	-$283,306
	17	$1,854,456	$1,638,845	$1,423,234	$1,207,623	$992,012	$776,400	$560,789	$345,178	$129,567	-$86,044	-$301,656
	16	$1,740,502	$1,534,387	$1,328,272	$1,122,157	$916,042	$709,927	$503,812	$297,697	$91,582	-$114,533	-$320,648
	15	$1,622,559	$1,426,273	$1,229,986	$1,033,700	$837,414	$641,127	$444,841	$248,554	$52,268	-$144,019	-$340,305

Table 13: RMU NPV Sensitivity Analysis

RMU		NPV (Base Case)	$503,214	Base Case)							
		Effectiveness Rate									
		60.0%	55.0%	50.0%	45.0%	40.0%	35.0%	30.0%	25.0%	20.0%	15.0%	10.0%
Benefit Year	25	$4,346,073	$3,896,653	$3,447,233	$2,997,813	$2,548,393	$2,098,972	$1,649,552	$1,200,132	$750,712	$301,292	-$148,128
	24	$4,207,612	$3,769,730	$3,331,849	$2,893,967	$2,456,085	$2,018,203	$1,580,322	$1,142,440	$704,558	$266,677	-$171,205
	23	$4,064,305	$3,638,365	$3,212,426	$2,786,486	$2,360,547	$1,934,608	$1,508,668	$1,082,729	$656,789	$230,850	-$195,090
	22	$3,915,982	$3,502,403	$3,088,823	$2,675,244	$2,261,665	$1,848,086	$1,434,507	$1,020,927	$607,348	$193,769	-$219,810
	21	$3,762,467	$3,361,681	$2,960,895	$2,560,108	$2,159,322	$1,758,536	$1,357,749	$956,963	$556,177	$155,390	-$245,396
	20	$3,603,580	$3,216,034	$2,828,489	$2,440,943	$2,053,397	$1,665,851	$1,278,306	$890,760	$503,214	$115,669	-$271,877
	19	$3,439,132	$3,065,290	$2,691,448	$2,317,607	$1,943,765	$1,569,923	$1,196,082	$822,240	$448,398	$74,556	-$299,285
	18	$3,268,928	$2,909,270	$2,549,612	$2,189,954	$1,830,296	$1,470,637	$1,110,979	$751,321	$391,663	$32,005	-$327,653
	17	$3,092,766	$2,747,788	$2,402,811	$2,057,833	$1,712,855	$1,367,877	$1,022,899	$677,921	$332,943	-$12,035	-$357,013
	16	$2,910,439	$2,580,655	$2,250,871	$1,921,087	$1,591,303	$1,261,519	$931,735	$601,951	$272,167	-$57,617	-$387,401
	15	$2,721,731	$2,407,673	$2,093,614	$1,779,556	$1,465,498	$1,151,440	$837,381	$523,323	$209,265	-$104,794	-$418,852

Table 14: Switching NPV Sensitivity Analysis

Switching		NPV (Base Case)	$2,249,778	Base Case)								
		Effectiveness Rate										
		60.0%	55.0%	50.0%	45.0%	40.0%	35.0%	30.0%	25.0%	20.0%	15.0%	10.0%
Benefit Year	25	$11,284,757	$10,228,122	$9,171,486	$8,114,850	$7,058,215	$6,001,579	$4,944,943	$3,888,307	$2,831,672	$1,775,036	$718,400
	24	$10,959,220	$9,929,713	$8,900,205	$7,870,697	$6,841,190	$5,811,682	$4,782,175	$3,752,667	$2,723,159	$1,693,652	$664,144
	23	$10,622,289	$9,620,859	$8,619,429	$7,617,999	$6,616,569	$5,615,139	$4,613,709	$3,612,279	$2,610,849	$1,609,419	$607,989
	22	$10,273,566	$9,301,196	$8,328,826	$7,356,456	$6,384,087	$5,411,717	$4,439,347	$3,466,978	$2,494,608	$1,522,238	$549,868
	21	$9,912,637	$8,970,344	$8,028,052	$7,085,760	$6,143,467	$5,201,175	$4,258,883	$3,316,590	$2,374,298	$1,432,006	$489,713
	20	$9,539,075	$8,627,913	$7,716,751	$6,805,589	$5,894,426	$4,983,264	$4,072,102	$3,160,940	$2,249,778	$1,338,615	$427,453
	19	$9,152,439	$8,273,497	$7,394,554	$6,515,612	$5,636,669	$4,757,726	$3,878,784	$2,999,841	$2,120,899	$1,241,956	$363,014
	18	$8,752,271	$7,906,676	$7,061,080	$6,215,485	$5,369,890	$4,524,295	$3,678,700	$2,833,105	$1,987,509	$1,141,914	$296,319
	17	$8,338,096	$7,527,016	$6,715,935	$5,904,855	$5,093,774	$4,282,693	$3,471,613	$2,660,532	$1,849,451	$1,038,371	$227,290
	16	$7,909,426	$7,134,068	$6,358,710	$5,583,352	$4,807,994	$4,032,636	$3,257,277	$2,481,919	$1,706,561	$931,203	$155,845
	15	$7,465,752	$6,727,367	$5,988,982	$5,250,596	$4,512,211	$3,773,826	$3,035,441	$2,297,055	$1,558,670	$820,285	$81,899