Business case addendum – Maintain underlying reliability performance program

2025-30 Revised Regulatory Proposal

5.9.3 - Maintain underlying reliability performance program - Business case addendum

December 2024

SA Power Networks

Empowering South Australia

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Glossary

Acronym / term	Definition
AER	Australian Energy Regulator
ADMS	Advanced Distribution Management System
Augex	Augmentation expenditure
BoM	Bureau of Meteorology
CAIDI	Customer average interruption duration index
Capex	Capital expenditure
CBD	Central Business District
CSIRO	Commonwealth Science and Industrial Research Organisation
DNSP	Distribution Network Service Provider
EDC	Electricity Distribution Code
EMCa	Energy Market Consulting Associates
ESCoSA	Essential Services Commission of South Australia
LFI	Line fault indicators
MED	Major event day
MVLC	Medium voltage line covering
NEL	National Electricity Law
NOC	Network Operations Centre
NVC	Native Vegetation Council
RCP	Regulatory Control Period
RIN	Regulatory Information Notice
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
STPIS	Service Target Performance Incentive Scheme
SWER	Singe Wire Earth Return
VCR	Value of Customer Reliability

1 About this document

1.1 Purpose

This document is an addendum to our original business case '5.9.3: Business case – maintain underlying reliability performance program - January 2024' included in our Regulatory Proposal (submitted to the Australian Energy Regulator (**AER**) on 31 January 2024), and contains the following:

- additional analysis, information and justifications in response to the issues raised by the AER in its Draft Decision that led the AER to adjust our proposed expenditure; and
- on the basis of this information, a revised expenditure forecast for the program.

The original business case should still be read for background information including with respect to further context on the program, including the identified need, the preferences of our customers, and drivers of the program's expenditure.

1.2 Expenditure category

This expenditure comprises one input to our overall capital expenditure (**capex**) on network augmentation (**augex**).

1.3 Related documents

This document should be read in conjunction with the following documents.

Documents supporting our original proposal:

- '5.9.1 - Reliability forecasting structure – Methodology - January 2024' — a structural overview of the approaches used to prepare the forecasts for the reliability improvement programs included in this business case;
- '5.9.5 - Worst Served Customers Reliability Improvement Programs - Business case - January 2024' — a combined business case for three reliability improvement programs aimed at improving supply reliability for some of our worst served customers, covering (1) the Low Reliability Feeder Improvement program, (2) the Supply Restoration Improvement program, and (3) the Regional Reliability Improvement Program;
- '5.3.12 - CBD Reliability - Business case - January 2024' — a combined business case for the Adelaide Central Business District (**CBD**) combining cable replacement (repex) and automation (augex), in order to return the reliability performance of our CBD network up to the jurisdictional reliability standard; and
- '5.9.6 - Adelaide flying-fox population trend - January 2024' - Consultant Report.

Additional documents supporting our Revised Proposal:

- 5.9.6 - Adelaide flying-fox population trend - Consultant Report – December 2024; and
- 5.3.12 - CBD Reliability - Business case addendum December 2024;
- 5.3.1 - Network Asset Replacement expenditure - Business case addendum December 2024;

2 Executive summary

This document recommends a capex forecast of $64.1[1] million over the 2025-30 Regulatory Control Period (**RCP**) on the 'Maintain Underlying Reliability Performance Program' (a component of our network augex). This expenditure forecast represents a prudent and efficient response to an identified need that:

- is primarily concerned with maintaining underlying distribution network reliability at historical levels, thereby aligning reliability with the Service Target Performance Incentive Scheme (**STPIS**) targets (i.e. achieving a neutral outcome versus the STPIS, that is, the program does not intend to achieve rewards by exceeding the STPIS targets); and
- achieving a service outcome aligned to the preferences of our customers who consistently recommended through our engagement that reliability be maintained.

The Maintain Underlying Reliability Performance Program consists of two distinct recurrent components:

1. Maintain Reliability component ($55.8 million) - the primary reliability management program that is used to upgrade the network to mitigate the ongoing effect that network faults have on customer supply reliability[2]; and
2. Protection Management component ($8.27 million) - a separate and distinct work program primarily to continually review, revise and upgrade the settings of existing protection devices across our network to ensure they continue to operate correctly as the network and connection to our network change over time - ensuring the optimal number of customers are interrupted when faults occur.[3]

The original business case in our Regulatory Proposal had forecast $62.4 million for this program, using a top-down forecast approach, using the most recent 5-year period of revealed costs at the time 2018/19 to 2022/23.[4] The AER Draft Decision reduced this to $43.3 million, based on the average revealed costs of a different period (most recent 8 years)[5], justifying the reduction based on their views that:

1. the spend level is not required to achieve jurisdictional compliance;
2. reliability is being maintained; and
3. we had not accounted for improvements occurring via other replacement expenditure (repex) and augmentation expenditure (augex) programs.

We do not accept the AER's Draft Decision. Therefore, this addendum now provides further explanation and analysis to address each of the Draft Decision's concerns, and proposes a revised expenditure forecast. Our revised forecast represents a prudent and efficient level of expenditure to maintain reliability performance to historic levels, on the following basis:

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1 All financial figures referenced within this document are in $June 2022, excl network and corporate overheads

2 Note, this program focuses on the reliability performance due to non-asset-failure fault causes (e.g. vegetation, weather, animals, third-party etc). The asset maintenance and replacement programs (i.e. repex) are used to address the performance due to asset-failure fault causes.

3 Note, if the most appropriate protection device does not operate as intended following a fault, then significantly more customers can be interrupted than is necessary to isolate the fault. It is important to stress that this program of work is critical to the ongoing reliability and safe functioning of the network.

4 Noting revealed cost for the regulatory years that will be used for setting the STPIS baseline (i.e. 2019/20 to 2023/24) were not available.

5 Note, we believe that there may have been an error in the AER's calculation, where it only used the revealed costs of the Maintain Reliability component to arrive at its estimate and omitted the revealed costs of the Protection Management component.

1. **expenditure set to maintain historic reliability** - we have clarified that the forecast expenditure amount for this program is not set to achieve jurisdictional compliance. Rather, it is the amount necessary to maintain performance in line with the average of the last 5 years (i.e. average over 2019/20 to 2023/24) to align our performance with the STPIS targets[6], which will be significantly more onerous than jurisdictional targets.
2. **reliability trends continue to worsen** - we have evidenced that reliability has worsened over this period and explained the factors driving these trends and how they affect future needs. Importantly, we have also provided the latest reliability performance outcomes, not available at the time of the Draft Decision, showing that reliability is not improving. Most notably, we explain the following:
   - our historical spend and the focus areas of this spend, demonstrating its effectiveness and that there is no significant lag effect from when an investment is made and its effect on reliability is observed. That is, there are no significant improvements still to be realised from investments in the current period;
   - the significant factors causing weather-related performance to worsen and why these will continue to effect needs in the next period, including:
     - vegetation-related outages, where we have shown this is not due to unusually extreme wind speeds, but greater desires of stakeholders to 'green' the environment and more onerous and restrictive planning regulations; and
     - lightning outages, where we have shown that the higher level of lightning activity in the current period is the most reasonable basis for the expected levels in the next period;
   - other significant factors causing outage performance to worsen and why these will continue to effect needs in the next period, including:
     - the significant increase in population size and range of flying foxes that are an increasing cause of network outages, providing a revised external expert report that considers that the current rate of increase is expected to continue for the foreseeable future; and
     - increases in third party outages and worsening restoration times, explaining the reasons for these increases, which will need to be managed moving forward;
   - why our solutions are cost effective, including:
     - explaining the factors that limit our use of opex vegetation management solution (e.g. planning and native vegetation regulations) – noting, we do already use this approach where circumstances allow and it is cost-effective; and
     - explaining the reasons for System Average Interruption Duration Index (**SAIDI**) solutions (i.e. non-System Average Interruption Frequency Index (**SAIFI**) solutions) not being cost-effective in many situations – noting, we do use such solutions where found to be cost-effective;
3. **Interactions with other programs are considered** - we explained why it is not valid to consider that we have not allowed for the effects on reliability via other repex and augex programs in how we have developed the program reliability target level or forecast expenditure amount for this program.

Our revised expenditure forecast for the program has been estimated on the basis of our revealed costs over the most recent 5-year period (ie 2019/20 to 2023/24).[7] This includes a minor revision from our Original Proposal, to have regard to our most recent year of revealed costs (2023/24), consistent with the AER's

[6] That is, the forecast effect of this program is to achieve a level of reliability performance over the next RCP such that once all the reliability adjustments in the STPIS decision are allowed for, this reliability should match the STPIS SAIDI and SAIFI targets for the next RCP. It will not be better or worse than these targets. In this way, this forecast reflects our view of the level that provides neither a revenue reward or penalty through the STPIS.

[7] Noting, this is the same basis of the STPIS targets for the next RCP.

approach to other areas of our Original Proposal.[8] We consider that this is a reasonable basis upon which to forecast a prudent and efficient level of expenditure noting that:

- the revealed cost period we have selected (i.e. 2019/20 to 2023/24) aligns consistently with the basis upon which the STPIS targets for the next RCP are being set[9];
- the abovementioned evidence detailed in this addendum, indicates that:
  - our revealed expenditure in the 2020-25 RCP has not improved reliability and it is reasonable to not expect any significant further improvements due to this investment (i.e. as yet unrealised lag in improvement);
  - we have had a range of external factors driving reliability over this period, which are reasonably expected to continue over the next RCP at least to the same degree that they have affected this period;
- should our level of forecast expenditure not be allowed, we expect that:
  - reliability will decline materially in the 2025-30 RCP, which is a service outcome that is expressly not supported by our customers – as a counterfactual we estimate that the level of **expenditure forecast allowed in the Draft Decision would worsen network SAIDI by 10 minutes over the RCP (7% worse SAIDI) and result in an increase in unserved energy costs to customers of between $75-93 million over the life of the investment**[10]; and
  - importantly, that the AER would need to make an upward adjustment to the STPIS targets for the 2025-30 in order to ensure that we have a reasonable opportunity to at least recover our efficient costs consistent with the National Electricity Law (**NEL**).[11]

8 That is, the relevant 5-year period has been advanced by one year from 2018/19-2022/23 to 2019/20-2023/24.

9 AER's STPIS Guideline (version 2.0) section 3.2.1 pages 10 and 11.

10 Cost is provided over the life of the upgrades (assuming 15-year life on average) for comparison of program capex, using our estimate of the average amount of unserved energy per network SAIDI minute and the average network Value of Customer Reliability (**VCR**).

11 This would be required to ensure that STPIS targets relevant to this alternative forecast reflected the correct neutral point from a revenue perspective, and did not result in a revenue penalty through the STPIS.

3 Background

3.1 Our original proposal

The business case in our Original Proposal forecast $62.4 million ($2022)[12] in capex on a network augex program '2025-30 Maintain Underlying Reliability Performance Program', pursuant to an identified need of maintaining underlying reliability at historical levels.

This program investment is required to align reliability performance over the next RCP with STPIS targets while also allowing us to continue to meet our jurisdictional reliability requirements. This intent also aligns with customer preferences, where our customers expressed a clear desire for us to invest sufficiently to maintain reliability.[13]

The program's expenditure was forecast using a top-down approach, based on the most recent 5-year period of revealed costs at that time (i.e. the revealed cost over the 2018/19 to 2022/23 period)[14]. The AER used the 2018/19 to 2022/23 average performance to establish the STPIS reliability targets in its Draft Decision but will include 2023/24 (i.e. period will be 2019/20 to 2023/24) to set the reliability targets for the 2025-30 RCP. The program's expenditure forecast includes two distinct components that reflected different recurrent programs:

(1) Maintain Reliability program ($53.8 million)

(2) Network Protection Management program ($8.6 million).

Note, the inclusion of the Network Protection Management program component as part of the Maintain Underlying Reliability Performance Program business case was a late decision. Consequently, the details of this program were erroneously omitted from the business case. Therefore, we have also addressed this omission in this addendum.

Although the Network Protection Management program component is fundamental to achieving the aims of the Maintain Underlying Reliability Performance Program, its drivers and activities are different to those of the Maintain Reliability program component (which were adequately covered in the business case).

It is also critical that we note that we believe that the AER may have erroneously omitted the additional historical costs associated with the Network Protection Management program in how it arrived at its alternative forecast in its Draft Decision. That said, we accept that we may be at fault for this omission, as the late decision to include the program in the business case resulted in the charts of historical expenditure in that document not including the revealed costs of the protection management program.

Therefore, for these reasons, we have treated the Network Protection Management program component separately in this addendum and address it in Section 7.

3.2 Summary of how this addendum addresses the AER's Draft Decision

The Draft Decision accepted the overall need to include expenditure for this program in our capex allowance. However, the AER considered that we had inadequately justified the level of expenditure for the next RCP, reducing the program's expenditure forecast by $19.1 million (ie a reduction from $62.4 million to $43.4 million).

12 All figures in this document are in $June 2022 excl. network and corporate overheads.

13 SA Power Networks, 5*.9.3 Maintain Underlying Reliability Performance* Program, business case, Pg 20.

14 SA Power Networks, 5*.9.3 Maintain Underlying Reliability Performance Program*, business case, Pg 17.

We do not accept the Draft Decision. We disagree with the considerations that led to this decision, and the level of expenditure forecast allowed, which will be insufficient to maintain reliability to our customers in 2025-30. Such an outcome would be inconsistent with the preferences of our customers, who have not altered their recommendation that we should maintain our historic level of reliability.

Therefore, this addendum now responds to the Draft Decision, by providing further information and analysis to address all of the specific concerns identified by the AER.

These concerns and how we have responded to them in this addendum are summarised in Table 1.

Table 1 Draft Decision considerations and how we have responded

AER considerations	How we responded
Reliability target of the program	
The primary focus of the AER review was how we have performed compared to Essential Services Commission of South Australia (**ESCoSA**'s) (i.**e.** jurisdictional) reliability targets, where it was noted that we had met those targets (except for the CBD).	We have explained why this is not the correct basis for defining the expenditure requirements for the next RCP and this significantly understates the requirements of the program forecast. The correct basis for the target level of reliability is the level required to maintain reliability to the average of the most recent 5-year period, which are far more onerous targets than the ESCoSA reliability targets. We discussed this further in Section 5.1.
Reliability is being maintained	
▪ A significant matter the AER uses to support its position is its view that reliability is being maintained, where it has noted various concerns: – our recent public planning and performance reports do not support the level of expenditure; – normalised reliability is being maintained and any deterioration would likely be addressed through investments during the current period; and – weather-related impacts were not increasing and may be more effectively mitigated by opex solutions, such as vegetation management. ▪ It was also noted through the AER's expert report that there was some uncertainty around this matter as performance data for 2023/24 was not yet available.[15]	We have provided more information to show that reliability has worsened and explained the factors driving these trends and how they affect future needs. This has included: ▪ updating results with 2023/24 reliability and expenditure data, showing reliability is worsening; ▪ providing more explanation of our historical expenditure and showing that there is unlikely to be any significant further improvement via investments in this period; ▪ providing more explanation and data on the various current and emerging issues driving our performance that we will need to manage over the next RCP; and ▪ explaining why it is unlikely that there exists more effective opex solutions, particularly vegetation management solutions, to address these issues We discuss this further in Section 5.2.
Interactions with other programs	
A significant matter the AER uses to support its position is its view that we had not taken into account improvements in reliability ('uplifts') expected from other programs.	This concern is not valid and we have explained how we have taken account of other repex and other augex programs in how we have developed the program reliability target level and forecast expenditure amount for this program.

15 Review of aspects of proposed expenditure, EMCa, pg67, para 343

AER considerations	How we responded
	We discussed this further in Section 5.3.
Forecast expenditure averaging period	
The AER accepted our top-down approach, but used the most recent 8 year period of revealed costs as the basis of its forecast.	We note that the AER did not provide a justification for why it used this specific period for preparing its alternative forecast. However, we presume it is because this reflected a lower amount consistent with its views on the likely level of expenditure to achieve its view of the target level of reliability for this program. Given we have addressed all the concerns raised by the AER, we still maintain that that the most recent 5-year period is the most appropriate to estimate the forecast expenditure for this program, and is consistent with the approach the AER has taken in its review of other aspects of our Proposal. Our reasoning for this is detailed in Section 6.

We note that the Protection Management component was not explicitly referenced by the AER in its Draft Decision. It is also important to note that in our view all the concerns raised by the AER that resulted in it substituting a lower amount for this program relate to the Maintain Reliability program component. Therefore, the addendum sections noted in the table above are only relevant to that component of the program.

As noted above, the Protection Management component is discussed separately in Section 7 as its driver and investment activities are different to the Maintain Reliability program component. Although we still consider that the revealed costs of the most recent 5-year period is the appropriate basis for estimating the forecast expenditure for the Protection Management component of the program, the historical profile is more consistent and so the forecast amount is less sensitive to the length of period used for this purpose. That said, as we will discuss further in Section 7, the outcome on reliability of this component is likely to be far more sensitive to changes in the expenditure on this component.

4 The context to the investment need

4.1 The identified need

The identified need that the program seeks to respond to remains unchanged from our original business case. However, we acknowledge that the manner in which it was described in our original business case has caused confusion, particularly as there are various limbs to the overall need, but the level of forecast expenditure responds primarily to only one of these limbs.

Therefore, to clarify, we state that the primary identified need of the level of expenditure forecast for this program is as follows:

- the need that the forecast expenditure must achieve, is a customer outcome of **maintaining reliability in line with historic performance**, pursuant to clause 6.5.7(a)(3)(iii) of the NER. More specifically, this means maintaining reliability in line with historical performance in order to align to the AER’s STPIS targets set for the 2025-30 RCP (this is to achieve a neutral STPIS outcome, i.e. to neither exceed nor underperform relative to the targets such that there is no reward nor penalty under the STPIS); and
- that achieving this outcome of maintaining reliability in line with historic performance, is also pursuant to addressing the concerns and **preferences of our customers** (pursuant to clause 6.5.7(e)(5A) of the NER), as expressed via our engagement process, wherein customers recommended that we should invest sufficiently to maintain reliability.

A secondary need for the program, but a need which is not driving the level of forecast expenditure, is to also prudently and efficiently comply with our jurisdictional reliability requirements (i.e. to use all reasonable efforts, skills and resources to achieve the jurisdictional reliability and restoration targets each regulatory year). However, as this addendum describes, the program should allow us to comply with our jurisdictional requirements, but only to the extent that we are currently meeting these requirements – this clarification is further discussed in section 5.1 below.

4.2 The drivers for change

Although the identified needs of both components of the program (Maintain Reliability and Protection Management) are the same, the drivers of these two components differ.

The drivers of the Maintain Reliability component are primarily the external environmental factors (e.g. weather, vegetation, animals, and other external parties) that can cause faults on our network, which result in network outages that in turn cause interruptions of supply to our customers. The changing patterns and behaviors of these external factors can change the ongoing network upgrade requirements and costs associated with this program component to maintain reliability.

These drivers are discussed in Section 3 of the business case for this program. Importantly, these drivers and how they are affecting program expenditure and reliability trends are very important in appreciating the ongoing requirements of this program. Therefore, further explanation and data on these matters is provided in section 5.2 below.

The Protection Management component involves internal activities to manage the protection devices on our network to ensure that they function correctly following a fault in order to minimise the extent of network outages, and so avoid unnecessarily interrupting customer supplies[16]. The drivers of the Protection Management component are primarily internal factors (e.g. routine reviews and investigations of protection

[16] For example, if a fault occurs on our network then if the appropriate protection device does not operate then a backup device should still isolate the fault, but this would result in far more customers being interrupted and can result in longer times to locate the fault and start to restore supplies.

settings, and activities to revise and upgrade settings as the network changes). These drivers tend to be more stable and not so sensitive to uncontrollable external factors (i.e. the primary factor setting ongoing activity levels are the number and type of protection devices).

As we have noted above, the explanation of the Protection Management component and its drivers was erroneously omitted from the original business case. This is a very necessary recurrent program that is critical to the effective and efficient reliability performance of our network. Therefore, this program component is discussed in more detail in section 7.

4.3 The preferences of our customers

We have continued our ongoing engagement with our customers and stakeholders via our Community Advisory Forum and Reset Advisory Group, subsequent to our Proposal and the Draft Decision. No new information has been identified to suggest any change in the preferences of our customers, with respect to the need that this maintain underlying reliability performance business case addendum responds to.

That is, the service outcome preferences of our customers is to:

- maintain reliability service performance in the 2025-30 RCP to the level of reliability service performance that customers currently experience; and
- ensure that the expenditure forecast is prudent and efficient.

5 Addressing the AER's key concerns

In this section, we address each of the key concerns from the Draft Decision that we understand are the basis for the AER reducing the forecast amount for the Maintain Reliability program:

1. Electricity Distribution Code (**EDC**) reliability targets are currently being met
2. Reliability is being maintained and there is not a worsening trend
3. Improvements in reliability performance ('uplifts') have not been allowed for.

For the avoidance of doubt, the expenditure in this section does not include the Protection Management program, which is discussed separately in Section 7.

5.1 Forecast expenditure is to maintain reliability consistent with the past five year average

We understand that a major reason that the AER (and Energy Market Consulting Associates (**EMCa**)) consider that we have overstated the level of expenditure forecast required for this program is that the South Australia EDC reliability targets are currently being met.

Although at a broad level, it is correct that the reliability performance during the current RCP has been within most elements the EDC targets, we consider this fact is fundamentally misunderstanding the target level of reliability that sets the expenditure forecast requirement of this program for our regulatory proposal.

One of the 'needs' for the program is to maintain compliance to the EDC reliability targets. But as discussed in section 4 this is not the primary 'need' that is setting the required forecast expenditure amount for this program. The primary need is to maintain reliability at a level consistent with the average reliability over the last 5-years. This need and customer outcome objective is significantly more onerous than just maintaining compliance to the EDC targets and is critical in aligning the aims of the program's expenditure forecast with the reliability targets of the AER's STPIS Draft Decision[17].

On this significant difference, it is important to recognise that the EDC targets applicable to the next RCP were set based on the average performance over a much earlier 10-year period, covering 2009/10 to 2018/19. This is a significantly early period when performance was much poorer than that being used to set the STPIS targets for the next RCP.

Figure 1 below show the significance of this difference in the target requirements of the program's forecast expenditure amount, showing the difference between the level necessary to maintain overall network SAIDI and SAIFI consistent with performance over the previous 5-year period (2019/20 to 2023/24) and the level necessary to only comply with the EDC targets[18].

[17] That is, the effect of this forecast expenditure is to achieve a level of reliability performance over the next RCP such that once all the reliability adjustments in the STPIS decision are allowed for, this reliability should match the STPIS SAIDI and SAIFI targets for the next RCP. It will not be better or worse than these targets. In this way, this forecast reflects our view of the level that provides neither a revenue reward nor penalty through the STPIS.

[18] In these charts we have included 2023/24 performance, which was not available at the time of the AER's draft decision. The network-level EDC target is an implied target, based on the weighted average network-category EDC targets using customer numbers in each network category as the weighting.

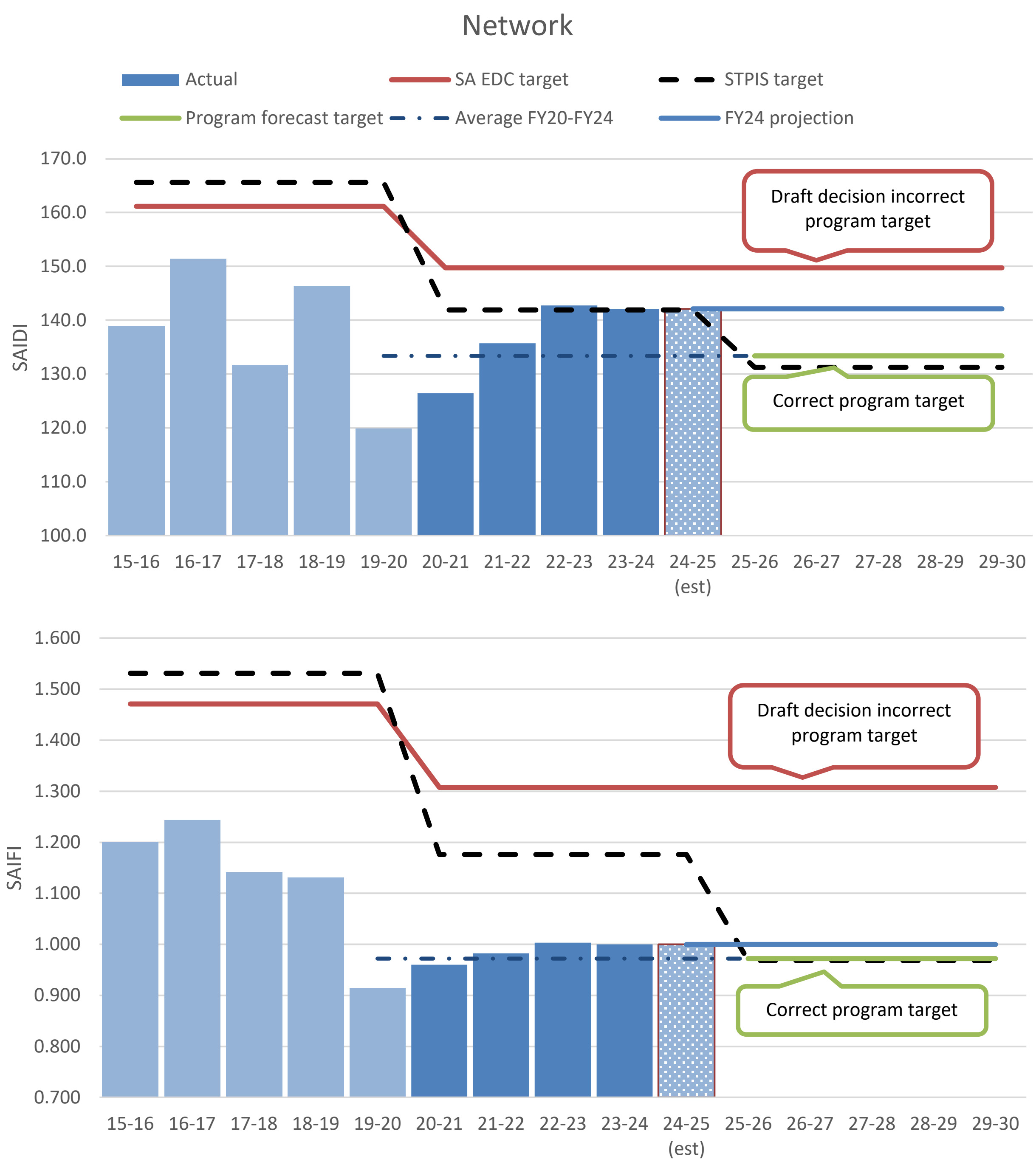


Figure 1 Historical network SAIDI and SAIFI (excluding Major Event Days (MEDs)) and the level

The key point to note from these charts is that the true reliability target for the forecast expenditure of this program (ie the average historical SAIDI and SAIFI over 2019/20 to 2023/24) is considerably more onerous than just complying with the EDC targets over the next RCP.

Importantly, the average network SAIDI over the last 5-year period (ie the objective of the program's forecast expenditure amount) is 18.5 minutes better than the EDC target (the objective that appears to have been assumed by the AER and EMCa). This represents a 13% difference in the objective of the forecast amount.

Although, as the AER and EMCa have noted, we have performed even better against the SAIFI measure, the difference between the level of SAIFI required to 'maintain' reliability and the level to comply with the EDC target is even greater at 34%.

Other important points to note from these charts are:

1. Although SAIDI and SAIFI performance during the current RCP has been better than the preceding RCP, overall performance has ***not*** been improving during the current RCP and in fact has worsened slightly. This result is counter to some claims in the Draft Decision and EMCa report that reliability is being maintained. We will discuss factors affecting the trend in reliability in the section below.
2. Our SAIDI and SAIFI performance in 2023/24 has been poorer than the average performance over the most recent 5-year period. That is, the most recent performance is poorer than the target performance for the program's expenditure forecast.

Similar charts for each network category (ie Urban, Rural Short and Rural Long) are contained in Appendix A. Table 2 below compares the 2023/24 performance against the average 5-year performance and EDC target for each network category.

This table indicates that although the Urban network is currently performing slightly better than the historical 5-year average, both the Rural Short and Rural Long networks are currently performing poorer than the historical 5-year average (in both SAIDI and SAIFI). The Rural Long network is also performing poorer than the EDC SAIDI target.

Table 2 Network category historical SAIDI and SAIFI (ex MED) performance[19]

			(program forecast target)	(AER focus)
		2023/24	2019/20-2023/24 average	EDC target
SAIDI	Urban	90.1	92.5	110.0
	Rural Short	197.5	167.4	200.0
	Rural Long	334.2	294.0	290.0
	Network	**142.1**	**133.4**	**149.8**
SAIFI	Urban	0.804	0.844	1.150
	Rural Short	1.296	1.142	1.650
	Rural Long	1.636	1.430	1.750
	Network	**1.000**	**0.971**	**1.300**

It is also important to recognise that there are some other elements of our EDC reliability targets that we are currently exceeding concerning minimum restoration times. Performance against these EDC targets have been worsening, and we are currently exceeding targets associated with our Rural Short and Rural Long networks.

Similar to the EDC SAIDI and SAIFI targets applicable to the next RCP, the EDC restoration targets were set based on the average performance over a much earlier 10-year period, covering 2009/10 to 2018/19. However, unlike our SAIDI and SAIFI performance, which was worse over this earlier period, our restoration performance was better than it currently is.

We discuss these trends in performance against these EDC targets and factors affecting these trends further below. However, it is important to recognise here that we have <u>not included any specific 'uplift' in the forecast expenditure amount to regain compliance to these EDC targets</u>.

[19] Note, we have removed the CBD network category from this table as this is not the focus of this program during the next RCP.

5.2 Reliability service performance is not improving

A critical element of the AER's position was its view that we are maintaining reliability and that there is not a worsening trend, presumably meaning that there is not a need to maintain expenditure levels consistent with the historical levels.

We disagree with this view and its significance to assessing the future expenditure levels. We consider that the AER and EMCa focused too much on longer-term historical SAIDI and SAIFI patterns, which does not sufficiently allow for the significance of more recent trends and recognise the underlying current and emerging issues that form the basis of future needs.

In this section, we first provide some further background on our historical spend to assist with the understanding of recent expenditure patterns and how they have impacted reliability over the current RCP. Following this, we will set out the various factors, including current and emerging issues that we will need to manage through this program during the next RCP to maintain reliability.

Before turning to these matters, as noted above, at the time of the Draft Decision the reliability performance for 2023/24 was not available to the AER. We understand that this resulted in some uncertainty of the AER and EMCa as to the reliability trend during the RCP (i.e. reliability in 2023/24 may well show an improvement supporting their view that a lower expenditure forecast was justified). The section above has shown at a high level that 2023/24 performance has not indicated an improving trend over the current RCP. This section provides a more detailed breakdown of 2023/24 performance and its significance moving forward.

5.2.1 Our recent program expenditure is not improving reliability

We understand that a concern of the AER (and EMCa) that led to its view that reliability was not worsening was that the recent high levels of expenditure in the current RCP, which have been higher than the AER notional allowance, would likely lead to improvements in reliability. We also understand that this view was driven by some uncertainty in the make-up of the program and a presumption that there was likely a significant lag effect from when the investment was incurred and the reliability improvement would be observed. However, the lack of 2023/24 performance data meant that there was some uncertainty of the AER to the extent of this issue.[20]

Appendix B provides further details of the historical expenditure on this program, demonstrating its effect on reliability including lag effects. This section summaries some of the key points most relevant to the ongoing needs of this program

Figure 2 below provides a breakdown of historical program expenditure by the primary effect on reliability of the upgrade, which can be viewed as three specific types:

1. reducing the number of customers who will have a 'sustained' interruption to their supply following an outage (this reduces SAIFI, which in turn can reduce SAIDI)
2. avoiding an outage occurring (this reduces SAIFI, which in turn reduces SAIDI)
3. reducing the average time to restore supply to interrupted customers (which reduces SAIDI, but does not reduce SAIFI).

[20] Review of Aspects of proposed expenditure, EMCa, page 68, para 350

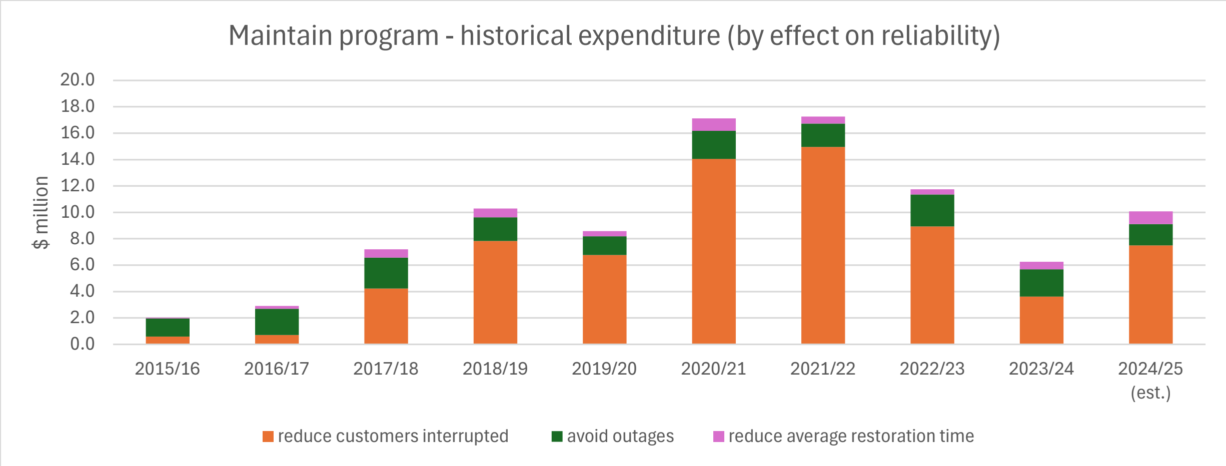


Figure 2 Historical program expenditure – by reliability effect

Investment in Feeder Automation to reduce the number of customers interrupted following an outage

The majority of expenditure over the last 5-year period (approximately 70%) has been on upgrades that reduce the number of customers receiving a sustained interruption following an outage, that is outages are not avoided, but their effect on the number of sustained customer interruptions is reduced. The major portion of this expenditure was used to install feeder automation, primarily on urban feeders, and this upgrade is the primary reasons for the high spend in 2020/21 and 2021/22.

Key results provided in Appendix B demonstrate that:

- the anticipated effect of the automation upgrades has been achieved in terms of reduced number of customer supply interruption per outage;
- there is not a significant lag between the timing of the investment and when the effect on reliability is observed ie the full effect is observable around the year of or the year following investment; and
- the investment in automation has arrested a decline in SAIDI of approximately 39 minutes and a decline in SAIFI of 0.28 interruptions that would have resulted without the investment.

It is important that we stress that automation upgrades will remain a critical component of our program to maintain reliability over the next RCP. For our Urban feeders, this upgrade solution will remain as the most cost-effective approach to arrest further decline in most circumstances, given its scope across all outage causes. We currently have automation on 279 feeders out of a total of 1,277 feeders suitable for automation (ie 22%).

Although the level of investment in the current RCP has resulted in a modest improvement in the performance of Urban feeders (see Table 2 above and Appendix A), many of the factors that will drive the decline in reliability over the next RCP affect our Urban network, including increasing flying-fox populations, worsening vegetation outside our authorised clearance zones, and worsening third-party incidents. These specific factors are set out and discussed in more detail in subsections below.

Investment in upgrades to avoid outages, primarily due to the flying fox issue

Approximately 15% of the investment over the last 5 years has been on upgrades that are intended to avoid an outage occurring.

The majority of this investment has been to avoid outages on Urban feeders, involving installing animal guards to mitigating the increasing number of outages due to the grey-headed flying fox issue that is affecting South Australia.

Other significant upgrades during the current RCP include:

- upgrading insulation to avoid outages due to lightning, primary on rural feeders
- installing line coverings and insulated conductor to avoid vegetation related outages, primarily on urban feeders.

The factors driving increasing trends in these outage causes and the ongoing need for these upgrade types is discussed in more detail below.

Investments to reduce average restoration time

Approximately 5% of the investment over the last 5 years has been on upgrades intended to reduce the average customer interruption duration. These upgrade solutions have been used on our rural feeders and predominantly our Rural Long feeders as these feeders are more susceptible to long duration interruptions. The main upgrades applied have been:

- installing line fault indicators (**LFI**) to allow our field crews to locate faults along our rural feeders more rapidly
- upgrading manually-operated switches (i.e. switches that required field crews to travel to the device to operate) with remote-controlled devices (i.e. switches that can be operated much more rapidly from the control room).

As noted above, these solution types improve SAIDI, but do not improve SAIFI. We note that there are suggestions, particularly in the EMCa report[21], that as SAIDI has not improved in line with SAIFI, it could be more optimal to focus on SAIDI solutions. We disagree with this view on the basis that there are limited circumstances for us to improve SAIDI without the optimal solution also involving improving SAIFI. This is because:

- our field services are already effective and efficient, and therefore, an opex-approach aimed at enhanced fault response and repair activities is unlikely to be optimal (and would require an opex step change to produce a meaningful change in Customer Average Interruption Duration Index (CAIDI) and in turn SAIDI[22]); and
- there are limited upgrade solutions, beyond those we currently use or are trialing, that focus solely on improving CAIDI.

In most cases, a SAIFI-focused solution (ie the upgrades we use to reduce interrupted customers[23] or avoiding outages) is optimal (ie provides higher net-benefits) in terms of its effect on SAIDI. Therefore, the CAIDI improvement upgrade options we can apply through this program have more limited circumstances when they can be found to be effective (ie optimal) compared to other SAIFI-focused options.

5.2.2 Reliability performance in 2023/24 shows a continued worsening trend in performance

As noted above, we understand that a major factor influencing the AER's position was the unavailability of 2023/24 reliability data, and so a presumption that this would likely show an improving trend. 2023/24 performance is now available and as we have noted, we consider that this demonstrates that this concern is not valid.

To show this further, Appendix C provides an update to the reliability performance charts provided in the business case. These charts have been revised to include the 2023/24 performance, which was not available

[21] Review of Aspects of proposed expenditure, EMCa, page 69, para 350, final dot point
[22] Noting SAIDI = SAIFI x CAIDI
[23] It is worth noting that our 'segmentation' upgrade that we apply to rural feeders primarily to reduce the number of interrupted customers can also reduce restoration times, as it can reduce the length of line section that needs to be patrolled following an outage.

at the time of preparing the business case, showing the annual SAIDI and SAIFI[24] and the contribution by outage cause. Figure 3 below provide the network-level performance (excluding MEDs), with similar network category charts provided in Appendix C.

The key points to note from these revised charts are summarised in Table 3 below[25].

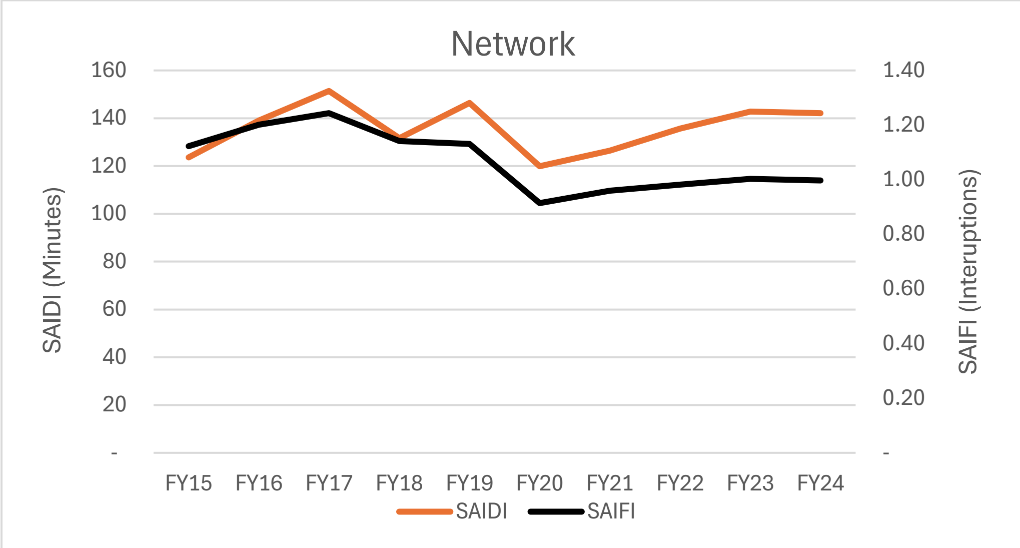
Table 3 Summary of updated performance

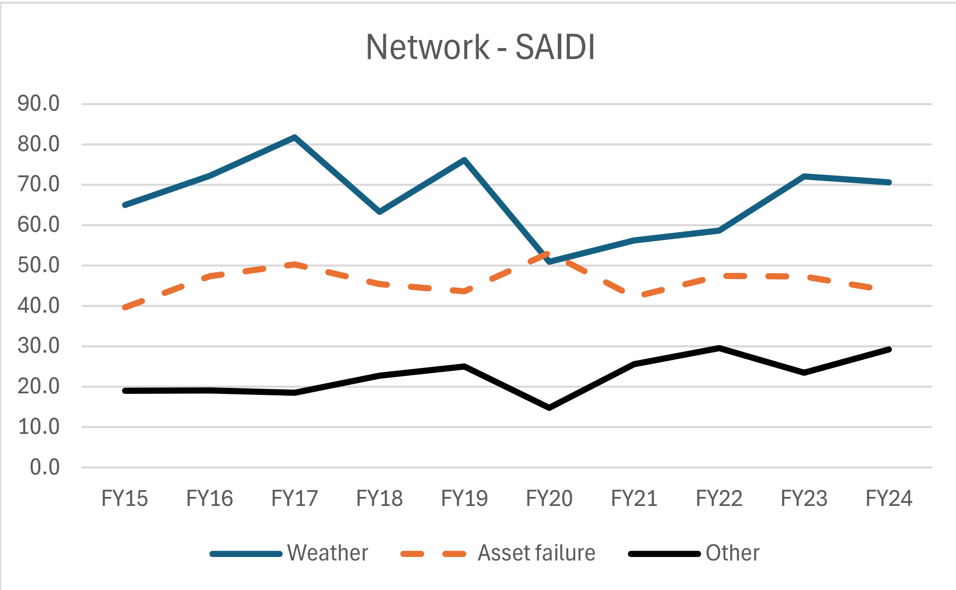
	Outage cause (addressed through this program)	
Feeder Type	weather-related	other
Urban	SAIDI and SAIFI worsened over the RCP, but performance in 2023/24 improved from 2022/23	SAIDI and SAIFI worsened over RCP, but performance in 2023/24 was slightly worse than 2022/23
Rural (Short and Long)	SAIDI and SAIFI worsened over the RCP and 2023/24 performance was worse than 2022/23	SAIDI and SAIFI has overall worsened over the RCP and 2023/24 performance was worse than 2022/23
Overall network	SAIDI and SAIFI worsened over the RCP, but performance in 2023/24 improved marginally from 2022/23	SAIDI and SAIFI worsened over RCP, with performance in 2023/24 worse than 2022/23

These findings are broadly in line with what we expect given our greater focus during the RCP on upgrading the Urban network. However, these charts indicate that 2023/24 performance is still indicating some underlying worsening trends associated with the Urban network that will need to be managed moving forward. There are also more significant worsening trends associated with our Rural Short and Rural Long networks that will need to be managed moving forward.

24 SAIFI by outage cause was not shown in the original business case

25 Note, in these charts the weather category includes the *weather*, *vegetation* and *unknown* Regulatory Information Notice (**RIN**) cause codes and the other category includes the *animal*, *network business*, *overloads*, *third party* and *other* RIN cause codes. Asset failures aligns with the equivalent RIN cause, but this is not discussed here as this cause is managed through the maintenance and replacement programs.





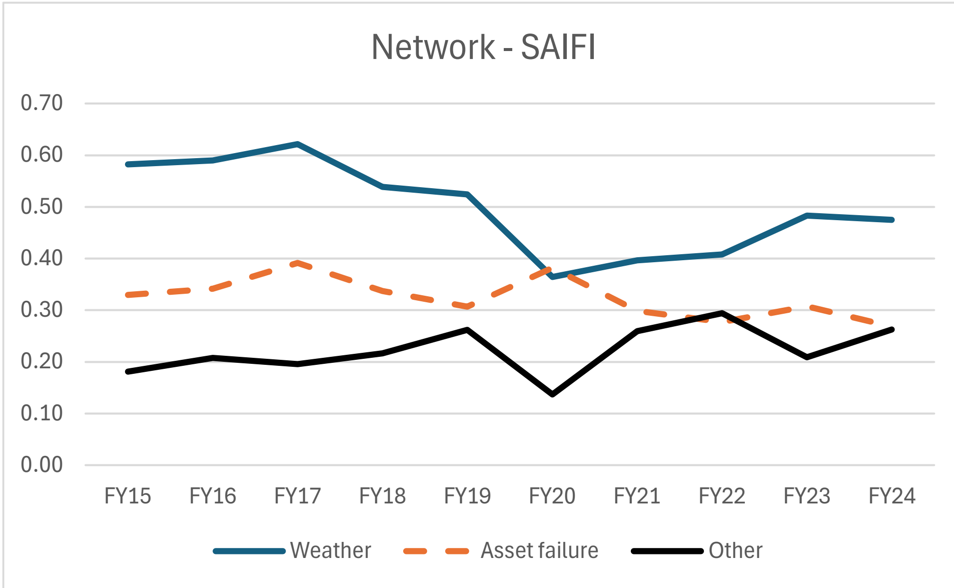


Figure 3 Network feeder performance – by high-level cause (excluding MEDs)

To further demonstrate the relationship that our historical expenditure has had on the reliability trends and the various outage causes, Figure 4 below shows the percentage change from the previous RCP to the current RCP for various other reliability metrics that provide a greater understanding of the make-up of the observed change in SAIDI and SAIFI[26].

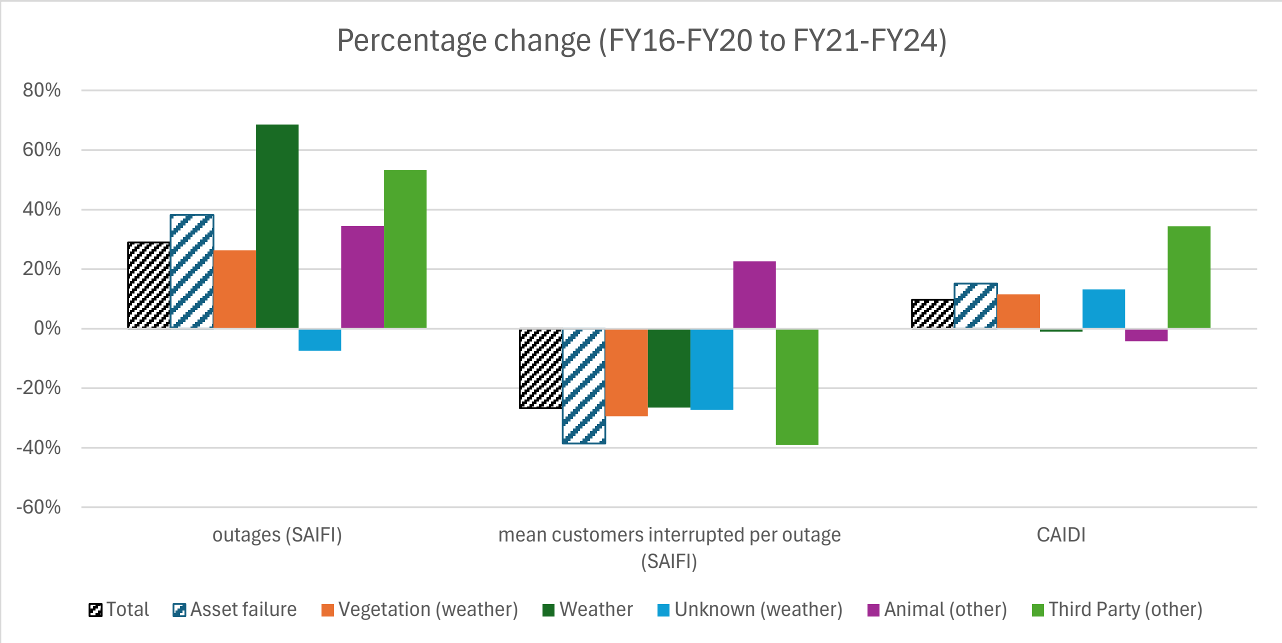


Figure 4 Reliability by outage cause – percentage change previous RCP to current RCP

This chart shows that the average number of customer interruptions per outage has improved across all cause categories, other than animal-related, while to a lesser degree CAIDI (ie average 'sustained' interruption duration) has worsened across most outage causes. These trends are as would be expected given our focus of the program during the current RCP on reducing the customer interrupted following outages through the automation and segmentation upgrades as discussed above and in Appendix B.

However, importantly for ongoing program needs, we have seen a significant rise in outage numbers from the previous RCP for most outage causes. As we have also noted above, this worsening trend in outages has reduced the improvements we could have expected from the expenditure levels this RCP and such a continuing trend will place significant pressure on this program moving forward to maintain reliability performance[27].

This increase in outage numbers across most causes is indicative of the increasing external drivers of reliability performance that need to be managed through this program to maintain reliability. We discuss the specific factors associated with these worsening outage trends further below.

5.2.3 The latest 2024/25 reliability data is also indicating this year is likely to be worse than 2023/24

We also analysed the latest available reliability data for 2024/25 and compared this against the performance at the same time in 2023/24 (this reflects performance to the end of October i.e. the first 4 months of the regulatory year). This indicates that we are on track to have much poorer performance in 2024/25 than in 2023/24 – see Table 4 below.

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26 Note, the outage causes in this chart compare directly to the RIN cause categories.

27 It should be noted that some of the increase in outages can be related to increases in outages only interrupting small number of customers and so these are not affecting reliability greatly. However, if even we only consider outages resulting in more than 100 sustained customer interruptions, we still see significant increases from the previous RCP to the current RCP.

As we have shown above, we are planning to increase spending on this program this year (2024/25), and so we hope that we can arrest some of this further decline through this investment increase. It is also worth acknowledging that this has been a worse year than either 2022/23 and 2023/24 years to this point, with 2020-25 RCP worsening trends continuing. However, it is unlikely that this investment should put us in a position to have performance back in line with 2023/24.

Table 4 SAIDI and SAIFI 2024/25 performance to date compared to 2023/24

	2024/25		2023/24	
Excl MEDs	**USAIDIn**	**USAIFIn**	**USAIDIn**	**USAIFIn**
URBAN	29.12	0.24	27.97	0.23
RURAL SHORT	49.91	0.38	58.30	0.37
RURAL LONG	148.64	0.63	83.77	0.44
State-wide	**49.92**	**0.32**	**40.70**	**0.28**

5.2.4 Weather impacts on reliability have been worsening and will likely continue

A significant factor leading to AER's position to reduce the forecast for this program was its view that weather-related reliability performance was not worsening and can be "more effectively mitigated by opex solutions (such as vegetation management)"[28].

We disagree with this view. In this section, we demonstrate that:

1. the number of weather-related outages has been increasing over the 2020-25 RCP and are expected to continue, but this has not yet resulted in a decline in USAIDIn or USAIFIn as some upgrade measures (e.g. feeder automation) are mitigating the effects.
2. opex solutions, such as vegetation management, are generally not more cost-effective solutions.

There are two different outage causes associated with weather, vegetation-related outages (including wind-borne debris) and lightning. We cover each of these separately.

Vegetation-related outages

Figure 5 below provides a set of charts that show the historical annual reliability due to vegetation outages (excluding MEDs), including SAIDI and SAIFI contribution, the number vegetation-related outages, and the percentage of these outages that are due to vegetation outside our mandated clearance zones. These charts demonstrate that vegetation-related reliability has been worsening during the current RCP, particularly in the Urban and Rural Long networks. The charts also demonstrate that increasing outage volumes since 2020/21, particularly due to vegetation outside the clearance zones, are the cause of this trend.

To examine to what extent wind speed could be driving this outage pattern, we have analysed historical wind speed. The key results of this analysis are provided in Appendix D. Figure 6 below provides example results for wind speeds measured at Adeliade Airport, indicating the number of days in each year with maximum wind speeds above those that typically result in vegetation outages (i.e. > 60km per hour) and an annual wind energy metric that provides an indication of the overall wind stress that year.[29]

Our analysis suggests that unusually high wind speeds are unlikely to be the primary reason for the high outage volumes over the current RCP. The wind speed in 2022/23 was likely unusually high (with higher wind energy and more days in the critical high wind bands), but wind speeds in 2021/22 and 2023/24 were more

28 AER Draft Decision, Attachment 5, pg 35.
29 This metric is calculated as the sum of square of the daily maximum wind speed.

usual – 2023/24 was arguably lower than usual (with less than usual number of days in the critical high wind bands).

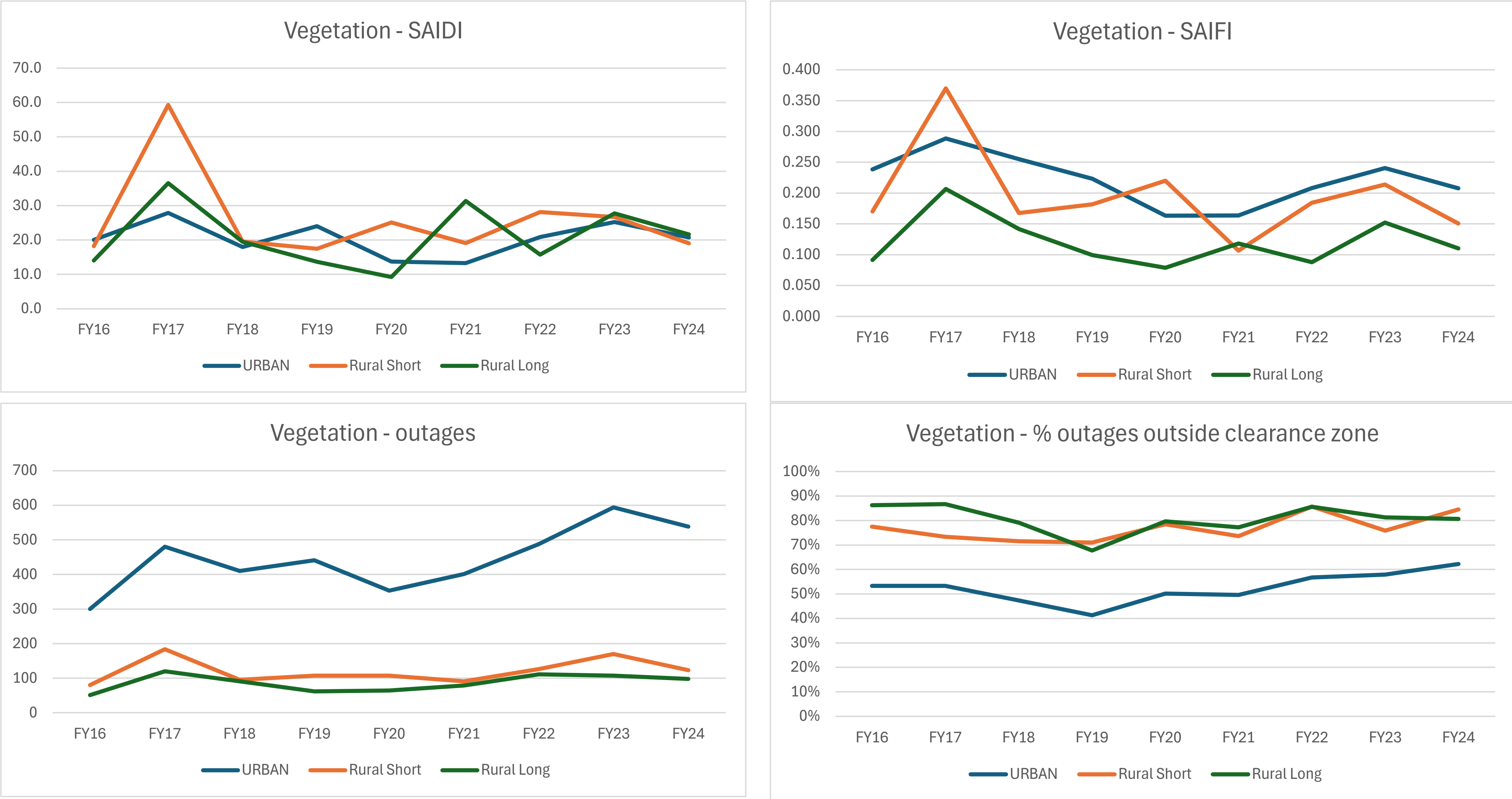

Figure 5 Vegetation-related reliability (excluding MED)

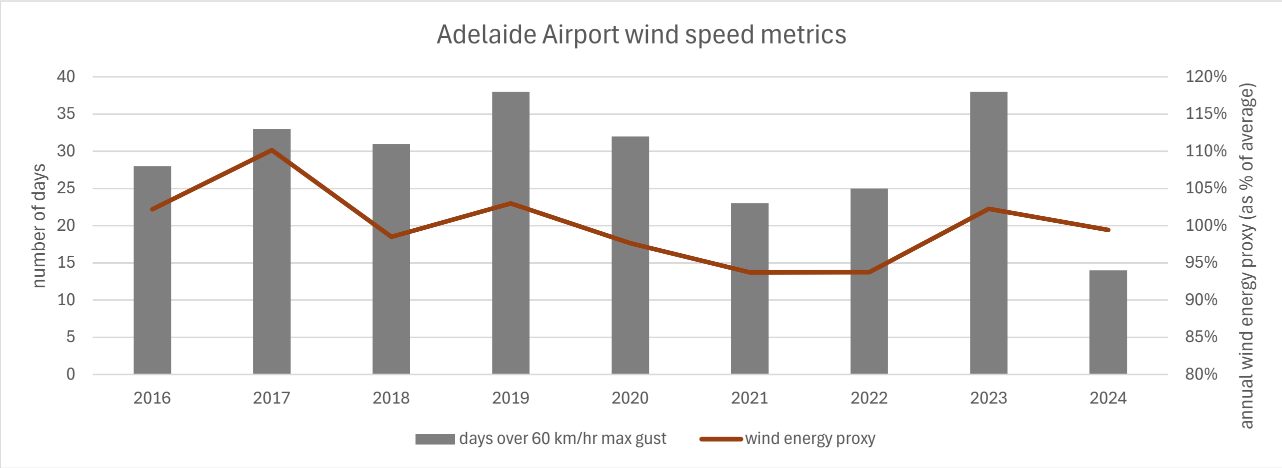

Figure 6 Wind speed analysis results – Adelaide Airport

In our view, the increasing outages are due to the recent greater pressure to 'green' metro and suburban areas. This is causing increasing volumes of vegetation in the vicinity of our network but outside our prescribed clearance zones. This view is also supported by recent surveys we have conducted on levels of vegetation in our urban areas[30]. The latest survey conducted in 2022 found that 16.7% of the entire metropolitan Adelaide footprint is covered in tree canopy, representing an area approximately 13,000 times the size of the Adelaide Oval, which represented a 4% increase over the findings from a similar survey conducted in 2018/2019.

Importantly for moving forward, new planning regulations were introduced in May 2024[31] that limit the removal of vegetation in metropolitan regions. An aim of these changes is for Adelaide to achieve a 30% tree canopy, which is widely accepted target for urban areas as documented through several key frameworks and strategic plans, particularly under the auspices of the Government of South Australia and the City of Adelaide. This represents a very significant increase in the tree canopy from current levels, substantially increasing the future drivers on our network from vegetation and making it very difficult for SA Power Networks to negotiate the removal of out-of-zone vegetation.

As such, it is reasonable to assume that the worsening trend in vegetation outages will continue without more intervention by us, likely requiring a dedicated program to arrest this worsening pattern moving forward.

We note that the AER considers that vegetation management (opex) solutions may be more effective, presumably meaning we would need less expenditure. However, we do not consider that this is the case. We do consider vegetation removal solutions where we are permitted to do so and this represents a cost-effective solution. But in most circumstances, this is not permitted.

In South Australia, the vegetation clearance zone for the 11 kV distribution network in the Non Bushfire Risk Areas only allows a Vertical Clearance zone of 1.5 meters, meaning vegetation is not allowed to be cleared completely from above our overhead conductors, resulting in the majority of vegetation-related outages

30 The most recent survey, known internally as the Urban Heat and Tree Canopy Mapping Project, was undertaken in 2022, using multispectral imagery, LiDAR technology and thermal imagery to map tree canopy (trees above 3M), across the entire metropolitan Adelaide footprint. This data was then analysed to calculate the percentage and total area of canopy cover.

31 In May 2024, South Australia introduced new planning regulations to protect Adelaide's tree canopy, focusing on maintaining vegetation in metropolitan areas. These changes, implemented under the Planning, Development and Infrastructure (General) Regulations 2017. Tree canopy targets are part of South Australia's broader environmental and urban planning strategy, aimed at mitigating urban heat, enhancing biodiversity, and improving livability. These targets are documented through several key frameworks and strategic plans, particularly under the auspices of the Government of South Australia and the City of Adelaide, Greening Our City Initiative, Adelaide's Resilient East Strategy and The Urban Tree Canopy Offsets Scheme.

occurring when tree branches fall onto our conductors from above the conductors[32]. South Australian powerline companies generally do not have the authority to remove trees from outside the designated clearance zones unless specific conditions warrant it.

The recent planning changes noted above have now made it virtually impossible to remove problem vegetation from above our conductors as these regulations now protect a greater number of trees by lowering the trunk circumference thresholds for regulated and significant trees. The size for regulated trees has been reduced from 2 meters to 1 meter, and for significant trees, from 3 meters to 2 meters, and new pruning requirements restrict the removal of the tree canopy to 30 percent every five years for both regulated and significant trees.

These changes reflect a significant shift in South Australia's approach to tree protection, aiming to enhance urban greenery and biodiversity while addressing community concerns regarding tree loss. However, it also greatly reduces our ability to clear or remove high-risk vegetation causing network outages.

In rural areas, we are often restricted in what vegetation we can remove through native vegetation removal laws, which are governed by the Native Vegetation Act 1991 and Native Vegetation Regulations 2017. These instruments aim to protect native vegetation for biodiversity, soil health, water quality, and erosion prevention, whereby in most cases, removing, clearing, or disturbing native vegetation requires a permit from the Native Vegetation Council (**NVC**). Specific exemptions can be obtained, but these are limited and typically require adherence to specific guidelines.

Therefore, the primary solutions we will have available will be network upgrades such as installing covered conductor and undergrounding to reduce vegetation outages or install feeder automation to reduce the number of customers interrupted due to the outage.

Applying Medium Voltage Line Covering (**MVLC**) to sections of existing bare conductors is the most cost-effective solution for reducing interruptions caused by falling vegetation compared to replacing bare overhead conductors with insulated conductors or underground. However, this method is limited to 1 to 2 spans due to the additional load stresses it places on the poles and wires. Furthermore, MVLC cannot be installed on the main backbone of feeders because it reduces the feeder's capacity rating. In cases where vegetation leads to interruptions across multiple spans or affects feeder backbones, where viable we replace those sections of conductor with Insulated Overhead Conductors, where large limbs and trees frequently bring down our conductors we then may consider undergrounding these sections as a last resort if viable to do so.

Lightning-related outages

The set of charts below show the effect of lightning on our network, indicating the SAIDI and SAIFI impact due to lightning (Figure 8) and outage volumes due to lightning (Figure 9). The charts show that the SAIDI, SAIFI and outage numbers due to lightning were all being maintained leading into the current RCP, but the performance of the rural network has worsened considerably over the current RCP with outage numbers rising consistently since 2019/20 across all network categories.

This recent increase is driven by a much higher volume of lightning ground strikes affecting SA, where ground strike numbers have also risen consistently since 2019/20, as shown in Figure 7 below. Unfortunately, lightning strike detection technology has not been installed in South Australia until recently, and as such we do not have a sufficiently long time-series of lightning strike data[33] to better understand to what extent the lightning activity during the previous RCP was lower than usual or the current RCP is higher than usual.

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[32] The *Electricity (Principles of Vegetation Clearance) Regulations 2010* in South Australia set out safety and environmental guidelines for the clearance of vegetation around powerlines to prevent fire risks and ensure reliable electricity supply.

[33] We can obtain reliable data from 2011 when the lightning sensor network was established to monitor all strikes.

Given this uncertainty, we consider it reasonable to assume we should continue with re-insulation upgrades in lightning-prone areas of our network. Currently, we have only upgraded approximately 7.5% of our rural network.

The need to continue with this program component is particularly important in the context of climate change. Although current climate models do not provide quantitative predictions of lightning activity levels suitable for our forecasting purposes, we understand it to be the excepted expert consensus view that it is reasonable to assume lightning activity is more likely than not to increase due to climate change[34]. Consequently, it is reasonable to assume that the higher levels seen during the current period are more likely than not to be a better estimate of levels in the next RCP than the lower levels seen during the previous RCP.

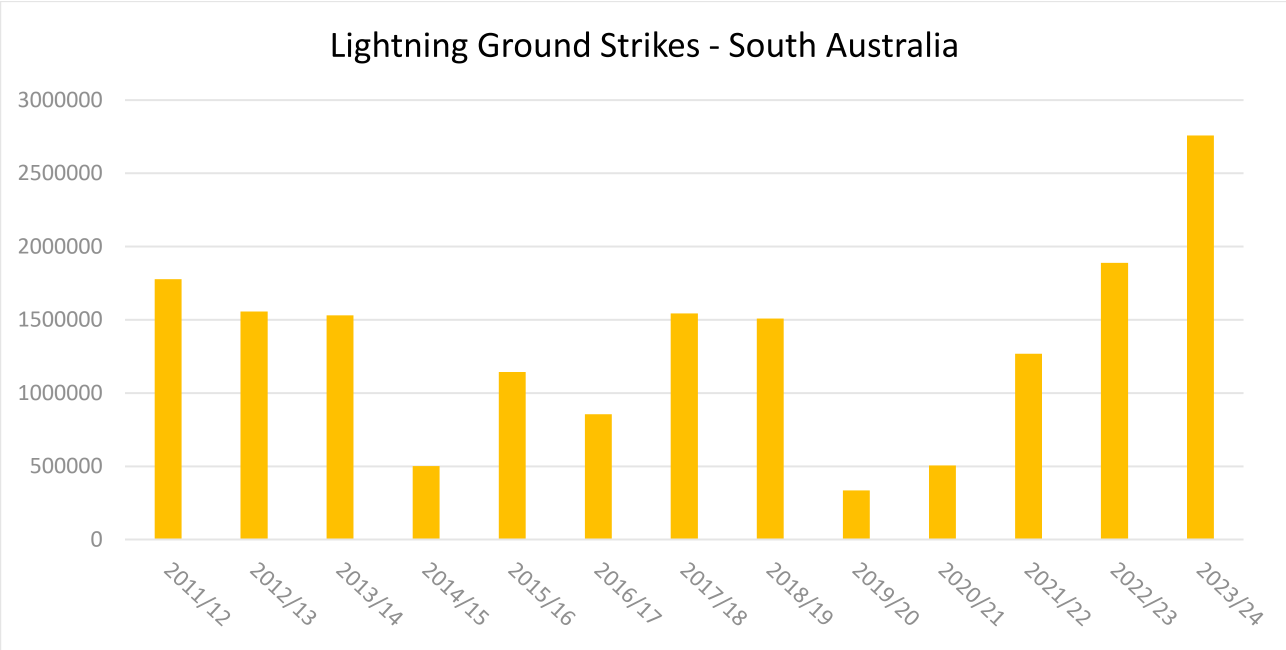

Figure 7 SA lightning strikes – sourced from from Weatherzone

[34] For example, the 2024 State of the Climate report, released by the Bureau of Meteorology (BoM) and CSIRO, provides updated insights on Australia's changing climate, including thunderstorm patterns and related extreme weather in Southern Australia noting that the frequency and intensity of extreme weather events, including thunderstorms, are projected to increase (Page 4 & Page 7)

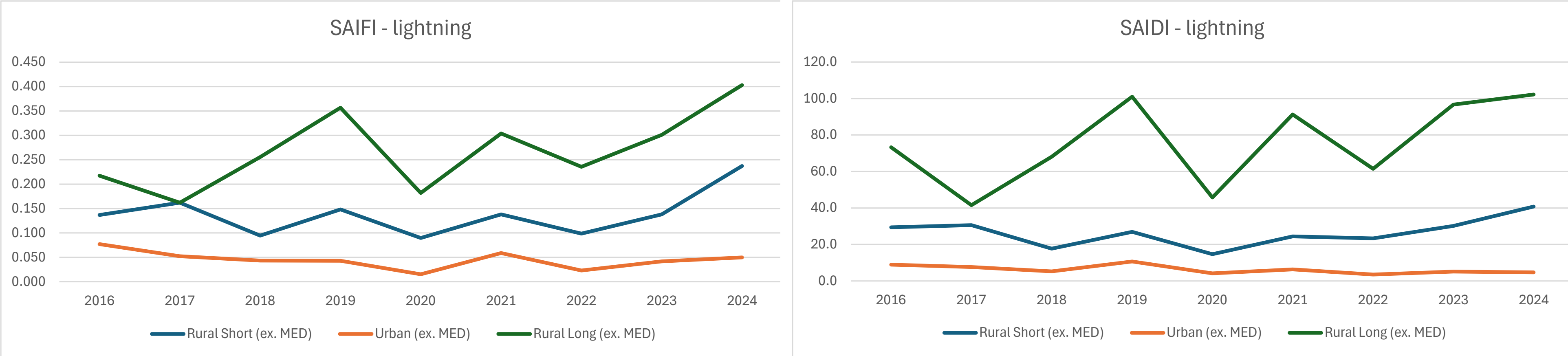

Figure 8 Lightning-caused SAIDI and SAIFI (ex MEDs)

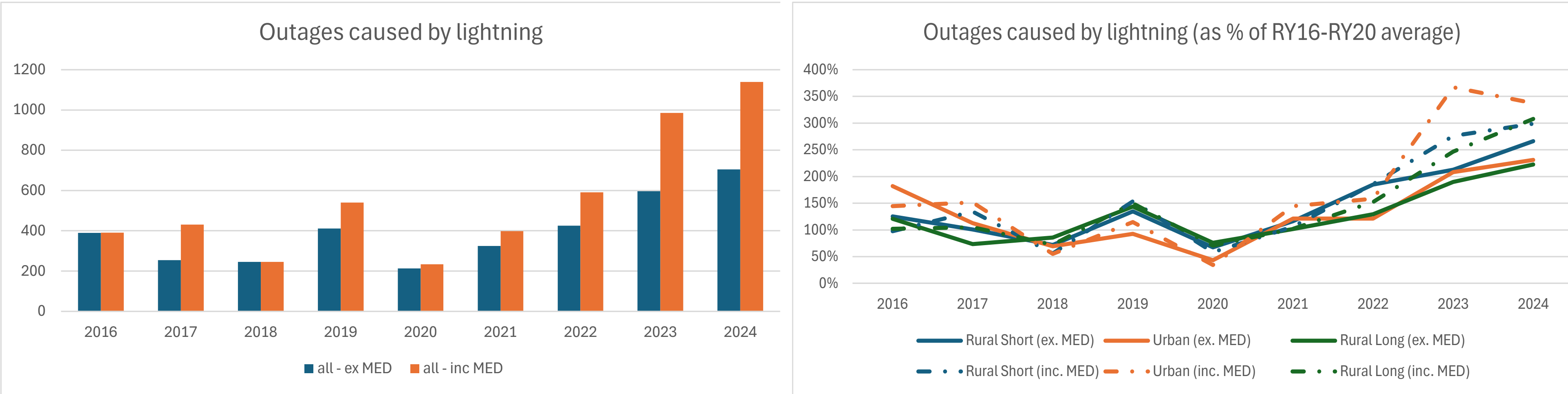

Figure 9 Lightning-caused outages

5.2.5 Other impacts on reliability remain relevant and will likely continue

The Draft Decision primarily focused on weather-related outages when discussing our reliability trend. However, it is important to recognise other current and emerging issues affecting reliability trends that this program will need to manage over the next RCP. That is, the other factors that are affecting reliability performance that will likely worsen reliability during the next RCP without continued investment through this program.

Before turning to these matters, it is important to recognise that these are only the significant matters known at this time. There may well be other issues that will arise during the next RCP that will need to be managed through this program.

Grey-headed flying-foxes

As discussed in our original business case and above, grey-headed flying-foxes are a significant issue affecting the performance of our network. This has been a particular issue during the current RCP affecting the performance of our Urban feeders, but is now starting to have an increasing impact on parts of our rural network where new colonies are forming[35]. As we have discussed above, we have been implementing a program of installing animal guards to avoid these outages.

We note that this issue was accepted by the AER in its Draft Decision where it considered it was appropriate to continue with this program – although, it considered its lower forecast amount was sufficient for this purpose[36].

We have commissioned our expert to provide revised population estimates and advice on this matter.[37] This advice and our 2023/24 performance suggest that this issue is still worsening and is expected to worsen considerably over the next RCP, increasing expenditure needs to maintain reliability. Therefore, in this section we discuss this issue further providing revised information.

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[35] It is worth noting that the flying-fox population can have a far more significant impact on our network than other DNSPs because of SAPN unique steel Stobie pole design, which are earthed right up to the pole top. Therefore, bat electrocutions and outages are far more common than compared to other on DNSPs.

[36] AER Draft Decision, Attachment 5, page 36

[37] South Australian Flying Fox Camp Trends Report - October 2024

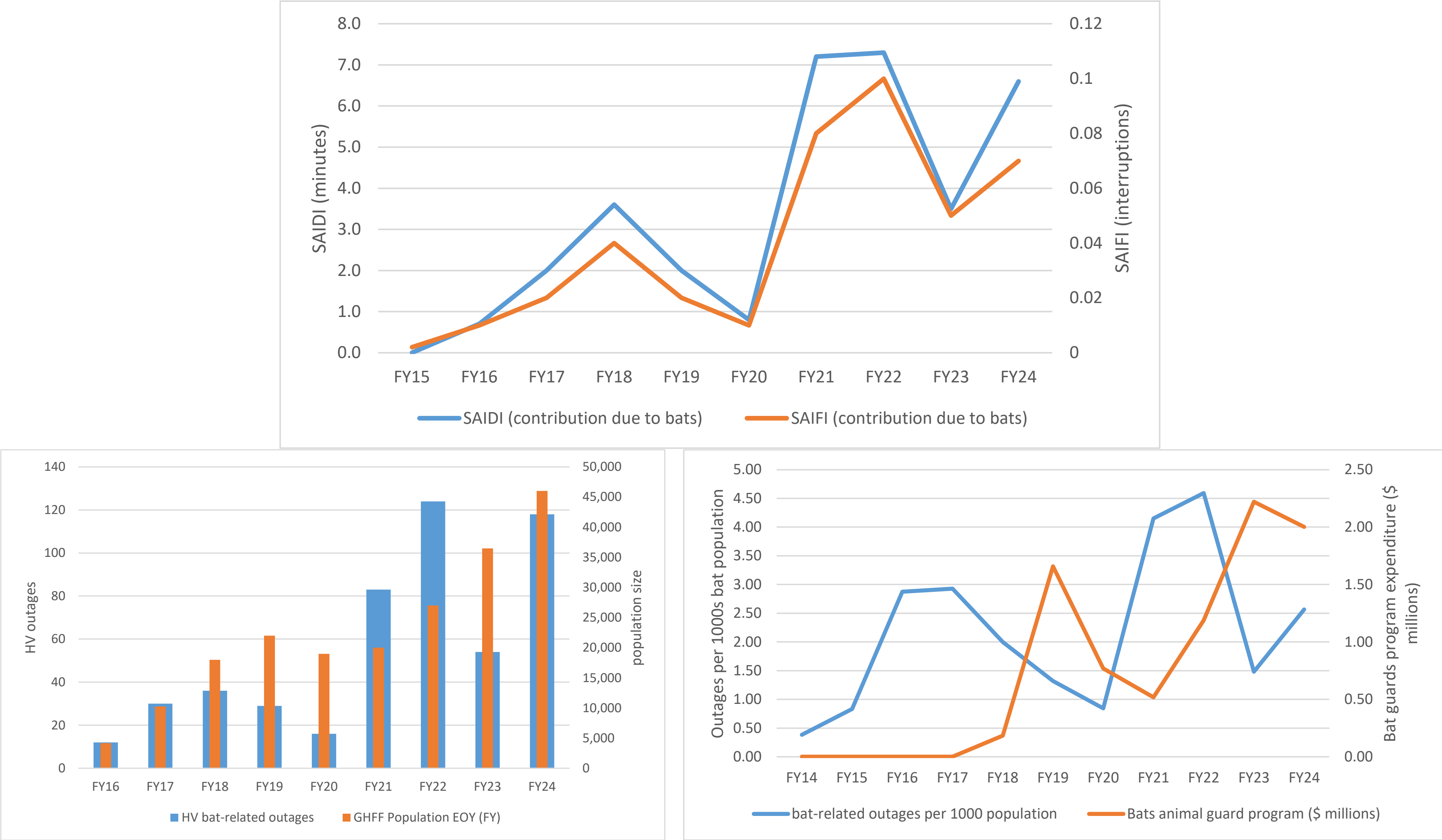

Figure 10 Reliability performance due to flying-fox (bats)

This issue started to materially affect the performance of our network around the start of the previous RCP. The population has risen steeply since, rising significantly over the current RCP. As shown in Figure 10 above, SAIDI and SAIFI performance due to fly-foxes (labelled as 'bats' in our systems) and outage volumes have risen significantly in 2023/24 compared to 2022/23. It is also important to note that although the SAIDI amount due to this outage cause was nearly 7 minutes, we estimate that our Animal Guard program to the end of 2023/24 has saved around 5 minutes of SAIDI and automation program a further 5 minutes ie without these programs the current flying-fox population size would have caused around a 17 minute increase in SAIDI.

The revised expert advice we recently commissioned has provided revised population numbers for 2023/24 (shown in the chart above). This indicates that the flying-fox population increased a further 25% just from 2022/23 to 2023/24 (increasing from 36,000 to 46,000), representing a nearly 150% rise in the population size since entering the current RCP (ie since 2019/20).

The expert advice also notes that 3 new camps have been identified during 2023/24 (rising from 5 camps in 2022/23 to 8 in 2023/24). Importantly, the expert advice states that the area covered by the camps has extended significantly also, increasing from an area covering 80,000 km^2 to 120,000 km^2 – it considers that this area may well be an underestimate.

Given this latest advice and the historical trend shown above, even though we implemented an animal guard program (which was initially rolled out in the Adelaide metropolitan region and has then been extended in 2023/24 into affected regional areas), this significant increase in population size is still causing a significant increasing trend in outage numbers. This increase is because our program has not been able to keep up with the extent that the increase in population size is resulting in an ever-increasing range that the flying-fox roost and travel across our network. The effect of this is shown in the chart above where our expenditure is trending up, but the overall trend in outages per population size is also increasing. This chart also indicates that short-term improvements in performance through our animal guard program occur almost immediately (ie they are effective at the location installed), but are then followed by further increases in outages in other unprotected areas as the population size increase and their range extends further[38].

Importantly for the trend into the next RCP, the expert has advised that population size, camp numbers and the areas covered are all likely to increase further, stating "additional flying-fox camps (locations currently unknown) already exist on a temporary basis across a larger extent of South Australia than is currently understood and documented. These temporary camps may become permanent in the future, supporting further increases in the number of flying-foxes and increases in the distribution of flying-foxes across suitable habitat in South Australia" and providing a concluding opinion that "based upon the pattern observed it is likely that the flying-fox population and number of camps will increase in the Adelaide region and across South Australia. Increased numbers of flying-foxes across a larger area of South Australia are likely to result with a higher frequency of electrocutions and associated power outages."

It is also worth noting that sprinklers were installed in Adelaide's Botanic Park in 2019 to cool the flying-fox colony as part of ongoing efforts to protect these flying-fox during extreme heat events[39]. Heatwaves had led to mass mortality events within this colony, with thousands of flying-fox deaths recorded during particularly hot periods. Now that these sprinklers have been installed, we are unlikely to see such drop-offs moving forward.

Therefore, it is critical to continue our program and we will need to extend it further to mitigate the effects of the predicted increase in the flying-fox population and their range. We currently only have 3.7% of the metro area covered, but are likely to need to extend this considerably over the next RCP to avoid reliability worsening. This will likely require us to not only extend this across the metro area, but also into regional

[38] Note, the lag issue raised by the AER and EMCa is not relevant here as improvements are very quickly masked through the population and range increases.

[39] South Australian Department for Environment and Water (DEW)

areas that are expected to be more significantly affected by flying-fox movements. For example, based on the current trend, we could expect the population size to double from current levels over the next RCP, resulting in a SAIDI increase of at least another 17 minutes without a significant animal guard program and the type of other gains that have been achieved through the automation program.

It is also worth acknowledging that we are receiving increasing complaints from customers and wildlife groups about flying-fox deaths due to our network. Therefore, although it is cost-effective to still use techniques such as automation as part of the ongoing approach to address this problem, it is also important to continue our animal guard program in order to address these community concerns regarding flying-fox electrocutions – noting other approaches to reduce the effect on reliability such as automation will not reduce flying-fox deaths.

We also note that EMCa suggested we may require a lower amount than we had forecast because the 'cost of installing fruit-bat guards is likely to be small because of the deployment method' we adopt[40]. The unit cost of this solution depends on the complexity of the installation. We have found a lower unit cost solution that can be used in some circumstances, but this only applies to around 50% of poles. The other 50% need more complex installations to be carried out at the higher unit cost, which remains the same. We expect that this lower cost solution will allow us to cover more poles in order to keep pace with the bat population increase. Since 2019 we have installed guards on 2,800 poles, we still have 375,000 poles including both metro and regional poles to protect (i.e. we have only protected about 0.7% that could be affected by this issue).

Third party outage

As noted above, third party outage numbers have risen over the current RCP. Figure 11 below shows that this increase is very much driven by a rise in outage numbers associated with the Urban network and primarily due to vehicles hitting our network (although, other third-party causes have also been rising).

These charts also show that currently this increase in outage numbers is not affecting observed reliability, where the SAIDI due to these outages has been maintained and SAIFI has reduced as outage numbers have risen. This relationship is as could be expected given our automation program in the Urban network that has occurred over this same period.

At this stage we are unsure of the exact reason that this increase has occurred. But we presume it will be related to increases in vehicle use and likely increasing distractions through the use of mobile phones. Estimates indicate that distracted driving accidents have increased significantly in recent years. For instance, reports have shown that fatalities from distracted driving rose by about 10% annually in some studies[41].

Although we are currently managing the effect of this issue, if this trend continues (which we have no reason to consider it will not) then this will increase needs on the upgrades such as the automation program to mitigate the future increase or possibly require a dedicated program to arrest the effects of this issue (i.e. pole relocations, pole guards, etc.).

On this need, it is important to note that vehicles hitting poles or pulling down lines can be significant outages, as they can be of longer than usual duration due to the damage they cause and safety issues they pose in their response and repair. As such, this is an important worsening trend to manage moving forward.

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[40] Review of Aspects of proposed expenditure, EMCa, page 69

[41] The National Road Safety Strategy has noted an uptick in accidents related to distracted driving, which researchers suggest is partly due to the distraction potential of modern smartphones. Recent studies indicate that distraction is a factor in approximately 16% of serious casualty road crashes in Australia. This trend has been rising in the context of growing smartphone use and other distractions while driving (Budget Direct Distracted Driving Survey and Statistics 2023).

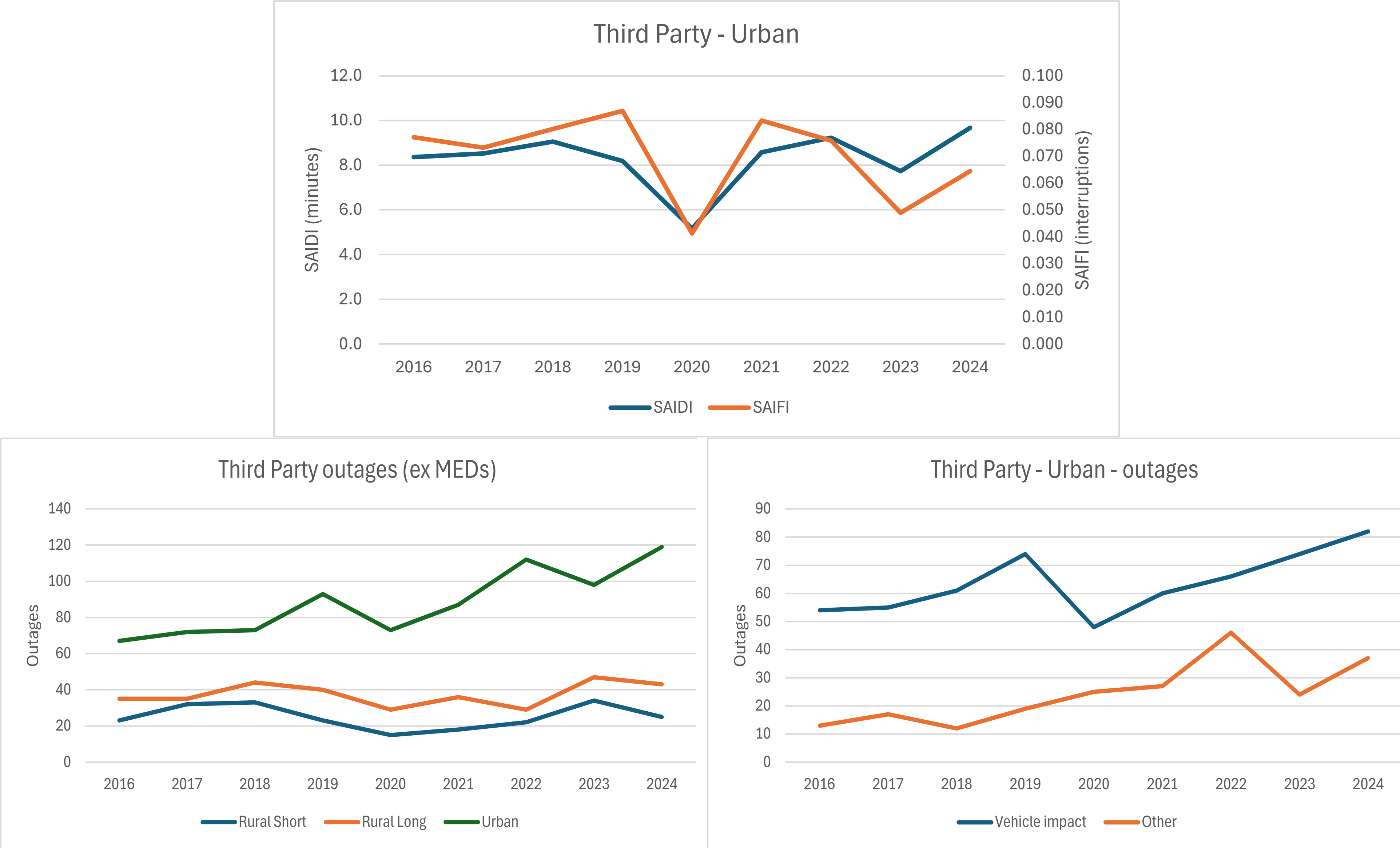


Figure 11 Reliability performance due to third party outages

EDC restoration targets

Declining restoration times over the current RCP particularly associated with our rural feeders is a known issue that will need to be managed moving forward. As we have noted above, this is one of the areas where we have consistently under-performed EDC reliability targets during the current RCP, which is counter to the AER's view that performance to EDC targets has been maintained.

The historical annual performance against the EDC restoration targets is provided in Appendix E, and is summarised in Table 5 below. These results show that both Rural Short and Rural Long feeders are likely to consistently exceed the EDC restoration time targets during the next RCP, with both types showing:

- worsening performance on average over the last 5 years compared to the previous 5-year period
- 2023/24 performance has worsened further since 2022/23
- performance in 2023/24 was significantly poorer than targets.

Table 5 Average performance to EDC restoration targets

Network	metric	2014/15-2018/19 average	2019/20-2023/24 average	2023/24	EDC target
Urban	% restored after 2hrs	26%	22%	22%	27%
	% restored after 3hrs	10%	11%	11%	11%
Rural Short	% restored after 3hrs	25%	25%	**29%**	**27%**
	% restored after 5hrs	8%	**10%**	**12%**	**8%**
Rural Long	% restored after 4hrs	31%	**32%**	**35%**	**30%**
	% restored after 7hrs	10%	**11%**	**15%**	**10%**

There are various reasons for this declining performance, including:

- the impact of the increased lightning activity (which can cause more widespread outages that take longer to restore);
- farm machinery hitting poles and lines resulting in more significate damage to repair (likely due to increasing use of GPS guided machinery);
- reduced access to our network (due to more locked gates on properties we need to access, likely driven by increasing security and safety concerns of owners); and
- SWER Sectionalisers no longer opening for faults due to customer embedded generation.

As noted above, we are not including any uplift to undertake these jurisdictional compliance requirements. But this increasing need has to be seen in the context of the range of factors that are driving continuing investment levels in the next period. This will likely require increased investment on solutions to improve restoration times in rural areas.

On this need, it is worth noting that the Rural Long supply restoration improvement program, which is included in our worst served customer reliability program (approved in the AER Draft Decision), is not aimed at achieving compliance to the EDC Restoration targets; it is only to improve restoration times to the worst served customers where the upgrade provides a net-benefit (but would not have a sufficient STPIS reward to be funded through the Maintain Reliability program). We discuss this interaction further the next section.

5.3 We have accounted for interactions with other proposed investment programs

A critical factor in the reason for the AER reducing our forecast for this program was its view that improvements in reliability through other programs were not allowed for, and so our forecast overstated the amount necessary to maintain reliability. In this regard, it specifically noted the asset replacement program and other augmentation programs, and the reliability improvement program (ie the worst served customer improvement programs).

We disagree with this view as we have specifically considered the interaction with other programs in developing the forecast for this program. That said, we accept that this interaction is more explicitly covered in the original business cases of these other programs and not addressed sufficiently in our original business case for the maintain reliability program.

Each of these other programs is explained in turn below.

5.3.1 The Asset Replacement program has been accounted for

The repex program expenditure forecast is set to maintain the SAIDI/SAIFI component due to asset failures at historical levels. That is, it is set to arrest the forecast decline (i.e. predicted future decline) in asset failure performance due to future aging effects. This is shown in the Figure 12 below, which is an output from the repex risk modelling, showing that the predicted effect of the repex program forecast on the SAIDI component due to asset failures is only to maintain reliability (in fact, it predicts a very slight deterioration) [42].

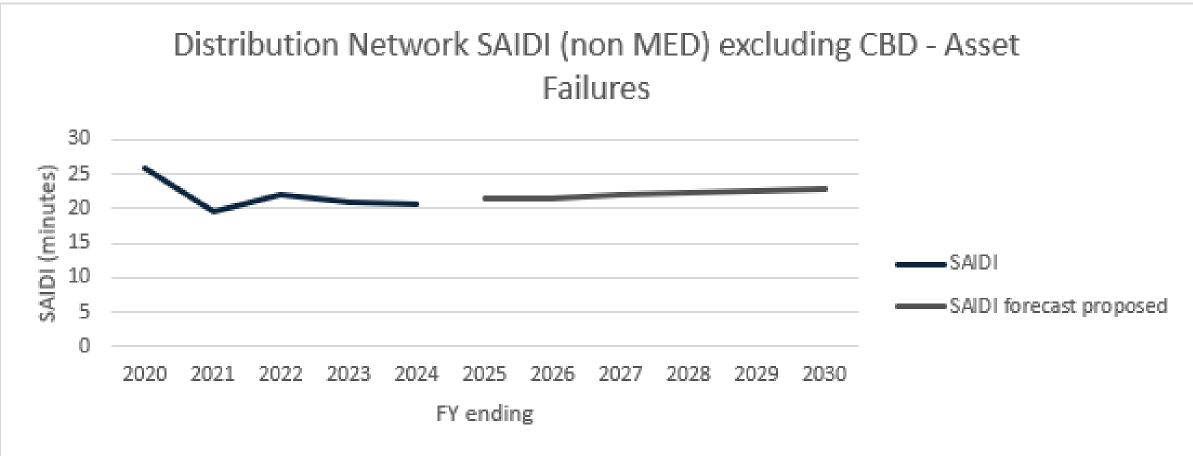


Figure 12 Effect of repex program forecast on SAIDI component due to asset failures

As such, the repex program expenditure forecast should have a neutral effect on the target level of reliability performance that the maintain reliability program forecast aims to achieve. The maintain reliability program does not have a specific component to address any expected decline in asset failure outages and assumes that the repex program forecast achieves its aim.[43] Importantly, any AER reduction in its Final Decision to our Revised Proposal for our repex could put increasing requirements on the maintain reliability program to mitigate the effects of a declining asset failure performance, which the maintain reliability program does not seek to address.

[42] See 5.3.1 Business Case Addendum: Repex for further detail.

[43] As discussed in 5.9.3 Business case: Maintain Underlying Reliability Performance Program, page 8 and page 10

5.3.2 The Reliability Improvement programs have been accounted for

As is discussed in the worst served customers reliability improvement programs business case (approved in the AER Draft Decision), specific adjustments to the STPIS SAIDI and SAIFI targets to allow for the expected improvements from each of these improvement programs were calculated and have been allowed for in the STPIS component of the AER's draft decision.

No overlap or double counting associated with historical expenditure used to set the forecast level for the maintain reliability program should be included, as the historical expenditure associated with the maintain program only allows for upgrades that would have been STPIS positive[44], whereas the improvement program only allow for upgrades that would not be STPIS positive.

We note that the AER suggests that the improvement programs will reduce the interruption duration and this effect has not been allowed for. It is valid that the improvement program should contribute to reducing outage duration *in principle*, but this impact is immaterial on the forecast level of expenditure. As we have stated above, the forecast amount is derived based on the amount to maintain SAIDI and SAIFI in order to achieve the STPIS targets. There is not a specific uplift in our forecast to separately achieve the EDC restoration targets. As such, how the reliability improvement programs affect average interruption durations are already allowed for implicitly through their SAIDI and SAIFI adjustments to the STPIS targets.

5.3.3 Other augex programs have been accounted for

The interaction with other augex programs is similar to the replacement program above. The primary aim of the capacity augex program is to address forecast demand growth in order to maintain, rather than enhance, reliability.

Current reliability performance metrics are not significantly affected by interruptions caused by overload or load shedding events. As a result, both existing and future capacity programs will not resolve the underlying causes of current reliability issues. Furthermore, the capacity program does not seek to introduce additional redundancy into the network that would improve overall network reliability.

Consequently, the Augex Capacity Programs will have a neutral effect on the target reliability performance levels that the Maintain Reliability Program forecast is set to achieve.

[44] It is very important to appreciate that in this context we only mean that the incremental effect of the individual upgrades undertaken through the Maintain reliability program realised a STPIS net reward. This can occur whether or not overall reliability is improving or worsening, and as such, whether or not the STPIS mechanism provides an overall revenue reward or penalty.

6 The revised expenditure forecast for the Maintain Reliability program

For the avoidance of doubt, the expenditure in this section only relates to the Maintain Reliability program component. It does not include the Protection Management program component, which is discussed separately in Section 7.

6.1 Analysis conclusions supporting the forecast expenditure being set equivalent to revealed costs over the most recent 5 year period

For our original business case, we applied a top-down approach to estimate the expenditure forecast for the Maintain Reliability program component, where we considered that the forecast should reflect the revealed costs of the program over the same 5-year period that represented the target reliability for the program (ie the average reliability over the same 5-year period).

The Draft Decision has accepted the top-down approach, but considered that the revealed costs of this program over the most recent 8-year period should be the basis of the expenditure forecast. The Draft Decision did not detail the reasoning for selecting the 8 years as the most appropriate period. However, we presume that this specific 8-year period was selected because it resulted in a lower amount that the AER considered reflected it concerns.

In the section above, we addressed all the substantial concerns and issues raised in the Draft Decision that formed its basis for it believing that a lower expenditure forecast was sufficient for this program. In summary:

- <u>On the AER's view that our reliability performance has met ESCoSA's reliability targets</u> (except for the CBD), we explained why this is not the correct basis for defining the expenditure requirements for the next RCP and this significantly understates the requirements of the program forecast:
  - we clarified that the forecast expenditure amount for this program is not set primarily to achieve the EDC targets, which we accept our historical performance overall has achieved (albeit with some specific targets that have been exceeded). Rather, the forecast amount is that necessary to maintain performance in line with the average of the last 5 years (i.e. average over 2019/20 to 2023/24). This program's reliability target is needed to align the program expenditure forecast to the AER's STPIS decision targets (it is not set to improve on those targets or gain through this scheme), meet customer desires to maintain performance (as recommended via our engagement process) and comply with NER expenditure forecast requirements; and
  - we have shown that the level of SAIDI and SAIFI necessary to maintain performance consistent with the average over this 5-year period is considerably more onerous than that necessary to only achieve the EDC targets.
- <u>On the AER's view that reliability is being maintained</u>, we have shown that reliability has worsened and explained the factors driving these trends and how they affect future needs:
  - we demonstrated that over the historical 5-year period that sets the reliability targets for the program's expenditure forecast, reliability overall has been worsening (both SAIDI or SAIFI);
  - we have shown that 2023/24 performance (unavailable at the time of the Draft Decision) does not suggest reliability is improving and we have demonstrated that there is very unlikely to be any significant improvement lag associated with historical upgrades that we are still to observe. Importantly, we have shown that we are <u>**not on track**</u> to enter the next RCP with overall network performance better than the historical 5-year average; and
  - we have also demonstrated a range of current and emerging issues that we will need to manage moving forward across our Urban and Rural networks. Given the range and scale of these issues, we see no reason for the AER to consider that ongoing drivers on this program during the next RCP will be less than those we have faced during the current period.

- On the AER's view that there may be more effective opex solutions, we have explained why it is unlikely that there exists more cost-effective opex solutions, particularly vegetation management solutions, to address these issues.
- On the AER's view that we had not taken into account the effects on reliability of other programs in our expenditure forecast, we have explained why it is not valid to consider that we have not taken account repex and other augex programs in how we have developed the program reliability target level or forecast expenditure amount for this program.

Taking all the above factors together, we remain of the view that the revealed costs over the same 5-year period that forms the basis of the STPIS targets for the next RCP (i.e. 2019/20 to 2023/24) is the most appropriate basis for estimating the forecast expenditure for this program. This 5-year period remains the best basis for estimating forecast expenditure, given:

- the revealed costs over this period have not resulted in improved SAIDI or SAIFI – which we have demonstrated in the section above;
- we are on track to be entering the next RCP with slightly worse performance than the STPIS targets that will apply over the next RCP and there is no evidence that there is a material lag in reliability improvement still to be realised from investments over this period that will significantly change this position – which we have demonstrated in the section above; and
- the factors contributing to the rise in outage rates have remained largely consistent over time, and many are projected to either continue at similar rates or expand under the next RCP. For instance, the growth of flying-fox populations, the spread of vegetation from outside regulated zones, the increase in lightning strikes and outages caused by third parties are expected to maintain or increase at current rates reasonably represents the expected future level and we do not have the network sufficiently protected for this level of activity (e.g. lightning) – which we have demonstrated in the section above.

We consider that using a longer period of revealed costs (i.e. the most recent 8-year period) that differs from the period used to set the program reliability targets (i.e. the most recent 5-year period) is not an appropriate basis for estimating the forecast expenditure for this program in our circumstances. This is noting that:

- an 8-year average would result in a substantially lower amount of expenditure than has been required over this period and would be insufficient to maintain performance in the face of the external drivers we are likely to face over the next RCP;
- the AER has not provided sufficient evidence that overall the external drivers in the next period will be materially lower. Rather, on the evidence we have provided in this addendum we consider that if anything there is a reasonable possibility that drivers could be higher (particularly noting the increasing issues we face with flying-foxes, vegetation outside the cut zones, third-party outages, and declining restoration times in rural regions); and
- therefore, we consider that our forecast basis using the most recent 5-year period of revealed costs is likely to be conservative, given we have not proposed any additional uplift to manage these risks moving forward.

Based on this reasoning, we have revised the forecast expenditure for the maintain reliability program, as the revealed costs from 2019/20 to 2023/24 (i.e. to allow for 2023/24 revealed costs and reliability, which are now available). This provides an expenditure forecast of $55.8 million over the next RCP. This represents a $2 million increase from our original proposal, due to the change in the relevant 5-year period.

The historical expenditure profile and program forecast amounts (including comparisons to the original proposal and AER draft decision) are shown in the Figure 13 below.

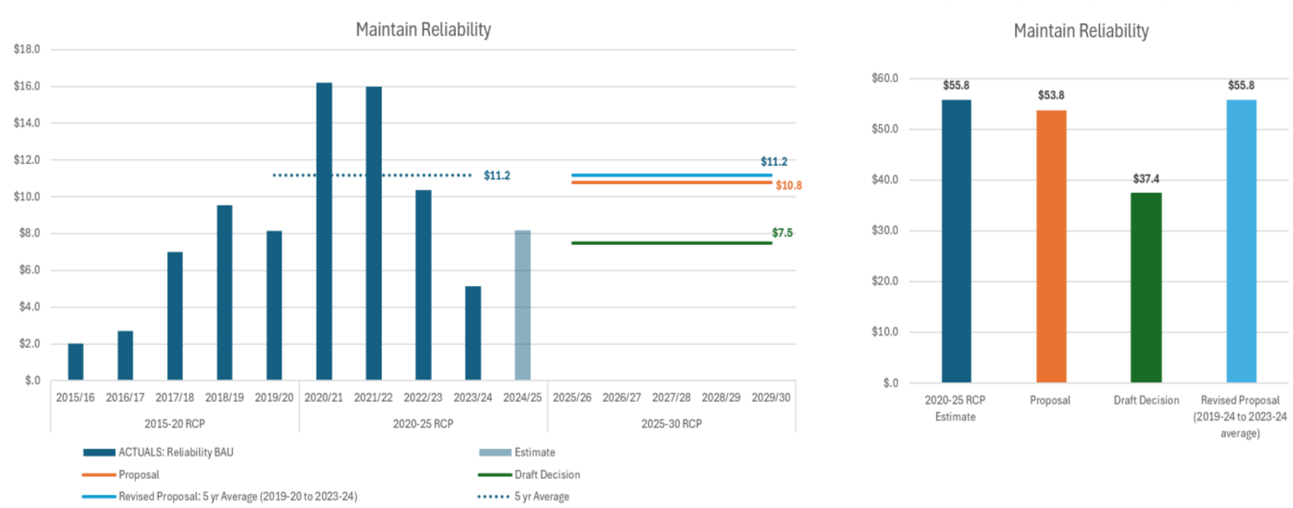


Figure 13 Historical expenditure profile and program forecast

This forecast expenditure will allow us to continue the various upgrade solutions we currently employ (noting that the make-up of these solutions may changes) in order to arrest the anticipated further decline in reliability over the next RCP, including:

- extending and enhancing feeder automation on our network – which will be required to arrest the anticipated further decline of the Urban network due to flying-foxes, vegetation and third-party outages, and help address other issues that could emerge during the next RCP
- continuing our program to install line coverings and upgrade with insulated conductors, etc. – which will be required to arrest the anticipated decline due to the emerging issue with out-of-zone vegetation
- continuing our program to install animal guards across our network – which will be required to arrest the anticipated further decline of the network due to flying-foxes
- continuing our program to re-insulate our network – which will be required to arrest the anticipated further decline of the rural network due to lightning
- increasing our work to upgrade existing SWER sectionalisers and installing SWER Line Fault Indicators – which is required to arrest the anticipated decline in rural restoration times.

The table below provides the annual breakdown of program expenditure over the next RCP.

Table 6 Costs by Cost Type ($ million, June 2022)

Cost Type	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30
Capex	11.16	11.16	11.16	11.16	11.16	55.79
Opex						
TOTAL COST	11.16	11.16	11.16	11.16	11.16	55.79

6.2 Alternative options and counterfactuals

As a counterfactual, if we pursued an alternative option of consistent with the Draft Decision, this would reflect a reduction in program expenditure of $16.4 million[45] resulting in program expenditure forecast of $37 million for this program (ie a 30% reduction in program expenditure). Consequently, we estimate that the Draft Decision approach would:

- result in a network SAIDI worsening by 10 minutes over the next RCP, representing a 7% worsening of SAIDI; and
- using the recent AER published Value of Customer Reliability (**VCR**), we estimate that the cost to customers of this decline in reliability and the associated unserved energy, would be approximately $6 to $8 million per annum[46].

Consequently, our Revised Proposal forecast for the program is clearly preferable compared to the alternative option. Table 7 compares our forecast for this program against this alternative AER option, and highlights that our forecast represents a significantly lower overall cost to customers.

Table 7 Comparison of preferred forecast against AER draft decisions

	($ millions)		
Maintain Reliability component (excludes Protection Management component)	Capex	Unserved Energy Costs (life)[a]	Total costs (life)[a]
Our forecast	$56	$0	$56
AER draft decision option	$37	$75 to $93	$112 to 130

a – cost is provided over the life of the upgrades (assuming 15-year life on average) for comparison of program capex. Upgrade operating expenditure is assumed to be immaterial for the overall net-benefit estimate.

45 Note, this assumes the reduction in the AER draft decision is all related to the Maintain Reliability program component, not the Protection Management component, as all the AER's specific concerns related to this component.

46 Note, change in SAIDI and the value of this change is a high-level estimate for demonstration purposes; hence a range is provided. In line with our expenditure forecasting methodology, this estimate has not been developed from at bottom-up analysis of customer interruptions that the program will avoid.

7 Protection Management program component

7.1 Background

As noted in the introduction, information on the Protection Management component of the program was erroneously omitted from the business case in the original proposal. Furthermore, the activities and drivers of these activities are different to the Maintain Reliability program component. We also believe that the AER may have erroneously omitted the historical costs associated with the Protection Management program in how it arrived at its alternative forecast in its draft decision. Therefore, this section provides more detail on these activities and the expenditure forecast for this component.

The Protection Management Program is a continuous, recurrent program that encompasses many varied protection related tasks. These tasks are essential to ensure that protection devices across our network have the correct settings and continue to operate correctly as the network and connection to our network change over time. This ensures that the optimal number of customers are interrupted when faults occur, and so, facilitates us effectively and efficiently managing the reliability of supply and safety to our customers[47].

It is important to stress at the outset that the continuation of this work program is critical to the ongoing functionality of the network, both in terms of reliability and safety and in operating the network consistent with good industry practice and in accordance with our distribution licence.

7.2 Supporting tasks that make up the Protection Management Program

There are a range of tasks that make up the Protection Management component of the program:

- undertaking protection setting upgrades to ensure reliability is safeguarded;
- ongoing protection settings audits;
- rectifying protection issues as they arise;
- upgrading protection settings to facilitate operational support ensuring that the network can be operated safely and efficiently by the Network Operations Centre (NOC);
- reviewing protection settings performance and upgrading protection settings of the network;
- protection software management and relevant software upgrades; and
- firmware upgrade management of network protection and detection devices.

These tasks are explained in more detail in Appendix F.

7.3 Protection Management forecast expenditure

For the original business case in our Regulatory Proposal, we used a similar top-down approach to prepare the expenditure forecast for this component using the most recent 5-years of revealed costs.

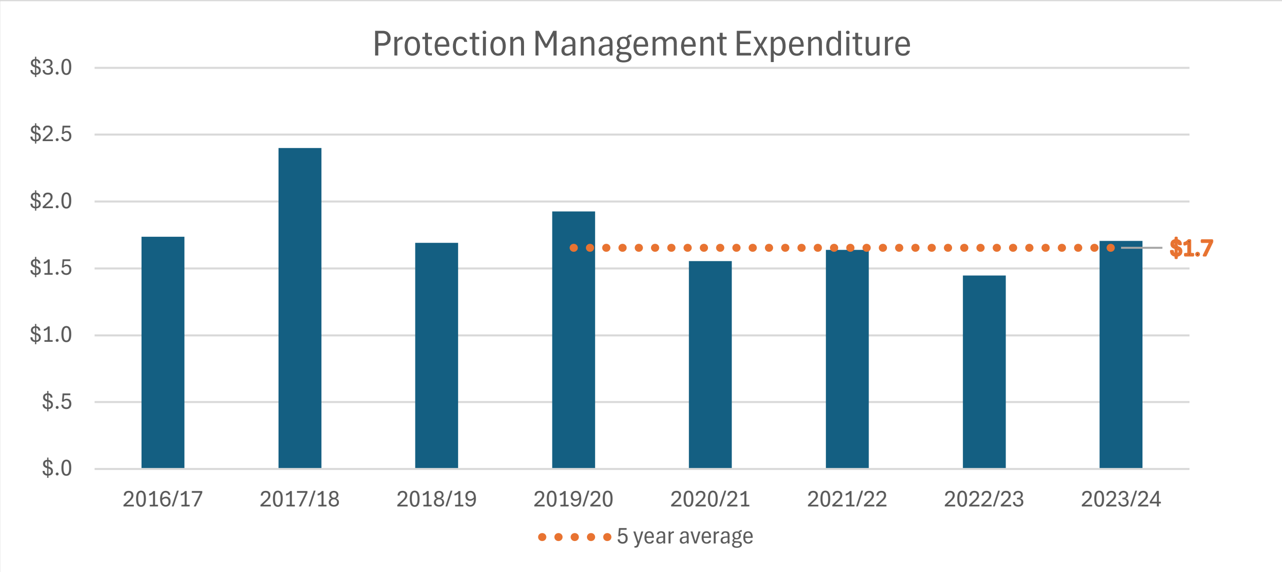
The costs associated with activities under the Protection Management component are more consistent and less variable to external and uncontrollable factors, as shown in the chart below which provides the historical expenditure profile. Therefore, the expenditure forecast is less sensitive to the revealed cost period assumed for estimating the forecast. Nonetheless, we still maintain that the most recent 5-year period is the most appropriate basis. This period better reflects the current nature of our network (e.g. the type and quantity

[47] Noting that if the correct protection device does not operate correctly to isolate a faulted portion of our network, significantly more customers can have their supply interrupted than should have occurred and the interruptions can last significantly longer.

of protection devices), while still averaging the small ups and downs in expenditure levels that we can expect to occur from year to year.

Based on this reasoning, we have revised the forecast expenditure for the Protection Management component, as the revealed costs from 2019/20 to 2023/24 (i.e. to allow for 2023/24 revealed costs and reliability, which are now available). This provides an expenditure forecast of $8.271 million over the next RCP, keeping expenditure flat relative to previous RCPs.

Figure 14 Protection Management historical expenditure



The table below provides the annual breakdown of the Protection Management component expenditure over the next RCP.

Table 8 Costs by Cost Type ($ million, June 2022)

Cost Type	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30
Capex	1.65	1.65	1.65	1.65	1.65	**8.27**
Opex	-	-	-	-	-	**-**
TOTAL COST	1.65	1.65	1.65	1.65	1.65	**8.27**

A. Appendix - Network Category reliability performance and program targets

This appendix provides charts of our SAIDI and SAIFI historical performance and the intended program targets for each Network category (excluding CBD, which is not the focus of this program during the next RCP). These charts show the recent historical trend in SAIDI and SAIFI, and importantly show the difference between the intended program targets for the next RCP (which are to maintain reliability performance) and the EDC jurisdictional targets.[48]

These charts are equivalent to the network-level charts provided in Section 5.1, and demonstrate that the intended target of the program (which is to maintain reliability performance at the 5-year historical average) is significantly more onerous than just to meet the jurisdictional targets (which has been the focus of the AER assessment).

These charts also demonstrate that broadly there has not been an improving trend in SAIDI or SAIFI over the current RCP. The factors affecting these trends and how these could affect reliability and program needs in the next RCP are discussed in more detail in Section 5.2.

48 Note, the 2023/24 projection (blue line) shown on these charts is provided only to help show where our current performance is relative to these next RCP targets. It is not the forecast performance of the program into the next RCP.

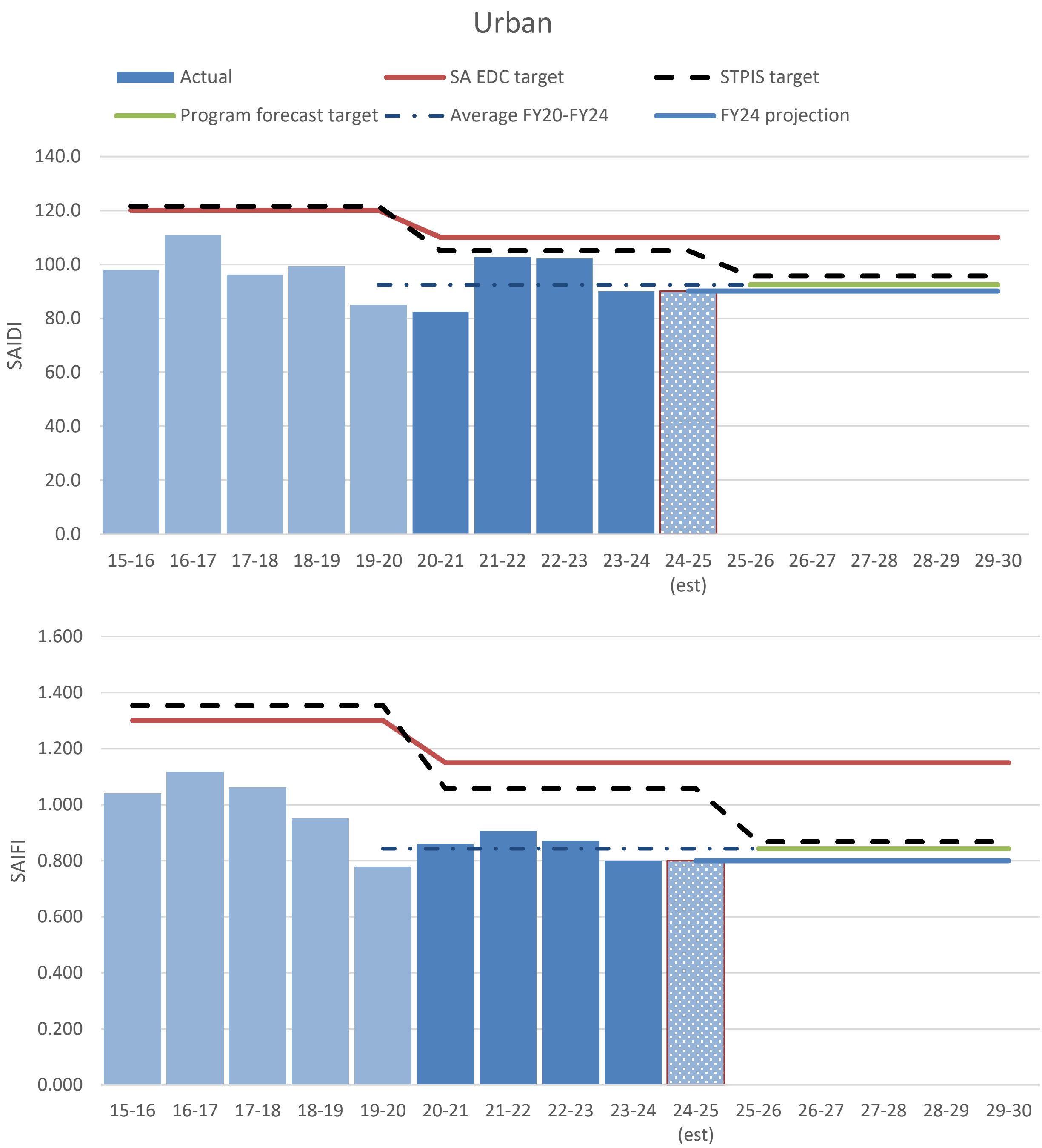


Figure 15 Historical network SAIDI and SAIFI (ex MEDs) and the level – Urban feeders

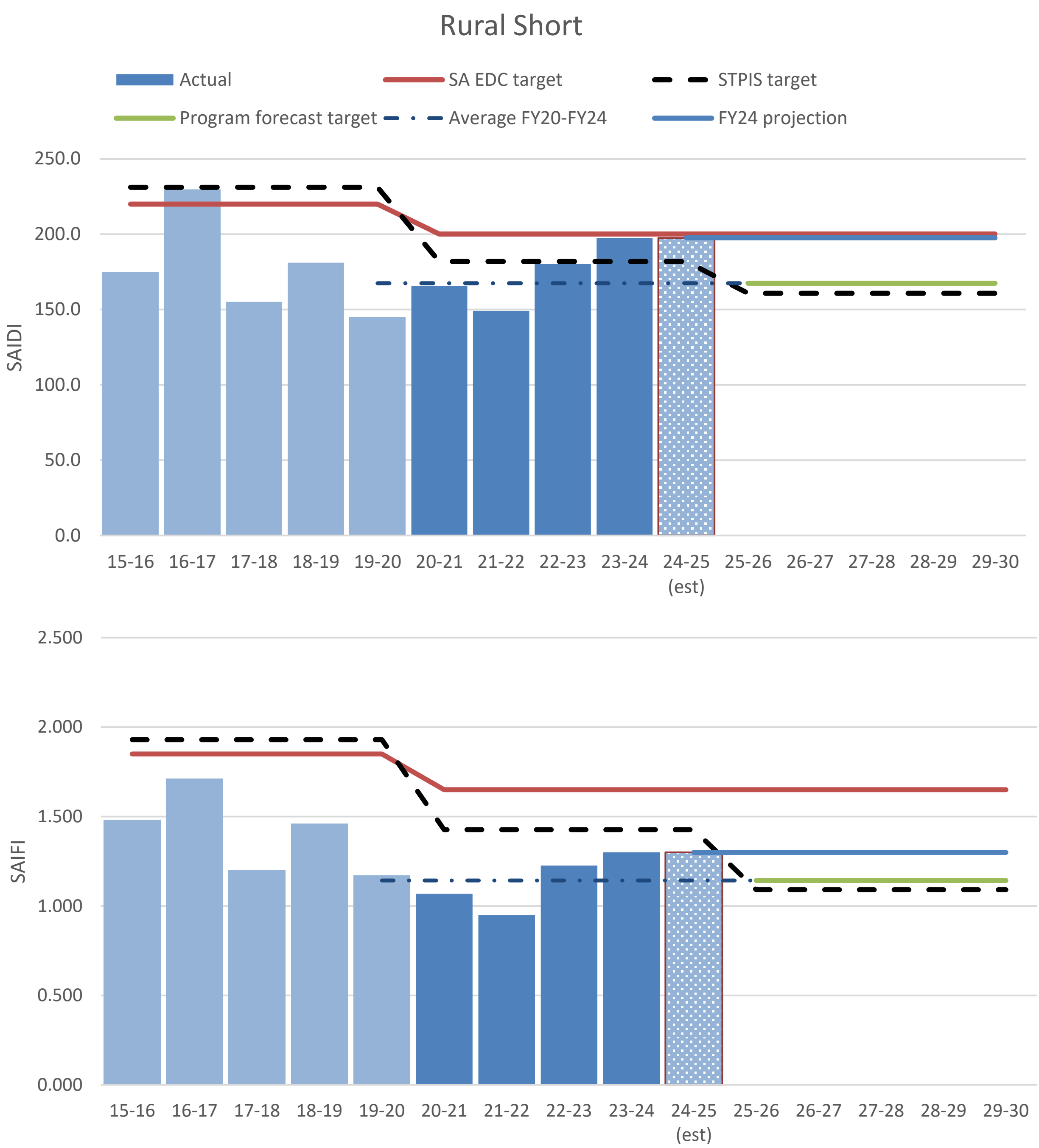


Figure 16 Historical SAIDI and SAIFI (ex MEDs) and the level – Rural Short feeders

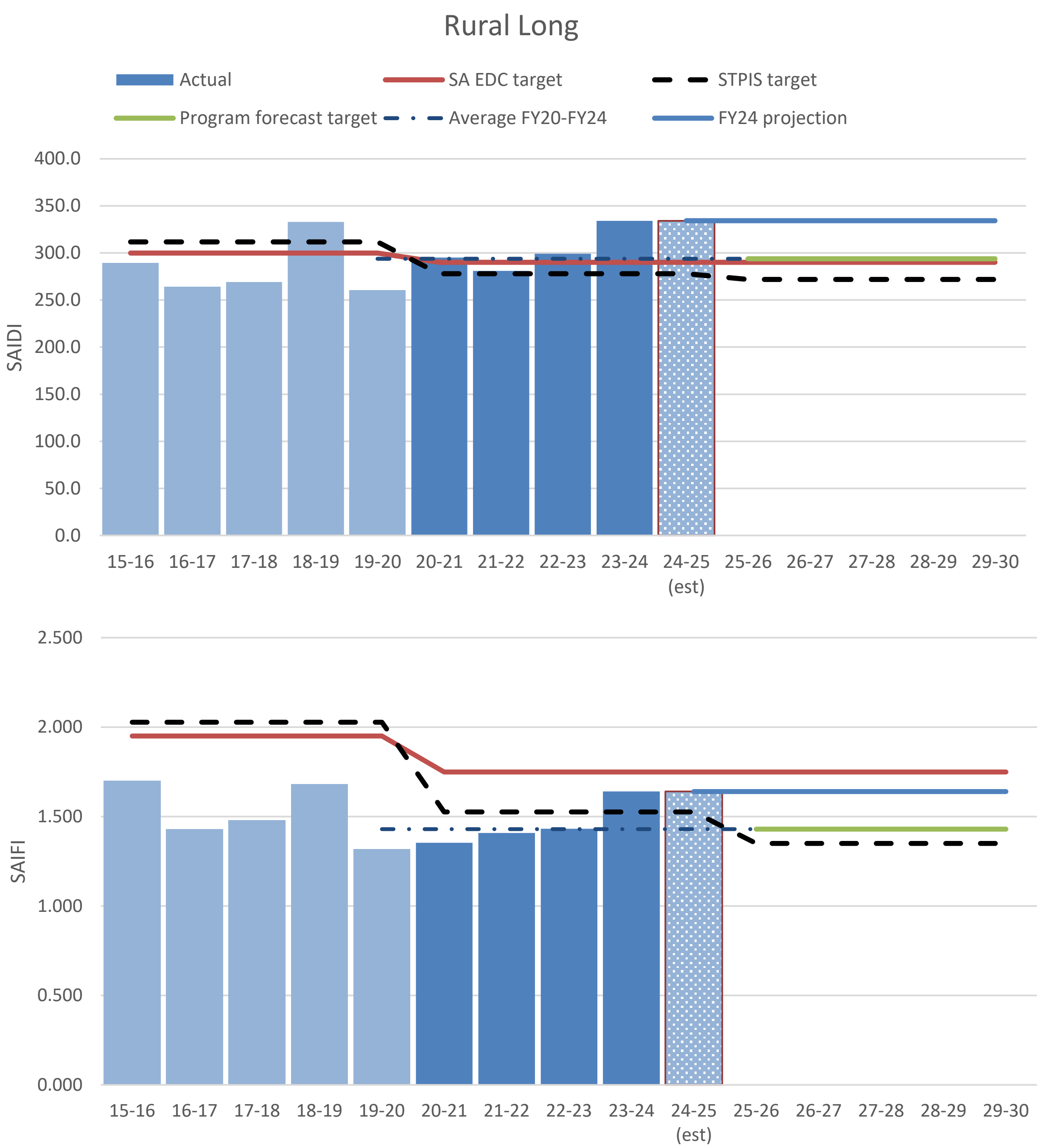


Figure 17 Historical network SAIDI and SAIFI (ex MEDs) and the level – Rural Long feeders

B. Appendix – Maintain Reliability program historical expenditure

This appendix provides further details of the historical expenditure on the Maintain Reliability program component[49].

The chart below provides a breakdown of historical program expenditure by the primary effect on reliability of the upgrade, which can be viewed as three specific types:

1. reducing the number of customers who will have a 'sustained' interruption to their supply following an outage (this reduces SAIFI, which in turn can reduce SAIDI)
2. avoiding an outage occurring (this reduces SAIFI, which in turn reduces SAIDI)
3. reducing the average time to restore supply to interrupted customers (which reduces SAIDI, but does not reduce SAIFI).

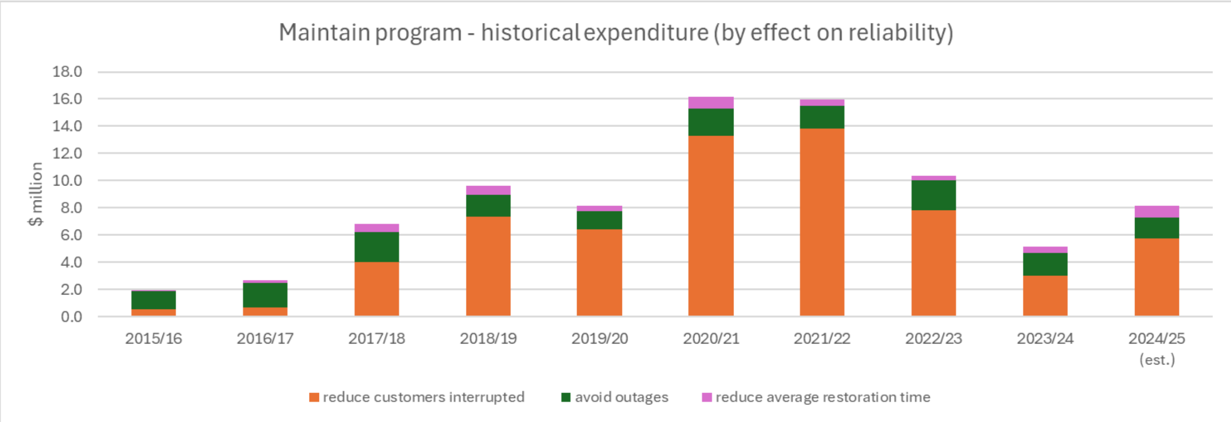


Figure 18 Historical program expenditure – by reliability effect

The key points to note from this chart are as follows:

- **Reducing customers interrupted** - The majority of expenditure over the last 5-year period (approximately 70%) has been on upgrades that reduce the number of customers receiving a sustained interruption following an outage i.e. the outage is not avoided, but its effect is reduced should it occur. This is achieved by installing switching devices on the network that can be used to rapidly restore some or all customers following the outage, such that these customers do not receive a sustained interruption.
- **Avoid outages** - A smaller proportion (approximately 15%) has been on upgrades that are intended to avoid an outage occurring. These solutions are usually specific to the cause of outage (e.g. caused by vegetation, animals, lightning, etc.).
- **Reduce average restoration time** - The smallest proportion (approximately 5%) has been on upgrades intended to reduce the average restoration time (i.e. average interruption duration). These solutions typically involve devices to either more rapidly find the physical location of a fault on a feeder or to reduce the time to restore some interrupted customers by replacing manually operated switches (i.e. a switch that field crews need to be travelled to in order to operate) with remote-controlled switches (i.e. a switch that can be operated from the control room).

[49] For the avoidance of doubt, this appendix does not include any expenditure or explanations associated with the Protection Management program component.

Expenditure to reduce customer interruptions and our automation program

The charts below show the annual profile of expenditure which was aimed at reducing the number of customers receiving a sustained interruption following an outage, showing the breakdown by network type (the first chart) and the breakdown by upgrade type (second chart).

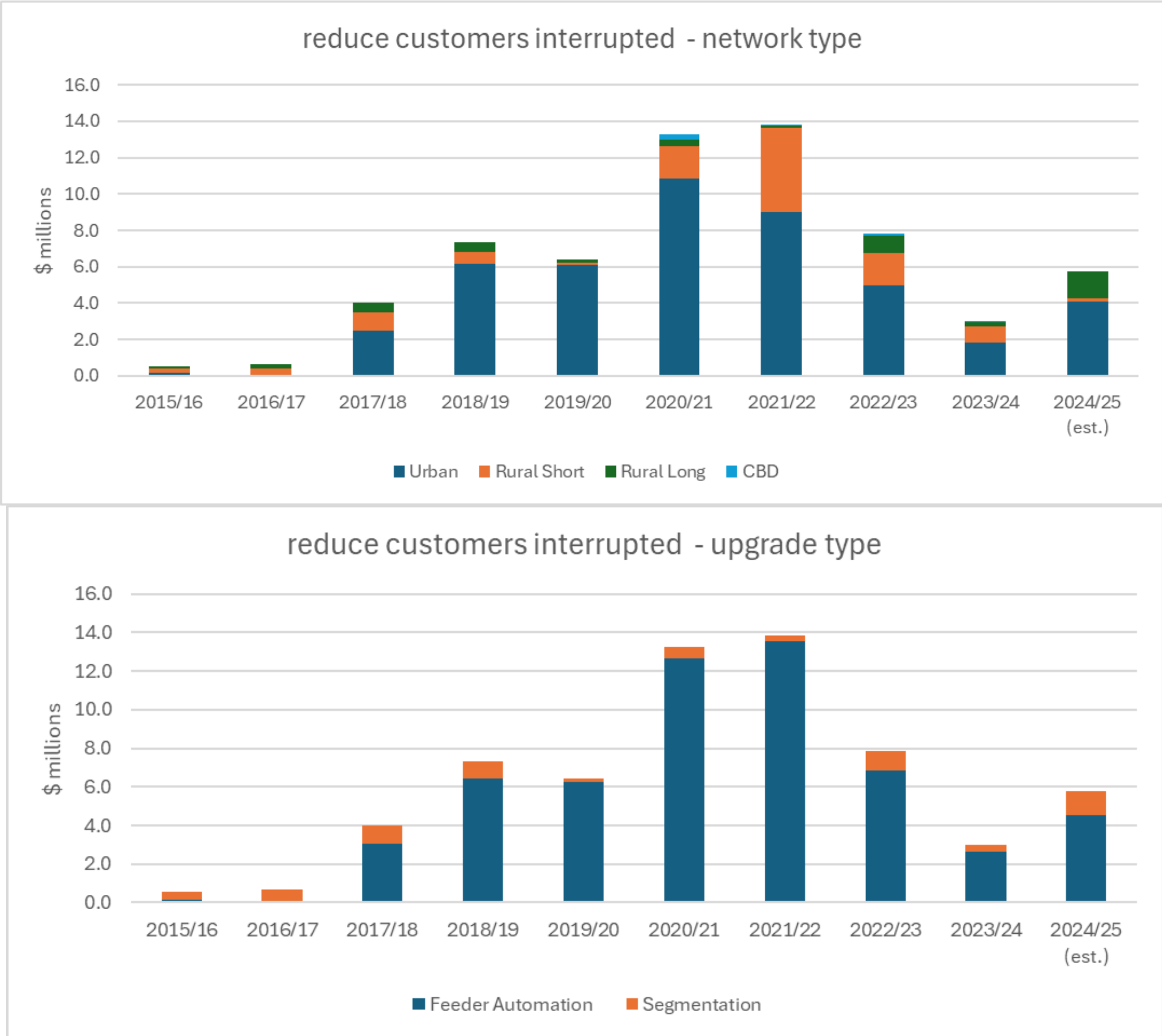


Figure 19 Historical program expenditure – reduce customers interrupted

The key points to note from these charts are as follows:

- the majority of the expenditure (approximately 75%) was used to upgrade urban feeders and this upgrade was primary installing feeder automation;
- a smaller portion (approximately 20%) was used for upgrading Rural Short feeders - this upgrade was primarily automation upgrades, but also included feeder 'segmentation' upgrades;[50] and
- a small proportion (approximately 5%) was associated with upgrading Rural Long feeders. This upgrade primarily involved feeder segmentation.

In appreciating the significance of the pattern of historical spend, the spend on the 'automation' of Urban (and some Rural Short feeders) is the primary reason for the high expenditure levels during the current RCP, which were well above the notional AER allowance most notably in 2020/21 and 2021/22. This was a matter

[50] Automation is not appropriate for radial rural feeders (i.e. there are no alternative supply paths to switch around). 'Segmentation' is the approach used on radial rural feeders, and typically involves installing mid-line recloser and/or sectionaliser on rural feeders to ensure that customers upstream of the fault do not receive a sustained interruption.

raised in the EMCa review and we understand is a significant factor in the AER's view that reliability may be improving, particularly if the lag effects of these high levels of spend are allowed for[51].

We intended to increase the investments in automation during the RCP (i.e. accelerating the planned longer-term program) to trade off penalties through the CESS with anticipated rewards through STPIS, which in turn would also pass across benefits to our customers in improved reliability. However, during the RCP we were directed by the Office of the Technical Regulator (OTR)[52] to implement the Distribution Under Frequency Load Shedding Project. This required us to use the same resource as needed to implement the feeder automation upgrades, and so we scaled down the feeder automations upgrades while the Distribution Under Frequency Load Shedding Project was being implemented. This project was completed in August 2024. Unfortunately, unplanned network outage incidents have increased far more than anticipated during the current RCP for reasons discussed in section 5.2 (e.g. flying-foxes, lightning, vegetation, third-party). This increase has masked some of the gains we had expected to see from advancing the automation program.

To demonstrate the automation program has still been effective (i.e. it has achieved its intended aims) and show the extent of the lag effect of this program, the charts below show how the annual customer interruptions per outage and average sustained interruption duration have changed due to this program. The first chart shows these two measures for only the urban feeders that had the automation upgrade during the 3-year period between (2019/20 and 2021/22) and the second chart shows these two measures for all urban feeders.

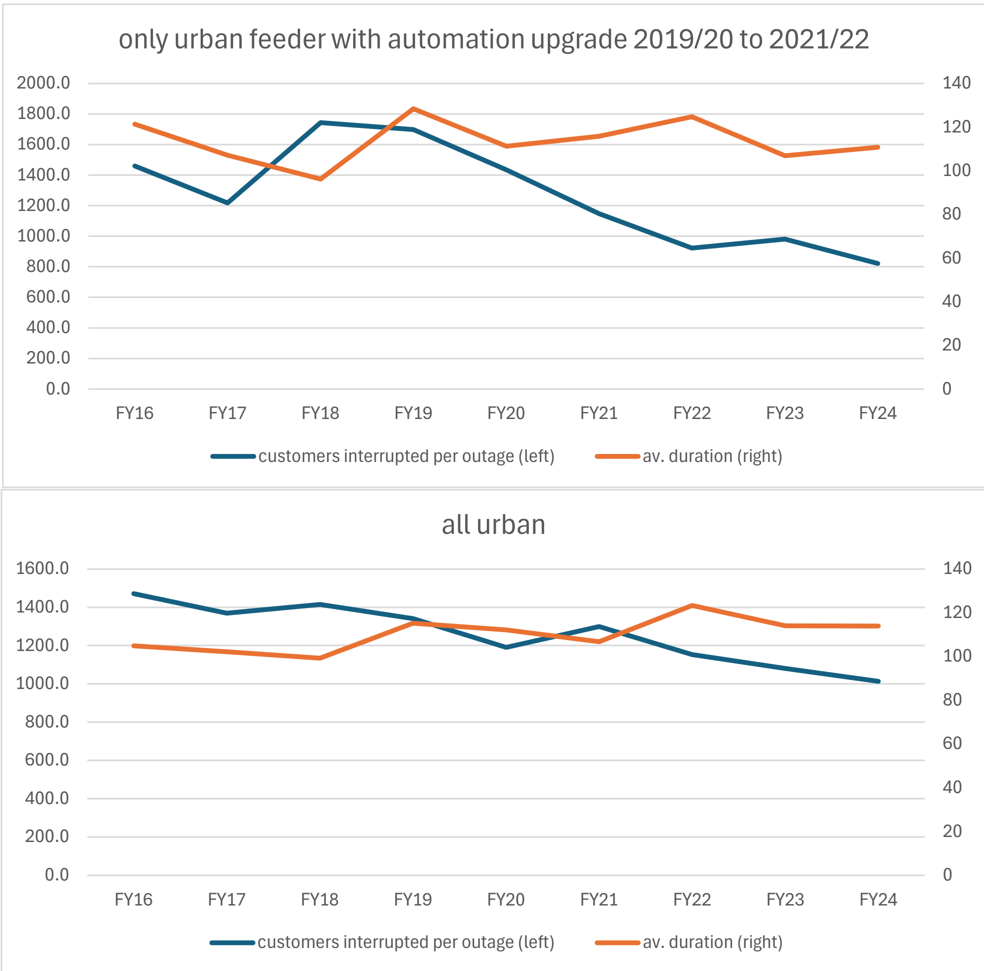


Figure 20 Automation upgrade - impact on customer interruptions per outage and interruption duration

51 AER Draft Decision, Attachment 5, page 35

52 The AER approved a pass through for the additional expenditure associated with this OTR direction. The OTR is the jurisdictional technical and safety regulator.

These charts demonstrate that the intended improvement effect of this upgrade has been realised, with both charts showing a declining number of customers interrupted per outage, particularly following the high spend levels in 2021/22 and 2022/23.

Importantly, these charts also demonstrate that there is not a long lag between the investment and its effect on reliability. The effect on reliability is seen almost immediately. That is as expected as any feeder identified for this upgrade will be subject to a number of faults in any year (on average 8 faults per year) and so the upgrade should have an observable effect on performance the year it is applied (assuming on average the upgrade is commissioned by the mid-year point).

It is also important to note that we typically see a slightly worsening average sustained interruption duration (ie CAIDI) with this solution. However, this reduction is not an indication that our actual field operations are declining (ie it is not because field response and repair times are worsening). Rather, it is because many customers that would have received a sustained interruption prior to the upgrade, will now be restored very rapidly through this upgrade such that they will now only receive a momentary interruption. As such, CAIDI may increase even when the number of customers interrupted decreases.

The critical point is that even though this effect can reduce the 'apparent' benefits as the SAIDI improvement appears less than the SAIFI improvement, this upgrade approach is still typically an optimal solution as it can mitigate the effects of a much larger proportion of the high-risk outages affecting the feeder. Automation solutions are particularly effective for urban feeders and the sub-urban parts of our rural towns where various interconnections can exist that can be utilised to automatically switch supply paths around a faulted part of the network to ensure supplies can be maintained to our customers following an outage.

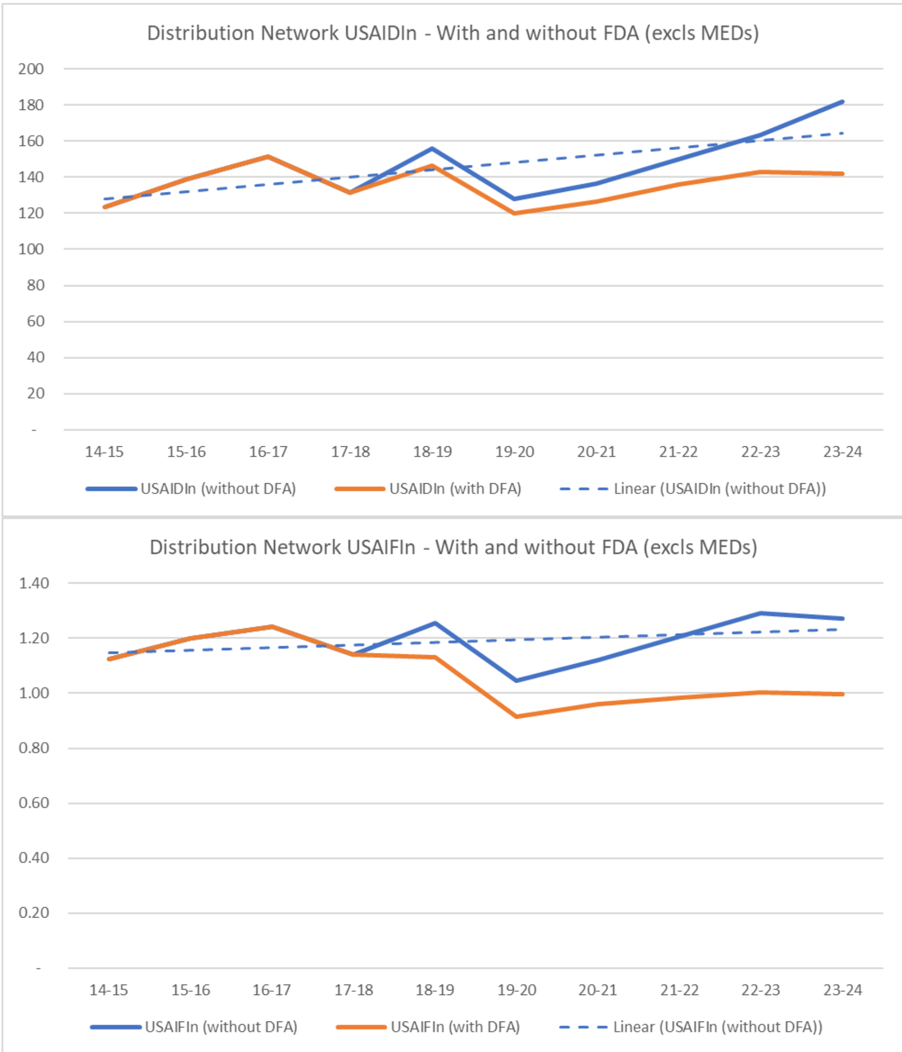


Figure 21 Automation upgrade – impact on SAIDI and SAIFI

The overall effect on reliability of the automation upgrades over the current RCP (to 2023/24) is shown in Figure 21 above. These charts provide our estimate of SAIDI and SAIFI without the upgrades compared to the actual performance, indicating that the investment in this upgrade over the last 5 years (i.e. 2019/20 to 2023/24) has arrested a decline in SAIDI of approximately 39 minutes and a decline in SAIFI of 0.28 interruptions that would have resulted without the investment[53]. The SAIFI charts also shows that the effect of the upgrades broadly follows the same profile of expenditure investment, demonstrating that there is not a significant lag in the full benefit being observed.

Expenditure to avoid outages

The two charts below show the annual profile of expenditure which was aimed at avoiding outages, showing the breakdown by network type (first chart) and the breakdown by upgrade type (second chart).

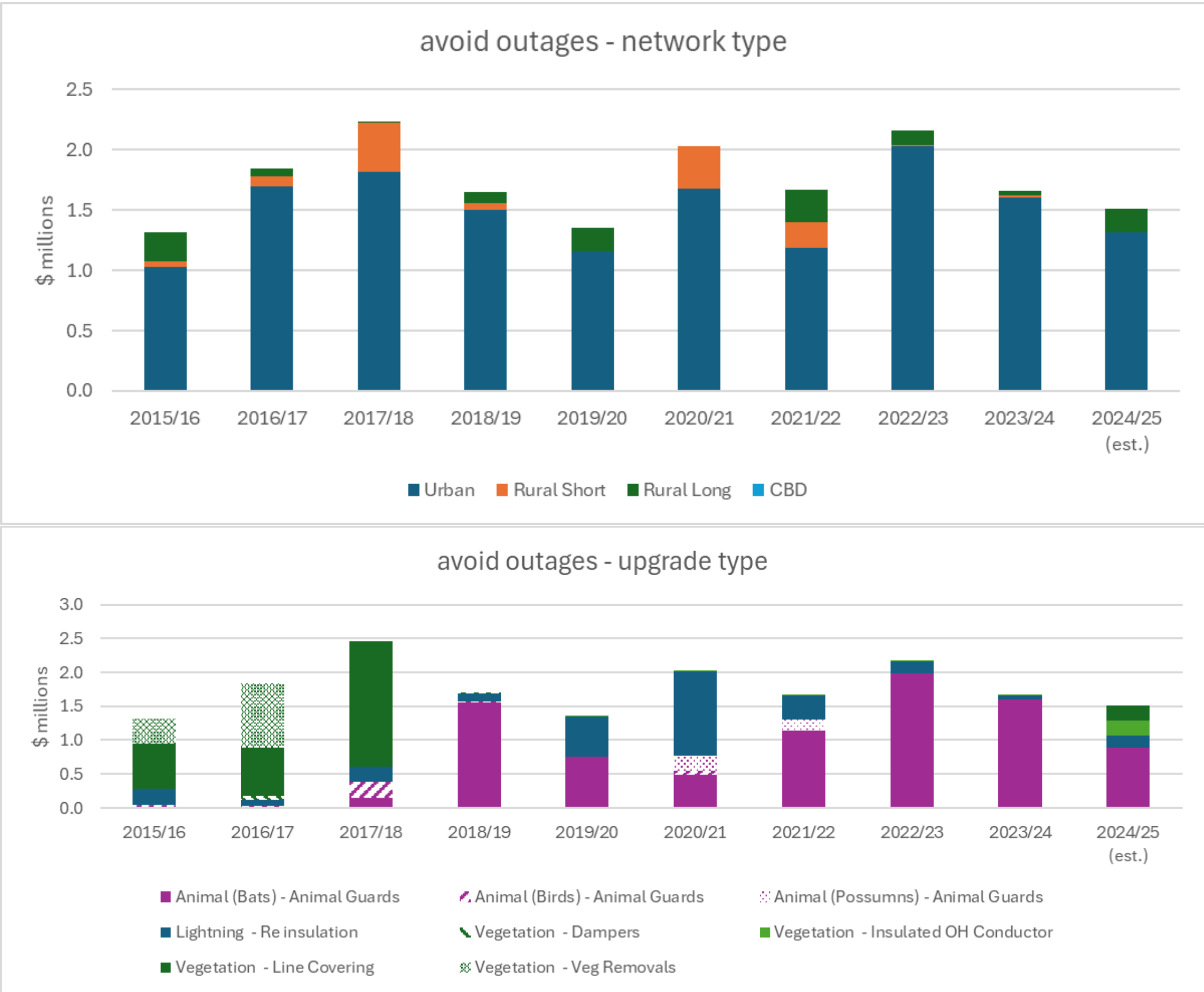


Figure 22 Historical program expenditure – avoiding outages

The key point to note from these charts is that the majority of the expenditure to avoid outages (approximately 85%) over the last 5 years was incurred to avoid outages on Urban feeders. This upgrade has primarily been installing animal guards to mitigate outages due to the grey-headed flying fox issue discussed in our original business case[54] and in section 5.2. This issue has been far worse during the current RCP than anticipated and as discussed in section 5.2 it is expected to continue. The other main upgrade on Urban

[53] This only represents the decline that has been avoided by the automation upgrades and not the further decline that would have occurred had the other components of this program not occurred.

[54] 5.9.3 Business case: Maintain Underlying Reliability Performance Program, pg 10

feeders this year (2024/25) is installing line covering and insulated overhead conductors to avoid outages due to vegetation (we discuss the factors driving this need in section 5.2).

Similar proportions of expenditure to avoid outages have been incurred to upgrade Rural Long and Rural Short feeders (approximately 7% each). This upgrade primarily involved re-insulation (i.e. avoiding outages due to lightning), installing animal guards (i.e. avoiding animal-caused outages, by installing animal guards). We have also replaced a small amounts of bare overhead conductors with insulated conductors on Rural Short sections in the Adeliade Hills.

We discuss outage trends associated with these outage causes in section 5.2.

Expenditure to reducing average restoration time

The charts below show the annual profile of expenditure which was aimed at reducing the average interruption restoration time, indicating the breakdown by network type (first chart) and upgrade type (second chart).

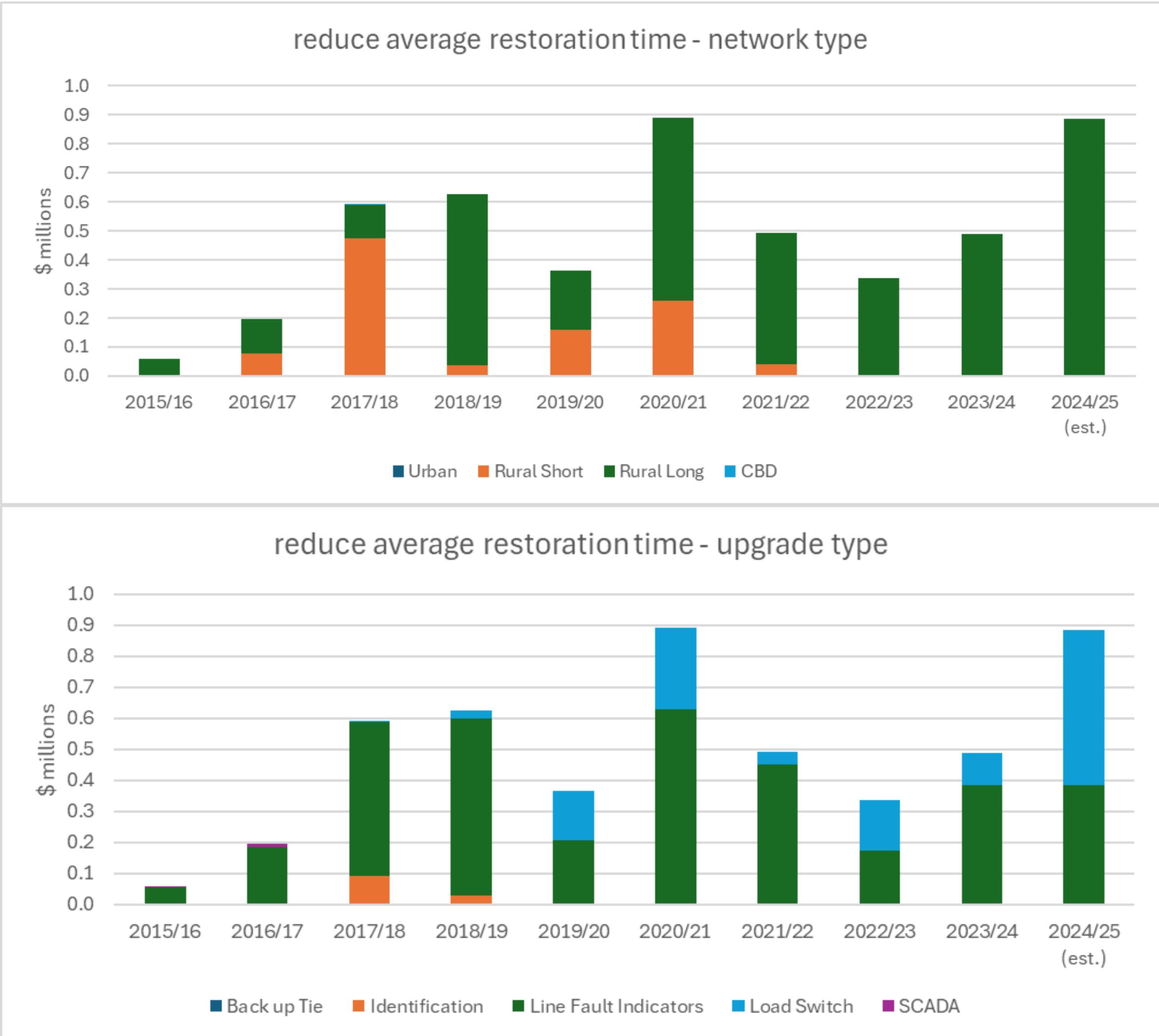


Figure 23 Historical program expenditure – reducing the average restoration time (i.e. interruption duration)

The key point to note from these charts is that these upgrades have only been used on our rural feeders and predominantly our Rural Long feeders as these feeders are more susceptible to long duration interruptions. The main upgrade applied has been installing LFI to allow our field crews to locate faults along our rural feeders more rapidly. We now have widespread installation across the network, with SAPN having the highest LFI deployment among DNSPs. This upgrade, however, has largely excluded our Singe Wire Earth

Return (**SWER**) network, as we have had to develop a LFI design suitable for our SWER network[55]. We intend to deploy LFIs on our SWER network during the next RCP.

We have also been replacing some manually-operated load switches with remote-controlled switches to allow customers upstream of faults to have their supplies restored more rapidly.

[55] This was required due to the low loads and on the SWER network and reverse power flows that can occur at times. We have been trialling devices since 2018 and have will be acceptance testing a device in late 2024.

C. Appendix - historical reliability performance

This appendix provides updates to the reliability performance charts provided in the business case. These charts have been revised to include the 2023/24 performance, which was not available at the time of preparing the business case. These charts show the annual SAIDI and SAIFI[56] and the contribution by outage cause for each network type (these charts exclude CBD, which is not the focus of this program). All charts exclude MEDs.

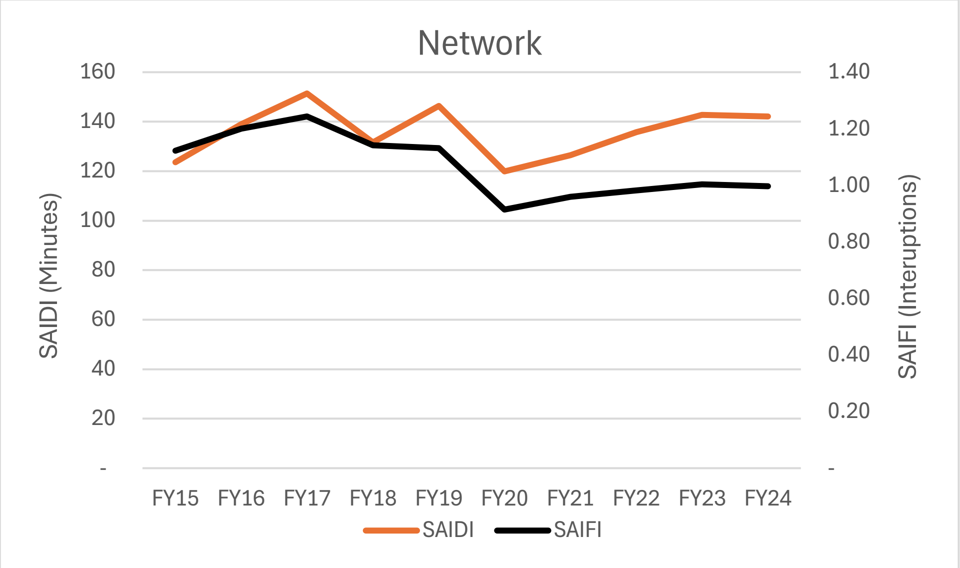


Figure 24: Network performance – (excluding MEDs)

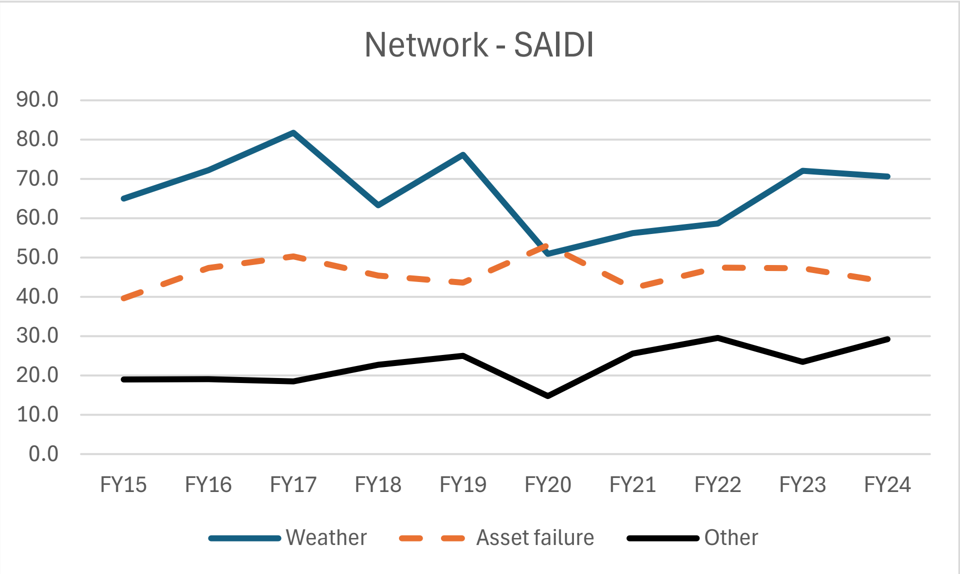


Figure 25: Network SAIDI performance – by high-level cause (excluding MEDs)

[56] SAIFI by outage cause was not shown in the original business case

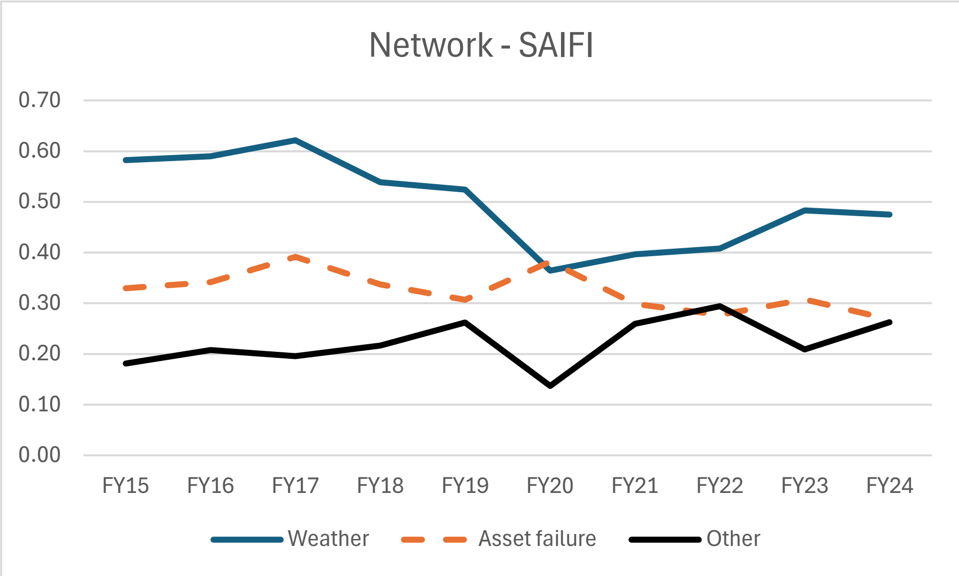


Figure 26: Network SAIFI performance – by high-level cause (excluding MEDs)

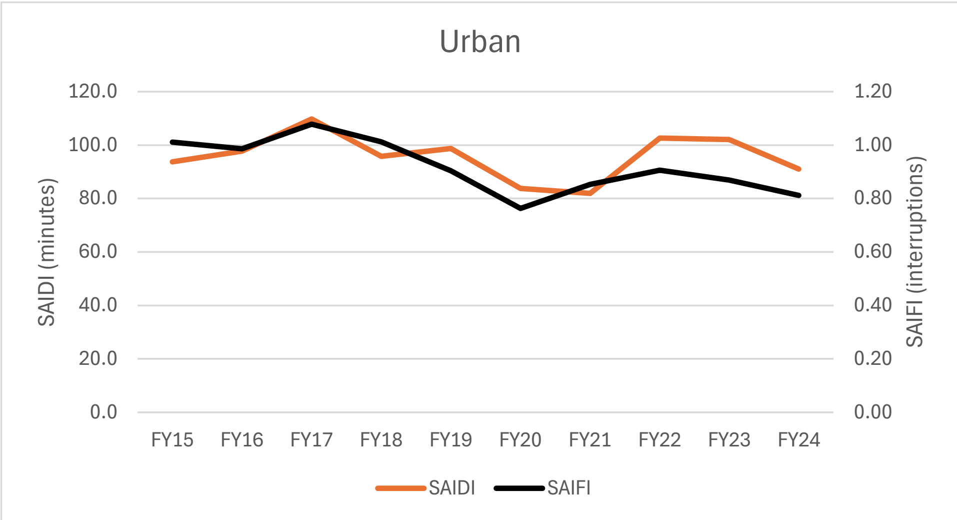


Figure 27: Urban performance – (excluding MEDs)

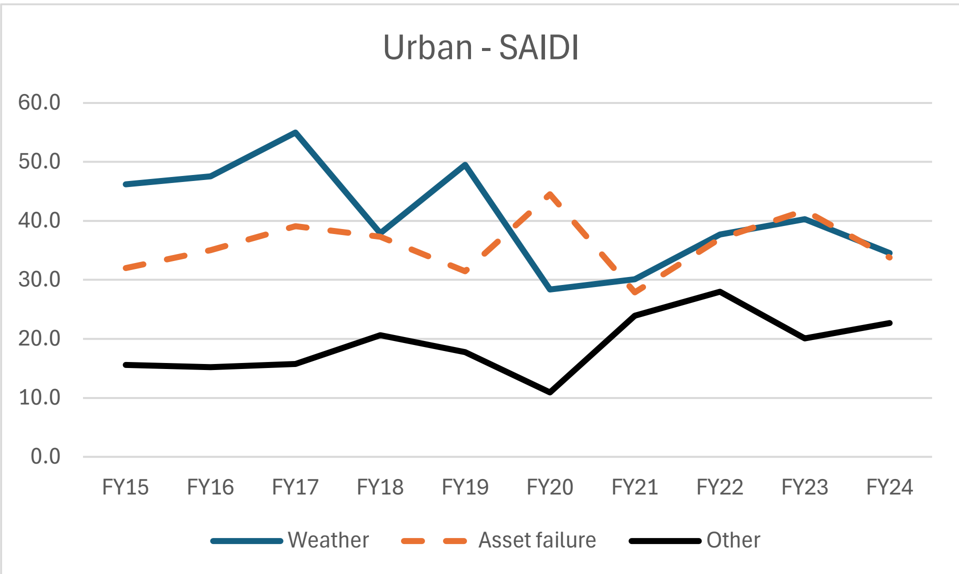


Figure 28: Urban SAIDI performance – by high-level cause (excluding MEDs)

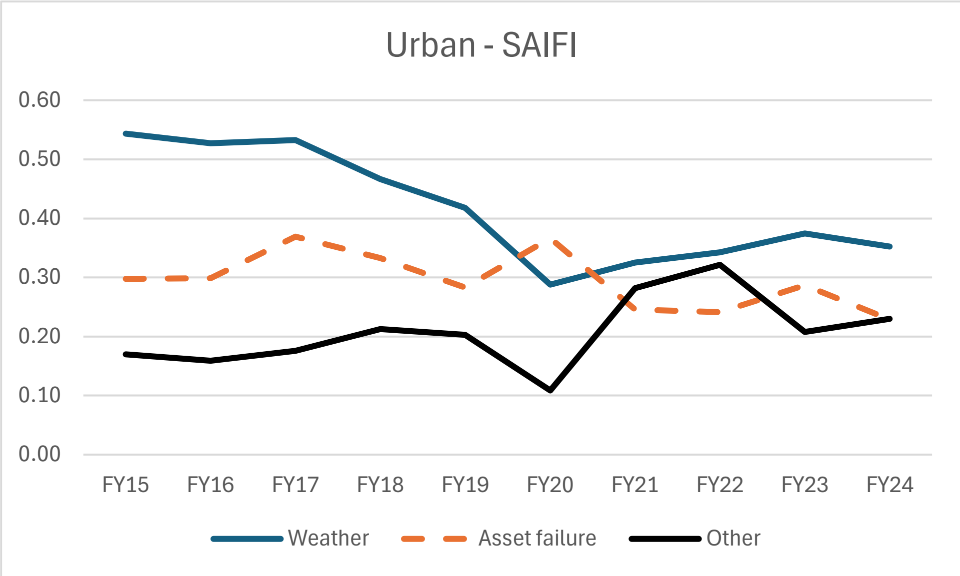


Figure 29: Urban SAIFI performance – by high-level cause (excluding MEDs)

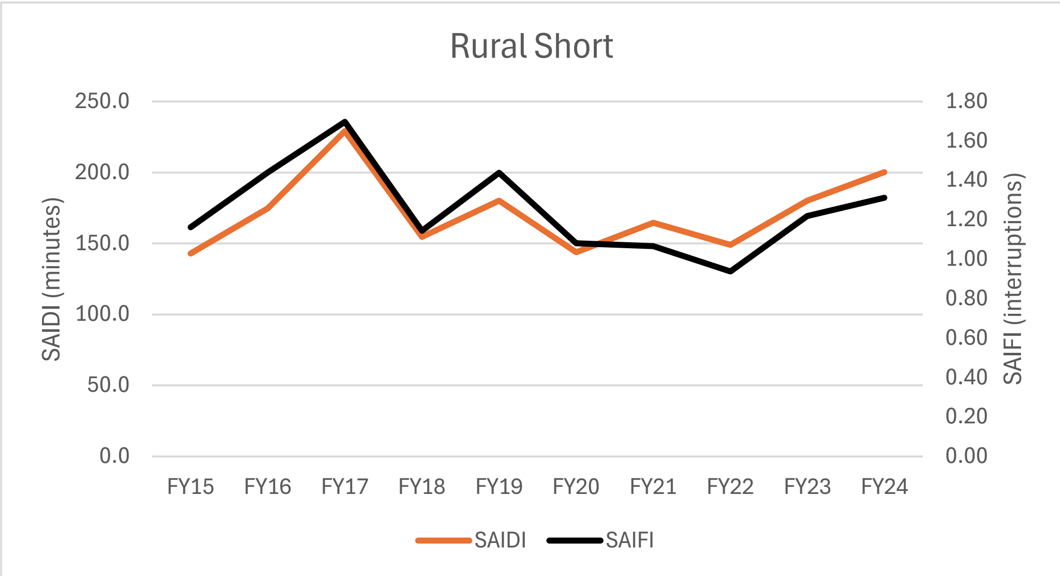


Figure 30: Rural Short performance – (excluding MEDs)

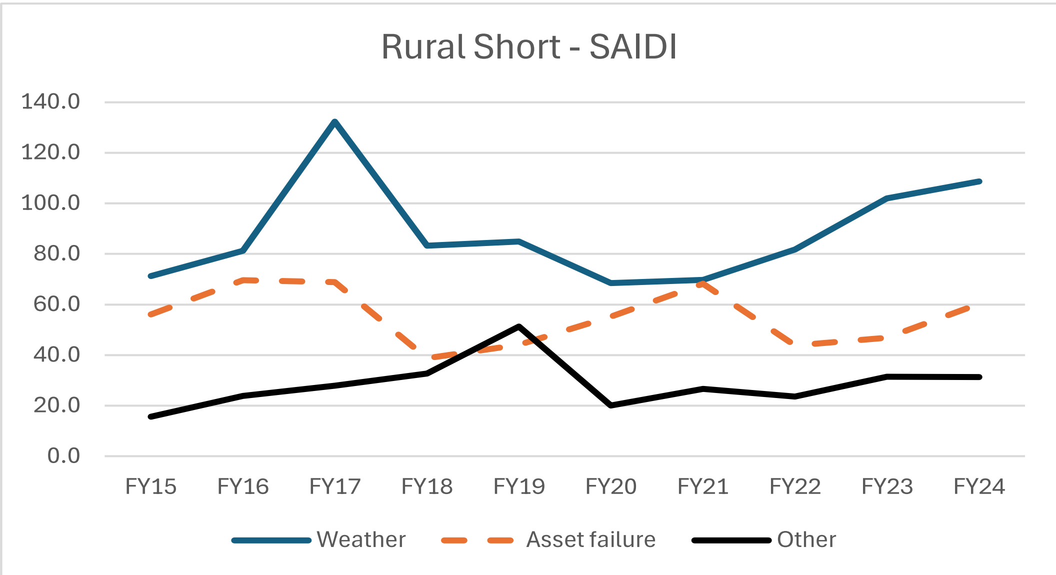


Figure 31: Rural Short SAIDI performance – by high-level cause (excluding MEDs)

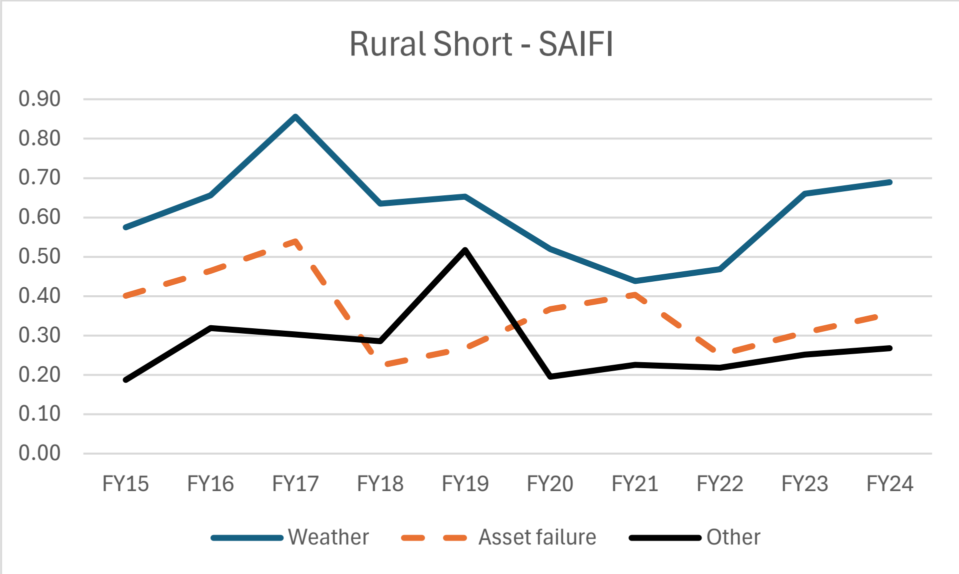


Figure 32 Rural Short SAIFI – by high-level cause (excluding MEDs)

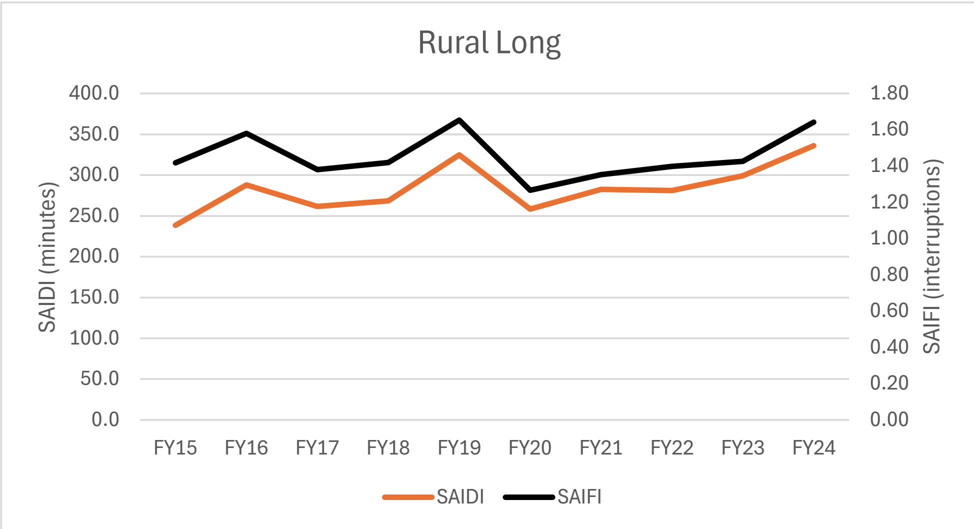


Figure 33: Rural Long Performance – (excluding MEDs)

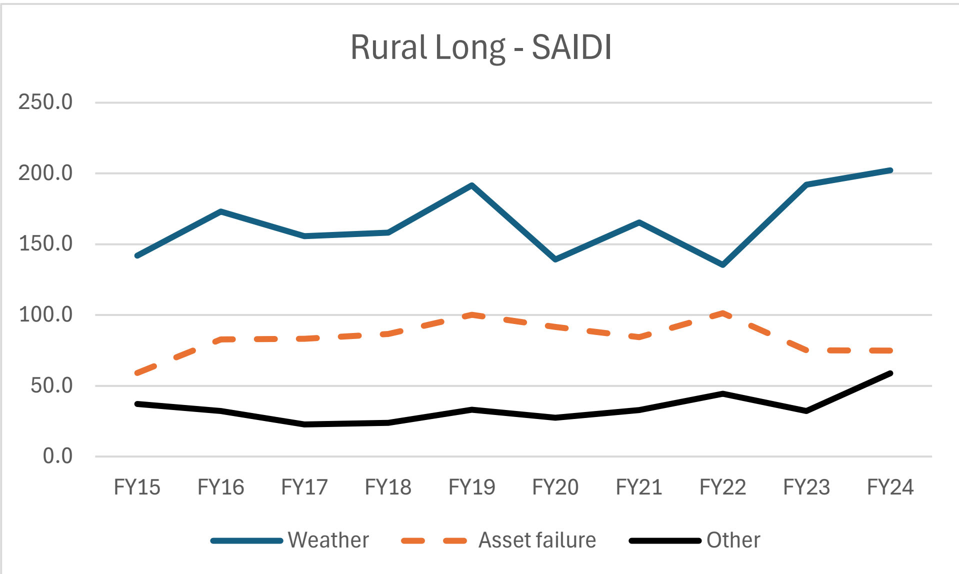


Figure 34: Rural Long SAIDI performance – by high-level cause (excluding MEDs)

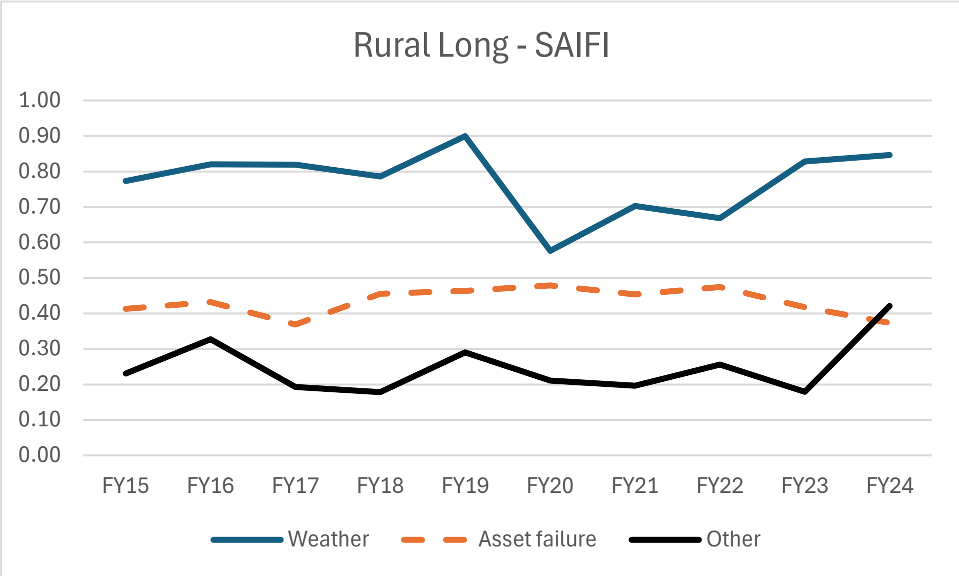


Figure 35 Rural Long SAIFI performance – by high-level cause (excluding MEDs)

D. Appendix – annual wind speed analysis

This appendix summarises the key results from our analysis of historical wind speed. This analysis has been used to examine to what extent wind speed could be driving the increasing number of vegetation-related outages that have affected our network over the current RCP (see discussion in Section 5.2.4). As part of this analysis, we have compared daily wind speeds for two locations that are representative of our network, Adelaide Airport and Mount Crawford.

The charts below summarise the results of this analysis, indicating the number of days in wind speed bands that typically result in vegetation outages and an annual wind energy metric that provides an indication of the overall wind stress that year.[57]

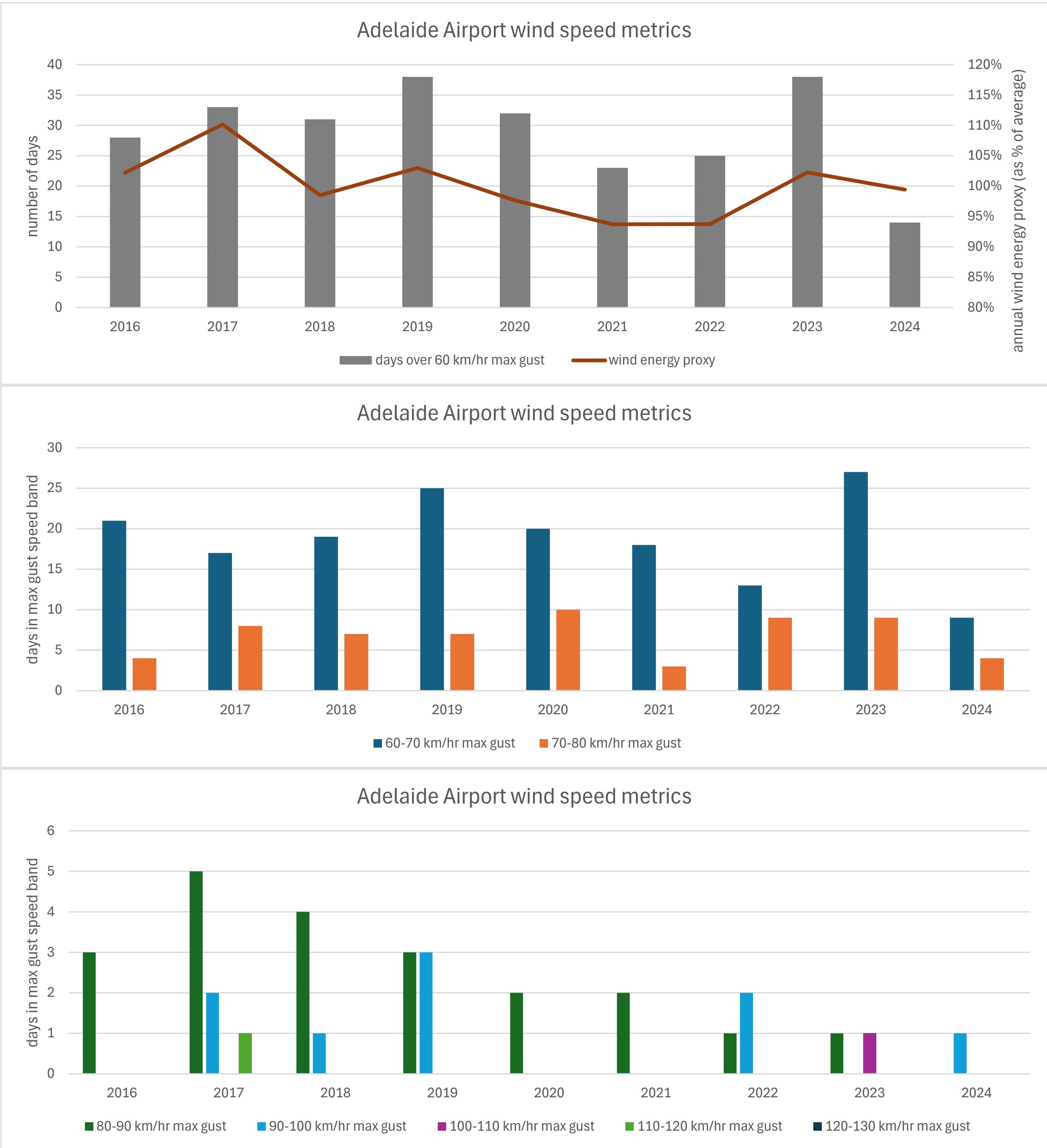


Figure 36 Wind speed analysis results – Adelaide Airport

[57] This metric is calculated as the sum of square of the daily maximum wind speed.

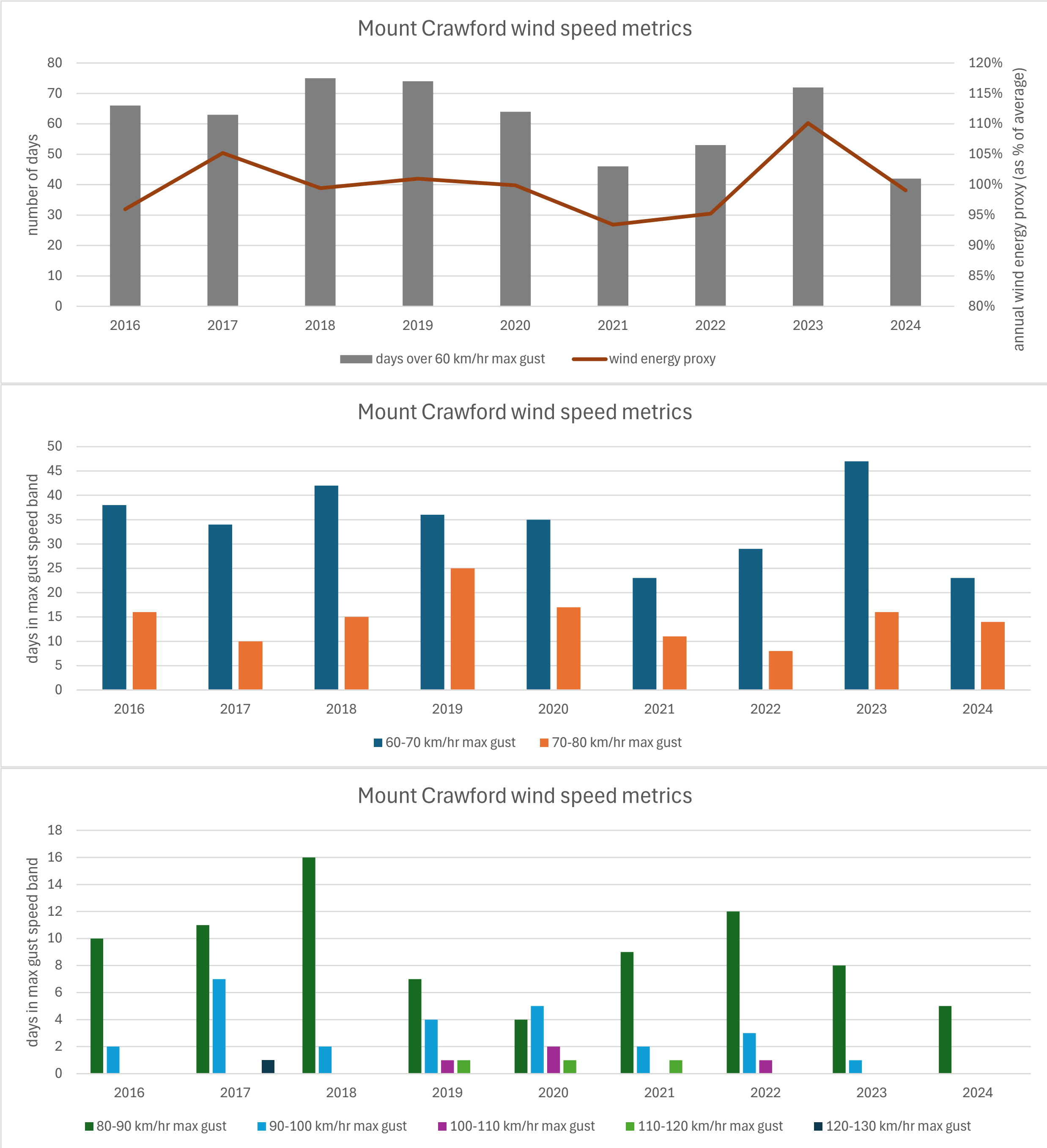


Figure 37 Wind speed analysis results – Mount Crawford

Our analysis suggests that unusually high wind speeds are unlikely to be the primary reason for the high vegetation-related outage volumes over the current RCP. The wind speed in 2022/23 was likely unusually high (with higher wind energy and more days in the critical high wind bands), but wind speeds in 2021/22 and 2023/24 were more usual – 2023/24 was arguably lower than usual (with less than usual number of days in the critical high wind bands).

E. Appendix – Historical performance to the EDC restoration targets

This Appendix provides our historical performance to the EDC restoration targets, including 2023/24 performance. These targets are set for each network category and define the percentage of customers that must be restored within a defined duration (see charts below for the percentage targets, duration limits and our performance for each network category, excluding CBD).

The recent performance indicates that both Rural Short and Rural Long feeders are likely to consistently exceed the EDC restoration time targets during the next RCP, with both types showing:

- worsening performance on average over the last 5 years compared to the previous 5-year period
- 2023/24 performance has worsened further since 2022/23
- performance in 2023/24 was significantly above targets.

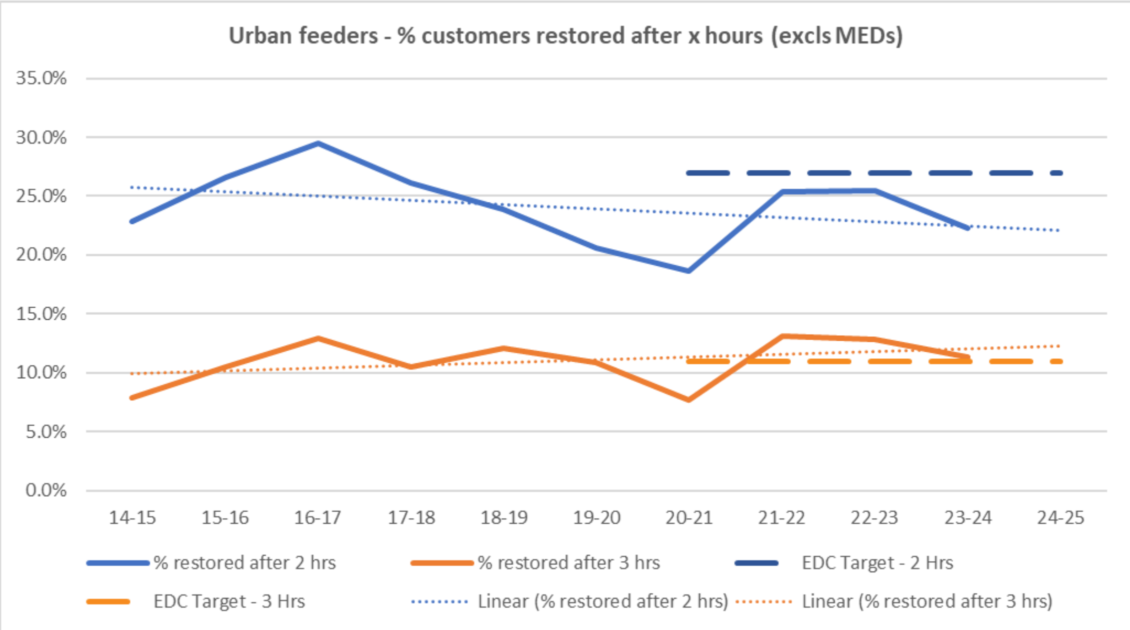


Figure 38: Urban Feeders – Percentage customers restored after x hours (Excl MEDs)

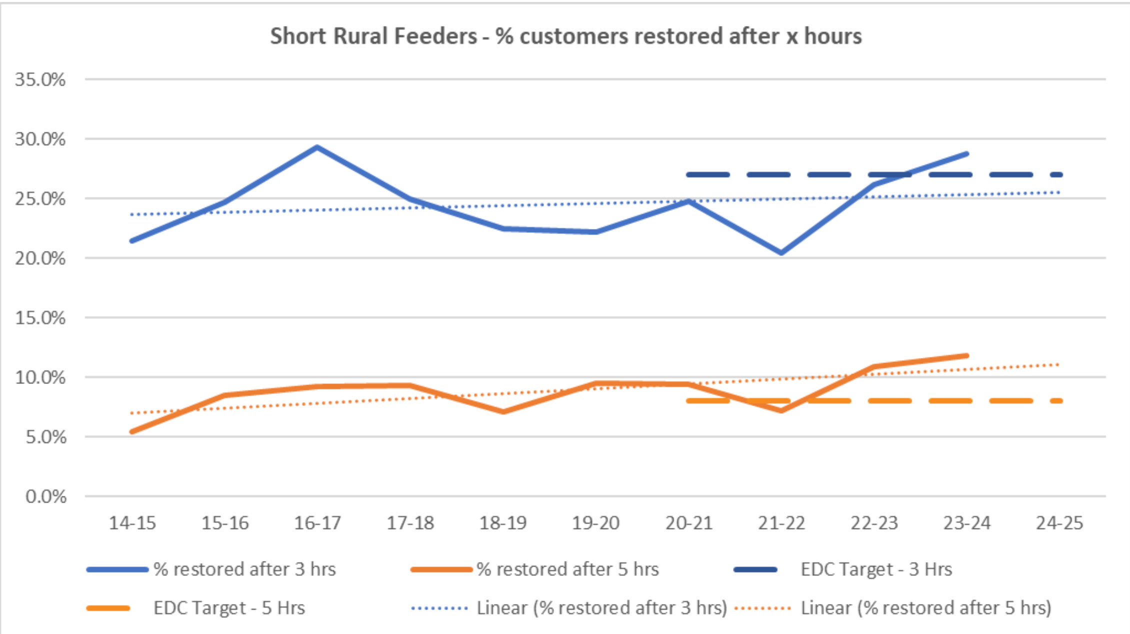


Figure 39: Short Rural Feeders – Percentage customers restored after x hours (Excl MEDs)

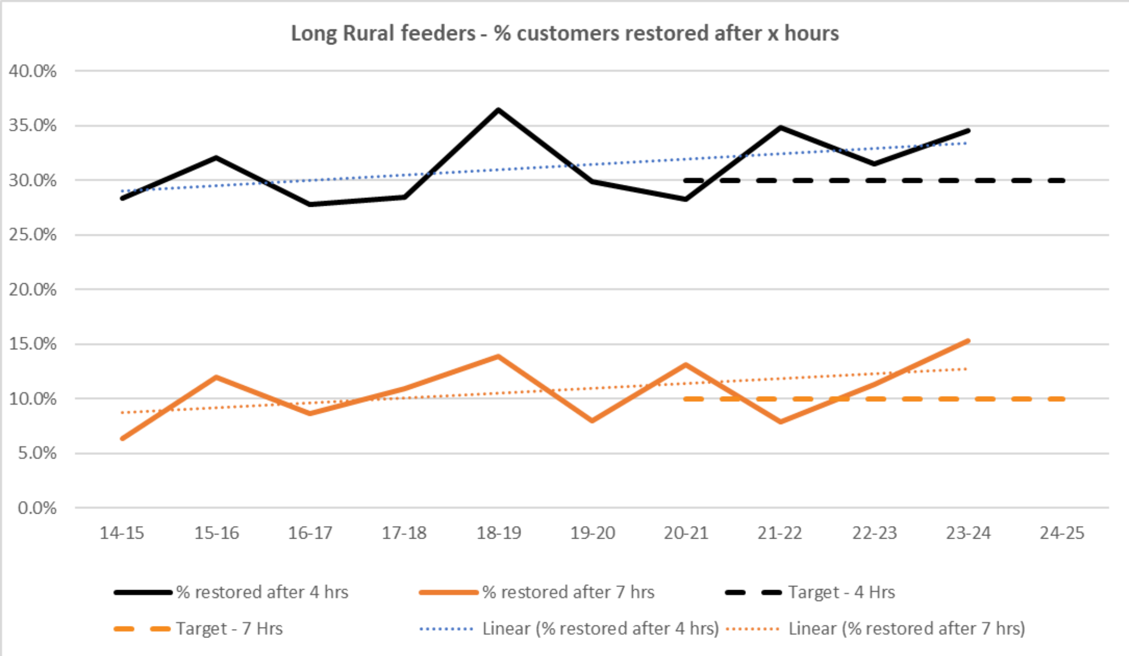


Figure 40: Annual performance to EDC restoration targets

F. Appendix- Protection Management program tasks

This Appendix provides further details on the various tasks that form the Protection Management program component, which is discussed in Section 7.

Ongoing protection settings audits and review

SA Power Networks has an ongoing substation audit program in place to audit protection device configuration (including settings) at substations. The aim of this program is to avoid significant outages (i.e. substation outages) by proactively checking the protection configuration including relay settings and files, functionality of equipment and drawings. By undertaking an audit of protection device settings, any discrepancies or issues that are identified can be fixed proactively to avoid a potential maloperation of protection equipment. Auditing the protection configuration enables drawing errors to be identified and fixed which may have been the cause of an inadvertent trip during fault and switching operations if left undetected.

This task is an ongoing requirement. When problems are identified, they inform the subsequent task to rectify protection issues as they arise.

Review settings performance of the network

The settings performance of the network is measured by monitoring and tracking outages and defects found on the network that are attributed to protection issues. This involves regular monitoring, reporting and analysis which facilitates the identification of protection issues as they arise due to outages and visibility of trends that can be used to anticipate and proactively manage future issues.

By monitoring maloperations, we can identify and rectify any issues to prevent the same maloperation from happening again at the affected site. In addition, where the issue may also be relevant to other sites, it is important to proactively implement a solution at other affected sites to reduce the likelihood of a future preventable maloperation.

This task is an ongoing requirement. When problems are identified, they inform the subsequent task to rectify protection issues as they arise.

Rectifying protection issues as they arise

The Protection Management Program includes the enhancement of protection systems following learnings from any outage, but especially from significant outage investigations (e.g. substation outage investigation). Where a protection system enhancement has been identified, it is crucial that it is not only implemented to prevent recurrence at the affected site but also to roll it out to other potentially vulnerable locations.

Detecting problems with any protection system within the network can be challenging and these issues typically surface during a power system fault. Consequently, activity levels for this task can vary and this is largely due to network conditions which are often influenced by uncontrollable factors such as weather conditions.

Issues can also be identified through substation audits and as a result of settings performance review (monitoring and tracking outages and defects that are attributed to protection issues).

Operational Support

The Protection Management Program includes operational support to ensure the network can be operated safely and efficiently by the Network Operations Centre (**NOC**). Protection engineering assessment is undertaken to determine appropriate protection settings to be implemented temporarily which will the ensure safety of personnel and equipment during switching (associated with capital works) and when crews are undertaking live line work (undertaken to minimise disruption to customers).

This task is an ongoing requirement.

Protection software and systems management

In addition to providing protection advice, it is essential that information stored within the protection setting software is up to date with accurate settings and device status for operational use.

Ongoing evaluation, testing and administration is required to optimise and maintain protection software programs to ensure that network data is accurate and up to date.

Protection setting software is used to manage, issue and store protection device settings for all protection and detection devices across the network and is essential for the safe operation of the network. Protection setting software is used by multiple operational teams across the business (including the NOC during restoration and switching to restore power after an outage) to view protection device settings. It is essential that this information is readily available, up to date with accurate protection settings and device status so that the network can be operated safely by the NOC. Other protection related software is also used and managed by Protection Engineers to undertake detailed protection analysis calculations.

This task is an ongoing requirement and is required to support the protection analysis and calculations required within the Protection Management Program.

Firmware management of network protection and detection devices

Relay firmware plays an important role in maintaining the reliability and functionality of both protection devices (i.e. relays and reclosers) and detection devices (i.e. load switches). Firmware updates ensure optimised usability throughout a device life cycle including the implementation of improvements, bug fixes and security enhancements.

Evaluation and testing of new firmware is critical to ensure that any problems are identified and fixed before being commissioned on field devices. Over the current RCP there has been a significant increase in the number of automated load switches installed on the network to enable feeder automation as well as the replacement of many older relays/reclosers with new digital relays/reclosers. This means there is a greater number of devices with firmware (and settings) to manage as well as greater device diversity across the network (i.e. different manufacturers, device models and generations of firmware). This increases the importance of thorough testing of firmware before deployment to the field as well as an increase in the amount of work required to deploy firmware updates to devices across the network when this is required.

Whilst improving performance and efficiency, as modern device functionality advances, it also introduces additional complexities compared to older relays due to the advanced features and functionalities they possess. These complexities can sometimes lead to unforeseen issues or vulnerabilities and as a result increasingly thorough testing is required to be undertaken prior to the deployment of any new firmware to devices on the network.

Additionally, as technology advances rapidly, protection device firmware updates are more frequent, each potentially introducing new variables and vulnerabilities including firmware bugs introduced by the manufacturer themselves. Each new firmware version is required to be tested and approved prior to being used on the network. As these updates become more frequent this results in an increase in the testing requirements included in this program.

This task is an ongoing requirement. It is important to recognise that we have an increasing number of devices to manage and an anticipated increase in frequency of firmware updates as technology advances rapidly. However, as we discuss in section 7, we are not seeking a specific uplift to allow for this increase.

Undertaking protection reviews

Detailed protection analysis is required to review, calculate and modify protection settings on the network to ensure that device settings are optimised to prevent maloperations. This analysis ensures that the network's protection systems are adequately configured to enable granular sectionalisation, thereby minimising the number of impacted customers when a fault on the network causes an outage.

Where there are two or more protection devices in series, these devices must be coordinated to ensure that the correct device operates when there is a fault to minimise the reliability impact to customers. When an outage is experienced on the network, the protection device (i.e. relay or recloser) immediately upstream of the fault (primary device) is designed to trip and isolate the faulted section. If this protection device does not isolate the fault, the next protection device upstream (backup device) will trip to ensure the fault is isolated which results in a larger outage impacting more customers than would have otherwise been affected. When there is a 'malgrade' between devices, the backup device may operate before the primary device unintentionally. When this happens, it also complicates restoration, increasing the area that may need to be patrolled to find the fault which is likely to extend the duration of the outage. Protection coordination between devices to ensure an upstream protection device does not trip for a fault beyond a downstream device impacting customers unnecessarily is fundamental to achieving our regulatory reliability obligations.

One of the key factors used to calculate protection coordination is network impedance which determines the expected fault levels at protection devices. Protection Engineers consider the fault level when calculating protection device settings to ensure that the correct device operates for a fault. The network is constantly evolving and changing and there are various factors which can result in changing fault levels on the network. This includes:

- new customer connections which affect the source impedance;
- conductor/cable/equipment upgrade; and
- previously unknown conductor/cable data becoming available or where incorrect data is identified and updated.

All of these factors can result in a change in the expected fault levels which are used to calculate appropriate protection settings. When the fault levels change, if the protection settings aren't reviewed and adjusted accordingly this can impact the reliability of the network if there is an unidentified maloperation between devices (i.e. an upstream device operating instead of or in addition to a downstream device for a fault beyond the downstream device).

Where a fault is beyond an automated detection device (i.e. load switch) the detection device is designed to sectionalise the affected section during the dead time of an upstream protection device reclose allowing the rest of the feeder to be restored. When a load switch does not correctly isolate the fault, this can result in a larger number of customers being isolated than would have otherwise been affected.

As data quality improves, it is anticipated that an increasing number of detailed protection reviews will be required. In addition, as network models (i.e. ADMS, Sincal, PSSE) are used by an increasing number of teams across the business and it becomes easier to check and update information in these systems, we anticipate an increase in protection reviews generated due to changes in the modelled network impedance as network models become more accurate.

This task is an ongoing requirement. It is important to recognise that we have various matters increasing work levels associated with this task, including the increasing number of devices to manage, changing network impedance, and data quality improvements. However, as we discuss in section 7, we are not seeking a specific uplift to allow for this increase.