

# Endeavour Energy Resilience Strategy

December 2022



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## Version History

Version	Edited By	Changes
0.1	Samuel Morris	Document Creation
1.0	Samuel Morris	Incorporated customer feedback. Document finalised.

# 1. Introduction

## 1.1. Purpose

This strategy maps out how Endeavour Energy will achieve both community resilience as well as an increased resilient network in the face of changing customer expectations, an evolving industry and to mitigate emerging risks.

This strategy has been developed with respect to, and informed by customer expectations and preferences and has also been informed by the AER's guidance note, *'Network Resilience – A Note on key issues' (2022).'*

## 1.1 Definition

In collaboration with other DNSPs and already established definitions<sup>1</sup>, Endeavour Energy defines resilience as:

*“Resilience is the ability to anticipate, withstand, quickly recover and learn from disruptive events”*

The key aspects of this definition include:

- **Anticipate** – Using evidence and modelling to predict the likelihood and impact of disruptive events
- **Withstand** – For the system and network to 'ride through' most disruptive events.
- **Recover** – In the event of disruption, having robust plans and processes to minimise customer impact.
- **Learn** – Review previous events and identify opportunities for improvements to get the best outcomes for customers.

## 1.2 Scope

Endeavour Energy recognises the three resilience risk themes summarised in Table 1. These themes cover the key resilience risks which may impact Endeavor Energy's ability to meet performance targets and customer expectations.

This strategy considers resilience theme 1, Endeavour Energy's response to climate change. The other two resilience themes are covered in the Endeavour Energy publications referenced in Table 1.

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<sup>1</sup> *Network Resilience - 2022 Collaboration Paper on Network Resilience*. Developed by NSW/ACT/TAS/NT Electricity Distributors

Table 1: Resilience risk themes

Resilience Theme	Definition	Examples	Reference
<b>1. Climate Change</b>	An increase in frequency and/or severity of major weather events impacting the network and customers through changing demand or damage.	Bushfire, floods, high wind	<ul style="list-style-type: none"> <li>• Sustainability strategy</li> <li>• Resilience strategy (this document)</li> </ul>
<b>2. Cyber Security</b>	Cyber-attacks which disrupt the network.	Malware, DDoS, phishing	<ul style="list-style-type: none"> <li>• ICT strategy and policies</li> </ul>
<b>3. Organisation</b>	Ability to adapt to organisational disruptions and continue BAU activities.	COVID, skills shortages	<ul style="list-style-type: none"> <li>• Endeavour Energy's Human Resources strategy</li> <li>• Business Continuity Management (BCM) framework</li> </ul>

## 2. Resilience concept

### 2.1 Resilience vs Reliability

The concepts of resilience and reliability are related and interdependent, summarised below.



**Reliability** is focused on average network performance and seeks to minimise outage time during normal conditions, including planned outages. Reliability is typically measured in normalised outages per customer, or normalised average duration of outages per customer.



**Resilience** is focused on average network performance and seeks to minimise outage time during major events, such as natural hazards and extreme weather, and looks to improve the network's ability to withstand such events. Resilience is typically measured in unnormalised outages per customer, or unnormalised average duration of outages per customer. This is the actual network performance experienced by the customer on Endeavour Energy's network.

Improving network resilience will likely improve the network reliability when considering overall average performance (i.e. unnormalised SAIDI), but the reverse is not true; a network could dramatically increase its reliability with no, or little, improvement on its resilience to major events.

### 2.2 Historical Context

In Endeavour Energy's pursuit of achieving the National Electricity Objective of maintaining quality, reliability, safety and security of supply, Endeavour Energy has been able to achieve a level of resilience in the past, however the approach was largely ad hoc and reactive. When disruptive events have occurred, Endeavour Energy has tailored its investment to ensure the minimisation of potential repeated future events for its customers.

#### 2.2.1 Catalyst for change

The risk presented by climate change has been an increasing threat to Endeavour Energy's ability to deliver consistent electrical network supply due to the impact on network assets exposed to extreme environmental conditions. The increasing frequency and severity of major weather events will lead to longer and more frequent outages if mitigation measures are not developed and implemented. These outages directly, and indirectly impact individual households and businesses financially and emotionally, in a society that is increasingly reliant on electricity.

Endeavour Energy's recent experiences with the Christmas 2018 windstorm, the 2019/2020 Black Summer Bushfires, the Hawkesbury-Nepean March 2021 Floods, and the multiple Hawkesbury-Nepean Floods in 2022, have reinforced for our customers the need to investigate additional mitigation measures.

These events were the catalyst for the development of this strategy, to ensure Endeavour Energy is focusing on reducing the impact of major disruptive events for the community while maintaining its business-as-usual performance. It is during these major events that the community is most dependent on electricity (eg: for warmth, telecoms, fuel and so on). The strategy will drive development of the plans and methods required to meet Endeavour Energy's strategic resilience goals.



## 2.3 Business Context

### 2.3.1 Organisational approach to climate change

This strategy forms one part of Endeavour Energy's overall approach to climate change, specifically considering the impact of increasing extreme weather events on network performance and communities. Endeavour Energy's overall approach to climate change is summarised in Figure 1, with relevant strategies defined below.

**Sustainability / Net-Zero Strategy:** Defines how Endeavour Energy will reduce its own contribution to sustainability and climate change, such as being waste neutral by 2030, and climate positive by 2040.

**Human resources strategy:** Defines how Endeavour Energy's workforce will be more resilient to climate related disruptions to ensure it is able to respond to major weather events. It considers aspects such as working conditions, working hours, employee capacity and capability (ie. diversity of skills and availability).

**Resilience strategy:** The resilience strategy (this document) defines Endeavour Energy's goals to ensure network assets and communities are resilient to major weather events.

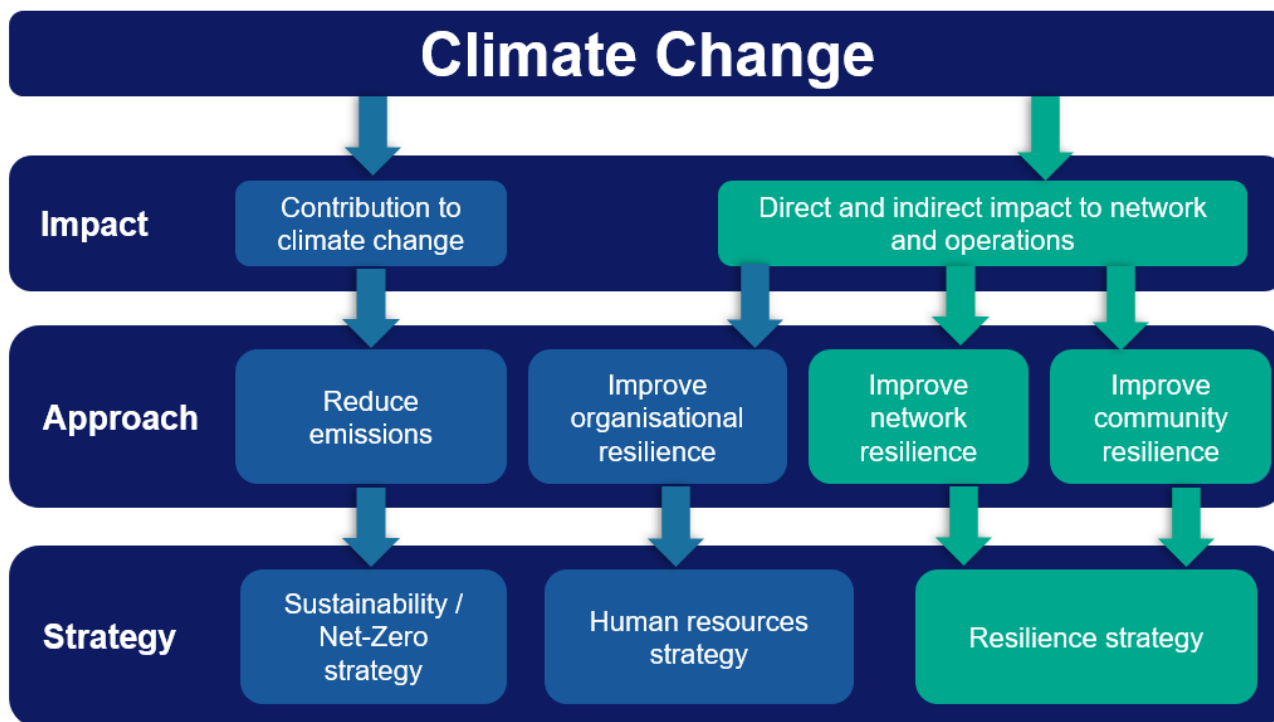


Figure 1 - Overall approach to climate change

### 2.3.2 Network Business strategy

The resilience strategy is considered an Enterprise Strategy informing investments that are driven by the Asset Investment Strategies, and collectively through the Network Business Strategy as shown in Figure 2. While improving network resilience will result in improvements across safety and reliability, the core driver for Endeavour Energy is achieving customer service expectations.

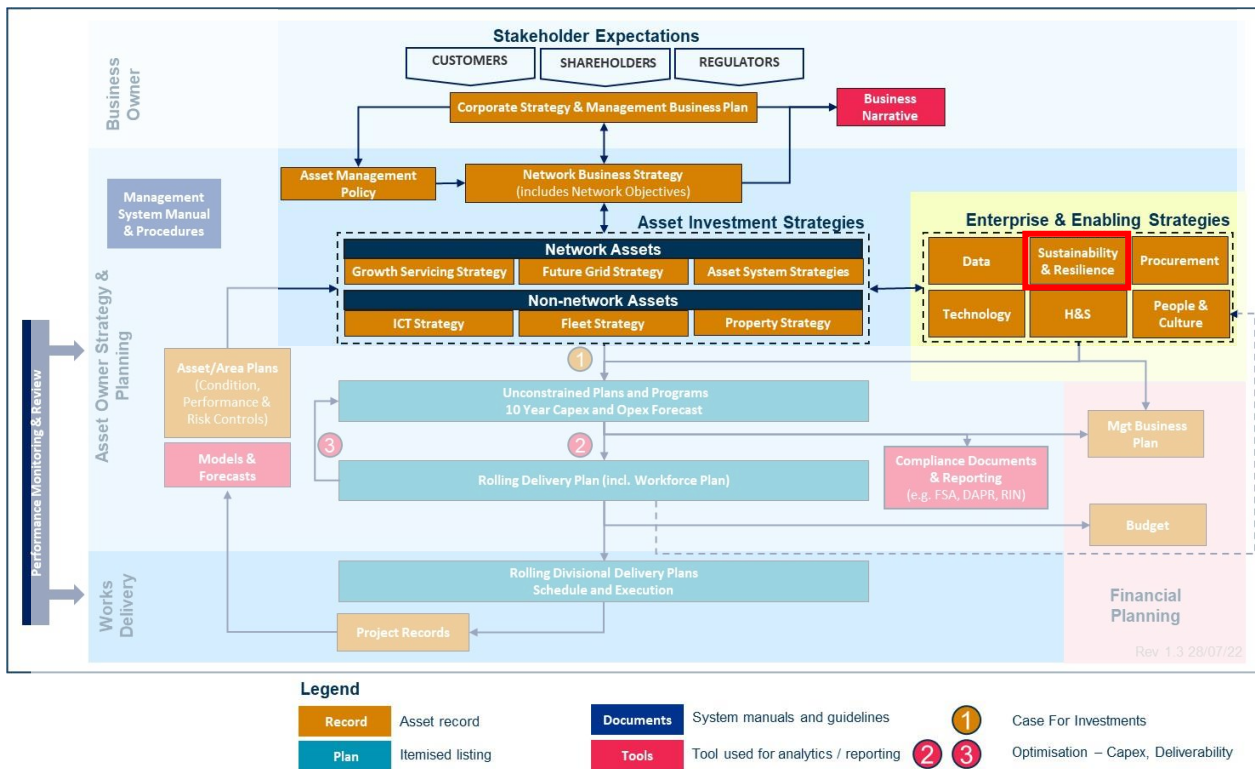


Figure 2- Network Resilience relationship to the Network Business Strategy

### 2.3.3 Resilience documentation

This strategy sets the goals for the three levels of resilience documentation defined in Figure 3, which together form Endeavour Energy's short to medium term approach to resilience.

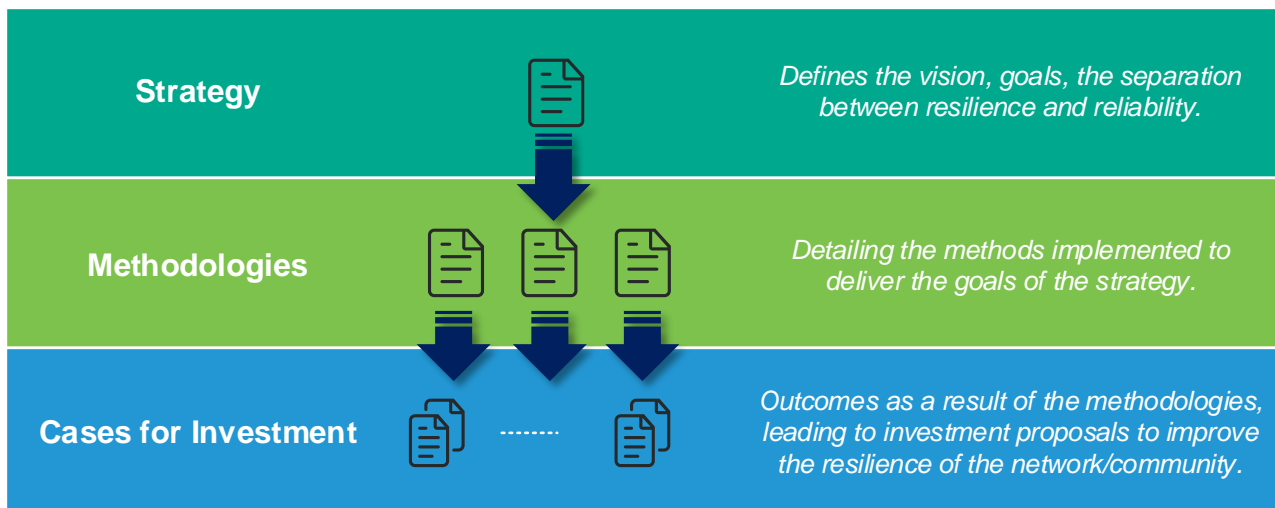


Figure 3 - Resilience documentation structure



## 3. Resilience Vision and Goals

### 3.1 Resilience Vision

Endeavour Energy's vision for its Resilience approach is defined as:

To deliver both the electrical network performance and community support, during and after major climate events, in line with our customers' expectations

To achieve this vision, Endeavour Energy's strategic resilience goals are to:



Define and predict the risk of climate change on network and community resilience



Enhance customer experience through support, education, regular engagement and improved electrical network resilience



Incorporate the concept of climate change resilience into investment planning

These goals are closely interrelated, with customers forming a key part of the definition and selection of investments, based on the defined climate change risks.

### 3.2 Goal 1 – Define and predict the risk of climate change

The trends and causes of climate change at a macro level are well understood. However, the climate risks and associated impacts to electricity networks are dependent on the local factors of an area. Endeavour Energy plans, builds, operates, and maintains an electricity distribution network that connects 2.6 million people to power, across Sydney's Greater West, the Blue Mountains, the Southern Highlands, Illawarra, and the South Coast of New South Wales. With a network covering different geographic areas, while supporting different and diverse communities, the risks to the network associated with each of these areas can be quite varied.

To be able to constructively start customer consultation, the second goal of this strategy, the risk to the network needs to be understood and quantified. The plan outlined in Figure 4 details the approach, which includes defining how extreme weather events have historically affected the network (and its customers) in terms of frequency and scale of impact, as well as predicting the potential future expected probability, and impact, of an extreme weather event occurring, and the associated likelihood that the impact results in network interruption.

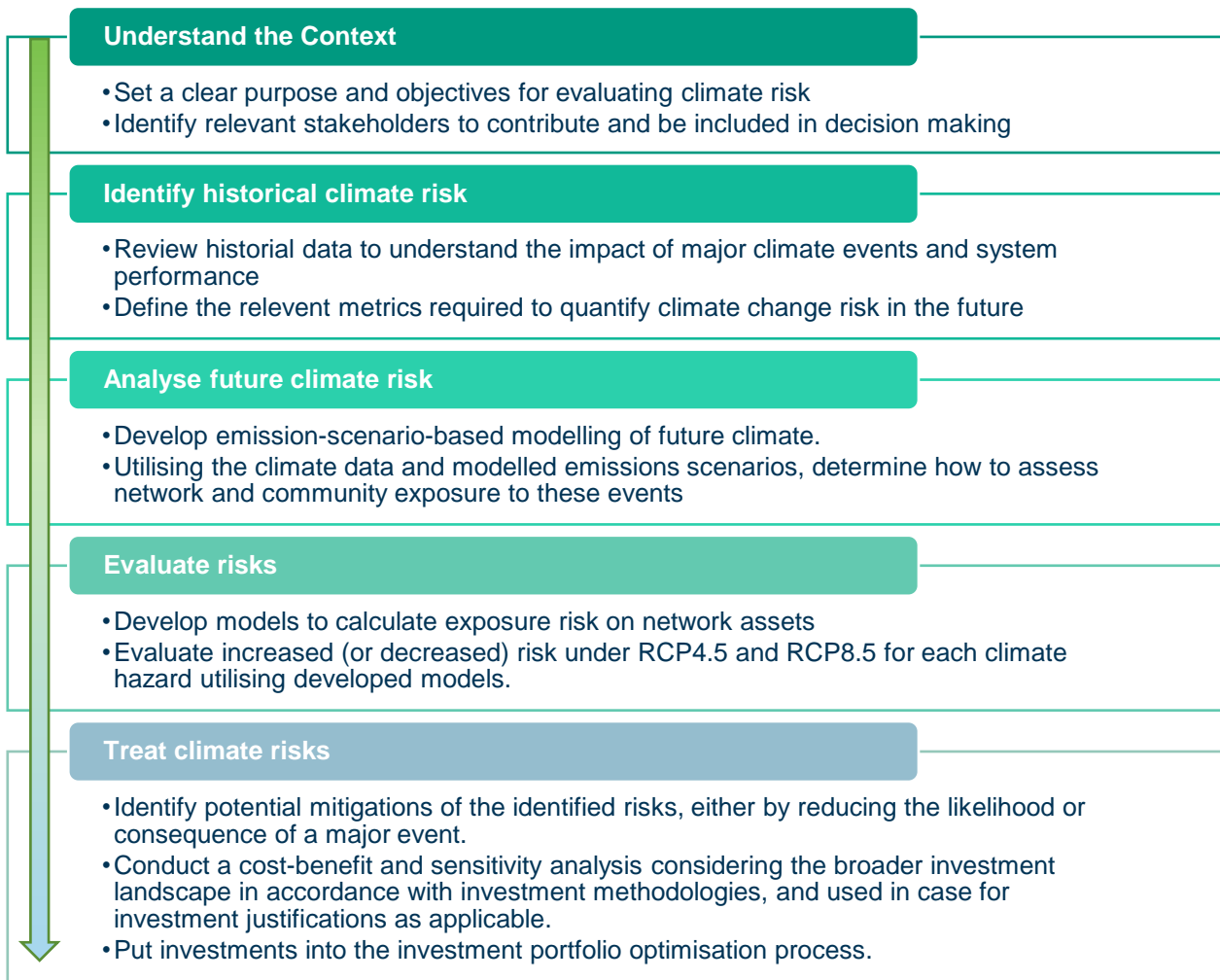


Figure 4 – Plan for climate change risks

### 3.3 Goal 2 – Enhance customer experience through support, education, regular engagement and improved electrical network resilience

Endeavour Energy recognises the value and importance of reliable electrical networks and the impact loss of supply events can have on the customers they serve. To achieve this goal with customers, Endeavour Energy will:

1. Be open and transparent;
2. Communicate clearly;
3. Commit to supporting customers before, during and after a loss of supply event; and,
4. Collaborate with and learn from its customers.

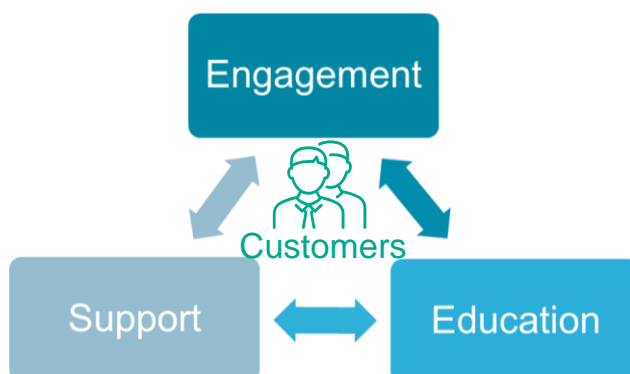
Customer engagement is a continuous process, embedded in both Endeavour Energy's business as usual activities and defined planning cycles. Endeavour Energy ensures customers are fully informed of investment options and the associated implications, collaborating throughout to help guide Endeavour Energy's investment direction in resilience.

As well as involving customers in decision making regarding resilience investment, it is important that Endeavour Energy ensures these investments result in an improved customer experience, such as reduced downtime or additional support during major disruptive events. This includes supporting customers, essential services, and emergency services during major events.

Endeavour Energy's engagement has been informed by *Endeavour Energy's Customer Value Framework* and the *AER Better Resets Handbook – Towards Consumer Centric Network Proposals Dec 2021*.

Endeavour Energy's approach to enhancing the customer experience, covers the following three main areas:

1. **Engagement:** Ensuring the customer is informed and involved during the development and ongoing improvement of our services for customers.
2. **Support:** As part of the community, Endeavour Energy is committed to helping the community, customers and other utilities where it can.
3. **Education:** Ensuring customers have the knowledge before, during and after an event about how they can reduce the possible impacts of these climate events on themselves and their communities.



### 3.4 Goal 3 – Climate change resilience in investment planning

The concept of resilience is a factor applicable to both operating expenditure and capital investments, across AUGEX, REPEX and Future Grid capital investment pillars. To incorporate resilience into Endeavour Energy's case for investments it must be quantifiable and incorporated into Endeavour Energy's investment modelling methodology<sup>2</sup>. Endeavour Energy, in keeping with Goals 1 and 2, will also need to evaluate the optimum investment avenue. This includes balancing the economic and service level trade-off between using emergency operating expenditure to recover from major events, versus proactive investment in resilience to reduce the likelihood or consequence of major events, whilst also considering the impact investment has on customer's bills, as shown in Figure 5.



Figure 5: Balancing network resilience and price

The plan for this goal is outlined in Figure 6 below.

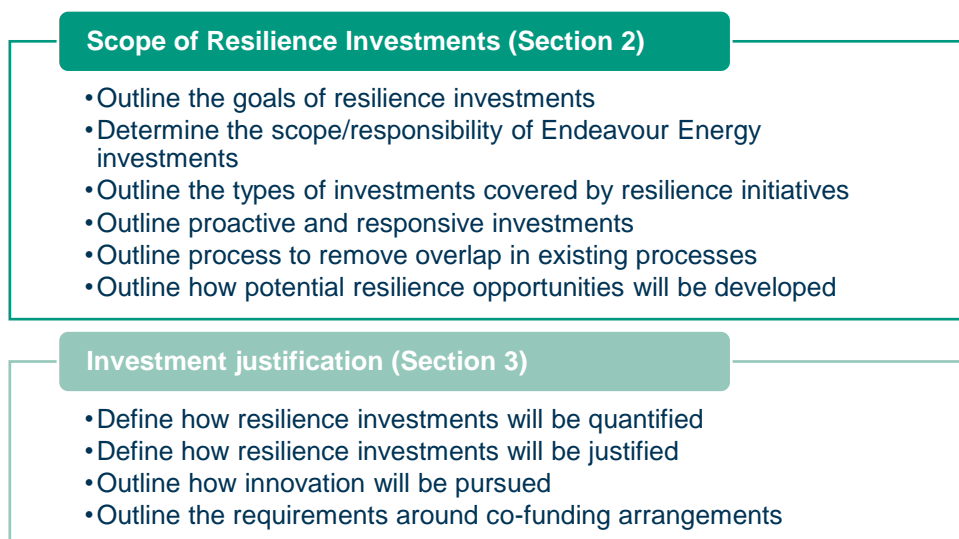


Figure 6 - Resilience Treatment Planning

<sup>2</sup> Endeavour Energy 2022, *Expenditure Forecasting Methodology 2025-29*

## 4. Network Objectives

The following network objectives have been developed to achieve both the vision and the goals set out in the preceding sections.

Table 2

Goal	Performance Measure	Performance Targets
Goal 1 - Define and predict the risk of climate change on network and community resilience	Partner with climate scientists to perform long term climate modelling analysis	<ul style="list-style-type: none"> <li>Have projections out to 2090 for likely weather hazards under multiple emissions scenarios</li> </ul>
	Perform historical base-line analysis on network impacts from climate hazards	<ul style="list-style-type: none"> <li>Perform historical base-line analysis on wind, fires, heat and flooding events</li> </ul>
Goal 2 - Enhance customer experience through regular engagement and improved electrical network resilience	5 year average of unnormalised SAIDI	<ul style="list-style-type: none"> <li>Performance is maintained or less than the previous 5 year average of unnormalised SAIDI</li> </ul>
	Comparison of the average customer outage between previous and subsequent events	<ul style="list-style-type: none"> <li>Outage duration is less than previous climate event</li> </ul>
	Partner with customers and councils to develop solutions to best serve the community	<ul style="list-style-type: none"> <li>Proactively engage with customers</li> <li>Facilitate the development of robust Local Council's Resilience Plans, incorporating loss of electrical supply events</li> </ul>
Goal 3 - Incorporate the concept of climate change resilience into investment planning	Use of calculated escalation factors into asset REPEX calculations	<ul style="list-style-type: none"> <li>Asset replacement calculations incorporating climate hazard escalation factors.</li> </ul>
	Use of Climate Economic Model to justify investment	<ul style="list-style-type: none"> <li>Economic model being used as BAU</li> </ul>

## Annexure B – Definitions and Abbreviations

Term	Description
<b>Community Resilience</b>	The ability of communities to withstand and recover from the impacts of natural disasters.
<b>Major Event</b>	A significant weather event which has the potential to impact the network sufficiently to result in a Major Event Day.
<b>Major Event Day</b>	Interruptions beyond the control of Endeavour Energy, or because they are not representative of a normal day in terms of reasonable network resource availability and go beyond a pre-defined threshold for organisational SAIDI.
<b>RAB</b>	Regulatory Asset Base
<b>Resilience</b>	The ability to anticipate, withstand, quickly recover and learn from disruptive events





# Define and predict the risk of climate change

Climate Resilience Methodology

December 2022



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# Version History

Version	Edited By	Changes
0.1	Samuel Morris	Document Creation

# 1.Introduction

## 1.1. Purpose

The purpose of this method is to provide context and a framework for the activities required to ensure Endeavour meet the first of three Resilience Strategy Goals defined in the Resilience Plan, specifically Resilience Goal 1, which is to:



Define and predict the risk of climate change on the network and community resilience

To achieve this goal, the process outlined in Figure 1, and further detailed in the following sections of this document, will be implemented.

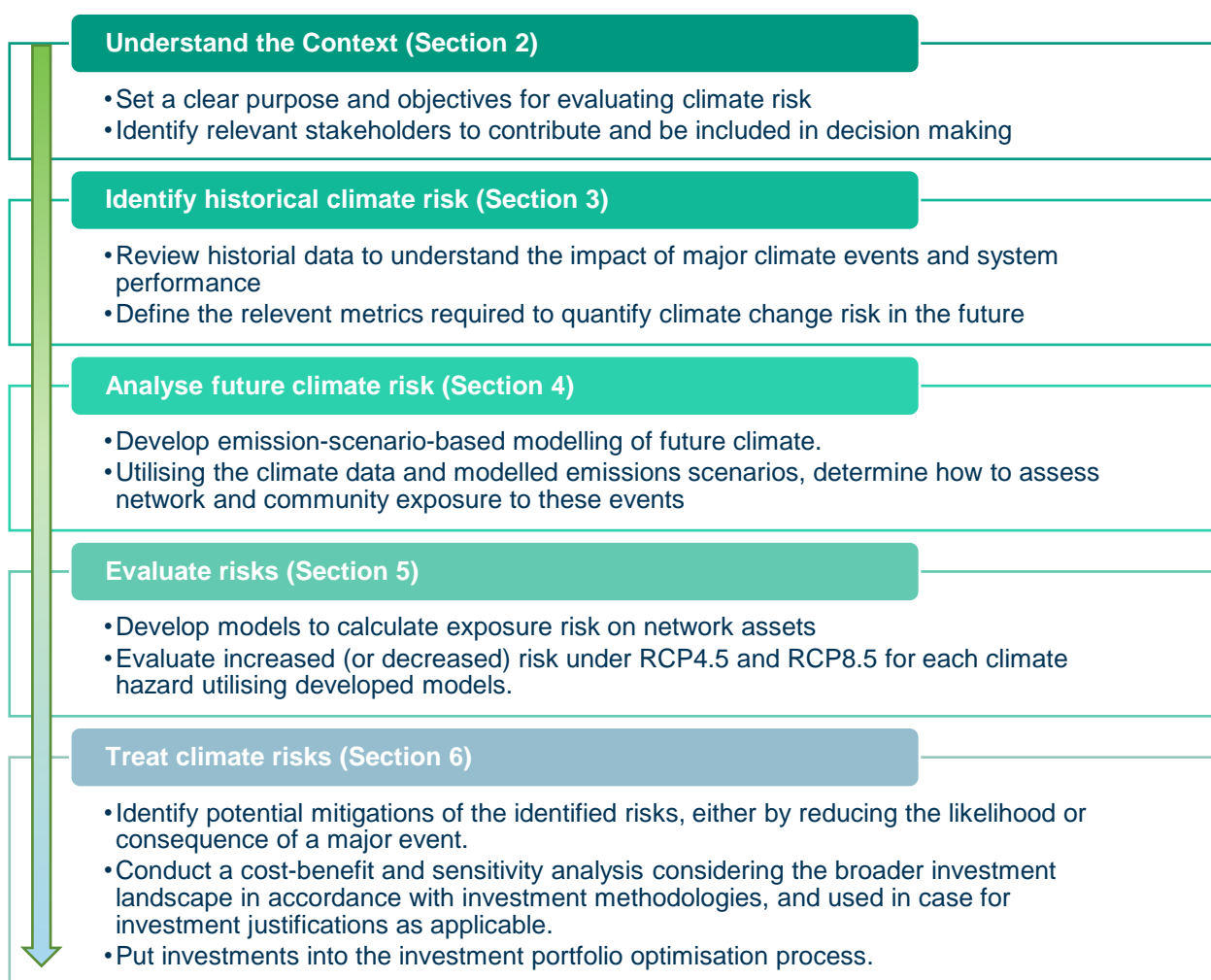


Figure 1 – Plan for climate change risks



## 2. Understanding the context

### 2.1. Objectives

#### 1.1 Objectives

The objective of this methodology is to set the framework in which Endeavour Energy will assess the current and potential future impact climate events can have on its network and its customers.

An effective climate risk methodology will enable Endeavour Energy to develop and implement investment opportunities to help support its customers.

#### 1.2 Stakeholders

The following table outlines the stakeholders who have interest in the development of climate modelling either due to the direct and indirect impact of climate. This methodology has been developed considering and informed by the engagement with these stakeholders.

Table 1 – Stakeholder of climate modelling

Internal stakeholder		External Stakeholder	
Stakeholder	Interest	Stakeholder	Interest
<b>Asset Performance</b>	Needs to understand and use escalation factors for major climate risks to determine their impact on optimum asset replacement decisions.	<b>Customers (incl. Major Customers)</b>	Need to understand the climate risks when engaged to help develop Endeavour Energy's investment strategies; having informed customers is vital to making efficient decisions.
<b>Asset Planning</b>	Needs to know the relative risk of various geographic areas to ensure design takes into account selection of asset location that minimises risk of assets to climate.	<b>Community Groups</b>	
<b>Future Grid</b>	Needs to understand the current and future climate as it is crucial to ensure innovation and developing the lowest cost to deliver energy to customers.	<b>Regulators (AER/IPART)</b>	Need to understand climate risks to ensure Endeavour Energy is being prudent and effective with its investments, and to solidify Endeavour Energy's partnership with its regulators.
<b>System Control</b>	Needs to understand the current and future climate exposure to optimise the post-event response to ensure the lowest possible outage duration for customers.	<b>Reliant Industry / Utilities</b>	Need to understand climate risks as these are likely shared and there may be increased reliance on consistent electrical supply for dependent providers, which could lead to co-funding opportunities for resilience investment.



## 2. Identify historic climate risk

### 2.1 Historical climate analysis

Endeavour Energy covers a large geographical area characterised by different vegetation and elevation profiles. This has a large impact on the conditions our network and customers experience. To determine the exposure to various climate events, historical climate data (1986-2005) from the Electricity Sector Climate Information (ESCI), as well as weather station data for wind, is utilised and summarised in Table 1 and Figure 2 to Figure 4.

This data demonstrates how the climate varies across Endeavour Energy's network. The southern areas experience a much cooler, wetter climate, while the northern region is drier with an increased fire danger risk as shown by the increased Forest Fire Danger Index (FFDI).

Table 2 - Climate Summary of Endeavour Energy's Area split by Distribution Areas (1986-2005)

Region	Area (km <sup>2</sup> )	Number of Customers	Average Maximum Annual Rainfall (mm/day) (1 in 20 year return period)	Average Number of Days > 35°C per annum	Average number of days with FFDI >25 per annum	Average Max Annual Wind Speed (km/h)
West	1214	107,471 (9%)	93.7	5	9.6	88.8
East	96	423,598 (36%)	124.4	9.5	12	72.8
Central	350	498,463 (43%)	136.5	7	10	63.4
South	783	134,287 (12%)	148.83	2.5	5	79.5
Entire Area	2,444	1,163,819	126.1	5.0	8.2	54.8

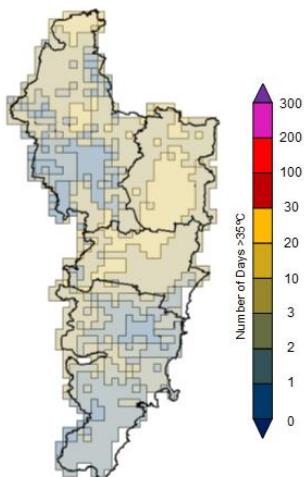


Figure 2 - Number of days > 35°C

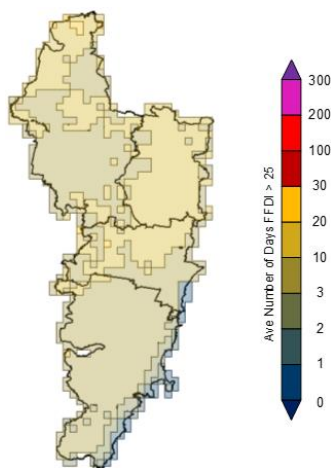


Figure 3 - Average Number of Days FFDI > 25

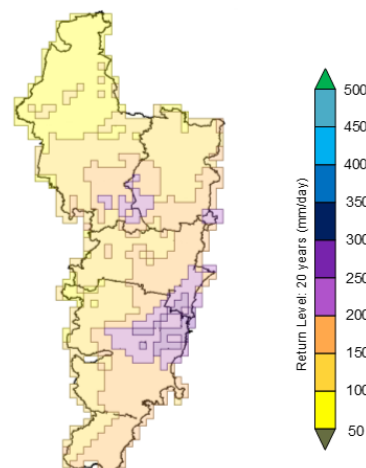


Figure 4 - 1 in 20 year return period for precipitation (mm/day)

## 2.2 Network impacts from climate events

### 2.2.1 Frequency and cost of events

To determine the impact of these climate events on Endeavour Energy's network, the reliability impact from events recorded within the Outage Management System (OMS) was extracted and analysed. Figure 5 below shows a summary of network impacts caused by major weather events over the past 10 years. This figure illustrates the variety of major events each year, with storms being dominant. The impact of these events has been quantified in terms of costs and service interruption (reliability), and is summarised in Table 3.

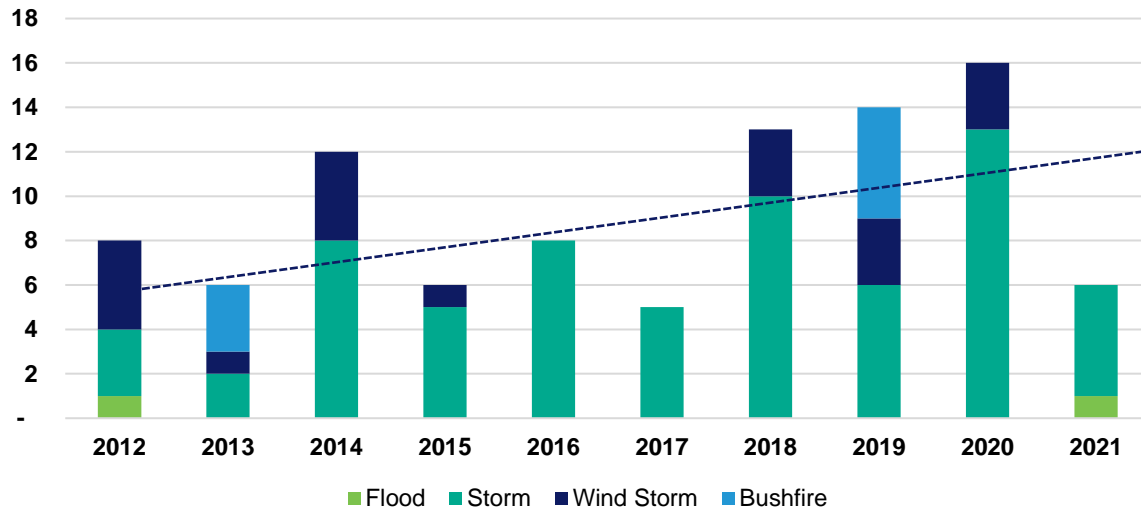


Figure 5 - Major Events experienced by EE (with trendline)

Table 3 - Major Events summary information.

		Bushfire <sup>1</sup>	Flood	Storm (Wind + Precipitation)	High Wind Storm
Freq	Average per year	0.40 (1 every 2.5 years)	0.30 (1 every 3 years)	6.40 (once every 2 months)	1.90 (Once every 6 months)
Financial Impact	Average Cost per year (\$million)	2.658	0.119	2.046	0.372
	Average Cost per instance (\$million)	5.981	0.432	0.295	0.176
Reliability Impact	Average Number of Customers Affected	26,358	17,521	31,725	24,172
	Average CMI (million)	46.5	5.2	4.6	3.91
	Average Yearly CMI (million)	11.1	0.6	32.9	8.4
Assets Lost	Poles Replaced	36	5	1.4	2.2

		Bushfire <sup>1</sup>	Flood	Storm (Wind + Precipitation)	High Wind Storm
	Pole Substations Replaced	1.9	3.0	1.7	0.5
	Length of Bare Conductor Replaced	5.9kms	0.6kms	0.442km	0.569kms
	Length of Covered Conductor Replaced	3.6	1.1	1.8	1.7
	Padmount Substations Replaced	0.1	1.0	0.1	-

1- A fire event is a major large scale bushfire event. Small or asset fires are not included in this figure.

The various major events vary in frequency but on average they are costing Endeavour Energy approximately \$4.76 million per year and resulting in 31 million customer minutes interrupted.

Further analysing the cost of each event shows that the main driver is labour accounting for an average of over 50% of total cost for each event, with the cost of physical asset replacement accounting for only 10% of total cost.

#### 2.2.1.1 High Temperature and Heatwave Events

In June 2022, Endeavour Energy undertook a summary into the impact high temperature days (>35°C), and heatwaves (3 consecutive days >35°C), detailed in the report *Network Reliability During Heatwaves*.

From this analysis it was found when comparing to reliability during a heatwave against the average daily reliability within each month, it was found:

- A single day over 35°C, did not result in deteriorating network performance;
- There was a trend of deteriorating reliability by the end of the third day, with an the outage duration being, on average, 143% higher; and,
- The areas which has the most frequent occurrence of these heatwaves is the Penrith and Kellyville areas.

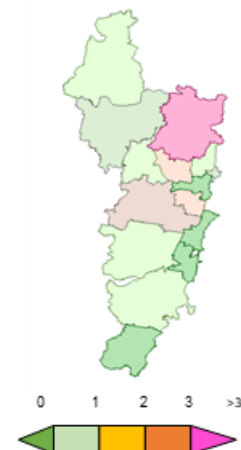


Figure 6 – Average annual consecutive days >35°C

#### 2.2.2 Reliability impact

Endeavour Energy's reliability performance from FY12 to FY21 is shown in **Error! Reference source not found.**, comparing the un-normalised and normalised System Average Interruption Duration Index (SAIDI). The trendline for normalised SAIDI (dark blue) indicates improved reliability performance of the network. Normalised SAIDI removes major climate events from the reliability metric. The trendline for unnormalised SAIDI (light blue) includes the impact of major climate events, resulting in a negative performance trend. This comparison demonstrates the quantifiable impact of major climate events, and the tangible impact on network performance.

If this trendline is extrapolated through to 2040, the average un-normalised SAIDI target would hit approximately 298 SAIDI minutes, almost double the current average of 158 minutes.

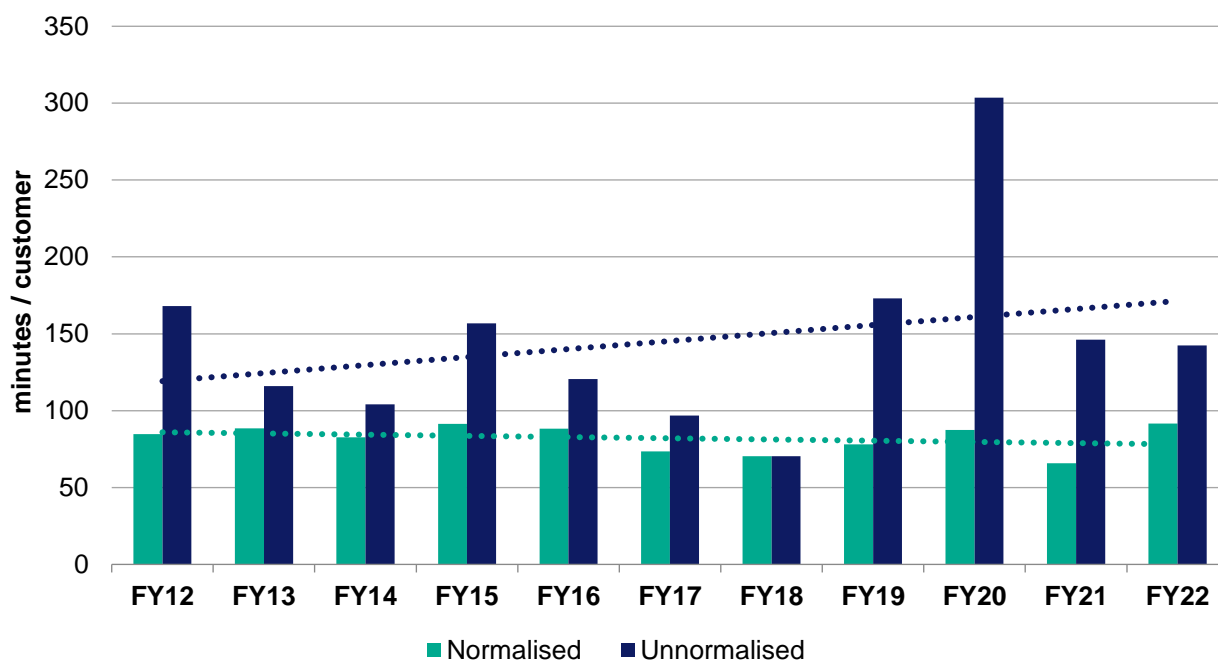


Figure 7 - Endeavour Energy reliability performance

## 2.3 Metrics for Climate Change

Using the past historical major events, and the subsequent impact on the network and system performance, can highlight the key major event hazards that should be considered as metrics for measuring future climate change. Table 4 outlines the key climate metrics for Endeavour Energy based on historical climate major events and likely future concerns. These metrics will be used when modelling different emissions scenarios (Section 3.1) to determine the future climate risks.

Table 4 - Hazards considered in climate change scenario analysis

Physical Hazard	Climate Metric	Metric Description	Unit
<b>Bushfire</b>	Very High Fire Days	Number of days annually where the Forest Fire Danger Index exceeds 25 (very high rating)	days
<b>Extreme Heat</b>	Extreme Heat	Number of days annually over 35°C	days
<b>Flood</b>	Extreme Wet Intensity	1-in-20yr wettest day rainfall	mm/day
<b>Extreme Wind Frequency***</b>	East Coast Low Frequency	Historical and future days per year where an East Coast Low occurs	%

## 3. Analyse future climate risk

### 3.1 Develop scenario models

Endeavour Energy's network assets have a service life of up to and beyond 50 years. Prudent asset management investment requires an understanding of what stresses are expected through an assets' lifecycle. This must include an understanding of the impacts of climate change to the environment which assets are exposed to, as well as the usual consideration of standard ageing and deterioration. Ultimately the analysis of the future climate risk needs to assess the change in the service levels of the network it impacts. To understand this impact, first the various scenarios of future climate risks need to be defined, measured, and understood.

The Intergovernmental Panel on Climate Change (IPCC) has developed 'representation concentration pathways' (RCPs) for greenhouse gas emissions. The RCPs scenarios represent future plausible scenarios based on carbon emissions. The two of most relevance are:

- RCP 4.5 – A moderate scenario whereby emissions peak by 2040 and then decline. Global temperature rise will be between 2-3°C.
- RCP 8.5 – A higher warming scenario where emissions continue to rise through the century. A global temperature risk of approximately 5 degrees is expected.

A 2022 report by Energy Networks Australia, *Electricity Networks: A guide to climate change and its likely effects*, estimated that for Endeavour Energy's area the impact in 2090 will be:

- **Temperature:** Estimated 1.1-1.9° increase
- **Rainfall:** Seasonal will likely decrease, but heavy rainfall to increase
- **East Coast Lows (ECLs):** to become less frequent but more severe in warmer months
- **Bushfire:** Season to start earlier and last slightly longer

### 3.2 Future exposure summary

The following table summarises the exposure of the four distribution regions to the various climate hazards, under different emissions scenarios out to 2090.

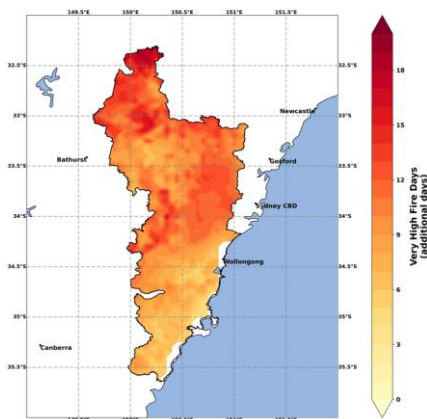
Table 5 – Future exposure and calculation of escalation factors based on location

Bushfire Exposure (average Number of days FFDI > 25)	Region	Historical	RCP4.5		RCP8.5		% increase RCP4.5		% increase RCP8.5	
			2050	2090	2050	2090	2050	2090	2050	2090
	East	15.7	22.2	26.9	22.0	26.8	42%	71%	40%	71%
	Central	15.8	19.6	19.9	17.4	22.2	24%	26%	10%	41%
	West	13.5	17.7	20.1	18.0	23.4	31%	49%	33%	73%
	South	4.0	6.0	8.8	8.0	11.0	49%	118%	99%	173%

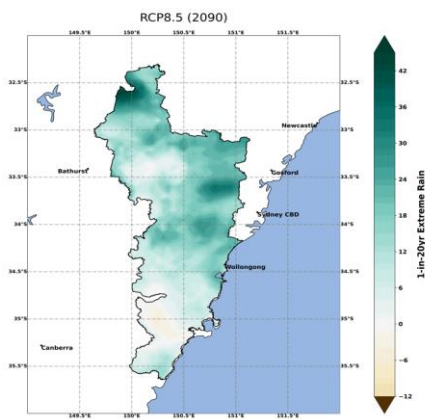
Extreme Heat (Days >35°C)	Region	Historical	RCP4.5		RCP8.5		% increase RCP4.5		% increase RCP8.5	
			2050	2090	2050	2090	2050	2090	2050	2090
	East	9.0	15.6	20.2	18.0	33.3	73%	124%	100%	270%
	Central	2.8	5.9	14.8	13.0	25.9	108%	422%	361%	817%
	West	6.5	11.9	17.1	15.3	29.4	83%	164%	136%	355%
	South	1.5	3.7	5.4	4.5	11.3	143%	261%	200%	649%

Flooding Event (1-in-20yr Extreme Rain level)	Region	Historical	RCP4.5		RCP8.5		% increase RCP4.5		% increase RCP8.5	
			2050	2090	2050	2090	2050	2090	2050	2090
	East	160.4	156.6	171.2	173.2	189.0	-2%	7%	8%	18%
	Central	154.64	164.9	177.9	169.3	187.7	7%	15%	9%	21%
	West	124.3	124.5	130.0	133.3	146.97	0%	5%	7%	18%
	South	165.2	179.7	181.2	186.6	180.4	9%	10%	13%	9%

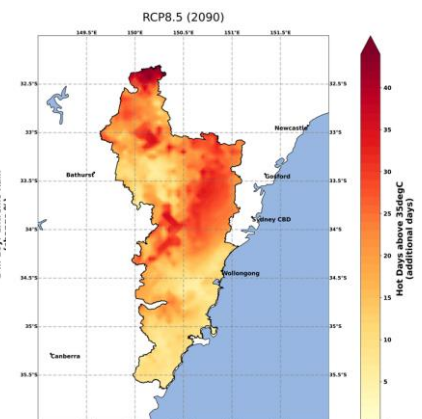
**Bushfire Risk Map**



**Flood Risk Map**



**Extreme Heat Map**





### 3.3 Note about wind modelling

It has been the advice given to Endeavour Energy from climate scientists, that the data available for wind modelling is not at a maturity level in which confidence in its output can be assured.

From literature assessment and with current data available, it has been assessed that:

- the intensity of wind events is set to vary between -3.0 to 8.5km/h; and,
- the frequency of severe wind events is set to decrease from 38-44 days per year to 18-29 days.

Utilising local weather station data over the last decade, a more localised exposure map, shown in Figure 9, can be produced for Endeavour Energy's franchise area.

Wind has large impacts to Endeavour Energy's performance, with an estimated 4500 interruptions per year due to vegetation, and a number of conductor clashing incidents.

As such, Endeavour Energy will not be factoring in wind exposure modelling into its climate projections until such time that better data becomes available. Endeavour Energy will however be exploring potential network investments that can be pursued under current exposure levels.

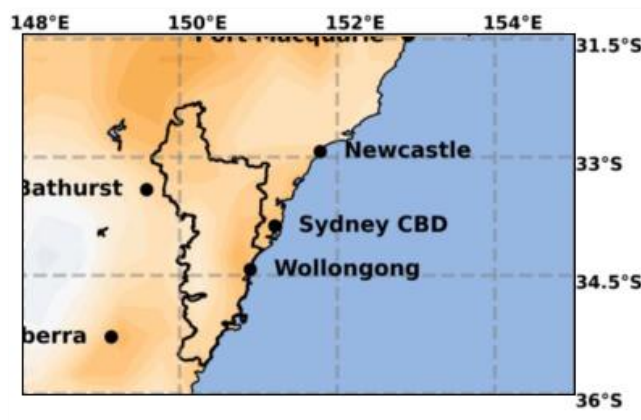


Figure 8 – Projected increase in wind speed by 2090

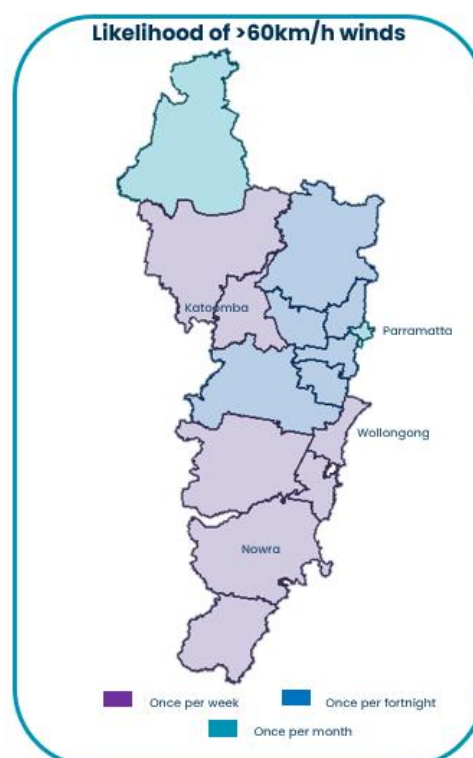


Figure 9 – Exposure to wind gusts >60km/h

## 4. Evaluate risks

### 4.1 Development of models to calculate exposure risk

Any investment will be assessed using Endeavour Energy's Customer Value Framework. The framework outlines how an asset risk is evaluated against intervention measures. Ultimately resilience investments are assessed like all other investments, with weighing up risks and opportunity benefits.

Climate escalation factors can be applied in two ways when calculating risks:

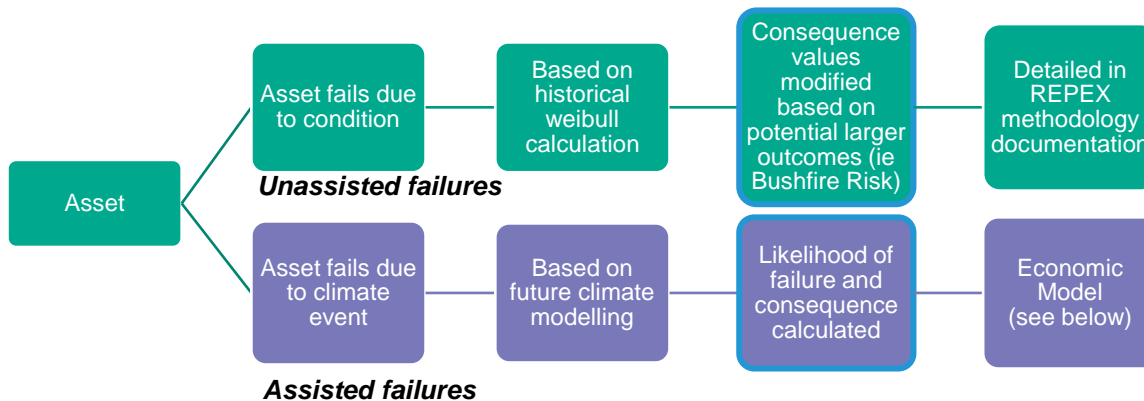


Figure 10 – Justification approaches based on failure type

The sections below detail how the economic model, in the case of assisted failures, is developed.

#### 4.1.1 Methodology for assessing assisted failures

The following graphic details the approach to assessing the impacts of major events to the network.

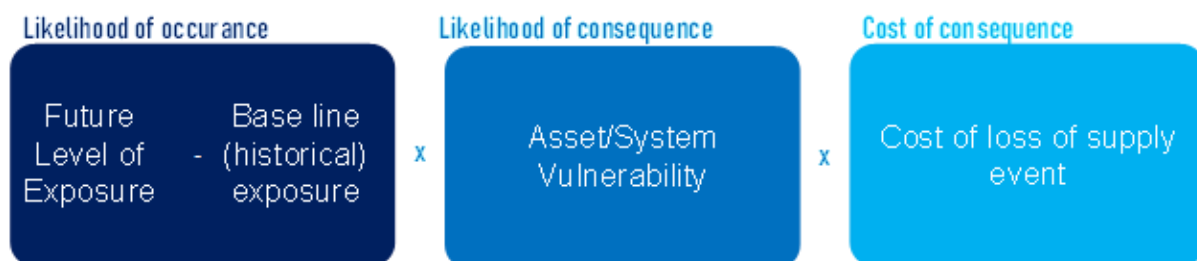


Figure 11 - Climate Assisted Failure Risk Probability

#### 4.1.2 Likelihood of occurrence

The following table summarises how the output of the climate modelling is extrapolated into a probability calculation.

Table 6

Climate Hazard	Annual Likelihood Calculation
Bushfire	Number of days above FFDI 25 / 365
Extreme heat	Number of days above 35°C / 365
Flood	Average rainfall (mm/day) / 264.9 (mm/day)

#### 4.1.3 Method/model to assess asset/system vulnerability (likelihood of consequence)

To determine an asset's vulnerability to a climate event, a mixture of qualitative and quantitative assessment is undertaken. This involves using a mixture of both failure data and interviews with subject matter experts.

The vulnerability is made up of two components:

1. Whether the asset, when exposed to the hazard will be affected (Annexure A); and
2. If the asset is exposed to the hazard, the probability it will result in a failure (Annexure B).

The outcome of this work is summarised in Annexure A and B, showing the vulnerability of Endeavour Energy's Asset Classes to key climate hazards.

#### 4.1.4 Methods/models for assessing risk costs

The assessment into the risk costs associated with a loss of supply event, is to be undertaken in line with Endeavour Energy's Asset Value Framework. The failure of an asset will be assessed under different risk categories of Safety, Reliability, Environmental and Bushfire. This is performed on a per asset-class basis, with each individual asset having unique approaches.

#### 4.1.5 Assessing indirect impact costs

Endeavour Energy acknowledges loss of supply during major climate events can cause stress and hardship for customers with both financial and non-financial impacts to its customer base. This has also been reflected in conversations with customers (Joint DNSP Engagement March 2022), and through research into major climate events (Resilient Sydney's – 'Insights into community resilience experiences' 2018). Currently, there is no industry accepted method to financially assess these impacts.

The electrical network is critical in facilitating the operation of many sectors in society, with its centrality illustrated in Figure 12. This was also highlighted within the Royal Commission into Natural Disaster Arrangements which outlined the importance of critical infrastructure (namely energy and telecommunication sectors), and the need for co-ordination and information sharing<sup>1</sup>.

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<sup>1</sup> (Pages 241-244, Recommendation 9.5)

There is further work to be done to understand and evaluate the implications of an electrical outage on other industries, including determining the indirect impact costs.

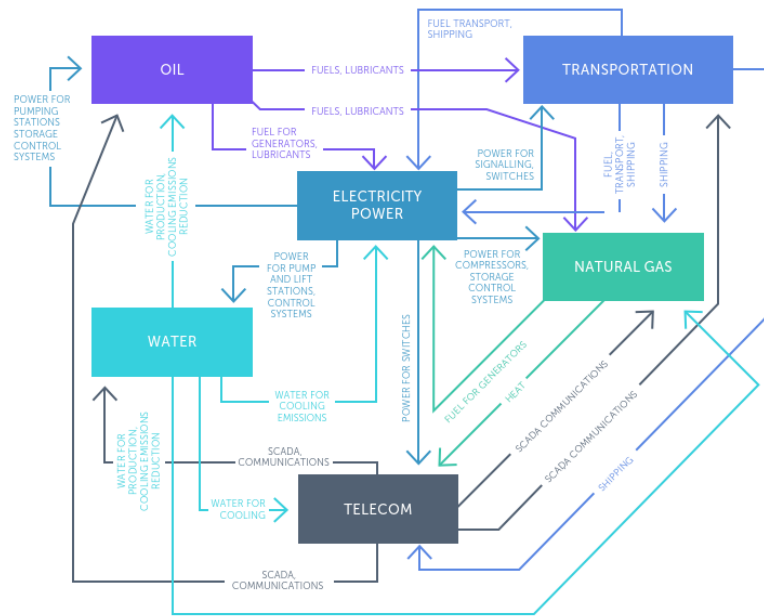


Figure 12- Centrality of a DNSP to industry<sup>2</sup>

<sup>2</sup> (Critical Infrastructure Resilience Strategy — Emergency Management Victoria (2015))

## 5. Treatment of Climate Risks

Once climate risk has been assessed, evaluated, and prioritised (as per the previous sections of this method) then the risk treatment options can be identified and assessed. The process for the treatment options is outlined in Figure 13 below.



Figure 13 - Climate Risk treatment process to determine investments

Risk treatment options can be categorised into two categories:

- Pre-event investment (network augmentation or network hardening); and/or,
- Post-event investment (customer support, operational responses).

### 5.1 Identify potential mitigations

Risk treatment options for can be determined several ways, some of which are highlighted in the figure below.

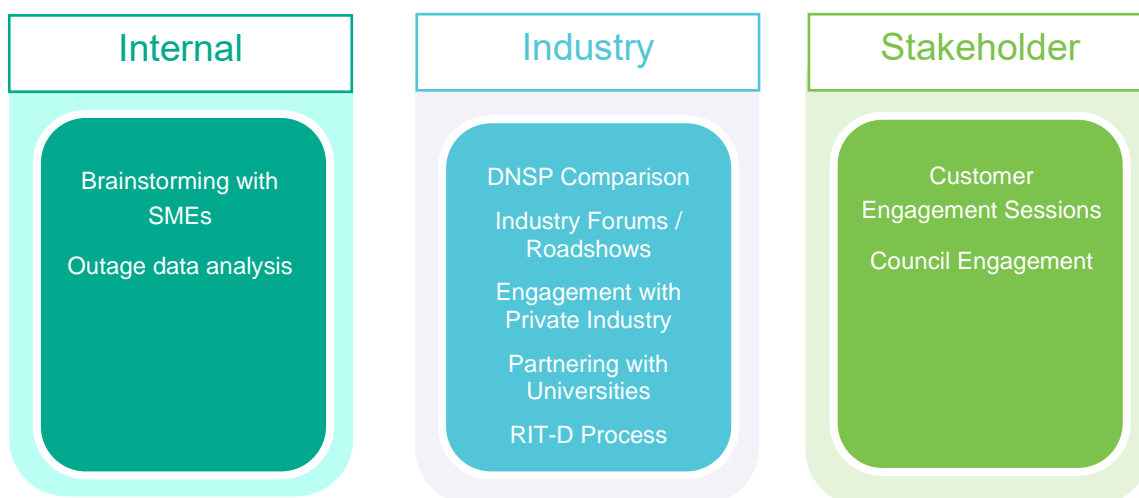


Figure 14

## 5.2 Credibility/Economic Test

With each generated treatment option, to ensure Endeavour Energy is delivering a safe, reliable and cost-effective solutions, each idea is tested for:

1. Technical and economic feasibility;
2. The effectiveness of the solution and residual risk, and whether this risk level is tolerable;
3. Assessing whether other solutions are more effective and can be implemented in time to meet the need.

These investments follow the process outlined in our Customer Value Framework and result in cases for investment (CFI) to then optimised along with other network investments.



# Annexure A – Vulnerability Matrices

Table 7- Asset Vulnerability Matrix

Asset Class	Asset Sub-class	Bushfire	Flood	Storm	High Winds	Heat Wave
Pole	Wood Pole	✓		✓	✓	
	Steel Pole	✓		✓		
	Concrete Pole	✓		✓	✓	
	Transmission Poles	✓		✓	✓	
Pillar	-	✓	✓			
Tower	Transmission	✓		✓	✓	
Substation	Pole mounted	✓	✓		✓	
	Padmount	✓	✓			
	Zone Substation	✓	✓		✓	
Conductors	Bare Mains	✓		✓	✓	✓
	Covered Mains	✓		✓		✓
	Comms	✓		✓	✓	
	Services Covered	✓		✓	✓	
Switches	LBS	✓		✓	✓	
	aLBS	✓	✓	✓	✓	
	Reclosers	✓	✓	✓	✓	
	Regulators		✓	✓	✓	

Table 8 - Likelihood of failure

Asset Class	Asset Sub-class	Bushfire	Flood
Pole	Wood Pole	5.0%	0.54%
	Steel Pole		0.54%
	Concrete Pole	0.5%	0.54%
	Transmission Poles	5.0%	0.54%
Pillar	-	75.0%	100%
Tower	Transmission	3.33%	3.33%
Substation	Pole mounted	0.5%	5.0%
	Padmount		50.0%
	Zone Substation	1.0%	2.0%
Conductors	Bare Mains – HV	1.12%	
	Bare Mains – LV	4.67%	
	Bare Mains – TR	4.67%	
Switches	LBS	0.93%	
	Reclosers	0.9%	50.0%
	Regulators		50.0%

## Annexure C – Definitions and Abbreviations

Term	Description
<b>Community Resilience</b>	The ability of communities to withstand and recover from the impacts of natural disasters.
<b>CMI</b>	Customer Minutes Interrupted. This is a summation of the durations each customer experiences during a particular outage event.
<b>Major Event</b>	A significant weather event which has the potential to impact the network sufficiently to result in a Major Event Day.
<b>Major Event Day</b>	Interruptions beyond the control of Endeavour Energy, or because they are not representative of a normal day in terms of reasonable network resource availability and goes beyond a pre-defined threshold for organisational SAIDI.
<b>Resilient Network</b>	The ability to anticipate, withstand, quickly recover and learn from disruptive events to the power network.
<b>SAIDI</b>	System Average Interruption Duration Index, the sum of the durations of all the Sustained Interruptions (in minutes), divided by the Customer Base. Momentary Interruptions (of three minutes or less) are excluded from the calculation of unplanned SAIDI.
<b>Normalised SAIDI</b>	SAIDI less approved exclusions, such as impact of major event days.
<b>Unnormalised SAIDI</b>	SAIDI inclusive of all interruptions, including major event days.
<b>FFDI</b>	Forest Fire Danger Index – developed by the CSIRO it indicates the potential fire danger by combining a measure of vegetation dryness with air temperature, wind speed and humidity.



# Resilience Investments

## Climate Resilience Methodology

December 2022



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## Version History

Version	Edited By	Changes
0.1	Samuel Morris	Document Creation
1.0	Samuel Morris	Customer feedback incorporated and document finalised.



# 1.Introduction

## 1.1. Purpose

The purpose of this method is to provide context and a framework for the activities required to ensure Endeavour meet the third of three Resilience Strategy Goals defined in the Resilience Plan, specifically Resilience Goal 3, which is to:



Incorporate the concept of climate change resilience into investment planning

To achieve this goal, the process outlined in Figure 1, and further detailed in the following sections of this document, will be implemented.

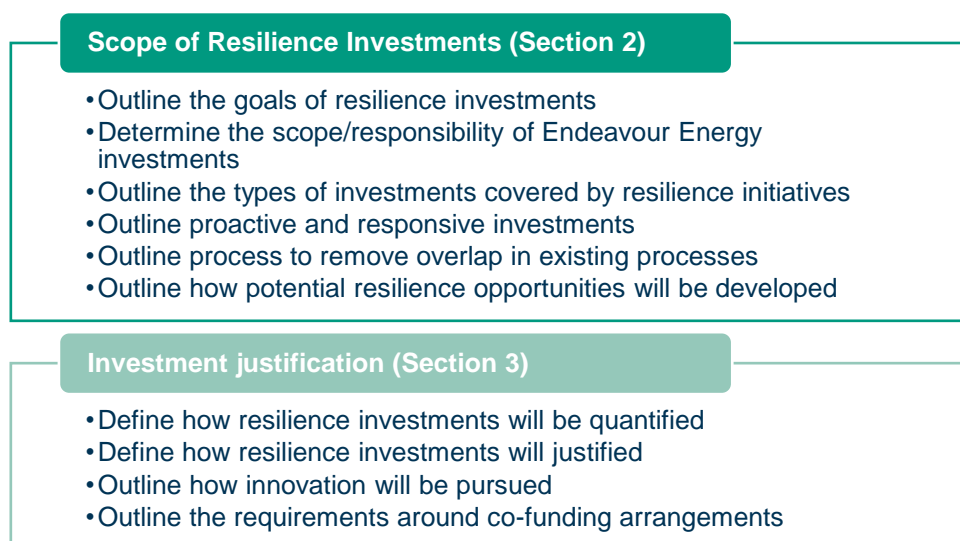


Figure 1 Resilience Treatment Planning

## 2. Scope of Resilience Investments

### 2.1. Goal of resilience investments

Investments specifically targeted for resilience deliver value for customers by providing additional support during and after a climate event. For Endeavour Energy, resilience investments have two outcomes:

- Increased network resilience to major climate events, resulting in less number and/or duration of outages experienced from customers; and,
- The ability for a community to withstand a loss of supply event.

#### 2.1.1. Scope of Endeavour Energy Investment

A measure of a community's resilience is a function of access to a wide range of resources, leadership and knowledge. This includes, but is not limited to access to the supply of electricity. Endeavour Energy's function is to deliver an electrical network that meets customers' needs. The provision and supply of resources and services that are outside of this scope, are not the responsibility for Endeavour Energy to provide.

As such, investments within the community resilience space are exploring ways in which Endeavour Energy can provide the electrical needs a community needs during a loss of supply event.

Access to social services, health and wellbeing, crisis support and emergency services is a function of other services. However, there are still opportunities where Endeavour Energy can support and/or collaborate with other parties who are ultimately responsible to ensure the best outcomes for the community (see Customer Method under Partnerships), however the ownership of the risks, and therefore the investments to mitigate those risks, sits outside Endeavour Energy.

### 2.2. Types of Resilience Investments

Investments to improve the resilience of both the electrical network and the community can be categorised as outlined in the table below.

Table 1

Category	Type of Investment	Impact on Resilience	How this will be achieved
Traditional funding arrangements	<b>REPEX</b>	Assets which fail may have increased consequences	Escalation factors, copperleaf
	<b>AUGEX</b>	Modification to existing assets to avoid/reduce the exposure to climate impacts	Exposure maps, planning procedures
	<b>OPEX</b>	Post-Event reviews to improve/adopt our response to climate events	Post-Event review processes
	<b>CAPEX/Innovation</b>	Introduction of new assets to reduce vulnerability to climate events. This would involve partnering with established and emerging companies.	Market testing, market engagement, benchmarking exercises, RFQs.
Non-Traditional	<b>Customer-focused Innovation</b>	Development of customer-focused innovative solutions, leveraging future network solutions.	LGA Engagement, Future Network Engagement/Development

Category	Type of Investment	Impact on Resilience	How this will be achieved
funding arrangements	<b>Co-Funding</b>	Exploring co-funding arrangements where the investment benefits both entities, which may not be cost justified by one single entity.	Proactive engagement with other utilities and private industry.

### 2.2.1. Proactive vs Responsive Investments

To be able to deliver a fully resilient network would come at the cost of unfavourably high cost-to-serve for our customers. Underground cabling, for example, provides protection against climate events, however still requires above-ground assets to function, and thus is not fully resilient, but most importantly, in some areas are practically unfeasible due to the exorbitant cost it would be to install (for example in areas of mainly rock embedment).

A balance between proactive investment and responsive investment, allows Endeavour Energy to provide a network that offsets risk with cost. Proactive investment allows Endeavour Energy, and our customers, to avoid long duration outages which puts strain and stress and inherent safety implications on the people, community and support services, effected by large-scale climate events. Responsive investments (post-event), allows us to serve when and where the community require that investment. As such, a balance between these two types of investments is required.

The chosen level of investment will be informed by the following aspects:

1. Customer's preferences;
2. Customer's willingness to pay;
3. The timing and risk associated with the climate event;
4. The risk associated with the 'do-nothing' option.

### 2.2.2. Overlapping investments

Due to the nature of investments in the resilience space, there can be the possibility of overlap between existing REPEX and AUGEX investments. To remove this overlap, it is necessary that any interventions proposed for resilience are checked against existing project scopes. This will be achieved through project review briefings between workgroups developing CFIs.

### 2.2.3. Generation of potential investments

The process of identifying treatment options for climate risks is described in Section 6 of the Climate Method and summarised again here.

Risk treatment options can be categorised into two categories:

- Pre-event investment (network augmentation or network hardening); and/or,
- Post-event investment (customer support, operational responses).

Risk treatment options for can be determined several ways, some of which are highlighted in the figure below.

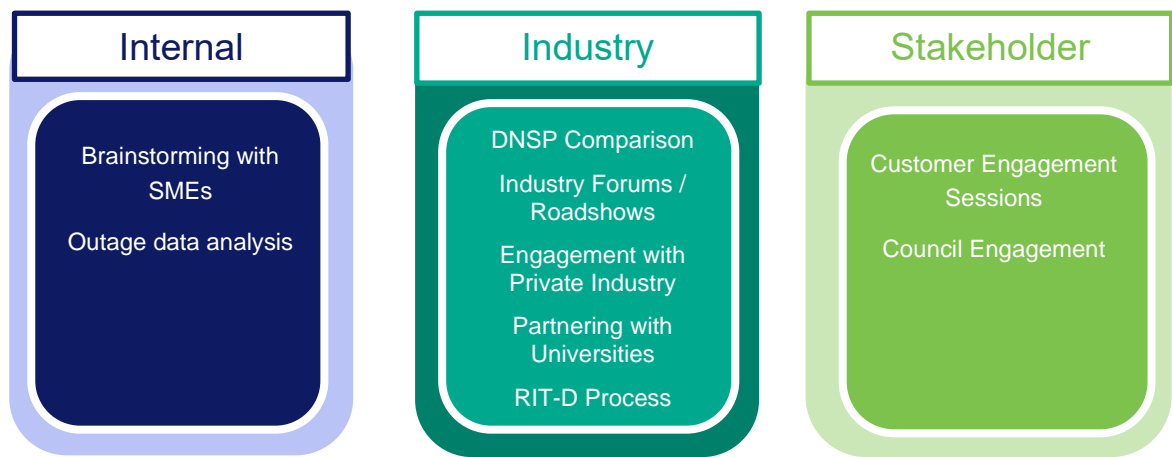


Figure 2 - Climate Risk Treatment Option Development

With each generated treatment option, to ensure Endeavour Energy is delivering a safe, reliable, and cost-effective solutions, each idea is tested for:

- Technical and economic feasibility;
- The effectiveness of the solution and residual risk, and whether this risk level is tolerable;
- Assessing whether other solutions are more effective and can be implemented in time to meet the need.

These investments follow the process outlined in our Customer Value Framework and results in CFIs to then optimised along with other network investments.

## 3. Resilience Investment Justification

### 3.1. Quantifying Resilience

To justify expenditure and also measure the effectiveness of various investments, resilience will be measured the following ways:

1. **Electrical Network Resilience** – This will be measured by the changes to outage duration for similar events over an extended period, to avoid natural fluctuations. These will be measured as average number of minutes off per customer (unnormalised SAIDI).
2. **Community Resilience to a loss of supply event** – the measure of resilience for community type investments does not have a quantified metric. Endeavour Energy seeks to see how it can help communities withstand but also recover quicker after major events. The measure and performance of this will be heavily measured by customer engagement.

### 3.2. Justification of resilience investments

All investments will be assessed and justified using Endeavour Energy's Customer Value Framework. The framework outlines how an asset's risk is evaluated against intervention measures. Ultimately, resilience investments are assessed like other investments - considering risks and opportunity benefits.

The approach to justifying resilience investments varies depending on the failure type that is being assessed. As outlined in Figure 6 below, for unassisted failures, Endeavour Energy utilises the Copperleaf system to model age-based failures and consequences of failures. Consequence of failures will need will be modified based on climate modelling. However, this system does not allow for integration of exposure likelihood and asset vulnerability, as such Endeavour Energy commissioned the production of an economic model to assess this risk.

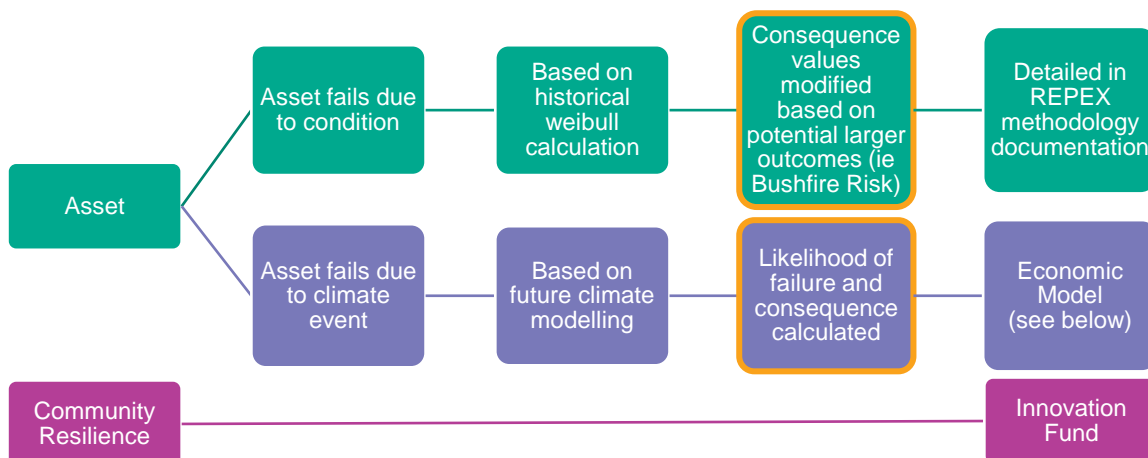


Figure 3 – Justification approaches

### 3.3. Innovation Funding

An Innovation Fund has been created and submitted as part of the FY25-29 Endeavour Energy Regulatory Submission and the justification and governance framework is detailed in '*Innovation Investment Framework (November 2022)*'.

The innovation fund will be a pool of funds dedicated to exploring new and emerging technologies to explore both new and potentially more efficient ways of delivery energy to customers. Within the resilience context, investments to deliver improved community resilience outcomes, such as community hubs, will be explored.

Innovation which falls into general exploration of new and novel asset management developments, will be covered under existing funding schemes.

### 3.4. Non-Traditional Co-Funding Arrangements

Traditionally, Endeavour Energy funds any investment into its network through the regulated funds, approved by the AER. In the interest of developing the best outcome for customers, Endeavour Energy is seeking to explore non-traditional co-funding arrangement with external companies and utilities, where there may be mutual benefit from the investment.

For Endeavour Energy to explore partnerships with external companies, the following must be met as a minimum:

1. The investment must be beneficial to the community;
2. For investment by Endeavour Energy to occur, Endeavour Energy must benefit from the investment;
3. The company with which we partner must be aligned in our core values in regards to ethical treatment of workers, safety and sustainability;

For the investment/funding to be approved, it must include, but not limited to:

1. Have a contract established, outlining deliverables from Endeavour Energy and level of investment;
2. Have a case for investment approved, following current processes, including a sensitivity analysis;
3. Any modifications/changes to the network, remain under the ownership and care of Endeavour Energy.

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# Annexure A – Investment Opportunities

The following section details the possible investment opportunities (2022). Each one of these opportunities will be assessed based on its economic feasibility and the benefit to improve resilience.

The following table summarises the potential investment opportunities to improve our Electrical Network Resilience. The prioritisation of these projects has been assessed for their potential contribution to improving network resilience and ease of implementation.

Table 2 - Improvements to Electrical Network Resilience

Goal	Investment Projects	Further Explanation
	<b>1. Increase rollout of automated switches</b>	Endeavour Energy has over 2000 locations where it is economically beneficial to replace an existing switch with an automatic switching device. This, when paired with FLISR, allows for automatic switching and a reduction in the duration of outages experienced by customers.
	<b>2. Investment in smart technology to create a self healing network</b>	Continuing the rollout of FLISR, based on areas best benefited for self healing networks.
	<b>3. Fortnightly Reliability Incident Reviews</b>	A scheduled fortnightly meeting to discuss reliability incidents in the last fortnight, and what happened, and how we can reduce the outage duration. This will have a flow on effect in our ability to get customers re-energised quicker by learning off past incidents and identifying future preventable outages.
	<b>4. Microgrids and SAPS</b>	A technical review into the feasibility in pursuing additional microgrids, batteries and SAPS within Endeavour Energy's network.
	<b>1. Utilise climate modelling to identify investments with positive Benefit to Cost Ratios</b>	Once the financial model has been finalised by the contractor, we will be able to use replacement costs, and the risk cost to determine where replacement of assets are cost justified. Projects such as raising spans over waterways, replacement of bare conductors to covered conductors.
	<b>2. Utilise local knowledge of troublesome areas (field staff / customers)</b>	By running information gathering sessions with field staff, and giving staff the avenue to propose potential troublesome areas, will allow the harnessing of 'hidden' knowledge.
	<b>3. Post Event reviews ('21 and '22 floods, 2019/20 Bushfires, Storm Response)</b>	Undertaking large scale post-incident review, will allow Endeavour Energy to capitalise on learnings from previous events. focusing on learnings and process improvement. Explore feasibility of move/modify assets to reduce their exposure in the future (eg Padmounts to flooding)
	<b>4. Scenario planning</b>	Performing "What if" scenario workshops, in the event that an asset was unexpectedly impacted. For example, if within the flood, we lost a zone substation – do we have a contingency plan?



Goal	Investment Projects	Further Explanation
	<b>5. Network Outages and Impacts on reliant industries (Telecommunications, water, transport)</b>	Through the use of case studies, develop an understand and financial model to determine the financial impact of a loss of supply on other industries. This is to aide in co-funding investment in the future.
	<b>1. Desktop review into frequent outages</b>	A desktop review into areas/feeders/assets which routinely get impacted by climate events. This will feed into the pursuit of more reliable technologies Endeavour Energy can utilise.
	<b>2. Increase the rollout of EFD sensors</b>	After a successful trial, we have plans to roll this out to 34 additional sites.
	<b>3. Asset Management Industry comparison into resilience technologies</b>	Performing an industry survey to identify other successful DNSP solutions addressing network resilience.
	<b>1. Utilising climate modelling outputs within the 3D model</b>	Inputting the climate modelling results into the 3D model to understand where potential network risks are. For example, if the wind speed is predicted to increase and/or temperature – will this cause more low main defects. In addition to see clearance to potential flood water levels.

## Improving Community Resilience

Table 3 - Projects to improve the community's resilience

Goal	Investment Projects	Further Explanation
<b>1. Improving Local Response</b>	<b>1. Local Emergency Management Plan Review</b>	Partner with the local government agencies and determine whether each LGA has: <ul style="list-style-type: none"> <li>• A local emergency plan</li> <li>• Whether the loss of supply has been adequately addressed</li> <li>• Whether each council points to Endeavour Energy in their resources (website/posters/flyers) in case of an outage</li> <li>• A critical resident register and checking whether life support customers have back up supply.</li> </ul>
	<b>2. Developing local resilient hubs</b>	In collaboration with the local councils, identify locations where, in the occurrence of a climate event, where residents can go for shelter, telecommunication services, sustenance etc.
<b>2. Education and Information</b>	<b>3. Review in Endeavour Energy communication protocols and resources during an emergency</b>	Customer engagement sessions to explore whether the level of information provided by Endeavour Energy during an emergency meets the needs of the community.

Goal	Investment Projects	Further Explanation
	<b>4. Development of education programs around preparation of these climate events</b>	Endeavour Energy currently has resources on its website, but a review into whether resources distributed in other forms may be more appropriate / better for the community. This will be a partnership with the Voice of the Customer section.
<b>3. Other</b>	<b>5. Partnering with councils to reduce vegetation trimming, but also increase urban cooling.</b>	Explore the possibility of introducing a tree planting/relocation program as to move vegetation away from powerlines.



# Customer Engagement

## Climate Resilience Methodology

December 2022



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# Endorsement and Approval

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## Version History

Version	Edited By	Changes
0.1	Samuel Morris	Document Creation
1.0	Samuel Morris	Customer feedback incorporated and document finalised.

# 1.Introduction

## 1.1. Purpose

The purpose of this method is to provide context and a framework for the activities required to ensure Endeavour Energy meets Resilience Goal 2, which is to:



Enhance customer experience through support, education, regular engagement and improved electrical network resilience

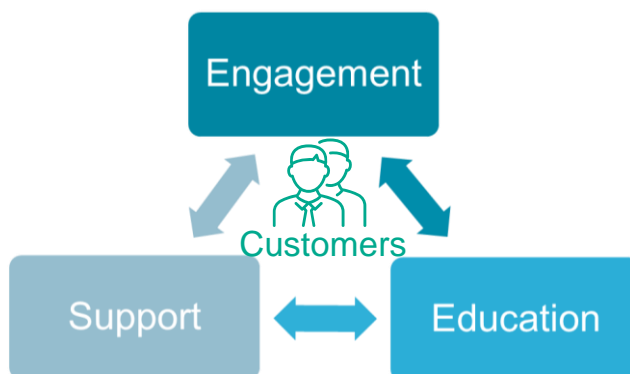
Endeavour Energy recognises the value and importance of reliable electrical networks and the impact loss of supply events can have on the customers they serve. To achieve this goal with customers, Endeavour Energy will:

1. Be open and transparent;
2. Communicate clearly;
3. Commit to supporting customers before, during and after a loss of supply event; and,
4. Collaborate with and learn from its customers.

Endeavour Energy's engagement has been informed by *Endeavour Energy's Customer Value Framework* and the *AER Better Resets Handbook – Towards Consumer Centric Network Proposals Dec 2021*.

Endeavour Energy's approach to enhancing the customer experience, covers the following three main areas:

1. **Engagement:** Ensuring the customer is informed and involved during the development and ongoing improvement of our services for customers.
2. **Support:** As part of the community, Endeavour Energy is committed to helping the community, customers and other utilities where it can.
3. **Education:** Ensuring customers have the knowledge before, during and after an event about how they can reduce the possible impacts of these climate events on themselves and their communities.





# 1. Customers

## 1.1 Customers and Stakeholder Groups

Endeavour Energy serves a broad and diverse set of stakeholders who have different needs and interests in a resilient energy network. Endeavour Energy aims to ensure each group is consulted and their views represented to shape our approach to providing a network to meet their needs. Table 1 provides a high level summary of these identified groups.

Table 1

Stakeholder Group	Who they are	Resilience Impacts
<b>Residential customers</b>	Urban, regional and remote customers. Sub groups are made up of: Vulnerable customers, life support customers and people who experience major weather events disproportionately.	Customers experience during, and after, major weather events which is tied to their wellbeing, standard of living and emergency responsiveness/preparedness.
<b>Universities / Subject Matter Experts</b>	Academics (Universities and schools) and special interest groups.	Developing new technical and societal solutions for the benefit of the community.
<b>Commercial customers</b>	Businesses including major growth areas in NSW earmarked as industrial and commercial hubs (for example, Western Sydney Aerotropolis).	Ability to operate, avoidance of economic and financial loss, and the ability to bounce back after extreme weather events.
<b>Industrial customers / data centres</b>	Manufacturing and industrial processing etc. who impose large loads on the network and/or use electricity on a different usage cycle, when compared to residential and commercial.	Safety of staff and ability to operate. Associated costs to their operations during outages, or sub-optimal service, during major weather events.
<b>Essential Services &amp; Critical Infrastructure</b>	Regulated services such as water and telecommunications, who heavily reliant on electricity supply. Often also critical infrastructure owners.	Being informed and engaged especially during major weather events. Ability to partner and share knowledge to jointly plan, prepare and respond to extreme weather.
<b>Emergency Services</b>	First responders (such as SES, RFS) and hospitals that are likely to be inundated during a major weather event.	Electricity service continuity, safety of their staff and geographic hazard zones that may be created by the network assets or network operation.
<b>Councils</b>	LGAs responsible for the local area's emergency preparedness and disaster response.	Working with Endeavour Energy to ensure electricity supply, especially at disaster relief zones, through jointly developing Community Hubs etc.

## 2. Engagement

Customer engagement is a continuous process that allows Endeavour Energy to get customer preferences in terms of type and level of investment, and to keep customers informed during major events.

For our resilience strategy, there are three avenues in which we will engage with our customers and stakeholders:

1. In the lead up to our regulatory submissions;
2. During and post a major event; and,
3. Through part of BAU engagement (newsletters, social media releases, customer forums, telephone and web-based services).

### 2.1 Regulatory Proposals

As part of Endeavour Energy's regulatory submission development, engagement on resilience will be rolled into the overarching Customer Consultation Plan, which follows the discover, explore, and prioritise phases. The key actions for developing regulatory proposals will be as follows:

- We will continue to engage with customers to get their preferences and guidance on our approach in line with their needs;
- We will tailor our responses to achieve this; and,
- We will report/inform back to them about how we went.

During a regulatory proposal, customer engagement will be made up of, but not limited-to, customer preference panels, deep dives into resilience, trade off discussions, and focus sessions dedicated to resilience.

In the pursuit of continual improvement and changing economic and social expectations, Endeavour Energy's engagement for Resilience will be ongoing.

### 2.2 Major Weather Events

Major weather events can displace people, cause emotional and social pressures on communities, business and support services. To help facilitate and support community resilience, keeping customers informed during and post event is crucial in reducing these stresses caused by these events.

#### 2.2.1 How are we going to keep customers informed?

Providing regular, consistent and clear communication is vital during a major event to avoid confusion and to enable customers to feel supported. Endeavour Energy has developed and maintains an online outage map on its corporate website that can be accessed (where telecommunications is still active and available).

This outage map allows customers to self-service, and find where outages are occurring in real time on the network, with a summary of status, customers affected and estimated time to restoration.

#### 2.2.2 How are we going to keep utilities/telecommunications informed?

Endeavour Energy recognises the importance of telecommunications during a major event, and has been actively working with telecommunication providers to establish real-time network status indication, to allow providers the ability to both know about network outages and be able to respond. We also engage with State and Local Emergency Centres that have representation from the relevant combat agencies to coordinate activities as required.

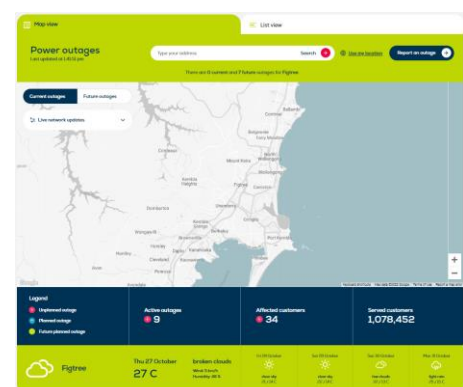


Figure 1 – Outage map on Endeavour Energy website

### **2.2.3 Post-event engagement**

In the pursuit of continual improvement and delivering on expectations, Endeavour Energy will survey both internal SMEs, the community and customers after extreme weather events to understand their experiences and pain-points and uncover improvement areas.

This engagement will improve the BAU processes, our future regulatory submissions and our customer education strategies.

## **2.3 Business-As-Usual Engagement**

Endeavour Energy is committed to providing regular and transparent information, and as part of this, will continue its engagement with its customers through the following mechanisms:

1. Company-wide newsletter updates;
2. Through scheduled meetings with councils;
3. Engagement with its HVCs;
4. Through ad-hoc interaction with its customers through our call-centre and web-based contact services; and,
5. Industry-wide forums and working groups.

### 3. Education

Endeavour Energy recognises the advantages of providing information to customers regarding how they can prepare and respond in the lead up to, and during these disruptive events, but also how to recover. There is also benefit to clarifying the responsibilities of Endeavour Energy and other service providers. This can be done using the following mediums:

Table 2

Category	Education Approach	Aiming to Achieve
<b>Education Materials</b>	Upload and maintain educational material on the Endeavour Energy website.	Giving the ability to customers to self-serve and get information around how they can prepare for an event.
	Letter drops at key timings for known weather event risk e.g., preceding bushfire season.	Information, education around expected risks and preparedness.
<b>Partnerships / Innovation</b>	Partner with councils, to align advice on emergency preparedness either in print, radio, or online.	Alignment of messaging and vital contact information of who/when.
	Development of Community Resilience Hubs in partnership with councils, emergency services (see Section 4.2).	Novel approach to community resilience, providing what the community needs.

Currently Endeavour Energy has sections of its website dedicated to safety in these major events, preparing for and recovery.

Partnering with the Customer Engagement team, will be vital in delivering the best customer experience during these major events.

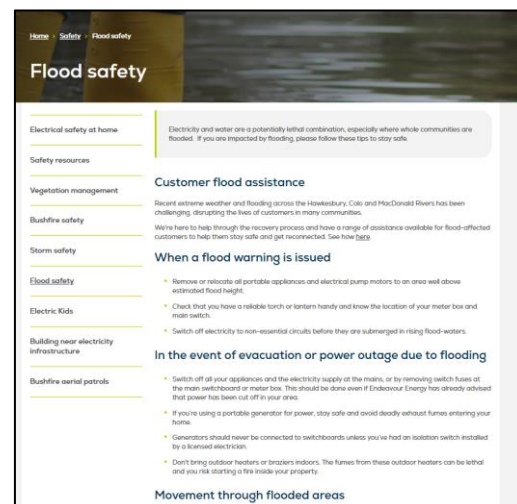


Figure 2 – Climate Hazard information on Endeavour Energy website

## 4. Support

Endeavour Energy has a role in supporting customers in the lead up to, during, and the recovery from a disruption to a major loss of supply event due to extreme weather.

Endeavour Energy, in collaboration with councils (see Section 5.3) will explore the best way to deliver resilience to customers which may be through initiatives such as Community Resilience Hubs.

### 4.1 Vulnerable Communities

Within Endeavour Energy's customer base, there are a few vulnerable groups of customers such as those on life support, those needing cultural and linguistically diverse (CALD) services, and those in low socioeconomic situations. Endeavour Energy has specific strategies and programs dedicated to helping each of these sub-groups, relating to additional notification procedures/timeframes, language resources and financial bill-support.

In the context of resilience to weather events, the term "vulnerable" relates to those more at risk from climate change due to their specific geographic areas, rather than the specific 'vulnerable groups' identified above. As such, resilience initiatives seek to improve the resilience of entire communities and the areas/network most at risk from climate events, which work in support of the already established programs/procedures it has set up to help vulnerable groups.

### 4.2 Community Resilience Hubs

The concept of a 'Community Resilience Hubs' is to establish a location in which customers can get access to telecommunications, power, emergency information and air conditioning during an emergency. Endeavour Energy intends to provide alternative supply during outages using a combination of the existing network and new renewables.

Each hub will need to be tailored for the area, so Endeavour Energy will engage with both councils and the impacted community/customers to develop these solutions, as well as engage on their effectiveness post major events. There is also the potential for co-funding of the investments, which again requires engagement and partnerships (see Section 0 and the Investment Method).

## 5. Partnerships and Innovation

In the context of network resilience to extreme weather events, Endeavour Energy has developed and will maintain partnerships with other industries and organisations to ensure that there is an integrated collaborative approach to resilience, especially when it comes to community resilience. Innovation within the resilience space requires sharing of knowledge; to plan, prepare, and respond to extreme weather events; reflect and learn, but also innovate with each other.



### 5.1 Essential Services and Critical Infrastructure

Endeavour Energy recognises the importance essential services and critical infrastructure has on the community and other utilities. Knowledge sharing with regards to criticality of other networks to Endeavour Energy, will allow Endeavour Energy the ability to respond and adapt to prioritise areas which can provide the greatest benefit. Conversely, knowing the reliability risk of their own assets allows them to make better investment decisions for their own resilience and contingency planning during emergencies.

Partnerships with Resilience NSW will allow Endeavour Energy greater access and facilitation. Currently Endeavour Energy has been engaging with both water and telecommunication service providers to explore these opportunities.

### 5.2 Industry Partnership with DNSPs and Private Industry

Partnerships with other DNSPs enable benchmarking opportunities and discovering additional resilience solutions and alternate technologies being considered. This allows Endeavour Energy to explore the “how do we know what we don’t know” question in terms of finding better ways to define, understand, and address, network resilience. Endeavour Energy has recently engaged with most Australian DNSPs and some American DNSPs on the topics of heat, bushfire, wind and flood resilience initiatives.

Endeavour Energy will also engage in partnerships with private industry and universities to establish innovative and unique solutions to network resilience risk and impacts, including maintaining reliability during extreme weather events. This will take the form of engagement sessions with universities, international working groups and RFQs.

### 5.3 Supporting Local Government

There is also the opportunity to support local government to best service communities by engaging with councils regarding plans in case of loss of supply events, and workshopping solutions with councils, particularly for Resilience Hubs as a trial project. Endeavour Energy has started engagement with councils to understand how Endeavour Energy can best support them to serve their communities, and this is to be continued.

# Annexure A – Customer Engagement Proposals

Table 3 - Investment Projects for Community Resilience and Engagement

Goal	Investment Projects	Further Explanation
Improving Local Response	<b>1. Local Emergency Management Plan Review</b>	Partner with the local government agencies and determine whether each LGA has: <ul style="list-style-type: none"> <li>- A local emergency plan</li> <li>- Whether the loss of supply has been adequately addressed</li> <li>- Whether each council points to Endeavour Energy in their resources (website/posters/flyers) in case of an outage</li> <li>- A critical resident register and checking whether life support customers have back up supply.</li> </ul>
	<b>2. Developing local resilient hubs</b>	In collaboration with the local councils, identify locations where, in the occurrence of a climate event, where residents can go for shelter, telecommunication services, sustenance etc.
Education and Information	<b>3. Review in Endeavour Energy communication protocols and resources during an emergency</b>	Endeavour Energy's communication during an event has been regarded as excellent. Are there any further things we can do to assist in information knowledge.
	<b>4. Development of education programs around preparation of these climate events</b>	Events are going to happen – ensuring that residents are prepared in the event of a loss of supply events.
Other	<b>5. Partnering with councils to reduce vegetation trimming, but also increase urban cooling</b>	Explore the possibility of introducing a tree planting/relocation program as to move vegetation away from powerlines.



## Annexure B - Definitions and Abbreviations

Term	Description
<b>Community Resilience</b>	The ability of communities to withstand and recover from the impacts of natural disasters.
<b>CMI</b>	Customer Minutes Interrupted. This is a summation of the durations each customer experiences during a particular outage event.
<b>Loss of Supply Event</b>	Planned, or unplanned, outage of power supply due to scheduled maintenance or major events
<b>Major Weather Event</b>	A significant weather event which has the potential to impact the network sufficiently to result in a Major Event Day.
<b>Major Event Day</b>	Interruptions beyond the control of Endeavour Energy, or because they are not representative of a normal day in terms of reasonable network resource availability and goes beyond a pre-defined threshold for organisational SAIDI.
<b>Resilient Network</b>	The ability to anticipate, withstand, quickly recover and learn from disruptive events to the power network.

