Annual Public Reliability Performance Report

Year ending 30 June 2024

SA Power Networks

Empowering South Australia

Contents

1. Executive Summary

About SA Power Networks

As our State's primary electricity distributor, SA Power Networks plays a vital role in our community, managing the distribution network that delivers electricity to over 900,000 homes and businesses across South Australia. We are recognised as an industry leader in reliability and safety. We are also number one for efficiency on an individual and a state-by-state basis as measured by the Australian Energy Regulator and that has enabled us to keep a lid on our prices over many years - holding increases in line with inflation since 1999. Currently our charges account for less than a third of the average residential electricity bill.

SA Power Networks has the oldest fleet of network assets in the National Electricity Market, and we currently maintain them with a remarkably low level of expenditure with, on average, only 0.3% of our assets being replaced per year. As those assets continue to age, delivering the levels of service and new services that our customers are expecting will be challenging. To do so will require increased investment in asset maintenance and replacements.

SA Power Networks' current funding to maintain the reliability of the distribution network is typically based on our historic spend[1], not on the obligation to meet the South Australian Electricity Distribution Code (**EDC**) reliability standards.

Customers and stakeholders

SA Power Networks customers and stakeholders are widespread, diverse and evolving. We serve almost the entire population of South Australia and as the state develops the number of customers we serve continues to grow. Our customers' and stakeholders' expectations are changing rapidly as technological changes sweep through the energy industry. They want to be able to use the network in new ways and be both exporters as well as consumers of energy. They want us to provide better information about outages and predicted restoration times, and they want to understand our costs better. Above all, our customers want us to:

1. maintain safety and reliability;
2. deliver good service;
3. enable the clean energy transition; and
4. keep the price as low as possible, and play our part in improving equity.

Public performance reporting

SA Power Networks is required by our electricity distribution licence to comply with the Electricity Distribution Code (**EDC**). Clause 2.7.4 of the EDC requires us to report directly to the public on:

a) our performance against service standards set out in clauses 2.1 to 2.4 of this industry code during the previous regulatory year

b) our performance in the regions[2] defined by the Commission's Electricity Industry Guideline No. 1 (as amended from time to time), and

c) instances of non-compliance with service standards, the reason(s) for the non-compliance and an explanation of how the distributor intends to improve its performance so as to meet the service standards set out in clauses 2.1 to 2.4.

[1] The historic spend has enabled us to comply with our reliability obligations, but this level of spend will not enable us to continue to comply with our reliability obligations as our infrastructure ages.

[2] There are ten mainly geographic areas specified in Guideline No.1

The following provides an overview of the performance of SA Power Networks in 2023-24 against the standards set out in the EDC clauses 2.1 to 2.4, which includes our reliability and customer service performance for the Year ending 30 June 2024.

With respect to reliability and customer service performance, SA Power Networks:

- met all of its customer service targets established by the Essential Services Commission of South Australia (**ESCoSA**); and
- Met all "best endeavours" requirements for reliability (eg outage numbers, duration, feeder type, historical comparison).

Historical trend analysis since 2005-06 shows South Australians typically enjoy significantly improved system reliability performance, highlighted by reduced average outage duration impact for the metropolitan area, major regional centres, and some regional areas such as the Eyre Peninsula. However, the recent restoration of supply performance is declining in rural areas due to the increased impacts of lightning and the increase in Solar PV penetration in these areas.

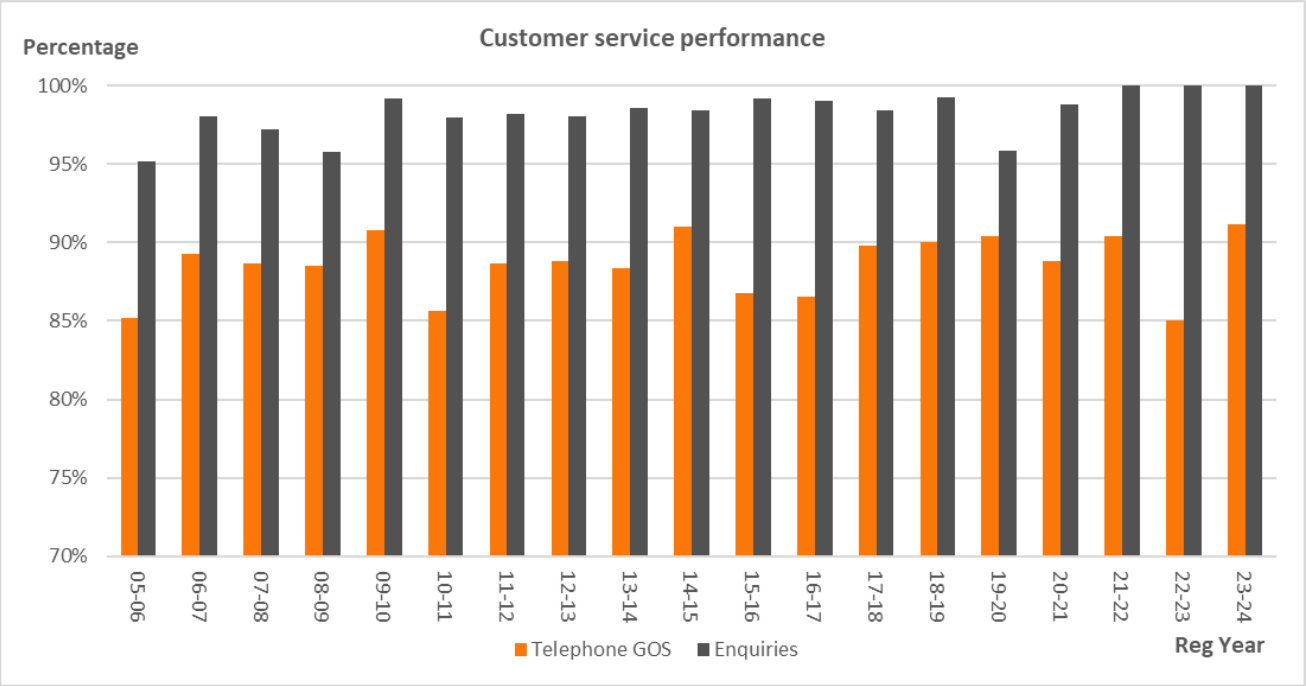
SA Power Networks achieved all customer service standards (EDC clause 2.1)

SA Power Networks:

- Answered 91%[3] of telephone calls within 30 seconds compared to a target of 85%; and
- Responded to 100% of enquiries within 5 business days compared to a target of 95%.

Figure 1 below highlights SA Power Networks' customer service performance on these two measures since 1 July 2005. SA Power Networks' performance was better than both targets during 2023-24.

Figure 1: Customer service performance



SA Power Networks achieved 11 reliability service standard targets

In 2023-24, SA Power Networks achieved 11 of the 16 normalised reliability targets, for the four feeder categories specified in the South Australian EDC. These targets exclude the reliability contribution from

[3] SA Power Networks answered 95.9% of Faults and Emergency calls in 30 seconds.

interruptions starting on Major Event Days (**MEDs**)[4]. The following measures are used to monitor reliability performance:

- Unplanned System Average Interruption Duration Index (**USAIDI**), which is the average time in minutes that customers are without their electricity supply due to unplanned interruptions per annum;
- Unplanned System Average Interruption Frequency Index (**USAIFI**), which is the average number of unplanned interruptions that customers experience per annum; and
- Customer restoration of supply (**CRoS**), which is a measure of the percentage of customers who experience an interruption for the year ending 30 June where the duration exceeds a specified number of hours.

The EDC specifies normalised measures and targets (ie excluding interruptions on MEDs), which are designated with a "n" (ie USAIDI**n** and USAIFI**n**). Table 1 and Table 2 below details our actual normalised performance for 2023-24 against the targets, for each of the four-feeder categories and overall.

Table 1: Feeder Category Normalised Reliability Performance

EDC Feeder Category	USAIDIn		USAIFIn	
	TARGET	2023-24	TARGET	2023-24
Central Business District (**CBD**)	≥ 15	14	≥ 0.15	0.12
Urban	≥ 110	90	≥ 1.15	0.81
Short Rural (SR)	≥ 200	197	≥ 1.65	1.30
Long Rural (**LR**)	≥ 290	334	≥ 1.75	1.64
Overall Distribution System[5]	≥ ***150***	***142***	≥ ***1.30***	***1.00***

Table 2: Restoration of supply performance (CRoSn)

EDC Feeder Category	Duration of Interruption (Hrs)	Target (%)	Actual (%)
CBD	≥ 1	11	10
	> 2	4	3
Urban	> 2	27	22
	> 3	11	11
SR	> 3	27	29
	> 5	8	12
LR	> 4	30	35
	> 7	10	15

4 A MED is any day where the USAIDI contribution from interruptions starting on the day exceed a predetermined USAIDI threshold which is recalculated annually, historically it has been around 6 minutes. On average there have been 3.1 MEDs pa over the 15-year period 1 July 2005 to 30 June 2020, contributing 56.5 minutes to USAIDI.

5 The ESCoSA reliability service standards do not include an overall distribution system target. These figures are the implied equivalent targets using the individual feeder category targets and the number of customers supplied from each feeder category.

The EDC incorporates a reporting threshold[6] which acknowledges the normal variation in annual performance[7] of the reliability measures. Of the five targets not achieved in 2023-24, four feeder categories exceeded the reporting threshold being:

- Short Rural CRoSn > 5 hrs, and
- Long Rural USAIDIn, CRoSn > 4hrs and CRoSn >7hrs.

There were five MEDs

For the 2023-24 regulatory year, there were five MEDs as summarised in Table 3 below.

Table 3: Major Event days 2023-24

Date(s)	USAIDI	Customers Affected	MED Category[8]	Comment
2 October 2023	26.8	32,290	Cat 3	Severe weather event
28 November 2023	5.0	32,093	Cat 1	Severe weather event
8 December 2023	5.4	21,780	Cat 1	Severe weather event
11 December 2023	32.8	64,967	Cat 3	Severe weather event
28 December 2023	6.3	12,584	Cat 1	Severe weather event
Total	**76.3**	**163,714**		

Section 6.2 includes further details of these MEDs.

SA Power Networks is maintaining the distribution system to deliver electricity to customers reliably

SA Power Networks monitors three key metrics (among others) to determine if the distribution system is being maintained cost effectively to reliably transport electricity to customers under normal weather conditions and on MEDs. The three metrics are:

- The contribution to USAIDIn of equipment failure related interruptions. This monitors our performance in maintaining the distribution system under normal operating conditions;
- The contribution to USAIDIn of weather[9] related interruptions; and
- The percentage of USAIDI resulting from equipment failure related interruptions on MEDs. This monitors the ability of the distribution system to cope with Severe Weather Events (**SWE's**).

Figure 2 (next page) indicates that SA Power Networks has been appropriately maintaining the distribution system as there is no increasing trend in the USAIDIn from interruptions caused by equipment failure or weather under normal conditions (ie non-MED days). However, there has been an increase in weather related interruptions (mainly lightning) since 2019-20, which has led to a decline in reliability performance since 2019-20. Noting this, the results continue to be better than the historic average. The percentage contribution to USAIDI from equipment failure related interruptions on MEDs is volatile and was below

6 The threshold is set so that on average once every four years the performance will be worse than the reporting threshold and therefore will require detailed explanation.

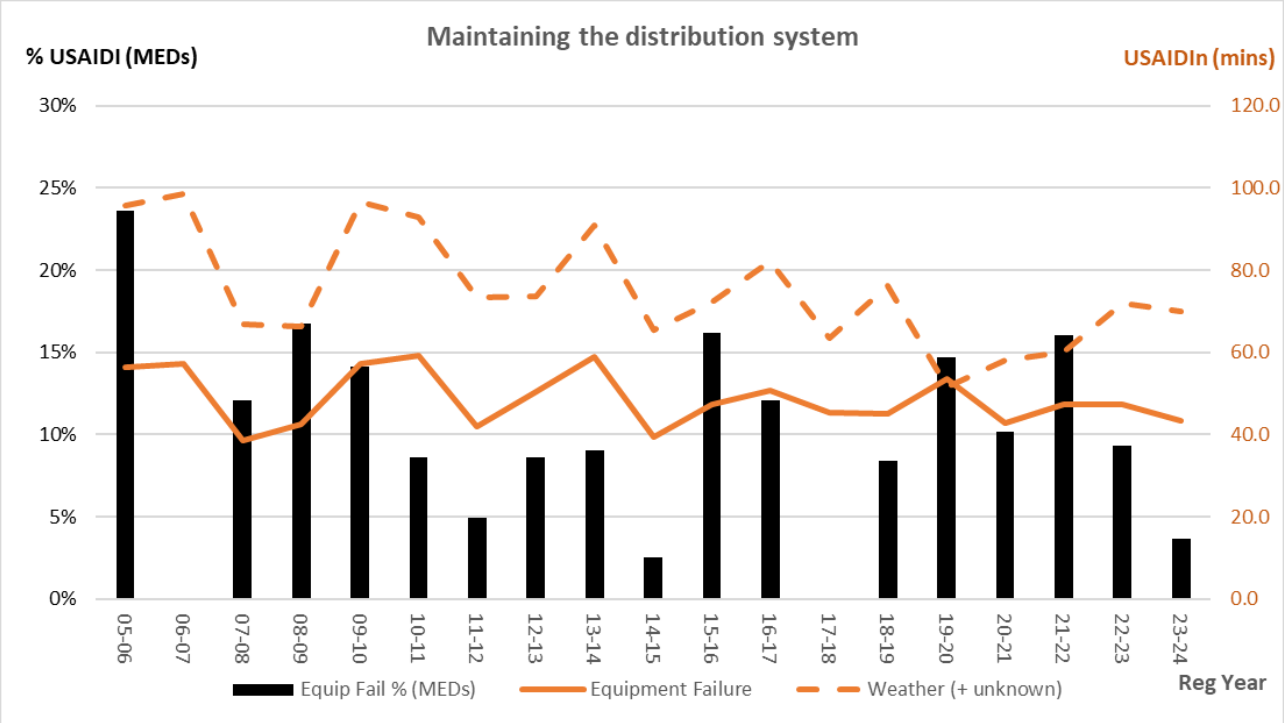
7 Noting that the EDC reliability targets are based on average performance over the 10-year period ending 30 June 2019, and there must be no expectation that the targets will be achieved every year. Also, no funding was provided to achieve the targets each year.

8 SA Power Networks categorises the severity of MEDs based on the USAIDI contribution from interruptions that commence on that day, with the severity graded from the least Cat1 to the most Cat4.

9 'Weather' includes 'unknown' and 'vegetation', as the contribution from these causes is higher during SWE.

average (ie 3.7% compared to an average of 9.5%) for 2023-24. There is no long-term increasing trend (ie no decline in distribution system's resilience) in the percentage contribution to USAIDI due to equipment failure on MEDs.

Figure 2: Maintaining the network performance



Four of the 16 reliability measures exceeded the reporting threshold.

In 2023-24, the Short Rural CRoSn > 5 hours and the Long Rural USAIDIn, CRoSn > 4hrs and CRoSn > 7hrs exceeded the reporting threshold, compared with an average of three over the 10-year Target Setting Period (**TSP**).

Table 4 details the reliability measures that exceeded the reporting threshold in 2023-24 and the reasons for that exceedance.

Table 4: Reliability performance that exceeded the reporting threshold.

Feeder Category and measure	Comment
Short Rural CRoSn	There was an increase in interruptions due to lightning strikes[10], vehicles damaging infrastructure and cable faults. In many cases, these types of faults can take significantly longer than average to locate, repair and restore supply to customers. Interruptions resulting from these causes contributed to 5.7% of the 11.8% total CRoSn for 2023-24.
Long Rural USAIDIn	The poor 2023-24 USAIDIn performance resulted from a combination of poor CRoSn performance and the contribution from the interruption causes of weather (mainly lightning), and third party (animals and vehicles damaging infrastructure). These interruption causes are typically beyond the control of SA Power Networks and contributed 51 minutes more than the average during the 10-year TSP. .

[10] Lightning strikes can result in only a small puncture in the insulator which is very difficult to locate visually, so it can take a long time to locate the fault.

Long Rural CRoSn	The Long Rural feeder category restoration of supply performance was adversely affected by the performance of 19kV SWERs (see the Monitoring evaluation and compliance strategy (**MECS**) section 6.2). 19kV SWER feeders contributed more than half the CRoSn >4hrs and the CRoSn >7hrs outcome in 2023-34.

As explained in our MECS, there is a systemic issue with the Long Rural restoration of supply performance due to the significant increase in Solar PV exports on 19kV SWER feeders continuing to export when there is a fault on the feeder. This prevents sectionalisers from operating. This results in longer patrol times to locate and then repair the fault, as the whole feeder must be patrolled instead of just the section downstream of the sectionaliser. The longer patrol times has caused a decline in both CRoSn and USAIDIn.

We are trialling alternative equipment options for sectionalising SWERs to mitigate this issue. Noting this, we experienced a slight improvement in the Long Rural USAIDIn contribution from equipment failure of approximately 10% compared to the 10-year TSP.

There are no declining trends in regional reliability performance

SA Power Networks is required to report the reliability of ten regions: nine distinct regions and another segmentation of feeders located in Major Regional Centres[11] (**MRC**) as defined in ESCoSA's Guideline No.1.

The annual regional reliability performance varies from year to year, both positive (better) and negative (poorer) than the long-term historical average (ie 15-year period ending 30 June 2020). There has been no declining trend in the reliability performance of any region's normalised reliability performance (ie excluding MEDs) over the long-term, despite service standards being established on feeder categories since 1 July 2015. SA Power Networks monitors the regional reliability using the measures USAIDIn and USAIFIn, to determine if historic performance of any region has declined.

In 2023-24, 14[12] of the 20 reliability measures performance (two per region) were better than the 15-year historic average. The only regional measure to exceed the reporting threshold was USAIDIn for the Riverland and the Murrayland (**RM**) regions. The RM region has exceeded the USAIDIn reporting threshold for the last three years. The poor USAIDIn performance of the RM region in these years were the result of:

- 2023-24 a significant increase in third party caused interruptions and an increase in weather (lightning) caused interruptions;
- 2022-23 a significant increase in weather related interruptions, and an increase in asset failure interruptions which contributed a total of about 50 minutes to USAIDIn; and
- 2021-22 two unusual asset failure caused interruptions on 33kV Sub-transmission lines, which contributed more than 80 mins to USAIDIn.

As the poor reliability over the last three years has resulted from different causes, we consider that there is no systemic decline in the reliability of the RM Region.

SA Power Networks used 'best endeavours' to meet all reliability targets in 2023-24

In 2020, the EDC incorporated a new reporting threshold, whereby we are required to demonstrate the use of best endeavours if the reporting threshold for a reliability measure is exceeded. The best endeavours benchmark means that SA Power Networks can still comply with these obligations despite not achieving some feeder category reliability targets. SA Power Networks has used best endeavours to meet all 16 targets.

[11] The MRC agreed high voltage feeders are in Urban centres and localities with a population of 10,000 or more as at the 2016 census, except Adelaide and Gawler.

[12] On average 12 targets of the 20 are achieved annually, with a minimum of two and a maximum of 19.

As outlined above, SA Power Networks achieved 11 of the 16 EDC feeder category reliability targets in 2023-24, compared with an average of nine over the 10-year TSP. Of the four targets not achieved, there is a declining trend in Long Rural restoration of supply performance, which is also causing a declining trend in Long Rural USAIDIn. The MECS details the actions we are taking to address this declining trend. Consequently, we consider that we have used best endeavours to achieve all reliability targets in the EDC.

Figure 3: Distribution system USAIDIn and implied target

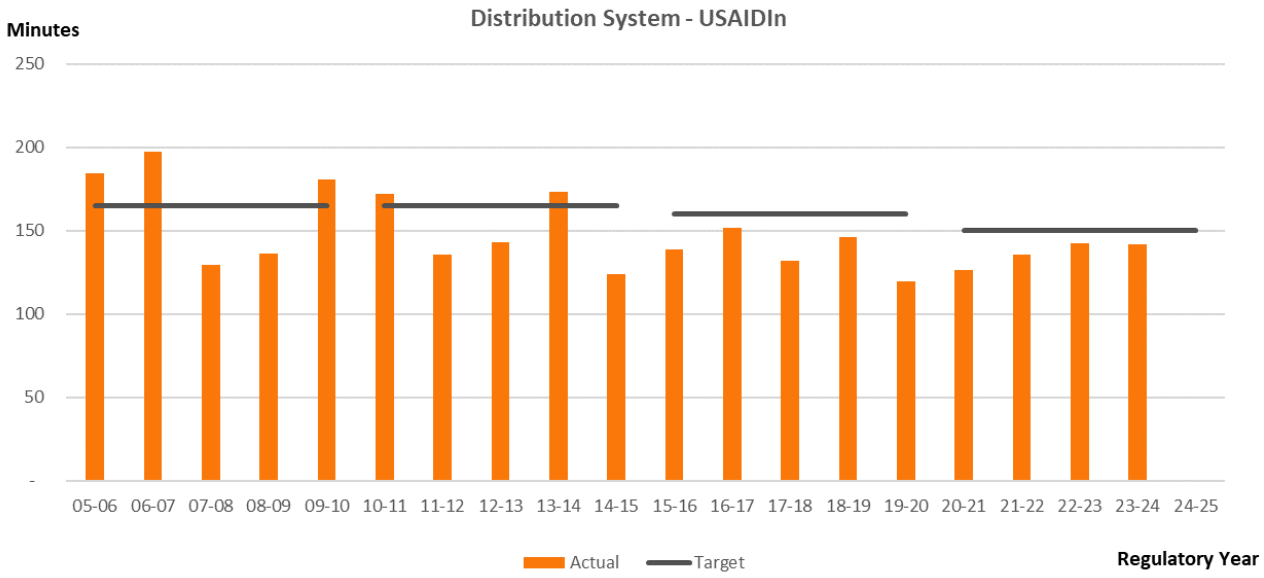
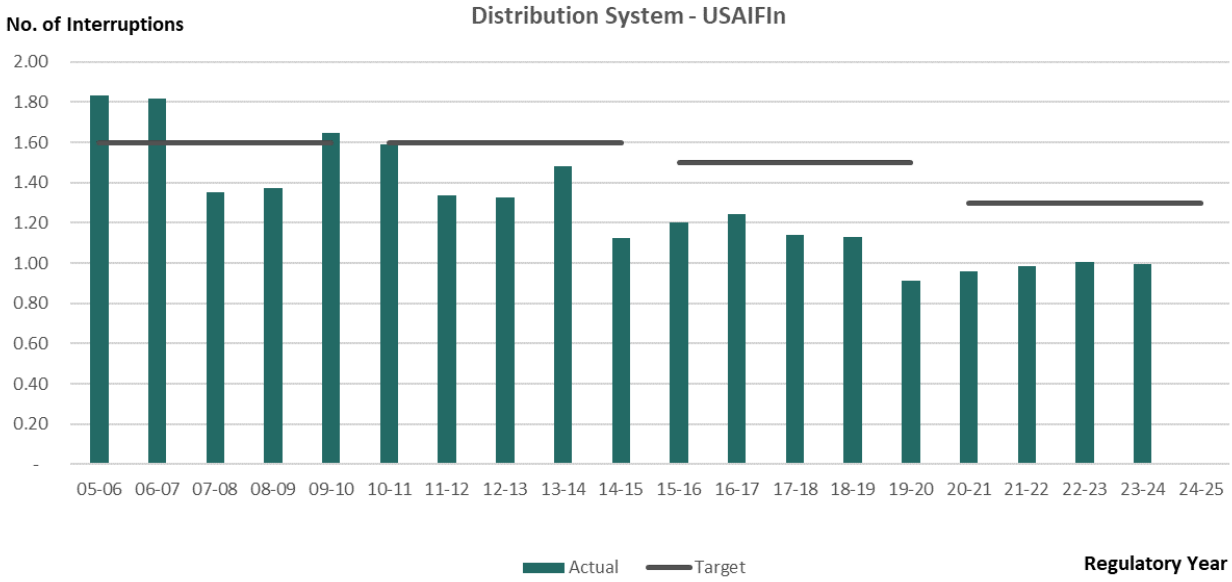


Figure 4: Distribution system USAIFIn and implied target



Our analysis demonstrates that the reliability performance at the aggregate level of the distribution system has been maintained in 2023-24 and it reflects that SA Power Networks is using best endeavours to meet the EDC reliability targets (see Figure 3 and Figure 4 above). This assessment is based on the following observations:

- Trends of normalised USAIDI and USAIFI performance demonstrate that our reliability performance has been maintained in 2023-24 and over recent years. As shown in Figure 3 and Figure 4, normalised reliability is improving (ie historic declining trend).
- Analysis of our distribution system maintenance practices and outcomes indicates that:

  - The contribution to normalised USAIDI performance due to 'equipment failure' is stable and has no worsening trend.
  - There is no declining trend in USAIDIn for Long Rural feeders due to 'equipment failure'; and

- The percentage contribution to USAIDI performance during MEDs due to 'equipment failure' is also stable.
- The reliability measures which exceeded the reporting threshold were either due to weather related interruptions or emerging systemic issues that are being addressed, where cost effective.

Emerging Issues

There are two emerging issues we are closely monitoring that have the potential to cause a detrimental impact on our reliability performance:

1. The increasing number of power outages caused by Grey Headed Flying Foxes (fruit bats) causing short circuits when they land on our overhead infrastructure in Urban areas of Adelaide – see Sections 4.3.d and 7.3.b.
2. The decline in the Rural long feeder category restoration of supply performance which was highlighted in SA Power Networks' MECS.

GSL payments (clause 2.3)

SA Power Networks must pay customers a guaranteed service level (**GSL**) payment associated with:

- connection of new premises,
- repair of streetlight faults, and
- minimise the frequency and total annual duration of unplanned supply interruptions[13],

where we do not meet the service level specified in the EDC. There are conditions and exceptions associated with each of these GSL payments.

Table 5: Number of GSL payments - Historic average and for year ending June 2024

GSL Payment numbers	Historic Ave.	Year ending 30 June 2024
Connection of new premises	154	365
Repair of streetlights	1,637	4,775
Frequency of Interruptions	1,606	754
Long Duration interruptions	27,843	29,445

The higher number of GSL payments made associated with 2023-24 were associated with the greater impact and severity of severe weather events in 2023-24. The higher streetlight GSL payments are due to a new contractor commencing and a reduction in the hard to repair streetlight faults (eg cable faults).

Reconnection of electricity supply after disconnection (EDC clause 2.4)

SA Power Networks completes more than 100,000 retailer requested reconnections annually, with all reconnections except eleven[14] during Year ending 30 June 2024, being completed in accordance with the EDC requirements. Actions have been taken to rectify the causes associated with these eleven instances.

[13] Certain interruptions are excluded (eg momentary interruption, interruptions of the ElectraNet's transmission system).

[14] These eleven reconnections were due to system issues that were not within SA Power Networks control.

2. Definitions

Definitions of terms used in this report:

Term	Definition
2.5β method	The IEEE Std 1366™-2012 2.5 Beta statistical method used to calculate T_{MED}.
ABA	Adelaide Business Area – geographic area/region as defined in ESCoSA's Guideline No.1 (same as the CBD).
AER	Australian Energy Regulator
BMY	Barossa, Mid-North & Yorke Peninsula– geographic area/region as defined in ESCoSA's Guideline No.1.
CBD feeder	a feeder supplying predominantly commercial, high-rise buildings, supplied by a predominantly underground distribution network containing significant interconnection and redundancy when compared to urban areas.
CRoS	Customer restoration of supply – percentage of total customers who have an interruption exceeding a specific number of hours.
CRoSn	Normalised CRoS (excluding interruptions that commence on MEDs)
EDC	South Australian Electricity Distribution Code version v13.1 unless otherwise stated.
EH	Eastern Hills – geographic area/region as defined in ESCoSA's Guideline No.1.
EP	Eyre Peninsula – geographic area/region as defined in ESCoSA's Guideline No.1.
ESCoSA	Essential Services Commission of South Australia
FP	Fleurieu Peninsula – geographic area/region as defined in ESCoSA's Guideline No.1.
Feeder	means a high voltage electric powerline and associated equipment which the distributor uses to distribute electricity
GAMA	Greater Adelaide Metropolitan Area – geographic area/region as defined in ESCoSA's Guideline No.1.
IEEE	US Institute of Electrical and Electronic Engineers Inc
SWE	Significant Weather Event – a significant weather event where the contribution to USAIDIn from weather related caused interruptions has a material contribution to USAIDI of the distribution system, feeder category or a region.
Long Rural feeder	a feeder which is not a CBD or urban feeder with a total feeder route length greater than 200 km, or otherwise as agreed by SA Power Networks and ESCoSA.
MED	Major Event Day – any day where the daily USAIDI accrued on that day, exceeds a predetermined USAIDI threshold. The threshold is determined in accordance with the IEEE Std 1366™-2012 2.5 Beta statistical method.
MRC	Major Regional Centres – geographic area/region as defined in ESCoSA's Guideline No.1 (agreed high voltage feeders in Urban centres and Localities with a population of 10,000 or more at the 2016 census, except Adelaide and Gawler)
RCP	Regulatory Control Period means the period covered by a regulatory distribution determination by the AER.
RM	Riverland & Murrayland – geographic area/region as defined in ESCoSA's Guideline No.1
RT	Reporting threshold as defined in the EDC Section 2.2.1
SE	Southeast – geographic area/region as defined in ESCoSA's Guideline No.1.
Short Rural feeder	a feeder which is not a CBD or urban feeder with a total feeder route length less than 200 km, or otherwise as agreed by SA Power Networks and ESCoSA.

STPIS	The AER's Service Target Performance Incentive Scheme with provides incentive for distributors to maintain or improve reliability performance.
T_{MED}	The daily USAIDI threshold used to determine if a day will be classified as a MED.
TSP	Target Setting Period is the ten-year period ending 30 June 2019 used to establish the feeder category reliability service standard targets.
UCAIDI	Unplanned Customer Average Interruption Duration Index (ie average time taken to restore supply to customers as a result of an unplanned interruption)
UN	Upper North – geographic area/region as defined in ESCoSA's Guideline No.1.
Urban feeder	a feeder, which is not a CBD feeder, with actual maximum demand over the reporting period per total feeder route length greater than 0.3 MVA/km, or otherwise as agreed by SA Power Networks and ESCoSA.
USAIDI	Unplanned System Average Interruption Duration Index – total number of minutes, on average, that a customer is without electricity because of unplanned interruptions[15] in a year.
USAIFI	Unplanned System Average Interruption Frequency Index – average number of times a customer's supply is interrupted per year from unplanned interruptions
USAIDIn	Normalised USAIDI (USAIDI excluding interruptions that commence on MEDs)
USAIFIn	Normalised USAIFI (USAIFI excluding interruptions that commence on MEDs)

[15] Excludes interruptions where the duration is three minutes or less.

3. SA Power Networks' service standards for the 2020-25 regulatory control period

3.1 Introduction

SA Power Networks is required by its distribution licence to comply with the service standards contained in the Electricity Distribution Code (**EDC**). The EDC requires us to use 'best endeavours' to achieve the service standard targets for each year ending 30 June. The EDC clause 1.5.1 defines best endeavours as to act in good faith and use all reasonable efforts, skill and resources.

As the service standard obligation is to use best endeavours, we can still comply with a service standard, despite not achieving the target, if we can demonstrate that we have used best endeavours.

The following sections summarise the four categories of service standards and the targets (where specified) for the 2020-2025 Regulatory Control Period (**RCP** – ie 1 July 2020 to 30 June 2025).

3.2 Customer service measures and targets

3.2.a Customer service measures

There are two customer service standards defined in the EDC relating to communication with our customers:

- Time to respond to telephone calls; and
- Time to respond to written enquiries.

These standards measure how quickly we respond to customer enquiries by both telephone and written responses.

3.2.b Customer service targets

SA Power Networks is required to use best endeavours to meet the following customer service standards for each year ending 30 June.

Table 6: EDC customer service measures and targets

Category	Customer service to measure	Target
Customer service	Time to response to telephone calls	85% within 30 seconds
Customer service	Time to respond to written enquiries	95% within 5 business days after receipt of the written enquiry

Achieving the telephone response target means that for every 100 telephone calls received we must on average answer 85 or more calls within 30 seconds. This response rate applies in aggregate to five specified telephone numbers including the Faults and Emergencies number. The EDC defines what is deemed to be an answered telephone call.

Likewise, achieving the written response target means that for every 100 written enquiries we receive (includes email and Facebook enquiries) we must respond to 95 or more of those within five business days.

For the year ending June 2024, SA Power Networks achieved all its customer service targets established by the ESCoSA.

3.3 Reliability performance measures and targets

3.3.a Reliability measures

As electricity distribution systems are extremely reliable, their overall reliability is typically measured in how many minutes on average they are not able to supply customers with electricity. For example, if a distribution system was unable to supply electricity for 180 minutes in a year, then it was able to supply electricity for 525,420 minutes of that year (ie its availability to supply electricity was 99.97%).

The reliability measures used by the ESCoSA and the Australian Energy Regulator (**AER**) to monitor a distributor's performance are:

- USAIDIn (unplanned system average interruption duration index) — a measure of how long on average each customer is without supply in minutes for the period (typically a year) and is normalised by excluding interruptions that start on Major Event Days[16] (**MEDs**));
- USAIFIn (unplanned system average interruption frequency index) — a measure of how many times on average each customer is interrupted for the period (typically a year) and is normalised by excluding interruptions that start on MEDs; and
- In addition, ESCoSA uses two customer restoration of supply (**CRoS**) targets for each feeder category. These measure the percentage of the customers supplied by that feeder category who have an unplanned interruption exceeding a specified number of hours.

The measures are normalised because the variation in annual performance is significant with the inclusion of MEDs and masks underlying performance trends. For example, the USAIDI result for the distribution system in 2016-17 was 481 minutes with 9 MEDs, compared with 148 minutes in 2015-16 with one MED and 132 minutes in 2017-18 with nil MEDs. Most MEDs result from significant weather events that are beyond the distributor's control and are the major cause of the annual variation in reliability.

So that regulators can assess whether a distributor is maintaining the network to cope with normal weather events amongst other outage causes (eg animals), MEDs are excluded from the reliability measures they monitor. However, it is important to monitor the performance on MEDs to ascertain if distributors are still maintaining their ability to effectively respond to the effects of MEDs on their distribution system. Distributors need to have processes and practices in place to respond to MEDs so that customers impacted on those days have their supply restored in a reasonable time. As MEDs can have different characteristics and severity, it is not possible to establish standards for performance on MEDs. For example, the USAIDI contribution of a single MED, can vary from about 6 USAIDI minutes to about 160 USAIDI minutes. Section 4.4 provides further details on MED categorisation and assessment of performance.

3.3.b Feeder categories

The EDC specifies reliability standards applying to each of the following four feeder categories:

- Central Business District (**CBD**) feeder – means a high voltage overhead powerline or underground cable in the CBD area supplying predominantly commercial, high-rise buildings, supplied by a predominantly underground distribution network containing significant interconnection between high voltage feeders;

[16] A MED is a day where the total USAIDI contribution from interruptions that commence on that day exceed a predetermined total distribution system USAIDI threshold value (Tmed). The value of Tmed is determined using a statistical process for each year based on the prior 5 years daily distribution system USAIDI data. Since 1 July 2005 there are on average about 3 MEDs pa.

- Urban feeder – means a high voltage overhead powerline or underground cable, which is not a CBD feeder, where the average17 maximum demand divided by average feeder route length is greater than 0.3 MVA/km;
- Rural Short (**RS**) – means a high voltage overhead powerline or underground cable which is not a CBD feeder or urban feeder with a total feeder route length less than 200 km; and
- Rural Long (**RL**) feeder – means a high voltage overhead powerline or underground cable which is not a CBD feeder, urban feeder or a rural short feeder.

The table below contains information about each feeder category.

Table 7: Feeder category statistics

Feeder	CBD	Urban	Rural Short	Rural Long
Areas supplied	Part of the Adelaide square mile.	Greater Adelaide Metro Area and some parts of large regional towns	Eastern Hills (50%), Fleurieu Peninsula, Riverland and parts of large and medium regional towns.	Barossa, Eastern Hills (50%), Most of Eyre Peninsula, KI, Mid-North, Murraylands, Southeast, Upper North
% of customers	1.0%	69%	15%	15%
Circuit length of powerline (km)	300	26,000	13,700	49,300
Annual Consumption (GWh)	500	6,800	1,300	1,300

3.3.c Establishment of the reliability of supply targets

The ESCoSA in its process to establish the reliability of supply standards for the 2020-25 RCP confirmed most customers were satisfied with their current electricity supply reliability and were unwilling to pay for improvements. Therefore, ESCoSA decided that the reliability service standard targets should reflect the average historic reliability performance of the four feeder categories. They decided to use the ten-year period (ie 1 July 2009 to 30 June 2019) to determine the historic average performance.

There is large annual variation in the reliability performance for each feeder category, often related to the severity of weather events in a year. For example, the Rural Short feeder category USAIDIn has varied from a best of 143 minutes (2014/15) to a worst of 283 minutes (2009/10). Therefore, the reliability service standard now includes a Reporting Threshold, which represents the normally expected variation in reliability for a feeder category. SA Power Networks must demonstrate the use of best endeavours where the reliability of a feeder category is worse than the reporting threshold. The reporting threshold has been established at a level that, with normal variation in reliability, it should typically require SA Power Networks to demonstrate the use of best endeavours once every five years.

3.3.d Jurisdictional reliability service standards

SA Power Networks is required by the South Australian EDC clause 2.2.1 to use ‘‘best endeavours[18]’’ to achieve the following reliability targets (see Table 8 and Table 9 below) for each year ending 30 June, over the 2020-25 Regulatory Control Period (**2020-25 RCP**) ie 1 July 2020 to 30 June 2025:

[17] The average maximum demand and average route length of the feeder is over the last three consecutive years, including the current reporting year.

[18] In the EDC, best endeavours, means “to act in good faith and use all reasonable efforts, skill and resources”.

SA Power Networks is required to report on how it has applied its best endeavours if its reliability performance is worse than the reporting threshold set out in Table 8.

Table 8: Feeder category reliability service standards

Measure		CBD Feeders	Urban Feeders	Rural Short Feeders	Rural Long Feeders
USAIDIn (average minutes off supply per customer per annum)	Target:	15	110	200	290
	Reporting threshold:	20	125	220	330
USAIFIn (average number of supply interruptions per customer per annum)	Target:	0.15	1.15	1.65	1.75
	Reporting threshold:	0.20	1.35	1.85	2.10

As highlighted above, these measures exclude interruptions that start[19] on MEDs. MEDs are days of significance where the organisation shifts from normal operation mode to emergency/crisis operation mode.

3.3.e Jurisdictional restoration service standards

SA Power Networks must use its best endeavours to achieve the minimum network restoration time targets. The proportion of the customers in each feeder category that experience unplanned interruptions that exceed the defined time periods, in hours, are set out in the following table for each year ending 30 June.

Table 9: Feeder category customer restoration of supply standards

Target (%)	Single interruption duration	CBD Feeders	Urban Feeders	Rural Short Feeders	Rural Long Feeders
Percentage of total customers in each feeder category per annum	Interruption equal to or greater than 1 hour	11			
	Interruption longer than 2 hours	4	27		
	Interruption longer than 3 hours		11	27	
	Interruption longer than 4 hours				30
	Interruption longer than 5 hours			8	
	Interruption longer than 7 hours				10

The EDC feeder category reliability targets were established using the average performance over the ten-year period ending 30 June 2019 (referred to as the target setting period (**TSP**)**.** The averages were then rounded to the nearest five minutes for USAIDI and the nearest 0.05 interruptions for USAIFI (ie some targets were rounded down and others up). As the targets are based on averages, there is no expectation[20] that all targets will be achieved each year. The number of targets detailed in Table 5 and Table 6 that were achieved annually during the TSP varied between 4 and 16 with an average of 9.

SA Power Networks is required to report on how it has applied its best endeavours if its performance is worse than the reporting thresholds set out in Table 10. Unlike the reporting threshold for USAIDIn and USAIFIn, which were based on the normal variation in reliability, the thresholds for the restoration of supply standards were established by adding 2.5% to the historic average, and therefore do not necessarily reflect normal variations.

Table 10: Feeder category customer restoration of supply reporting thresholds

Reporting Threshold	Interruption duration	CBD Feeders	Urban Feeders	Rural Short Feeders	Rural Long Feeders
Percentage of total	Interruption equal to or greater than 1 hour	13.5			

[19] Where an interruption begins on a day and is restored in following days its contribution to reliability performance is accrued to the day it started.

[20] SA Power Networks receives funding to maintain average historic reliability performance not to achieve all EDC reliability targets every year.

customers in each feeder category per annum	Interruption longer than 2 hours	6.5	29.5		
	Interruption longer than 3 hours		13.5	29.5	
	Interruption longer than 4 hours				32.5
	Interruption longer than 5 hours			10.5	
	Interruption longer than 7 hours				12.5

Note: These standards reflect unplanned supply interruptions on the low voltage and high voltage distribution network but exclude:

a) Any planned supply interruptions and unplanned supply interruptions with a duration no more than three minutes; and

b) Any unplanned supply interruption that starts on a day which qualifies as a MED.

ESCoSA expressed concerned that establishing service standards using feeder categories may result in some regional areas of the state experiencing a decline in reliability. Consequently, it requires SA Power Networks to report on the reliability of ten regions, to enable it to monitor if there was any longer-term decline in regional performance. See Section 8 for each region's performance.

3.4 Guaranteed service level payments

3.4.a Introduction

SA Power Networks is required to make guaranteed service level (**GSL**) payments where we do not:

- connect a new supply address on the date agreed or within six business days of the customer meeting all the necessary preconditions;
- repair a streetlight which has gone out within five business days in metropolitan areas and ten business days in non-metropolitan areas (referred to as other areas); and
- minimise the frequency (number) and the total duration of unplanned supply interruptions for the year ending 30 June.

3.4.b Connecting a new supply address

SA Power Networks is required to connect a new supply address on the date agreed or if no date is agreed within six business days, provided the customer has met all necessary pre-conditions for connection. Where this is not achieved, we will pay the customer $65 dollars per business day that we are late to a maximum of $325.

This GSL payment only applies in situations where electricity supply is available adjacent to the property and all that is required to connect the premises is to install a service or make the connection between the distribution network and the customers electrical installation. It does not include the installation of the electricity meter which is now the responsibility of retailers.

3.4.c Repair of streetlights which are out (SLO)

SA Power Networks is required to repair a streetlight out (**SLO**) within five business days within Metropolitan Areas and ten business days for non-Metropolitan (other) areas.

SA Power Networks is required to pay customers $25 for each period (five or ten business days) until the streetlight is repaired. The EDC Clause 2.3.1(b) contains the details of when day zero is determined amongst other conditions.

3.4.d Reliability GSL payments

SA Power Networks must use its best endeavours to minimise the frequency and duration of supply interruptions to a customer's supply address. If the total number of interruptions and/or the total duration of all interruptions across a regulatory year exceeds the thresholds in the following tables below, we must make payments (GSL reliability payments) to customers experiencing interruptions as set out in those tables.

Table 11: Thresholds and payment amount for frequency of interruptions

	Threshold
Number of unplanned interruptions in a regulatory year	>9
Payment (GST inclusive)	$100

Table 12: Thresholds and payment amounts for total annual duration of interruptions

	Threshold 1	Threshold 2	Threshold 3
Total annual duration (hrs) of unplanned interruptions	> 20 and ≤30	> 30 and ≤60	> 60
Payment (GST inclusive)	$100	$150	$300

Customers' electricity accounts will be credited with their eligible reliability GSL payments in the quarter following the end of the regulatory year (ie typically in August each year). Payments will be made in respect of the supply address, not the customer. The resident of the supply address will receive a SMS or letter advising them of the reliability GSL credit that has been applied to their electricity account.

The above scheme excludes:

(i) interruptions caused by the following:

  (A) transmission and generation failures

  (B) disconnection required in an emergency situation (e.g. bushfire)

  (C) single customer faults caused by that customer

(ii) momentary interruptions (ie interruptions where the duration is three minutes or less)

(iii) planned interruptions, and

(iv) partial interruptions to a supply address such as:

  (A) interruptions that affect only one or two phases of supply at a supply address with three phase supply, and/or

  (B) interruptions to one connection point where the supply address has multiple connection points.

3.5 Reconnection after disconnection

In summary, where the National Energy Retail Rules (**NERR**) require SA Power Networks to reconnect a previously disconnected customer's premises, we must:

- reconnect on the same business day in the Adelaide Business Area and the Major Metropolitan areas, provided the request is receive by us prior to 5pm on the business day; and
- use best endeavours to reconnect on the same business day in other areas and in any event on the next business day, where the request is received after 5pm.

The EDC clause 2.4 details all the possible scenarios for a customer requesting reconnection and the timeframes required for reconnection or whether a customer payment is required to achieve those timeframes.

Under the deemed standard connection contract, under which reconnections are performed, the obligation to reconnect lapses if the customer does not request a reconnection within 10 business days of their

disconnection. Therefore, the reconnection timeframes only apply if a customer has requested a reconnection of their premises within 10 business days of the disconnection.

Under the AER and National Energy Retail Law (**NERL**) compliance framework, SA Power Networks is required to report quarterly any failures with our reconnection obligations to the AER. SA Power Networks had eleven instances during 2022-23 where we failed to reconnect21 a customer within the specified timeframe. Actions have been taken to rectify the causes for these five instances.

3.6 The Australian Energy Regulator's Service Target Performance Incentive Scheme

The AER is required by the National Electricity Rules (**NER**) to develop a scheme that provides incentives for distributors, like SA Power Networks, to maintain or improve customer service including supply reliability. The AER scheme is known as the Service Target Performance Incentive Scheme (**STPIS**) which is detailed in the AER STPIS Guideline[22].

Under the reliability component of the STPIS, the AER establishes feeder category USAIDIn and USAIFIn targets for a RCP, with those targets detailed in its final distribution determination every five years. Under the STPIS regime the distributor is then annually rewarded or penalised based on the variation from those targets for each year. A positive variation is rewarded, and a negative variation penalised.

The STPIS targets are different to EDC feeder category targets as the targets are based on a 5-year average (ie 1 July 2014 to 30 June 2019). These targets have been adjusted because the incentive reward outcome was capped twice in this 5-year period and we received funding for improving some low reliability feeders. Table 13 below details the adjusted STPIS feeder category reliability targets that apply to each year of the 2020-25 RCP.

Table 13: STPIS Reliability targets (year ending 30 June) for the 2020-25 RCP

Feeder Category	USAIDIn	USAIFIn
CBD Feeders	22.5	0.185
Urban Feeders	105.1	1.057
Short Rural Feeders	181.9	1.427
Long Rural Feeders	277.9	1.526

21 SA Power Networks completes more than 100,000 reconnections annually.

22 The AER's STPIS Guideline is at https://www.aer.gov.au/system/files/AER%20-%20Service%20Target%20Performance%20Incentive%20Scheme%20v%202.0%20-%2014%20November%202018%20%28updated%2013%20December%202018%29.pdf

4. Assessment of Reliability Performance

4.1 Introduction

As outlined in Section 3, SA Power Networks is required to use best endeavours to achieve the EDC feeder category normalised reliability targets for each year ending 30 June. We can still comply with our reliability obligation when our reliability is worse than the target, provided we can demonstrate the use of best endeavours.

The EDC defines best endeavours as:

*'**best endeavours**' means to act in good faith and use all reasonable efforts, skill and resources.*

SA Power Networks is not funded to achieve the absolute performance targets each and every year, we are funded to maintain the average long-term historic performance. ESCoSA will determine whether we have used best endeavours to meet those targets.

SA Power Networks' reliability obligation in its simplest form can be expressed as "to maintain historic average reliability levels". While positive and negative variations occur, there should be no long-term worsening trend in reliability in any of the feeder categories. A worsening trend is when the performance of a reliability measure exceeds the RT in two consecutive years.

The exclusion of MEDs from the reliability service standard targets reduces the extreme variation in annual reliability. The variation in reliability comprises three components: variations in normalised performance (ie non-MEDs), and variations due to the number of MEDs (which has varied from nil to nine) and the severity of individual MEDs (which has varied between 6.0 and 161.3 USAIDI minutes).

This section explores the major influencers of the annual variation in normalised reliability and the variations in annual MED performance experienced by customers.

4.2 Reliability of the distribution network

The normalised reliability performance of the distribution network is dependent on:

- The proportion of the network that is overhead, because underground cables are not typically affected by weather;
- How the system is designed and constructed (eg meshed or radial network);
- How the system is being maintained (eg performance would decline in the long term if the network was not being appropriately maintained);
- Trees[23], vegetation debris or other objects impacting powerlines from outside the regulated 'clearance zones';
- The interruptions/failures of the network that result from local SWEs. These events have a material[24] USAIDIn impact (ie excluding MEDs) and are the result of many weather (eg lightning) caused interruptions on a single day; and
- How well a distributor responds to interruptions during MEDs, especially in terms of the time taken to restore customers' electricity supply.

[23] SA Power Networks is limited by the Electricity Act on the extent that it can clear vegetation from around powerlines. SA Power Networks must clear vegetation from around a powerline so it must not grow or bend into the clearance zone.

[24] Material impact in this context means the USAIDI attributed to the day exceeds 3% of the average annual historic performance (ie about 10 times an average day's contribution)

SA Power Networks has varying degrees of control over these individual factors. Any assessment of the use of best endeavours should only consider those factors that SA Power Networks can reasonably control/affect.

4.3 Major causes of annual variations in reliability

4.3.a Introduction

SA Power Networks is obligated to use best endeavours to meet average historic levels of normalised (ie excludes MEDs) reliability. The determination of best endeavours from analysing the reliability measures is difficult, considering the significant variations in reliability from one year to the next, despite the exclusion of MEDs.

The main causes of significant annual variations in unplanned reliability levels, in order of greatest to least, are:

- Weather (includes unknown[25]);
- Equipment failure; and
- Other (includes operational, third party (eg vandalism, car hit pole, grey-headed flying foxes) and other causes).

4.3.b Weather-caused interruptions

Weather-caused interruptions during the TSP have varied in their contribution to USAIDIn (ie normalised reliability which excludes MEDs) from a low of 63 minutes in 2017-18 to a high of 95 minutes in 2009-10, and an average of 79 minutes. The contribution to USAIDIn in 2023-24 from weather caused interruptions was 72 minutes.

Figure 5 shows a declining (improving) contribution to USAIDIn from weather caused interruption. This improvement has resulted from SA Power Networks reliability improvement initiatives (eg installing lightning resistant insulators in areas of repeat lightning strikes).

4.3.c Equipment failure caused interruptions

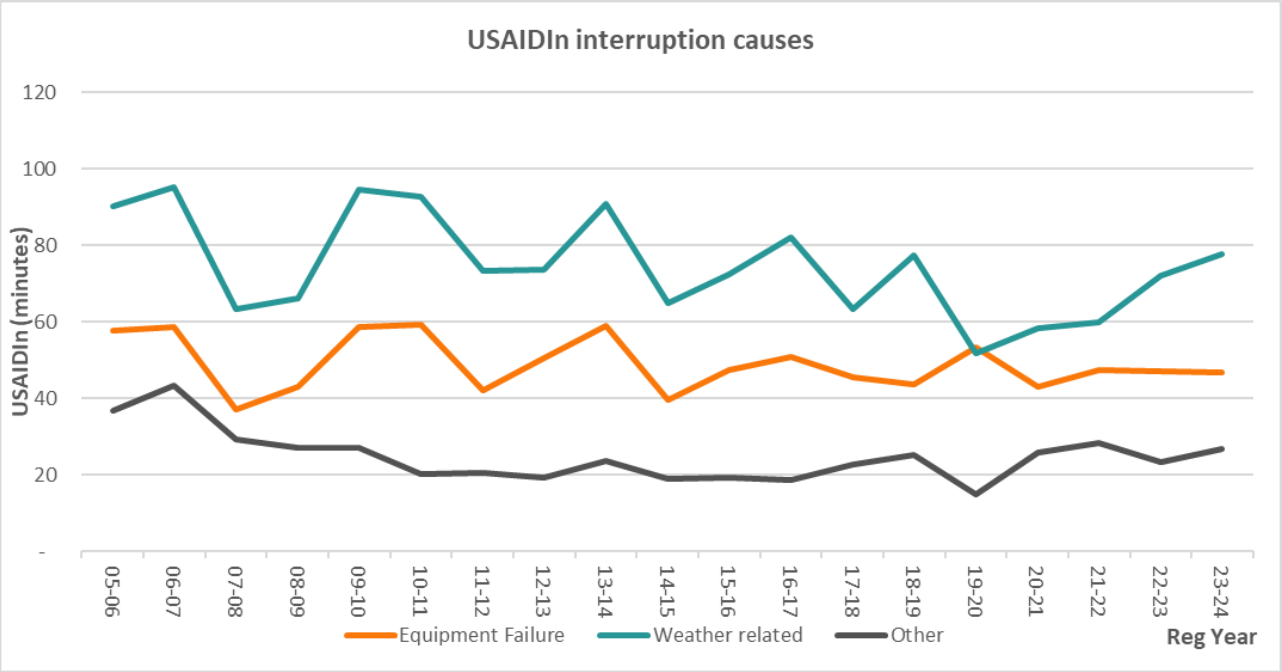
The contribution of equipment failure-caused interruptions to USAIDIn during the TSP has varied from a low of 45 minutes in 2017-18 and 2018-19, to a high of 59 minutes in 2010-11, with an average of 50 minutes. The contribution to USAIDIn in 2023-24 from equipment failure caused interruptions was 47 minutes.

Figure 5 shows a stable contribution to USAIDIn from equipment failure caused interruptions. This stability demonstrates that SA Power Networks has been appropriately maintaining the distribution system.

Figure 5 also shows some correlation in the variations in the contribution to normalised USAIDI from weather caused and equipment caused interruptions.

[25] There is a reasonably strong correlation between weather and unknown causes, so these are grouped together to simplify the analysis.

Figure 5: Annual USAIDIn contribution from interruptions caused by weather, equipment failure and other.



4.3.d Other-caused interruptions

Other-caused interruptions contribution to USAIDIn during the 10-year target setting period varied from a minimum of 19 minutes in 2015-16 to a high of 27 minutes in 2009-10, and an average of 22 minutes.

Figure 5 above highlights that the contribution to USAIDIn from interruptions by 'other' causes (eg due to third parties) has been relatively stable at around 20 minutes since 2010-11. There was an increase in 2020-21 and 2021-22, a slight decrease in 2022-23 and an increase in 2023-24 USAIDIn due to the number of interruptions caused by the increase in the grey-headed flying fox (fruit bats) population, which mainly affects Urban Feeders. We are currently trialling different methods to mitigate the number of interruptions caused by fruit bats[26] on Urban feeders. However, the geographic extent of the fruit bat impact is increasing with four colonies now established in Rural areas.

4.3.e Conclusion

There is no worsening trend in the Asset failure and Weather-related causes and while the impact of fruit bats has contributed to a worsening trend in the 'Other' category in recent years, this has not resulted in a failure to meet targets. SA Power Networks is therefore appropriately maintaining and operating the distribution system for the benefit of customers.

4.4 Categorisation of MEDs

4.4.a Introduction

The overall annual contribution to USAIDI, at the distribution system aggregate level, from interruptions on MEDs has varied from nil to 329 minutes over the 15-year period to 30 June 2020. The significant variation is due to the:

- annual number of MEDs varying from nil to nine; and
- severity (using USAIDI as a proxy) of a single MED varying from 6.0 to 192.8 USAIDI minutes.

[26] Fruit bats migrated and established a colony (near the Adelaide Botanic Gardens) in South Australia in 2012.

As highlighted previously, although excluded from the EDC reliability service standards, it is important that our performance on MEDs is still monitored. This section details how MEDs are classified and how SA Power Networks categorises them to enable comparison of our performance on similar severity MEDs.

4.4.b MED classification

A MED is determined using the US Institute of Electrical and Electronic Engineers Inc (**IEEE**) Std 1366™-2012 2.5 Beta Method (**2.5β Method**). The 2.5β Method pre-determines a MED USAIDI threshold ($\mathbf{T_{MED}}$) that applies for a reporting period (ie a year). Any day where USAIDI exceeds the threshold is classified as a MED. (See Appendix A for further details). In determining the daily USAIDI, any interruptions that commence between midnight and midnight on that day are accrued to that day.

4.4.c Factors affecting restoration of customers' electricity supply on MEDs

The other component of ESCoSA's 2020-25 RCP reliability framework is the monitoring of MED performance. The main measure of SA Power Networks' performance on MEDs is the average time taken to restore customers' electricity supply. Restoration of electricity supply times on MEDs is affected by the:

- number of interruptions;
- numbers of customers affected;
- location of interruptions/damage (eg metro vs rural and difference in the corresponding distance travelled to patrol or repair);
- extent of damage to infrastructure (eg broken insulator can be fixed by a crew and an elevated platform vehicle, but in comparison a failed Stobie pole needs a new pole, a crew, elevated platform vehicle, crane, and consequently takes significantly longer to repair and restore supply);
- crew availability;
- duration of SWE (crews cannot work beyond 16 hours in any 24-hour period and this can adversely affect MED resourcing if the event commences prior to the MED); and
- accuracy of weather forecast (ie if severe weather event isn't forecast we haven't had the ability to adequately prepare for the event).

4.4.d Categorisation of MEDs

These factors make the determination of whether SA Power Networks' response during MEDs has declined or not complex. SA Power Networks considers it essential to compare each MED with similar historic MEDs to determine if the restoration of supply times have declined or not. This categorisation is important in assessing the MED performance because since 1 July 2010 the distribution system has experienced more intense MEDs[27]. SA Power Networks has ranked the intensity of the MEDs, albeit with limited data for some MED categories, into the following four categories which are:

- Category 1 (Cat1) MED where the maximum daily USAIDI is less than nine minutes (note: more than half the MEDs fall into this category)[28];

[27] The BoM has advised SA Power Networks that it is likely that the number and intensity of SWEs will increase due to the effects of climate change.

[28] Note some MEDs that would classify as a Cat1 due to its USAIDI value (<9 minutes), are classified as Cat2 as they mainly affected rural areas, and as such the response times are longer.

- Category 2 (Cat2) MED where the maximum daily USAIDI is more than nine minutes and no more than 23 minutes[29];
- Category 3 (Cat3) MED where the maximum daily USAIDI is more than 23 minutes and no more than 55 minutes; and
- Category 4 (Cat4) MED where the maximum daily USAIDI exceeds 55[30] minutes.

SA Power Networks may assign MEDs to a higher or lower category based on other factors like:

- Extent of the damage to infrastructure (eg many pole failures versus just insulator failures);
- Locations of the interruptions to electricity supply (eg rural versus urban areas);
- Significant weather event lasts more than 24 hours; and
- Access to our infrastructure (eg preventing from accessing our infrastructure due to a bushfire, ground too wet for vehicle access).

[29] The 23-minute threshold was based of the IEEE Std 1366 2.5β methodology for determining MED but used a 3.5 multiplier for Beta.

[30] The 55 minute threshold uses the IEEE's 1366 2.5β methodology but with a 4.15 multiplier for Beta which is referred to in the IEEE's standard as a Catastrophic Event Day (**CED**). There has been one Cat4 MED, on 4 Feb 2014.

5. Reliability assessment framework and use of Best Endeavours

As outlined in Section 4, SA Power Networks is required to employ best endeavours to achieve the EDC's feeder category reliability targets for each year ending 30 June. Despite the exclusion of interruptions commencing on MEDs, ESCoSA must assess whether SA Power Networks has complied with its reliability service standards, in that it has used best endeavours where the performance is worse than the target.

The exclusion of interruptions commencing on MEDs removes the extreme variations in annual reliability performance but there can still be significant variations (eg up to 50% of the reliability target) in feeder category reliability measures. These variations are normally related to local or state-wide SWEs that do not breach the MED USAIDI threshold.

5.1 Introduction

Each year during the 2020-25 RCP ESCoSA will determine whether SA Power Networks has:

- used best endeavours to meet the normalised reliability targets;
- maintained its responsiveness to restore customers' electricity supply as soon as practical, for those customers that experience an outage on MEDs; and
- maintained the historic reliability levels for those customers in the 10 regions.

How each of these components should be determined and assessed is detailed below.

5.2 Normalised reliability

5.2.a Introduction

In determining whether best endeavours have been used to achieve the EDC reliability targets it is first necessary to consider normalised reliability (ie excluding MEDs) and determine if:

- Reliability levels are stable for the aggregate distribution system and an individual feeder category basis (ie there has been no worsening trend in performance over several years);
    - the distribution system is being appropriately maintained if there has been no declining trend in the following measures:
    - USAIDIn resulting from 'equipment failure' caused interruptions; and
    - USAIDIn resulting from weather caused interruptions; and
- any remaining significant deviations in performance are the result of local or state-wide SWEs that do not result in a MED and/or 'one-off' type events or causes.

5.2.b Normalised reliability analysis

The first step in analysing normalised reliability is to examine the performance trend over several years, as large annual variations generally result from either local SWEs or one-off events. Longer term trend performance is analysed as it may take many years before any degradation of the network can be identified from its reliability performance.

Individual feeder categories for the 10 regions can have significant variations in normalised reliability as the normalisation process is less effective at sub-system levels of the distribution system as previously explained.

A stable non-declining trend in USAIDIn, provides a good indication that SA Power Networks has used best endeavours to meet EDC reliability targets and to maintain historic regional reliability, provided any material excursions are due to weather events or one-off non-systemic events.

5.2.c Design, construction and maintenance of the network

The next step in analysing whether best endeavours have been used is to analyse the trend performance in the overall average daily USAIDIn contribution from weather caused interruptions. This measure provides an indication that:

- The distribution system is being maintained to cope with 'normal' SWEs (ie non-MED SWEs); and
- new additions to the network are appropriately designed and constructed to withstand normal weather variations.

Another indicator of whether SA Power Networks is adequately maintaining all parts of the network is to analyse the trend performance in USAIDIn that is attributed to equipment failure. A stable non-declining trend in USAIDIn from equipment failure caused interruptions indicates that SA Power Networks is appropriately maintaining the network to achieve the EDC reliability targets.

5.2.d Normalised reliability conclusion

SA Power Networks considers that the use of best endeavours is demonstrated by a stable non-declining trend performance in:

- USAIDIn and USAIFIn at the aggregate distribution system and feeder category level;
- Annual contribution USAIDIn from weather caused interruptions is not increasing; and
- USAIDIn contribution from equipment failure-caused interruptions is also not increasing.

5.3 MED Performance

5.3.a Introduction

Section 4.4 above detailed the factors that impact MED reliability performance. The common denominator that results in longer than average Unplanned Customer Average Interruption Duration Index[31] (**UCAIDI**) during a MED is the degree of the damage to infrastructure or delays in safe access to make repairs. For example, the MED on 3 January 2020, should have been categorised as a Cat 1 but was categorised as a Cat 4, as SA Power Networks was prevented from accessing infrastructure to restore supply due to raging bushfires on Kangaroo Island. Delays in restoring supply under bushfire conditions result from factors like, extended times to patrol, gain access to the fire grounds and make repairs and to ensure premises can be safely reconnected or to disconnect unsafe premises prior to restoring supply.

5.3.b Measures

SA Power Networks assesses the use of best endeavours during MEDs by analysing:

- MEDs by their category[32] (ie Cat1, Cat2, Cat3 or Cat4 as defined in Section 4.4 above);
- the equipment-failure contribution to the MED USAIDI (this should indicate if the distribution system is being appropriately maintained to cope with MEDs or Major SWEs); and
- individual MED UCAIDI by MED Category. This is a measure of SA Power Networks' processes and practices in responding to major SWEs, with MED performance the proxy. UCAIDI will normally be longer as the category increases from Cat2 to Cat4, especially when there is extensive infrastructure damage associated with the MED or there are access issues (eg flooding preventing access).

[31] UCAIDI is a measure of the average time, in minutes, that customers who experience an interruption are without supply.

[32] A Cat1 MED would normally occur every year, Cat2 every few years and Cat3 or Cat 4 once every 5 years or more.

5.3.c MED reliability conclusion

SA Power Networks considers that the use of best endeavours during MEDs can be demonstrated by achieving reasonable average restoration of supply times for:

- Cat1 UCAIDI — typically 180 minutes with expected range between 150 and 210 minutes;
- Cat2 UCAIDI — typically 330 minutes with expected range between 230 and 500 minutes:
- Cat3 UCAIDI — typically 290 minutes with expected range between 210 and 430 minutes; and
- Cat4 UCAIDI — typically 600 minutes but expected to be greater than 500 minutes and is associated with extensive infrastructure damage; and
- demonstrating no decline in trend performance in the proportion of USAIDI attributed to equipment failure.

Cat1 UCAIDI provides the best indicator of whether SA Power Networks has maintained its ability to appropriately respond to MEDs. This is because Cat1 MEDs make up at least half the MEDs, have the smallest variation in USAIDI and consequently are associated with similar intensity SWE.

6. Distribution system reliability performance during 2023-24

6.1 Overall Normalised Performance 2023-24

6.1.a Test for use of best endeavours

As detailed in Section 5.2 the test for determining if SA Power Networks has employed best endeavours in maintaining normalised reliability performance is no declining trend performance in:

- USAIDIn and USAIFIn at the aggregate distribution system and each feeder category level;
- Annual contribution to USAIDIn from weather caused interruptions is not increasing; and
- Annual contribution to USAIDIn from equipment failure caused interruptions is also not increasing.

6.1.b Aggregate distribution system reliability performance

Table 14 below shows the aggregate distribution system normalised reliability is better than the implied distribution network target.

Table 14: SA Distribution System's Unplanned Normalised Reliability Performance

	USAIDIn		USAIFIn	
	Target	**Actual**	**Target**	**Actual**
2023-24	150	143	1.30	1.00

Figure 6: Distribution system normalised reliability (excludes MEDs)

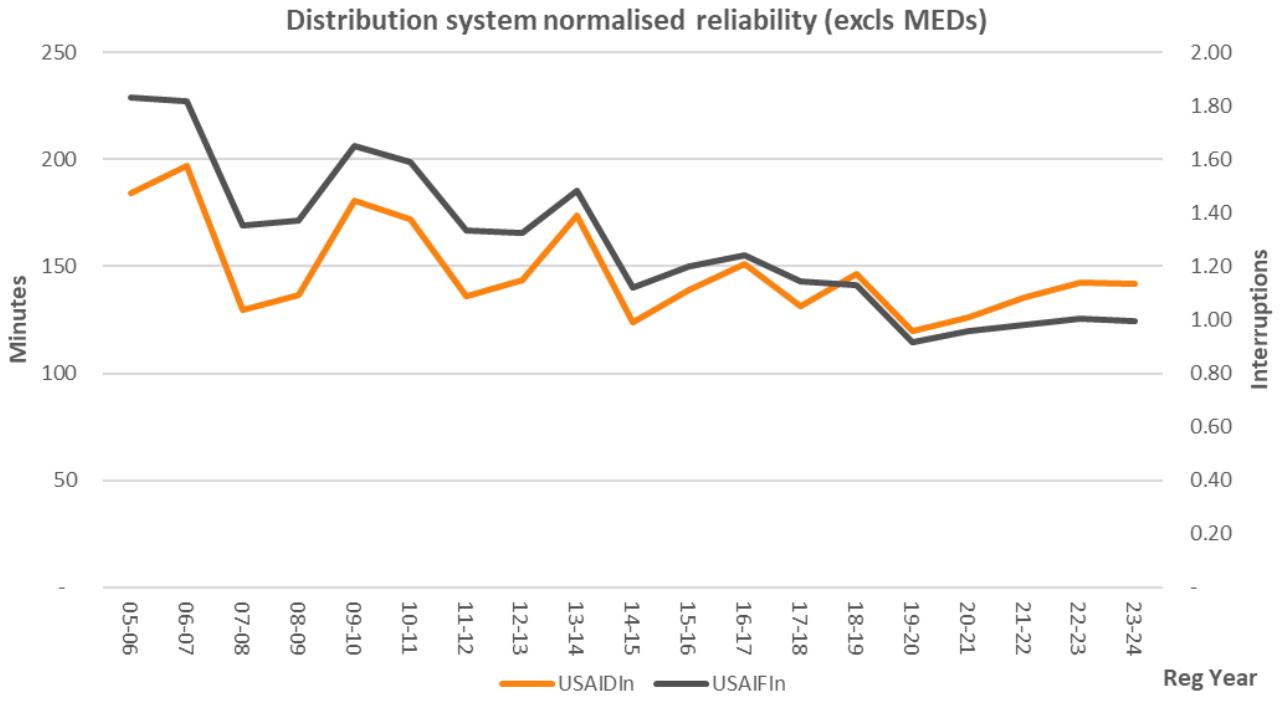


Figure 6 above demonstrates that *overall* there is a positive trend (ie customers on average are experiencing less minutes without supply and less interruption each year) in the distribution network's normalised reliability performance, as measured using USAIDIn and USAIFIn, over the past 18 years. However, from 2019-20 there has been a slight decline in the reliability trend, this has stabilised over the past year (2023-24).

Figure 7: Customer restoration of supply

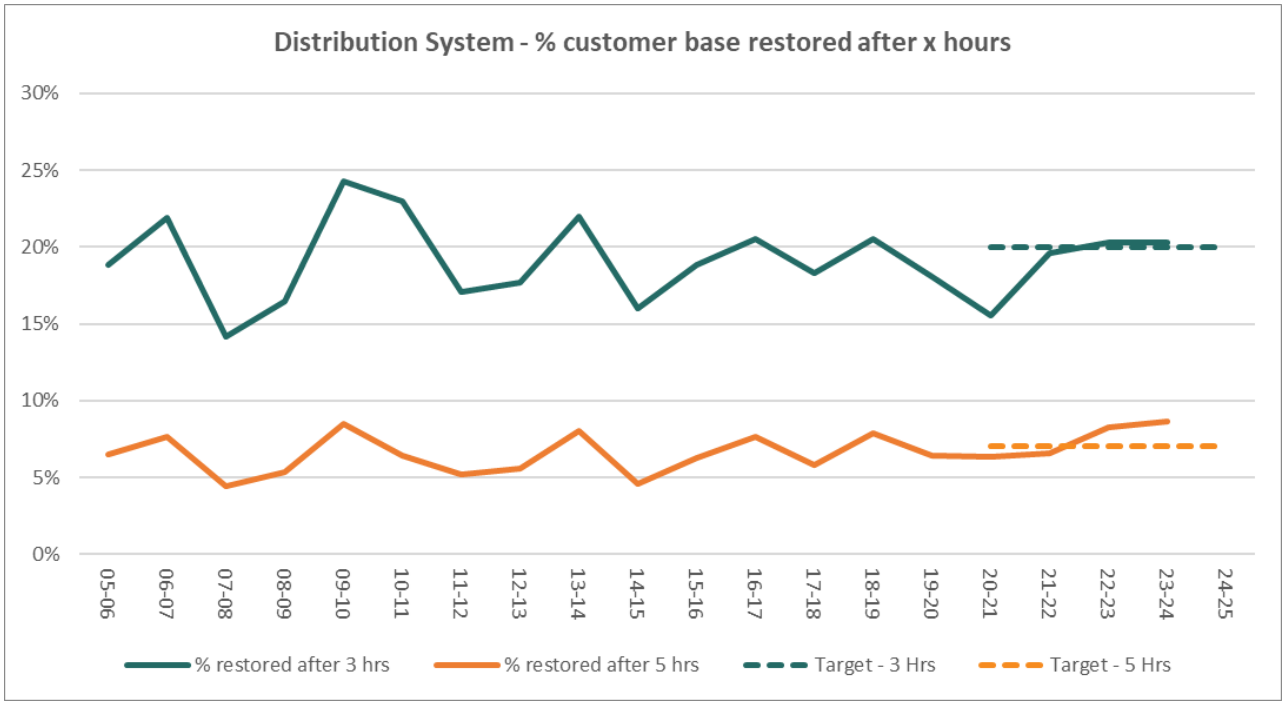


Figure 7 highlights there was an increase in the percentage of customers who experience an unplanned interruption longer than five hours in 2023-24. The performance in 2023-24 resulted from a combination of several severe weather events which did not result in a MED or were immediately before or after a MED, and Solar PV adversely impacting SWER sectionalisers operating.

6.1.c USAIDIn Cause Contribution to Normalised Performance

Figure 8 below demonstrates there are no trends in the cause categories of weather[33], equipment-failure or 'other', over the 18-year period. The figure shows that the 2023-24 normalised reliability performance contribution to USAIDIn from these categories is within normal variation and indicates that there is no negative trend. This indicates that the distribution system is being appropriately maintained to cope with normal weather events, and to cost effectively manage the interruptions that result from equipment failure. The increase in 'other' in 2020-21 and 2021-22 is mainly due to the impact of juvenile grey headed flying foxes, and the significant increase in the colony size near the Adelaide Botanic Gardens. The impact of flying foxes was lower in 2023-24 than the previous two years due to the on average wetter conditions and cooler nights. We are currently investigating options to mitigate the impact of these flying foxes.

The increased asset inspections undertaken during the 2010-15 and the 2015-20 RCPs identified a significant increase in the volume of work required to replace poor condition assets. Management has placed priority on addressing the highest risk defects which has enabled the impacts of the condition of the network infrastructure to be managed.

[33] Weather includes weather and unknown causes, as the majority of interruptions categorised as cause 'unknown' occur during weather related events (ie SWE, storms etc).

Figure 8: Normalised USAIDI contribution due to weather and equipment failure

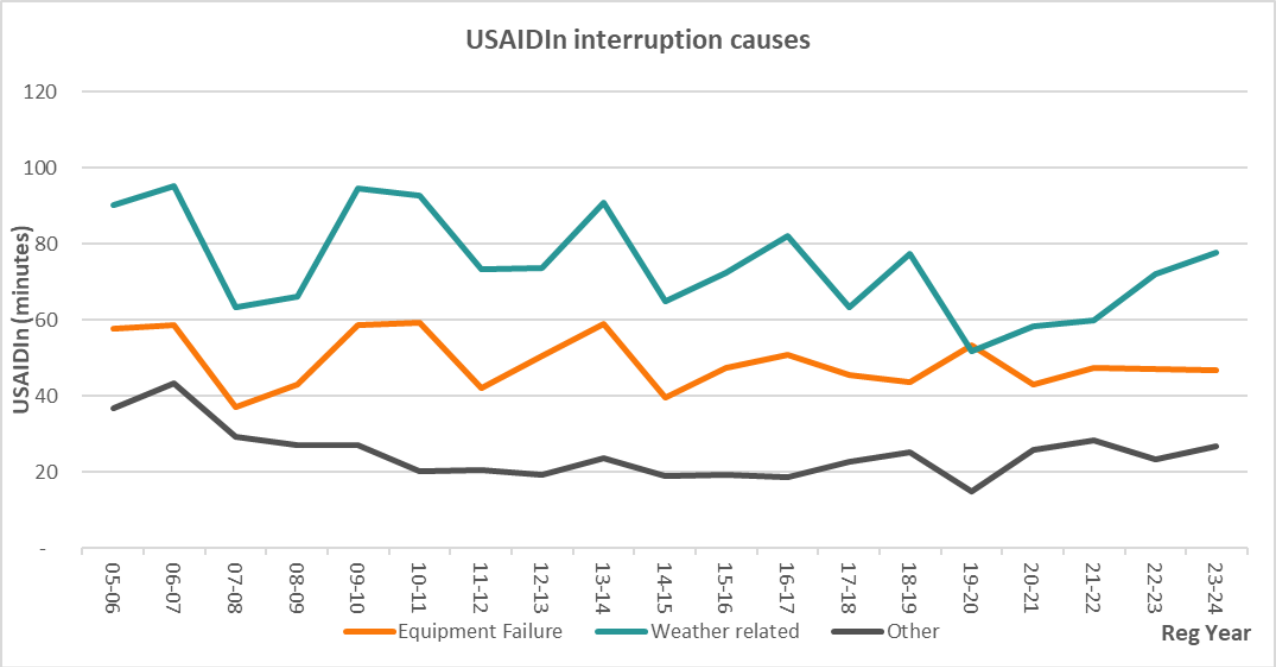


Table 15: Distribution system USAIDIn cause contributions

USAIDIN	WEATHER	ASSET FAILURE	OTHER
2023-24	78	47	27
TSP	79	50	22

Table 15 above shows that all causes except Other had a lower contribution to USAIDIn in 2023-24 compared to the TSP. The USAIDIn from cause Other was above average for the TSP.

6.1.d Conclusion – normalised reliability performance 2023-24

The overall normalised reliability performance during 2023-24 has shown:

- no decline in normalised performance;
- the normalised reliability performance achieved the implied targets;
- no decline in performance due to any specific cause including 'equipment failure'; and
- no decline in the network's resilience to cope with non-MED SWEs.

Consequently, we consider that we have employed best endeavours to maintain normalised reliability performance in 2023-24, to achieve the EDC reliability targets.

6.2 MED Performance 2023-24

6.2.a Test to determine if performance during MEDs has been maintained

Section 5.3 outlined the test for determining if SA Power Networks has maintained its responsiveness to restoring supply to customers interrupted during MEDs.

6.2.b MED Performance during 2023-24

In 2023-24 there were a total of five MEDs contributing 262.2 minutes to USAIDI, comprising one Cat1, one Cat2, one Cat3 and two Cat4 MEDs.

Table 16 below details the date of these MEDs and their USAIDI and USAIFI contributions and the UCAIDI on the day.

Table 16: Details of MED exclusions during 2023-24

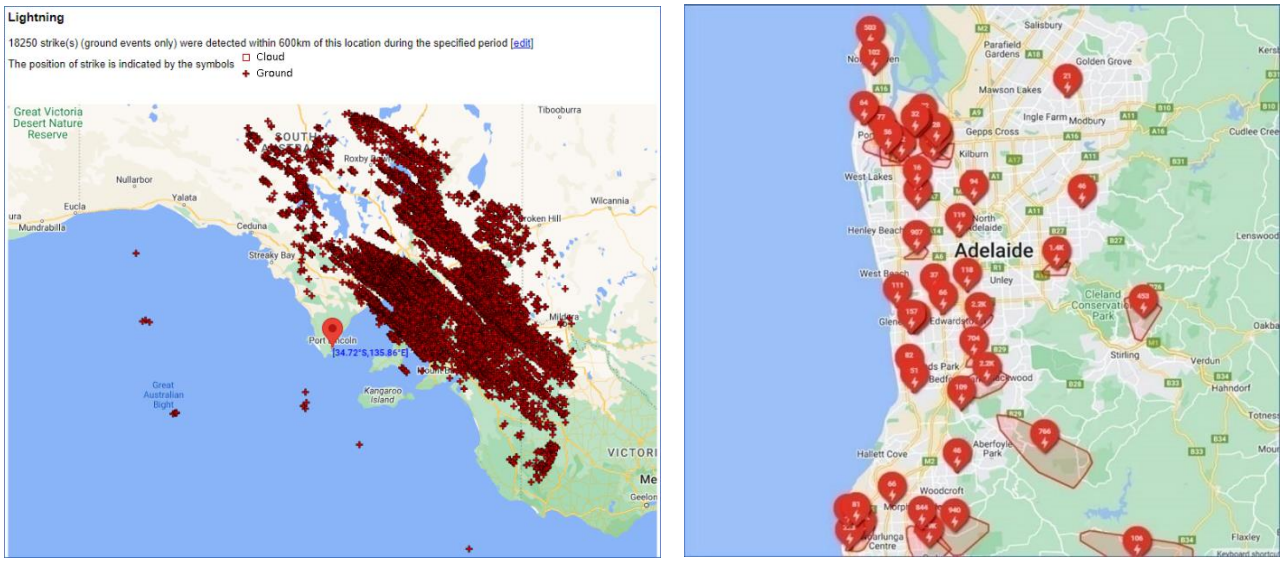
Event #	MED Category	Dates	USAIDI	USAIFI	UCAIDI	Comment
1	Cat 3	2 Oct 23	26.8	0.035	773	Severe weather event
2	Cat 1	28 Nov 23	5.0	0.034	145	Severe weather event
3	Cat 1	8 Dec 23	5.4	0.023	231	Severe weather event
4	Cat 3	11 Dec 23	32.8	0.070	470	Severe weather event
5	Cat 1	28 Dec 23	6.3	0.014	466	Severe weather event
Total		**5 days**	**76.3**	**0.177**		

6.2.b.1 Cat3 MED on 2 October 2023

Severe thunderstorms followed fire danger conditions on the evening of 2 October 2023. Lightning activity and strong winds resulted in widespread customer interruptions. There were over 18,000 lightning strikes to ground across the state along with high wind speeds with 107km/h wind gusts observed at Port Augusta, 105km/h at Noarlunga, 101km/h at Whyalla and Outer Harbor and 94km/h at Adelaide Airport.

The high wind speeds and lightning resulted in 32,290 customers without supply and 550 separate outage notifications. Given the extent of damage to the network, supply restoration required considerable resourcing, which resulted in long restoration of supply durations.

Figure 9: Lightning strikes to ground (left) and SA Power Networks outage map (right) - 2 October 2023 event.



In the lead up to the forecast weather event, additional trade skill workers (TSWs) – double the normal amount, were placed on availability to provide additional resources to respond to the event quickly, with crews being immediately mobilised on the night. Repairs to the network continued until the early hours of Wednesday morning, with supply progressively restored to customers. Photos of the storm damage are provided below, which provides an example of the amount of effort required to safely restore supply.

Figure 10: Storm damage to SA Power Networks' infrastructure - 2 October 2023 event

In accordance with our normal practice, a Post Event Review was undertaken to identify and document what went well, as well as to identify any opportunities for improvement.

6.2.b.2 Cat1 MED on 28 November 2023.

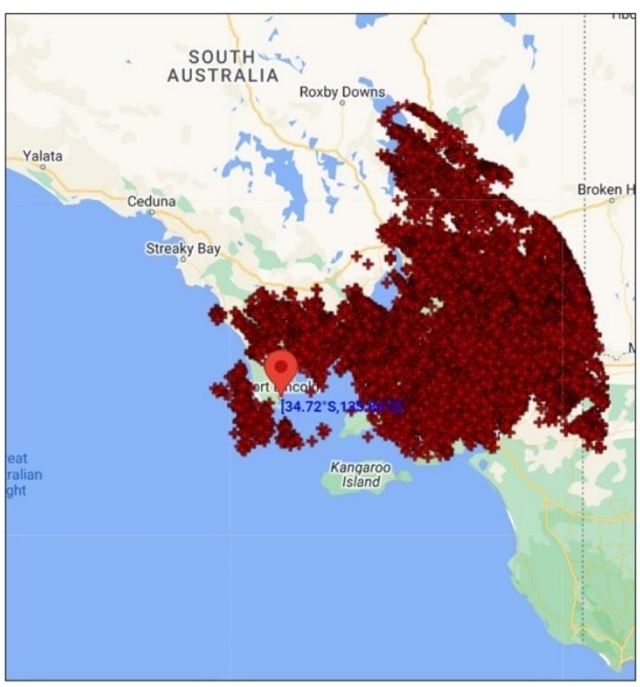
Severe thunderstorms occurred across the state on 28 November 2023. This weather event had a significant impact on our network, resulting in widespread supply interruptions.

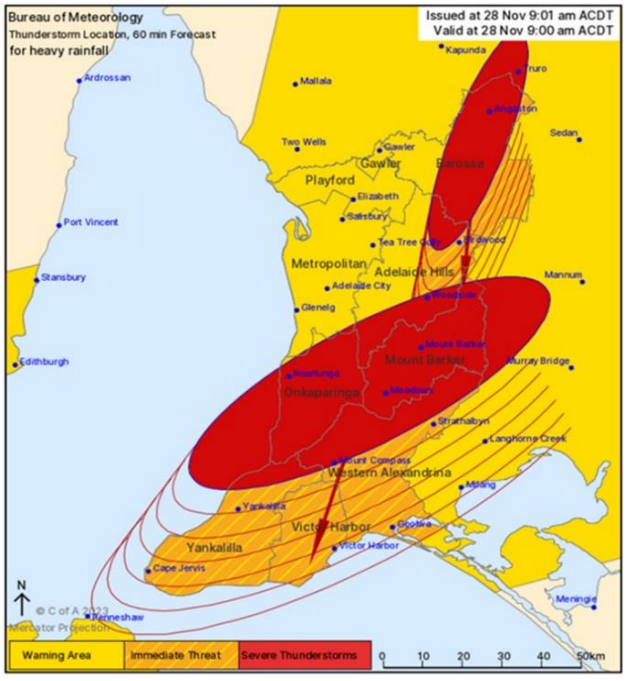
With reference to the first image below, there were over 30,000 cloud-to-ground lightning strikes across the state, together with local intense rainfall and damaging winds. Large parts of the populated area of the state were affected.

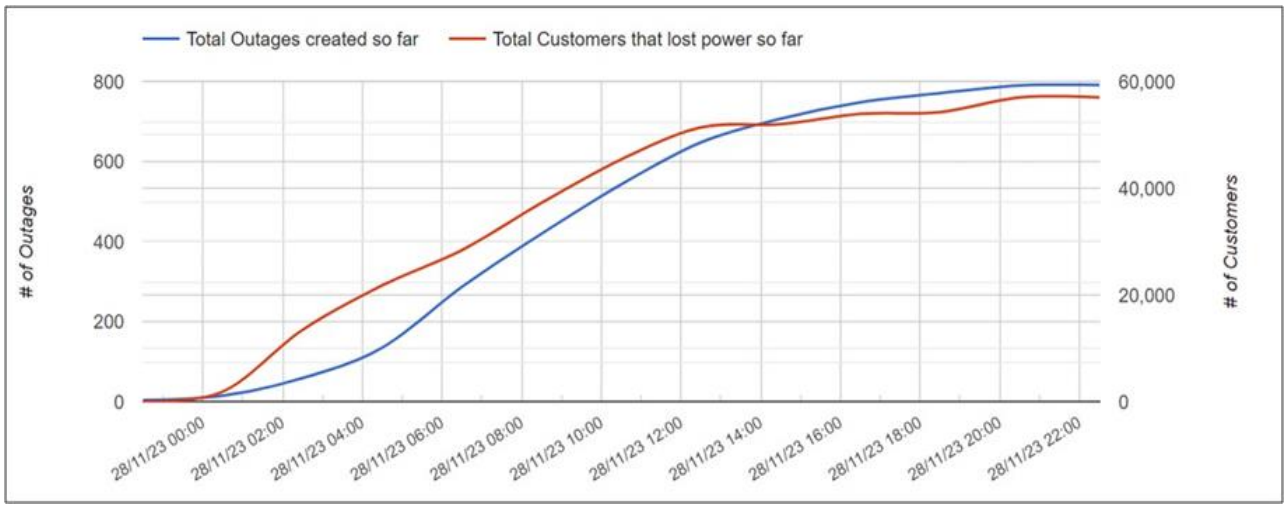
Scotch College at Torrens Park, recorded 45.8mm of rain between 06:00 and 07:00, and Bellevue Heights recorded 46.6mm of rain over a three-hour period, resulting in localised flooding. The average rainfall for all of November is 30mm. The weather warning issued by the Bureau of Meteorology (**BOM**) at 09:00 is shown in the second image below. The red patches in the image represent the movement of the severe thunderstorm cells at the time.

With reference to the graph in the final image below, there were almost 60,000 customers who lost power throughout the event and almost 800 separate outage jobs.

Figure 11: Lightning strikes to ground (left) and BOM severe thunderstorm warning (right), number of customers without supply (below) - 28 November2023 event







The 28 November 2023 event was classified as a Cat 1 MED with an average restoration of supply time of 145 minutes compared to the average restoration of supply times for a Cat 1 of between 150 and 210 minutes. The restoration time for this event was better than average for supply restoration. Consequently, we consider best endeavours was employed to restore supply as soon as practical.

6.2.b.3 *Cat1 8 Dec 2023 and Cat 3 11 Nov 2023 MEDs - Bushfire Risk Management and Storm Response*

Extreme weather conditions on Friday 8 Dec 2023 and over the following weekend had a significant impact on the network and our customers.

As a precaution for elevated bushfire risk conditions, large parts of our network were placed in fire danger protection settings (a combination of high-speed protection and reclosing disabled). While this was necessary to manage bushfire risk, it meant our network was more vulnerable to supply interruptions.

We experienced Catastrophic Fire Danger conditions in five weather stations across the state, with extreme temperatures and strong winds. The highest wind gusts observed were 93km/h in Cultana and 89km/h in Snowtown. We reached Fire Danger Level 3 (highest risk) conditions at four weather stations (a consequence of sustained fire danger conditions and strong winds).

The high fire danger conditions required us to disconnect supply to mitigate the high risk to the community. Supply to approximately 800 customers in Port Pirie and 12,000 customers in the Roseworthy areas were affected. Supply was progressively restored throughout the day as conditions eased.

Coincident with the bushfire conditions, significant lightning activity occurred throughout the day. There were over 15,000 cloud-to-ground lightning strikes in the 24-hour period on Friday. Refer to the first image below. With reference to the second image below, there were around 40,000 homes and businesses affected by supply interruptions throughout Friday, resulting in 250 separate outage jobs.

Figure 12: Lighting strikes Friday 8 October 2023

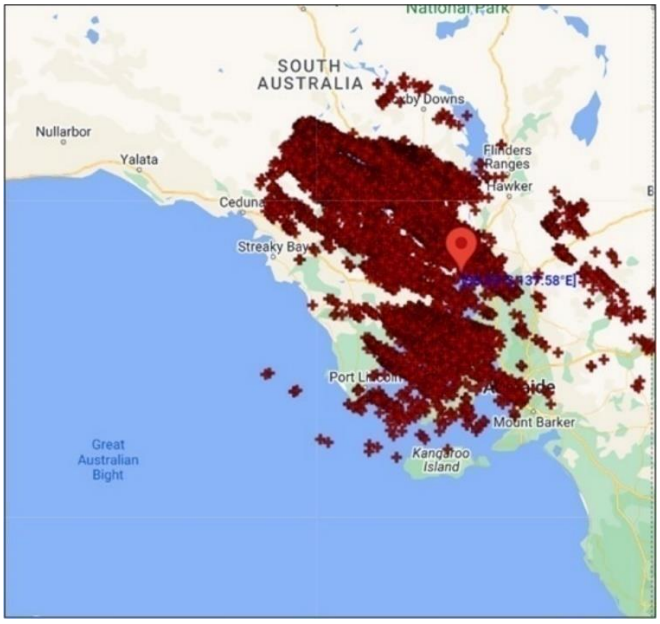


Figure 13: Number of customers interrupted and number of total interruptions on 8 Dec 2024 from mid-night to 8 pm.

The Bureau of Meteorology reported that parts of South Australia received more than two months of rainfall in less than 24 hours on Saturday.

Over Sunday (10 Dec 23) and Monday Morning (11 Dec 23) there was more than 21,000 cloud-to-ground lightning strikes again over the network. Refer to the Figure 14 below. Over this period there were more than 50,000 homes and businesses affected by supply interruptions with 650 separate outage jobs. Refer to Figure 15 below.

Figure 14: Number of lightning strike to ground on Sunday 10 December and the morning of Monday 11 December 2023.

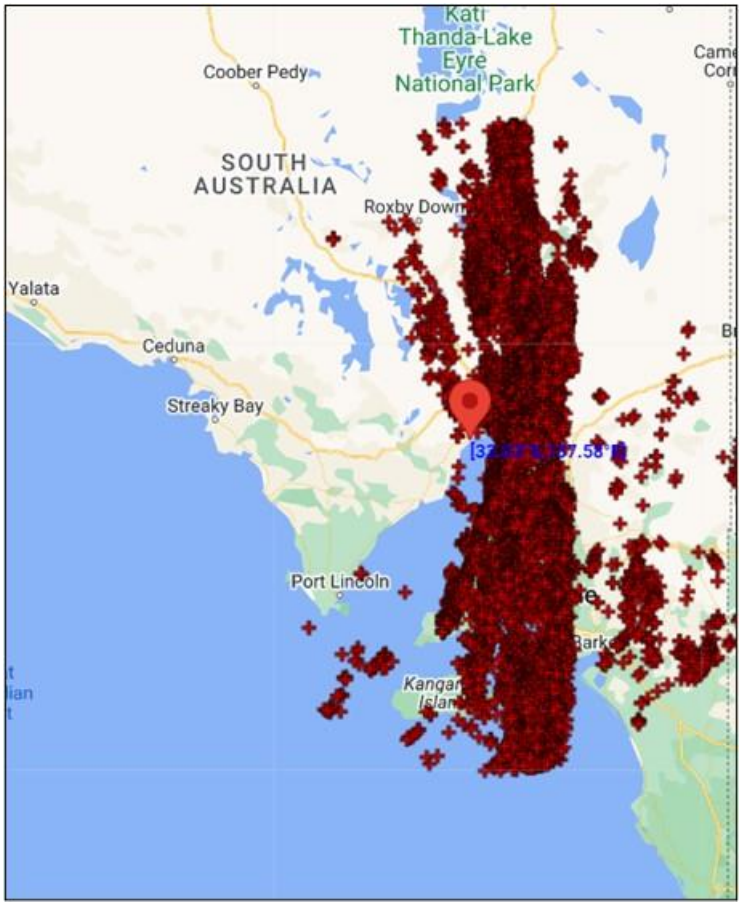


Figure 15: Number of customers interrupted and number of supply restoration jobs on 10 and 11 December 2023.

The photos provided below demonstrate the destructive nature of the weather conditions and the subsequent network damage.

Figure 16: Storm damage to SA Power Networks' infrastructure – 10 and 11 December 2023 event

6.2.b.4 Cat1 MED on 28 December 2023

The 28 December 2023 MED was the result of severe weather (specifically lightning). Outages were widespread across the following regions:

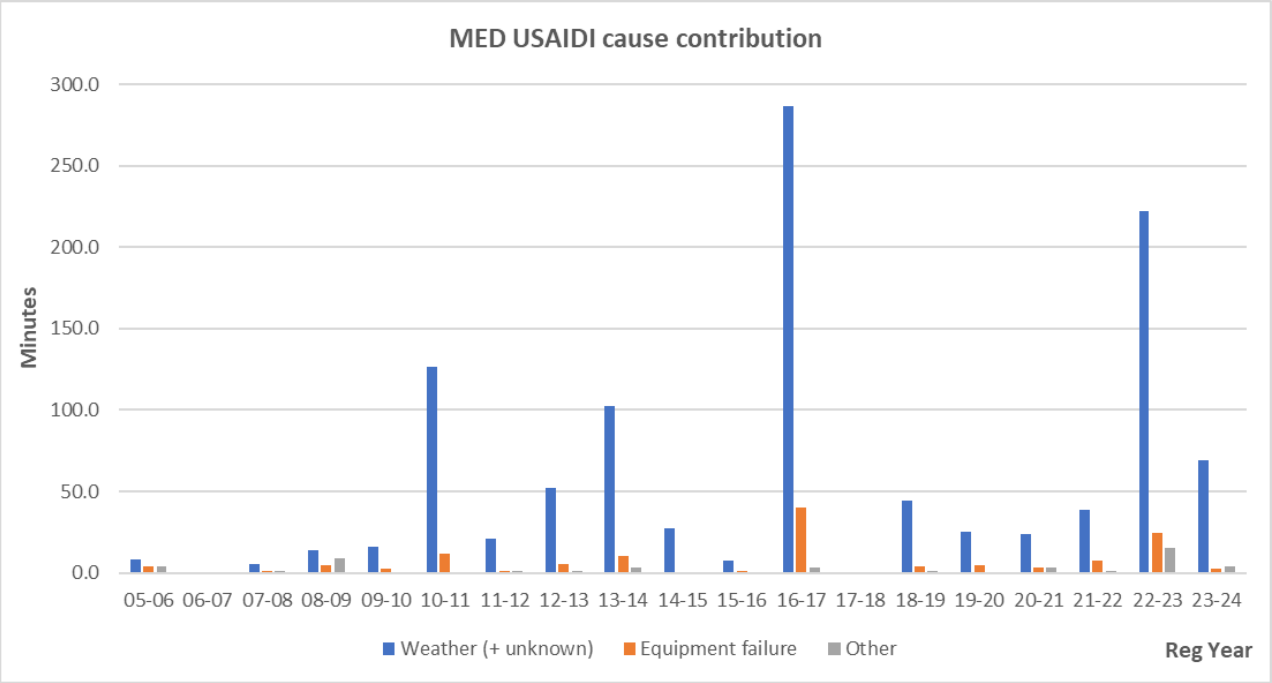
- Barossa, Mid-North, and Yorke Peninsula;
- Eyre peninsula; and
- Riverland and Murraylands.

The MED occurred between Christmas and New Year when there were minimum staffing levels. While SA Power Networks had in place minimum staffing levels to ensure that sufficient personnel were available to respond to interruptions over the holiday period, this event occurred in rural areas exacerbating response times due to the extent of travel required.

6.2.c Equipment failure component of MEDs

Another indicator of whether SA Power Networks is appropriately maintaining the distribution system is the proportional contribution to USAIDI on MEDs that result from equipment failure outages, being cognisant that as the MED USAIDI increases so does the absolute value of USAIDI due to equipment failure (ie as intensity of the MED increases there are more interruptions due to electricity infrastructure damage and consequently longer restoration times). Figure 17 below shows the contribution to MED USAIDI from weather (and unknown), equipment failure and other.

Figure 17: MEDs USAIDI contribution from causes weather and equipment failure



The contribution from 'equipment failure' on MEDs in 2023-24 of 4%, was proportionally lower than the 10-year TSP historic average of 10% and a 5% reduction from the 2022-23 result of 9%. In addition, the USAIDIn contribution from equipment failure was 47 minutes, 3 minutes lower than the TSP where the average was 50 minutes. Figure 17 shows no declining trend in this metric. Consequently, we conclude that the proportion of USAIDI contribution during MEDs from 'equipment failure' is relatively stable.

The stability in our equipment failure performance reflects the priority given to addressing the highest risk defects identified from our increased asset inspections. Those inspections have identified a significant increase in the volume of work required to address the condition of ageing assets.

6.2.d MED performance conclusion

SA Power Networks considers that average restoration of supply times has not declined in 2023-24, but was poor in 2023-24 due to three MEDs associated with a number of severe weather events 2 October and 8 December and 28 December, which stretched resources due to the severity of the events and the location/timing of the events.

In addition, the proportional contribution to MED USAIDI from equipment failure-caused interruptions is within the normal range in 2023-24. This provides evidence that the distribution system is being appropriately maintained to achieve the EDC reliability targets. Consequently, SA Power Networks concludes that our responsiveness to restore customers who experience interruptions during MEDs in 2023-24 has been maintained.

6.3 Conclusion – overall reliability outcome for 2023-24

The distribution system's reliability was maintained during 2023-24 and SA Power Networks' response during MEDs has been maintained. In particular,

- The normalised reliability of the distribution system has been maintained;
- The USAIDIn contribution due to equipment failure-related interruptions is stable;
- The USAIDIn contribution from weather related interruptions is not increasing;
- The average restoration of supply times MEDs have been maintained; and

- The equipment failure percentage contribution to USAIDI during MEDs has been stable.

SA Power Networks has therefore complied with its reliability obligations at a distribution system level in 2023-24.

7. EDC Feeder Category reliability performance

7.1 Introduction

In the sections to follow, SA Power Networks assesses each of the feeder categories' reliability performance in three steps:

- Determining if the normalised performance achieves the reliability targets.
- Determining if over the last few years there has been any declining trend in performance.
- Where the normalised performance is worse than the EDC normalised targets, explaining that performance by removing the effects of local SWEs, other one-off type events and analysing the annual USAIDIn cause contributions.

Note:

- Where a feeder category's normalised performance meets the service standard target, no further comment will be made except to determine if the performance was consistent with historic performance.
- The normalisation process, as explained earlier, does not work equally well for all feeder categories' performance.

7.2 CBD feeder category normalised performance

7.2.a Introduction

The feeders within the CBD category supply 1% of customers, using 0.4% of the distribution system. These feeders supply the Adelaide CBD and immediate surrounds. Due to the very low customer numbers and low targets, the performance of the CBD feeders is very sensitive and can be significantly impacted by a single interruption.

7.2.b Normalised reliability performance

SA Power Networks achieved all four reliability targets (ie USAIDIn, CRoSn ≥ 1hour and CRoSn > 2hours) for the CBD Feeder category in 2023-24.

Table 17: CBD reliability by interruption cause

	Asset failure	Weather	Other	Total
USAIDIn				
2023-24	11.4	1.3	1.3	14.0
TSP Ave	13.0	2.1	1.2	16.2
TSP RT	14.2	4.1	1.9	20.2
USAIFIn				
2023-24	0.095	0.006	0.022	0.178
TSP Ave	0.099	0.029	0.019	0.147
TSP RT	0.115	0.051	0.034	0.200

Table 17 above compares the cause contributions to USAIDIn and USAIFIn for 2023-24, the TSP average and the TSP Reporting Threshold. It highlights that all causes were marginally lower than the average during the TSP.

Figure 18: CBD feeder category USAIDIn

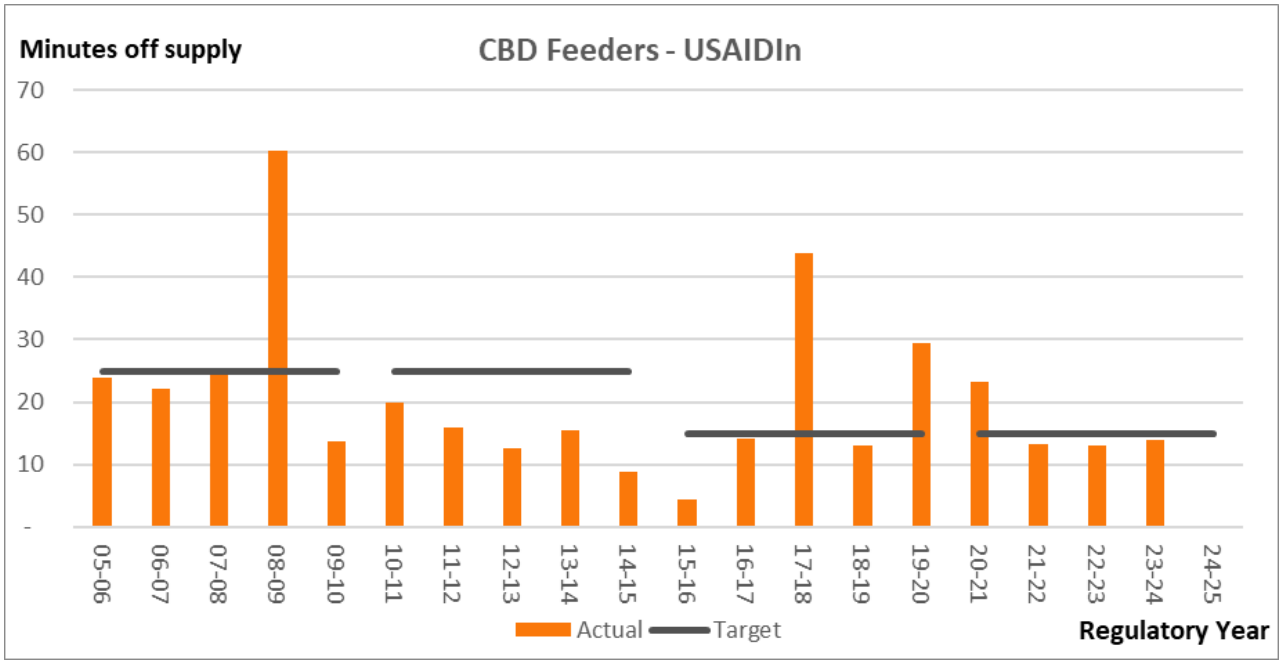


Figure 19: CBD feeder category USAIFIn

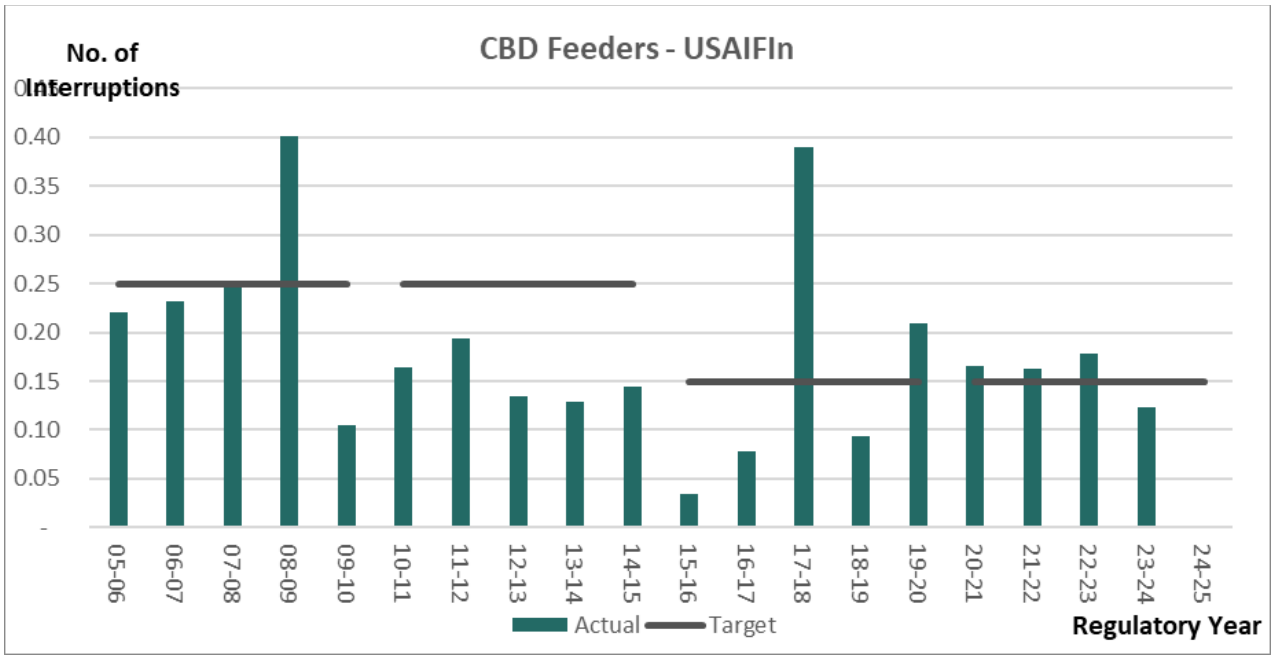
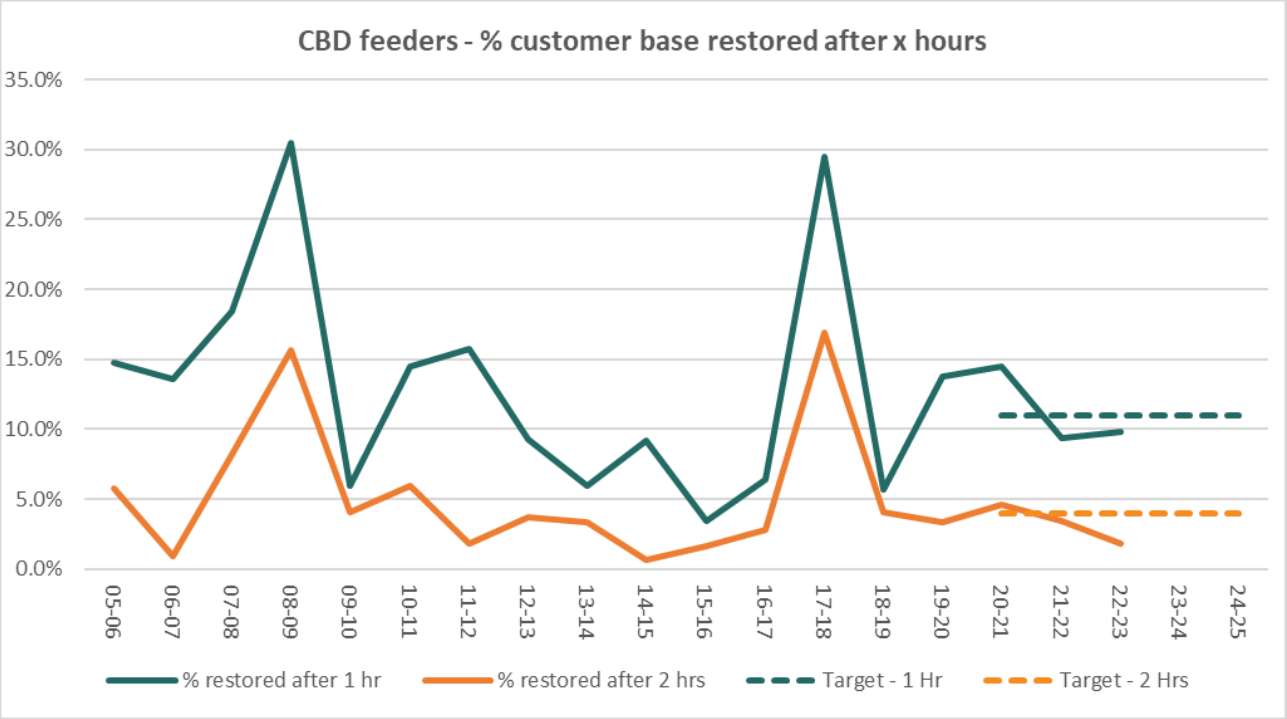


Figure 20: CBD feeder category CRoSn (≥ 1hour and > 2hours)



7.2.c Conclusion

All four CBD feeder category targets were achieved in 2023-24. SA Power Networks considers it has used best endeavours to achieve the CBD feeder category targets in 2023-24. While we have achieved the category targets, a worsening in performance of some older cables in the CBD has been observed. It is forecast that additional expenditure will be necessary over the 2025-30 period to address this worsening performance.

7.3 Urban feeder category normalised performance

7.3.a Introduction

The Urban feeders supply about 69% of customers utilising about 29% (ie 24,535 route kms) of the distribution system. They supply the Adelaide Metropolitan area (excluding part of the Adelaide CBD and some major regional towns (eg Mt Gambier and Pt Augusta).

7.3.b Normalised reliability performance

SA Power Networks achieved the four Urban feeder category targets for 2023-24. Table 18 below demonstrates that there has been an improvement in USAIFIn, and no decline in USAIDIn and CRoSn.

Table 18: Reliability performance of the Urban feeder category

Urban feeders	USAIDIn	USAIFIn	% Restored 2 Hrs	% Restored 3 Hrs
2023-24	90	0.80	22	11
Target	110	1.15	27	11
Reporting threshold	125	1.35	29.5	13.5

Figure 21: Urban feeder category USAIDIn

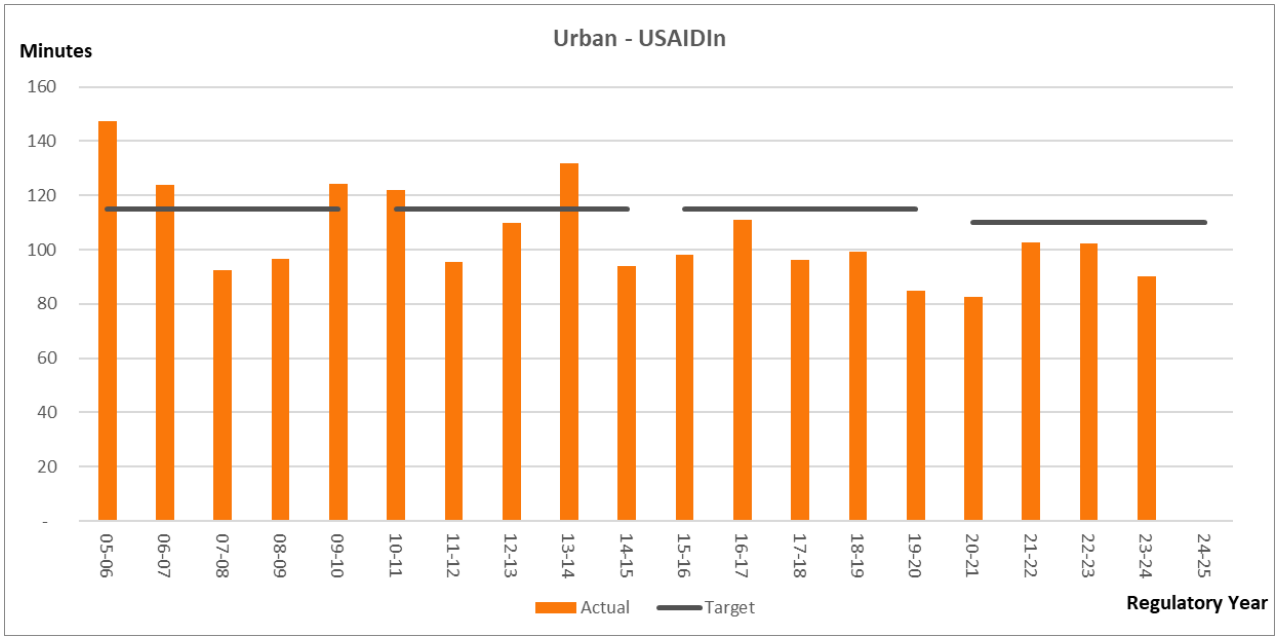


Figure 22: Urban feeder category USAIFIn

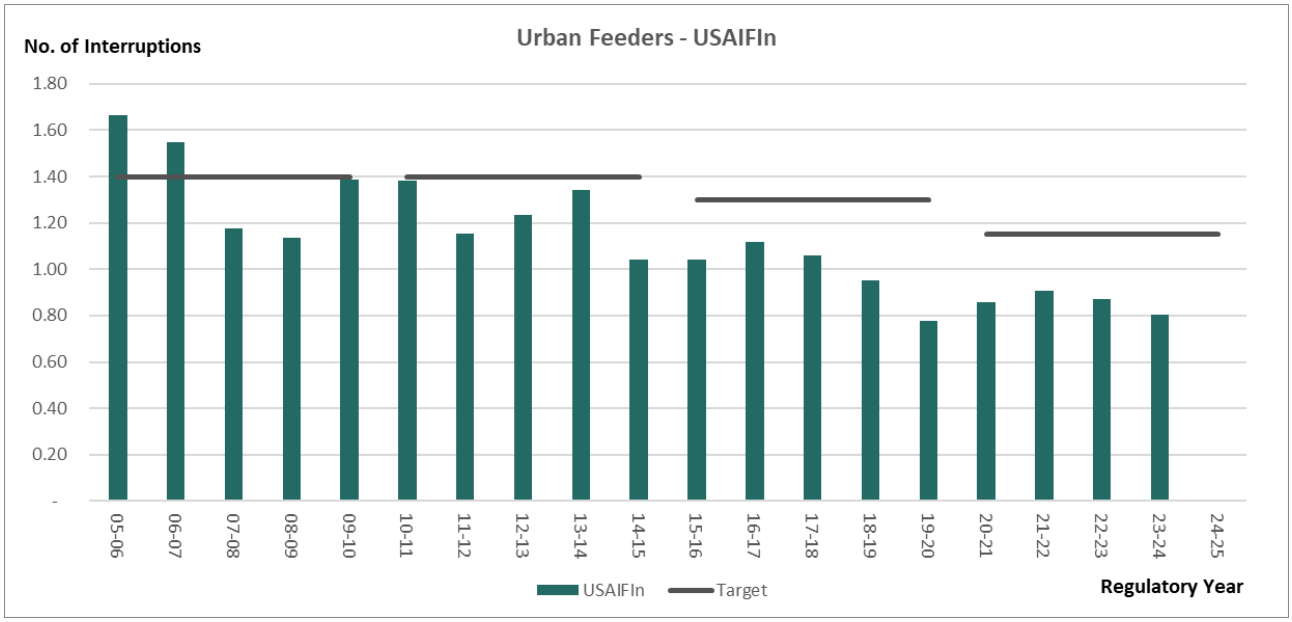
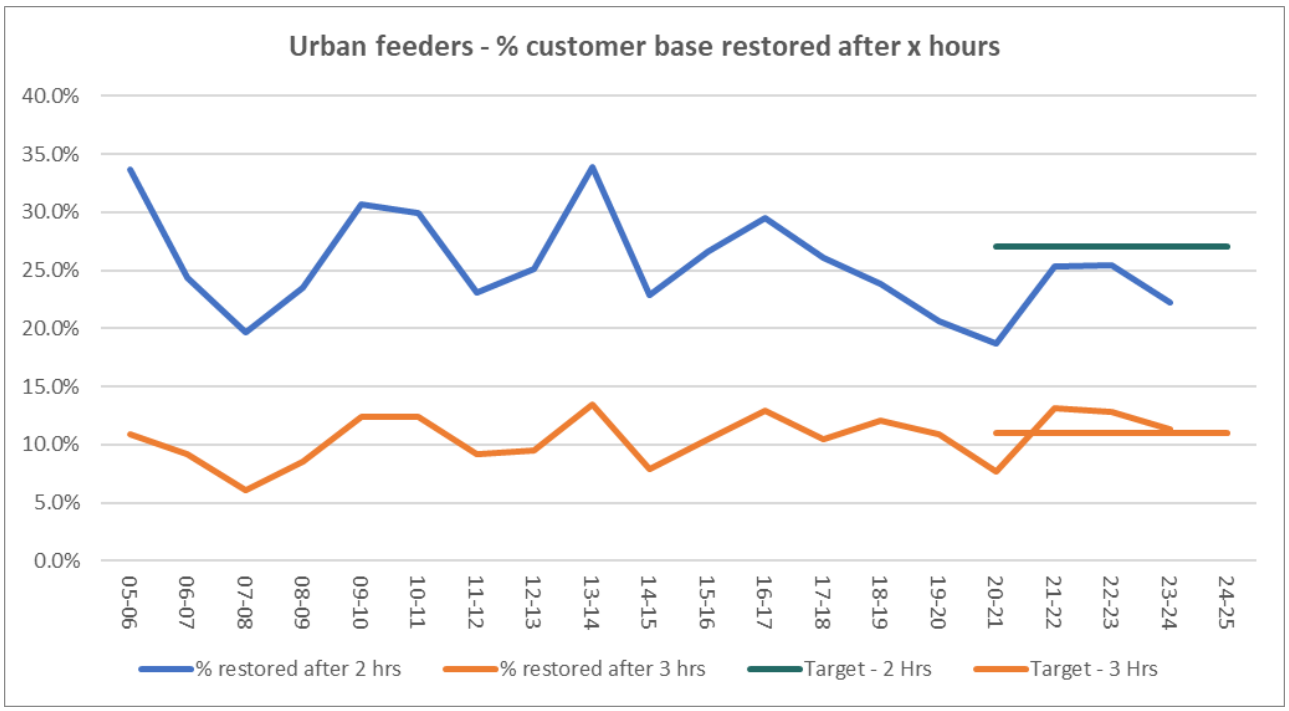


Figure 23: Urban feeder category CRoSn (> 2hours and > 3hours)



7.3.c Conclusion

As all four reliability targets were achieved in 2023-24, no performance was worse than the reporting threshold and there is no declining trend in the reliability measures, best endeavours have been employed to meet the EDC's Urban feeders USAIDIn, USAIFIn and customer restoration of supply targets in 2023-24.

7.4 Rural Short feeder category normalised performance

7.4.a Introduction

The Rural Short (**RS**) feeders supply about 15% of customers utilising about 15% (ie 12,587 route kms) of the distribution system. These feeders supply customers in the fringe areas of the Adelaide Metropolitan area and most regional towns (eg Victor Harbor).

7.4.b Normalised reliability performance

SA Power Networks achieved two of the four RS feeder category targets for 2023-24. Table 19 shows the actual performance when compared with the target and the reporting threshold (ie normal bounds of the variation in performance). Figure 24, Figure 25 and Figure 26 demonstrates there has been a gradual improvement in historic reliability performance and that there has been no decline in networks restoration performance for > 3 hours and > 5 hours.

Table 19: Rural short performance (normalised)

Rural Short feeders	USAIDIn	USAIFIn	% Restored 3 Hrs	% Restored 5 hrs
2023-24	197	1.30	29	12
Target	200	1.65	27	8
Reporting threshold	220	1.85	29.5	10.5

Figure 24: Rural short feeder category USAIDIn

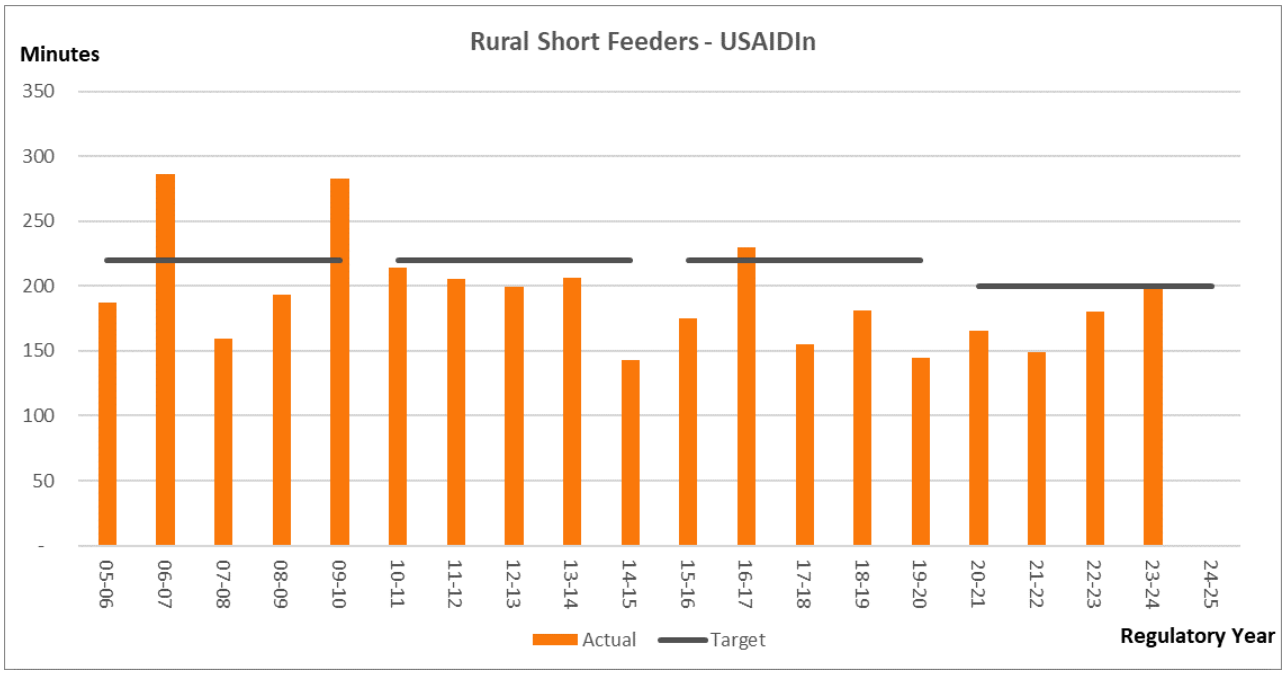


Figure 25: Rural short feeder category USAIFIn

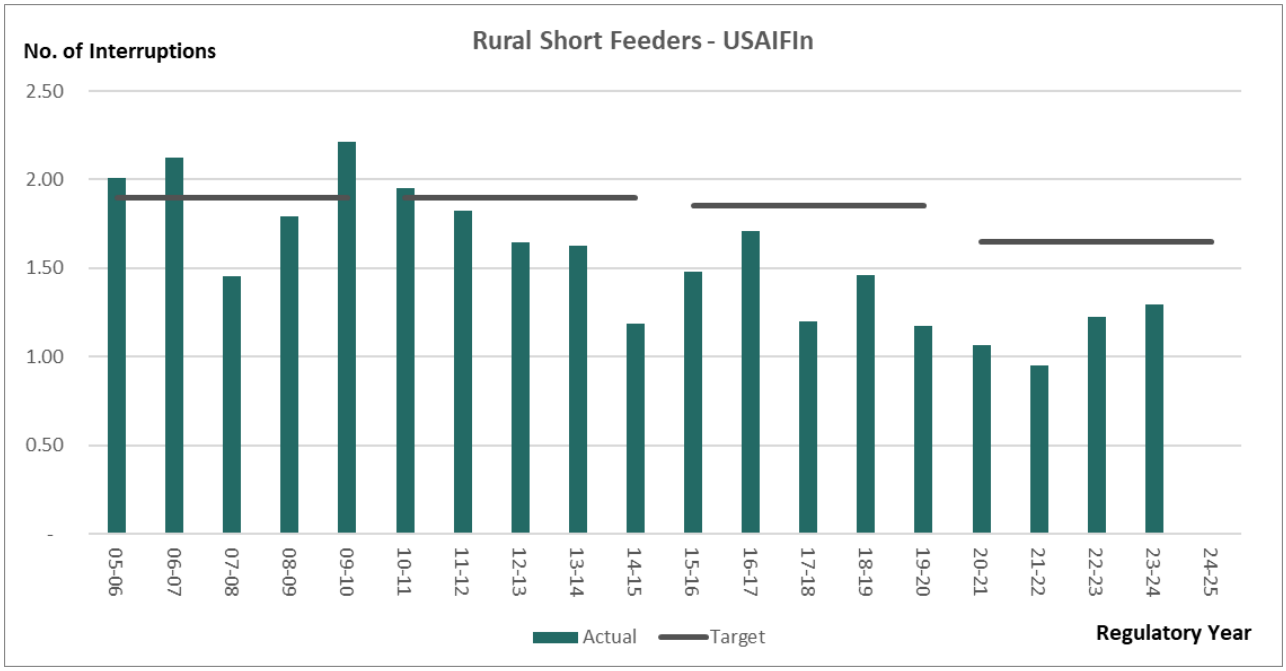
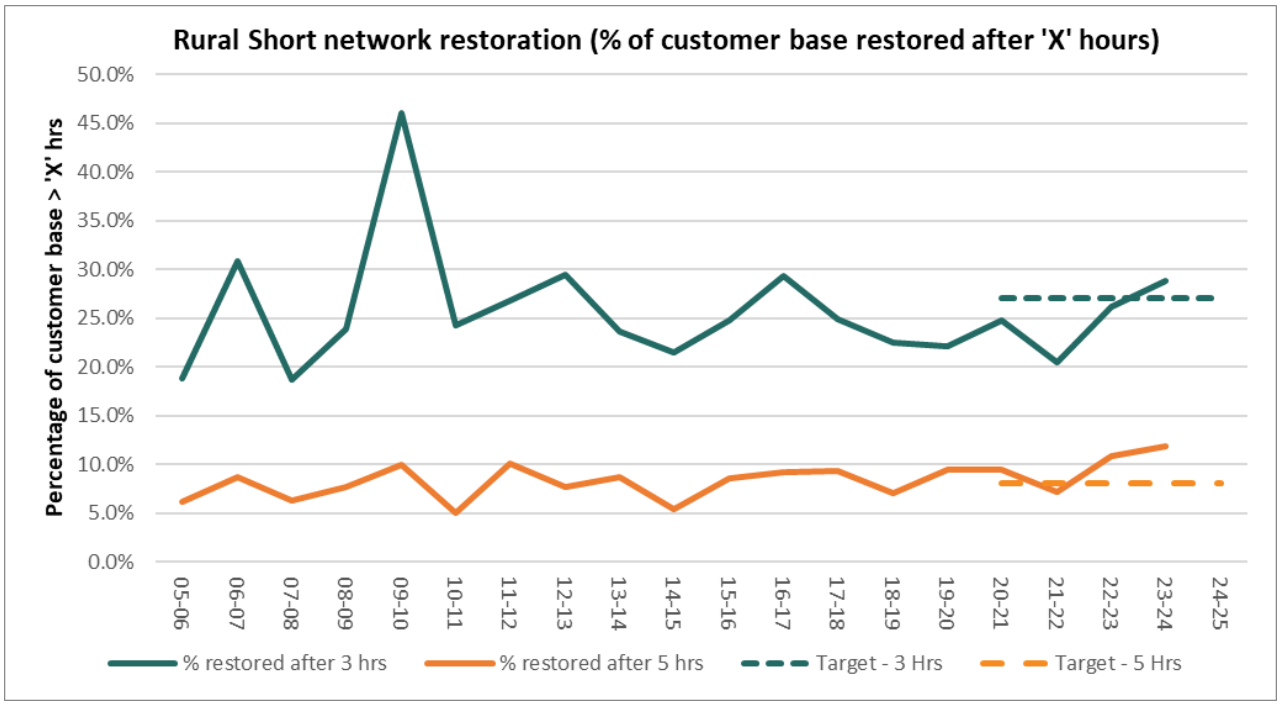


Figure 26: Rural short feeder category CRoSn (> 3hours and > 5hours)



Major factors influencing RS reliability performance

SA Power Networks achieved both the USAIDIn and USAIFIn but did not achieve either of the restoration of supply targets. There were severe weather events and third party (eg car hit pole) caused interruptions that resulted in both restoration of supply targets being exceeded. The increase in weather related interruptions is mainly due to the significant increase in lightning strikes since 2019-20, see Figure 27 below.

Figure 27 - Lighting ground strikes - SA

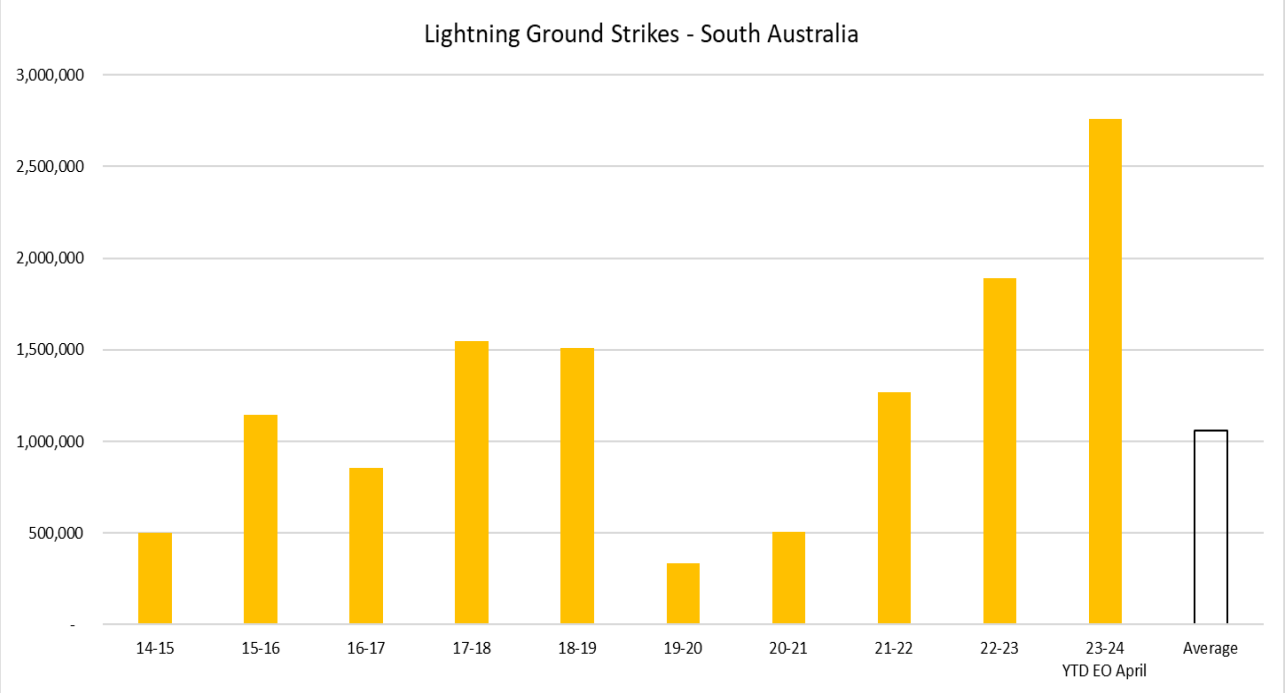


Figure 28: Insulator damaged by lightning

It can be very time consuming to locate and repair an insulator damaged by lightning. Surprisingly, some lightning strikes cause minimal observable damage to the insulator as can be seen in Figure 28 (the arrow points to the small puncture hole in the insulator caused by lightning).

These types of insulator failures significantly increase the restoration of supply performance. Weather caused interruptions contributed almost half the CRoS > 3hr outcome and more than a third of the CRoSn > 5hr outcome in 2023-24.

Weather caused interruptions are not typically within SA Power Networks control.

SA Power Networks field crews and inspectors have Gyroscope binoculars to assist in find these types of failures. We have trialled an alternative method to assist (ultrasonic defectors), but this has proven ineffective to locate these types of faults. As a precautionary measure, where we locate this type of insulator failure, we replace adjacent insulators with lightning resistant insulators.

7.4.c Conclusion

Two of the four reliability targets have been achieved and there is no long-term declining trend in reliability performance, best endeavours have been used to meet the EDC's Rural Short feeder's reliability targets in 2023-24.

7.5 Rural Long feeder category normalised performance

7.5.a Introduction

The Rural Long (**RL**) feeders supply about 15% of customers utilising about 55% (ie 49,277 route kms) of the distribution system and supply mainly rural areas.

7.5.b Normalised reliability performance

As outlined in Table 20 below, SA Power Networks only achieved one of the four RL feeder category targets for 2023-24. Of the three targets not achieved, all were worse than the reporting threshold. The below target performances were due to several severe weather events and third party caused (animals and vehicles colliding with poles) interruptions (see below for more detail). Figure 29, Figure 30 and Figure 31, demonstrate there has been a gradual improvement in historic reliability performance, but a decline in CRoSn. SA Power Networks has proposed funding to address the decline in CRoSn in its Regulatory Proposal for the 2025-30 RCP.

Table 20: Rural long feeder performance (normalised)

Rural Long feeders	USAIDIn	USAIFIn	% Restored 4 Hrs	% Restored 7 hrs
2023-24	334	1.64	35	15
Target	290	1.75	30	10
Reporting threshold	330	2.10	32.5	12.5

Figure 29: Rural long feeder category USAIDIn

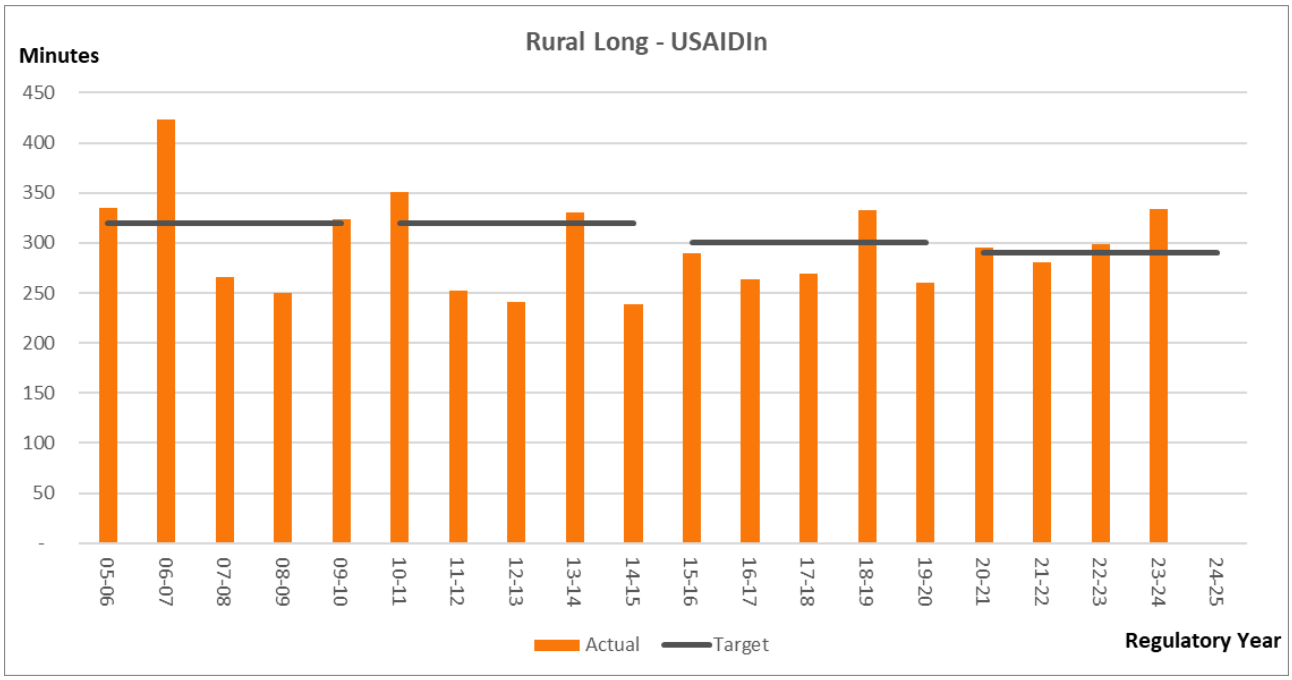


Figure 30: Rural long feeder category USAIFIn

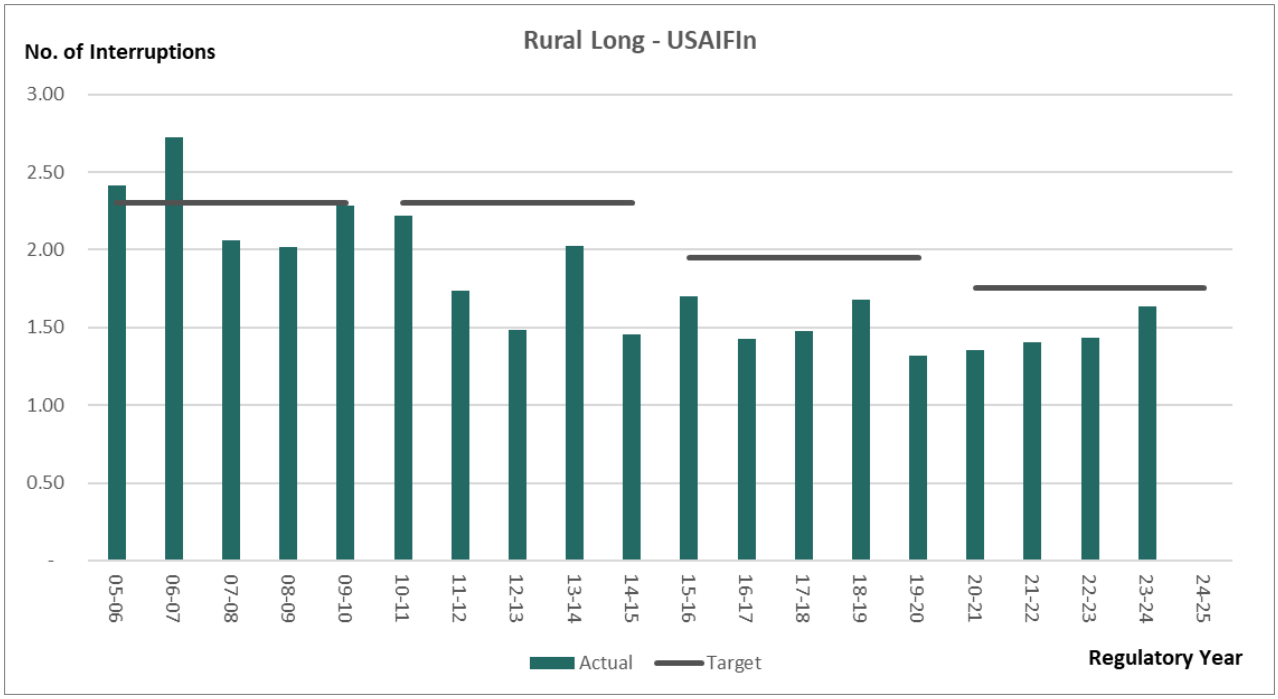
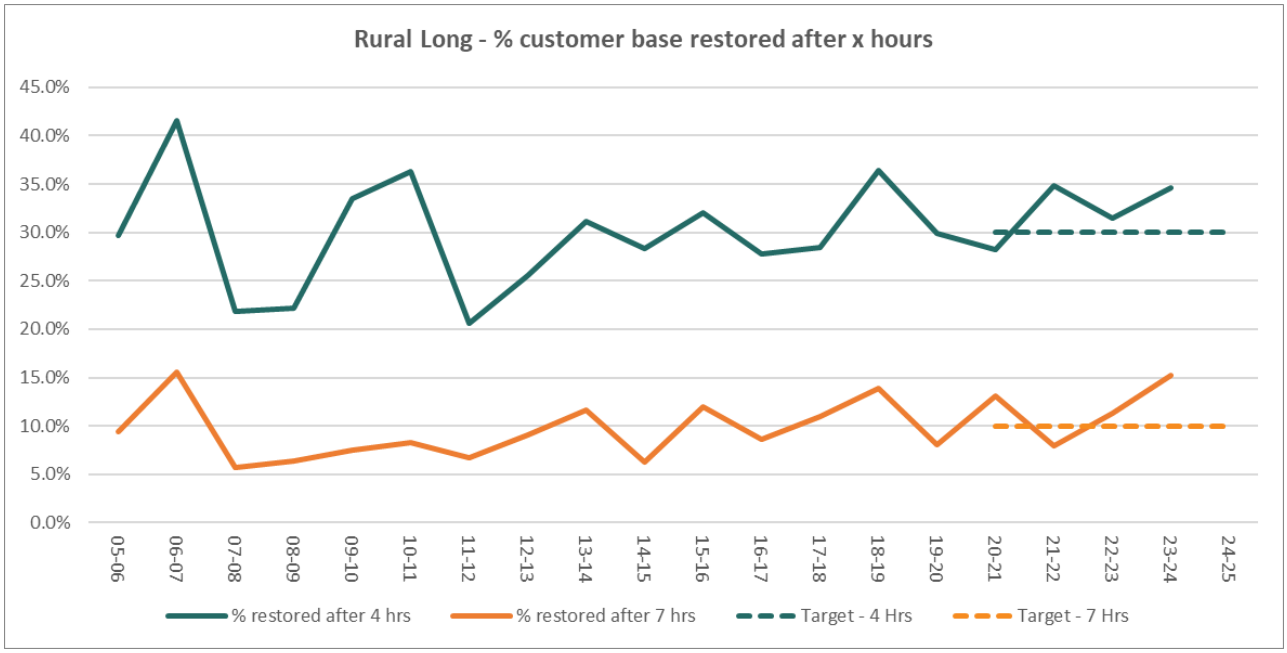


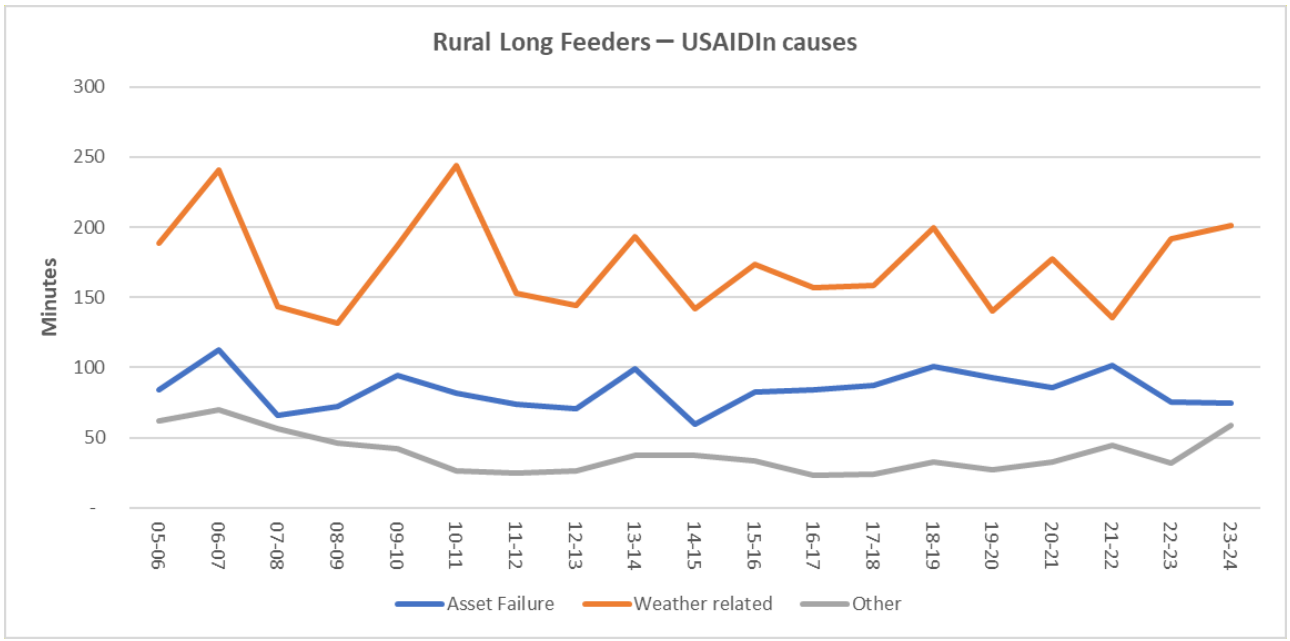
Figure 31: Rural long feeder category CRoSn (> 4hours and > 7hours)



Major factors influencing RL reliability performance

The poorer than target USAIDI performance was a result of a significant increase in weather related interruptions of around 25 minutes and a significant increase in other caused (animals and vehicles) interruptions of around 18 minutes. This USAIDIn performance also resulted from the poor restoration of supply performance on 19kV SWER feeders as explained further in our MECS. Figure 32 highlights the increase in weather related and other caused interruptions.

Figure 32: Long Rural USAIDIn interruption causes



The poorer network restoration performance in 2023-24 was due to:

- Severe weather events which contributed 4.9% to CRoSn > 4hours and 2.7% to CRoSn > 7 hours more than the average over the six years prior to 2022-23; and
- Third party caused interruption contributing 3.2% to CRoSn > 4hours and 2.1% to CRoSn > 7hours than the average over the six years prior to 2022-23.

These types of interruptions are typically beyond our control, and we are acting as set out in the MECS to improve our restoration of supply performance. The other major contributor to the decline in CRoSn performance is the impact of increasing Solar PV impacting on the operation of our sectionalisers.

7.5.c Conclusion

In summary, one of the four RL reliability targets were achieved, with the non-achievement of the three reliability targets resulting from severe weather events and third party causes (animals and vehicles colliding with infrastructure). However, as also highlighted in our MECS we are concerned that there is an emerging trend in the RL customer restoration of supply performance. We are proposing additional funding in our regulatory proposal for the 2025-30 RCP to address this emerging decline in performance. As the poorer 2023/24 performance was impacted by factors beyond our control we believe that best endeavours have been used to meet the EDC's Rural Long feeder's category reliability targets in 2023-24.

7.6 Overall conclusion

Table 21 compares the achievement of the reliability measures in 2023-24 in comparison to the best year, worst year and the average over the target setting period. It highlights that the performance in 2023-24 was slightly better than the average.

Table 21: Overall performance

	2023-24	Average TSP	Best (2014/15)	Worst (2010/11)
Targets achieved	11	9	16	3
> target & < RT	1	4	0	7
> RT	4	3	0	6

The above feeder category analysis highlights that there is no declining trend except in the Rural feeder categories restoration of supply performance. SA Power Networks has significantly increased its expenditure and resources to address this declining performance. Consequently, SA Power Networks has used best endeavours to achieve all the reliability targets in 2023-24. Consequently, SA Power Networks has complied with its EDC reliability service standard obligations.

8. EDC Region reliability performance

8.1 Introduction

ESCoSA is concerned that establishing reliability standards solely based on the four feeder categories may mask a decline in performance in regional areas. Consequently, ESCoSA requires us to report on nine geographic areas and another segmentation that comprises feeders in all the major rural townships. The ten regions are:

- Adelaide Business Area (**ABA** - same as those feeders classified as CBD);
- Greater Adelaide Metropolitan Area (**GAMA**);
- Major regional centres (**MRC** – includes the townships of Pt Lincoln, Whyalla, Pt August, Pt Pirie, Murray Bridge, Mt Gambier, Stirling-Aldgate, Mt Barker and Victor Harbour)
- Barossa and Mid-North (BMN);
- Eastern Hills (**EH**);
- Eyre Peninsula (**UNE**);
- Fleurieu Peninsula (**FP** – includes Kangaroo Island);
- Riverland and Murraylands (**RM**);
- Southeast (**SE**); and
- Upper North (**UN**).

The following sections detail the assessment criteria that SA Power Networks will use to determine if the historic reliability performance of the ten regions has been maintained. These criteria will then be used to assess whether or not each region's reliability performance has been maintained.

8.2 Assessment criteria for determining if a region's reliability has been maintained.

The two measures used to monitor reliability performance of a distribution system due to unplanned interruptions are:

- USAIDIn (the average time customers are without supply in minutes per annum); and
- USAIFIn (the average number of interruptions experienced per annum).

These measures are normalised to exclude interruptions that start on a MED, as these can significantly impact on the reliability performance of a region. Once MEDs are excluded from a region's USAIDI and USAIFI result, the remaining variability is generally due to either:

- Localised or state-wide SWEs that don't result in a MED; or
- one off, non-systemic interruptions.

In the sections to follow, SA Power Networks assesses whether each region's reliability performance is being maintained by examining the long-term trend, over several years, in:

- normalised USAIDI (ie USAIDIn which excludes MEDs); and
- normalised USAIFI (ie USAIFIn which excludes MEDs)

Where the performance is outside normal variation[34] we will detail the reasons for the excursion and, if not systemic, conclude that reliability performance is being maintained.

The process to determine if reliability has been maintained for a region will involve assessing the following two criteria:

- Is the historic reliability performance[35] being maintained (ie is there no long-term decline in performance and performance is better than the equivalent reporting threshold); and
- Is the non-achievement of the target related to one-off type events or SWE (ie not a systemic issue).

Where the first criterion is achieved, it means that the performance in that year is better than the historic average, consequently, it is appropriate to conclude that reliability for that region has been maintained. Also, if the second criterion is met, in that there is no declining trend, then the reliability for that region has been maintained. Consequently, where either of these two criteria are met the reliability for the region has been maintained.

8.3 Summary of regional performance

The information, tables and charts provided below demonstrate that there has not been a decline in any of the 10 region's reliability performance. The poorer than historic performance for the RM was due to one-off failures or SWEs. There were no systemic issues identified.

8.4 Adelaide Business Area

The Adelaide Business Area feeder category feeders supply 1% of customers[36], using 0.3% of the distribution system. These feeders supply the Adelaide CBD and surrounds. Due to the very low customer numbers and low targets, the performance of the CBD feeders can be significantly affected by one-off interruptions.

Table 22 highlights the Adelaide Business Area USAIDIn and USAIFIn performance for 2023-24, the historic 15-year period 1 July 2005 to 30 June 2020 average performance and the reporting threshold.

Table 22: Adelaide business area historic performance comparison

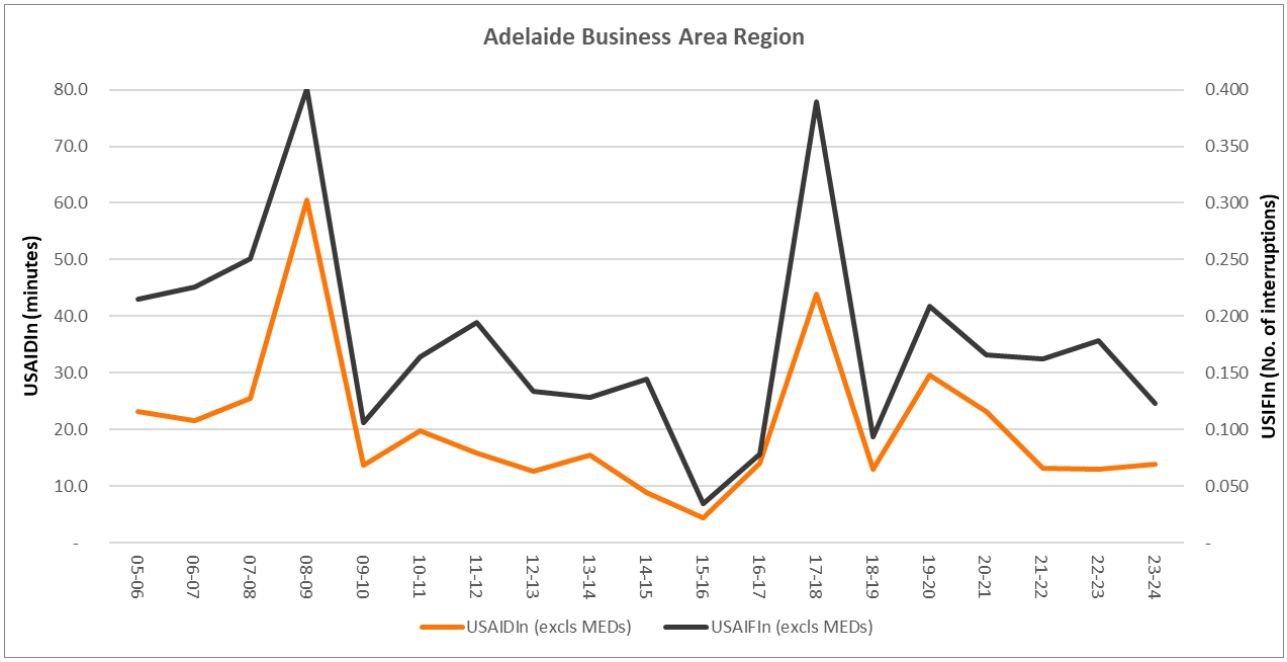
Adelaide business area	2023/24	Historic Ave.	Reporting threshold
USAIDIn	14	21	25
USAIFIn	0.12	0.18	0.23

[34] Outside normal variation means that it is outside the reporting threshold as introduced by ESCoSA for the 2020-25 RCP.

[35] Historic average is the average reliability performance over the 15-year period from 1 July 2005 to 30 June 2020.

[36] In addition, there are about 100,000 people living and working in the CBD each day.

Figure 33: Adelaide Business Area reliability performance



Conclusion

The historic performance of the Adelaide Business Area has been maintained as both the USAIDIn and USAIFIn are better than the average historic performance and there is no long-term declining trend in either of the two measures. As explained in section 7.2, we have identified a worsening performance of older cables in the CBD and have gained agreement from stakeholders to propose funding in our Regulatory Proposal for the 2025-30 RCP to address this worsening performance.

8.5 Greater Adelaide Metropolitan Area

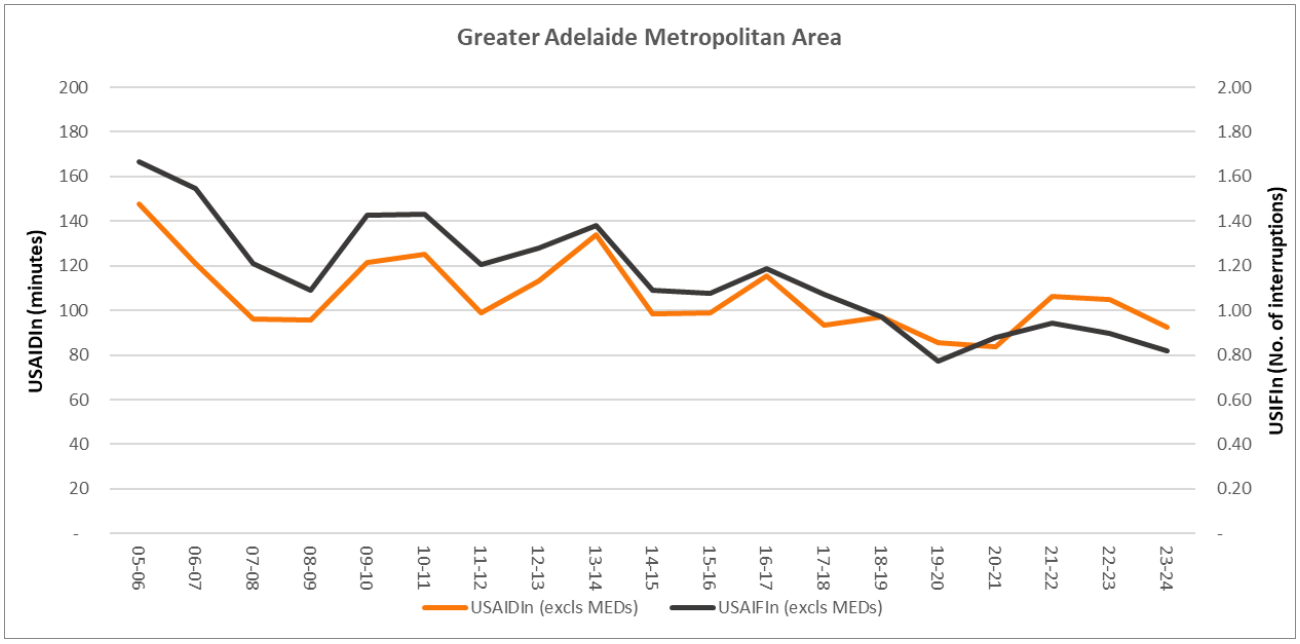
The Greater Adelaide Metropolitan Area supplies about 600,000 customers representing about 65% of total customers. Figure 34 shows that the reliability performance has gradually improved since the 2005/06 regulatory year.

Table 23 highlights the performance of USAIDIn and USAIFIn for 2023-24, the historic 15-year period 1 July 2005 to 30 June 2020 average performance and the reporting threshold.

Table 23: Greater Adelaide metropolitan area reliability performance

Greater Adelaide metropolitan area	2023/24	Historic Ave.	Reporting threshold
USAIDIn	93	109	121
USAIFIn	0.82	1.23	1.43

Figure 34: Greater Adelaide Metropolitan Area reliability performance



Conclusion

The historic performance of the Greater Adelaide Metropolitan Area has been maintained as USAIDIn and USAIFIn performance for the 2023-24 regulatory year were better than the historic average performance and there is a gradual improvement in reliability performance since the 2005-06 regulatory year.

8.6 Major Regional Centres

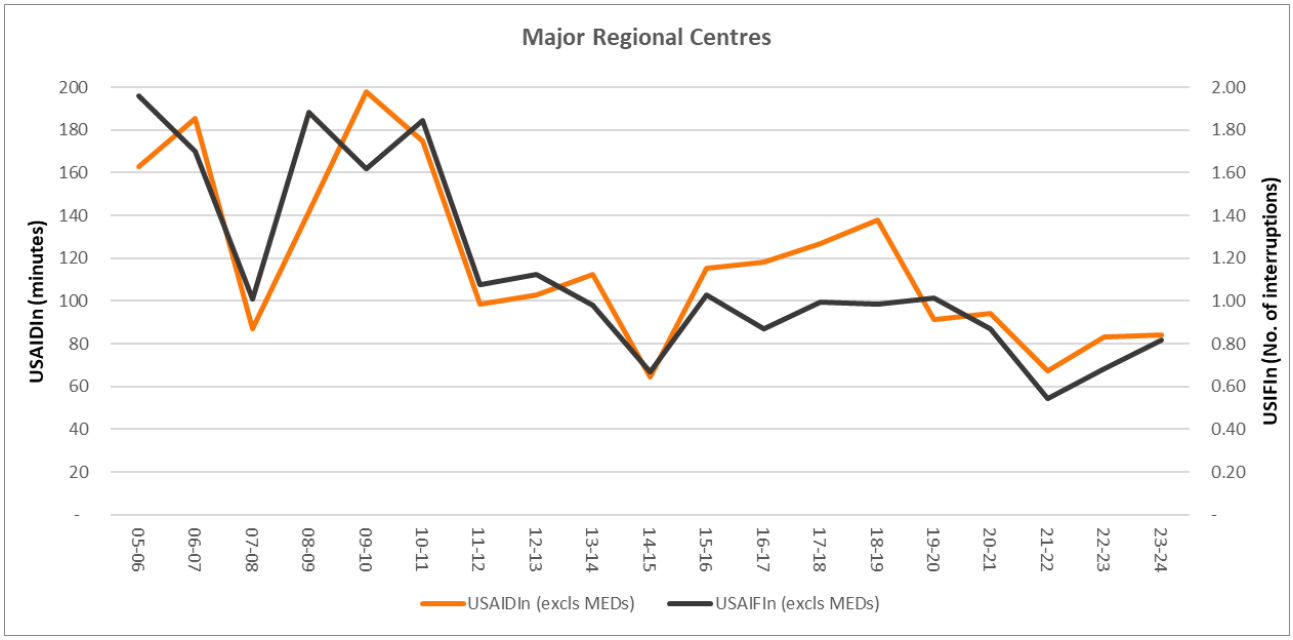
About 86,000 customers are supplied in major regional cities that make up the Major Regional Centres. The graph below shows that the reliability performance has improved since the 2005/06 regulatory year.

Table 24 highlights the performance of USAIDIn and USAIFIn for 2023-24, the historic 15-year period 1 July 2005 to 30 June 2020 average performance and the reporting threshold.

Table 24: Major regional centres reliability performance

Major Regional Centres	2023/24	Historic Ave.	Reporting threshold
USAIDIn	84	128	147
USAIFIn	0.82	1.25	1.70

Figure 35 - Major regional centres reliability performance



Conclusion

The historic performance of the Major Regional Centres has been maintained as USAIDIn and USAIFIn performance for the 2023-24 regulatory year were better than the historic average performance and there is a gradual improvement in reliability performance since the 2005-06 regulatory year.

8.7 Barossa, Mid-North and Yorke Peninsula Region

About 59,000 customers (ie 5.4% of total customers) are supplied in the Barossa, Mid-North and Yorke Peninsula region. The graph below shows that the reliability performance has gradually improved since the 2005/06 regulatory year.

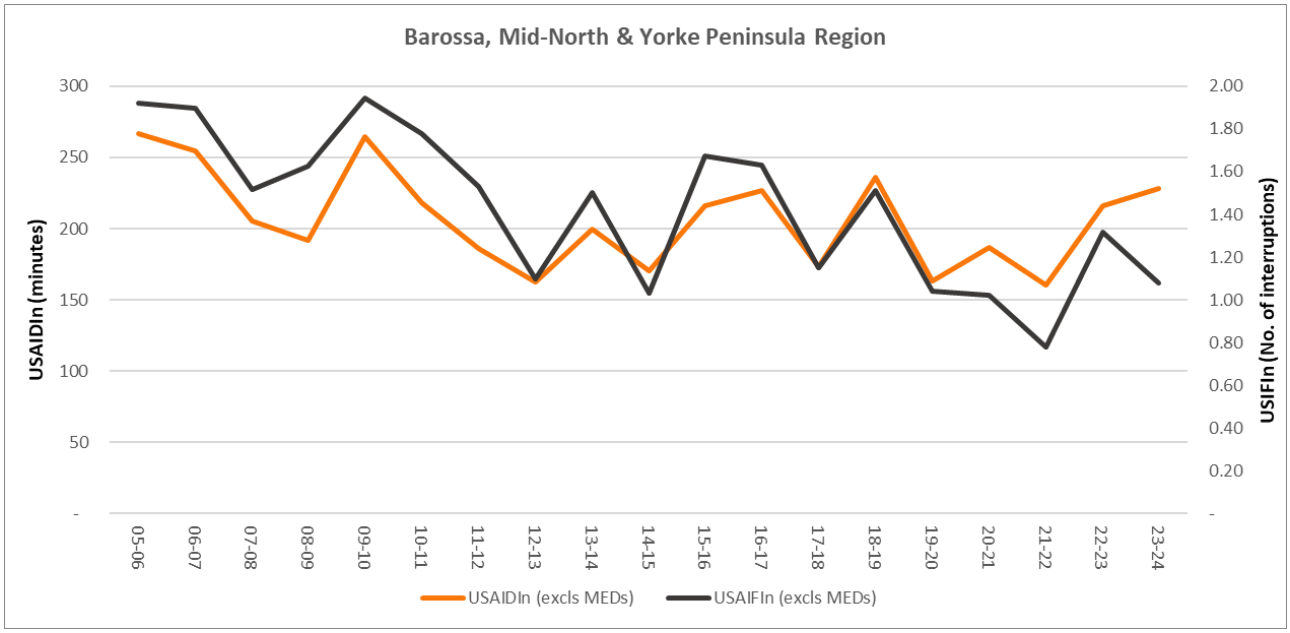
Table 25 below highlights the performance of USAIDIn and USAIFIn for 2023-24, the historic 15-year period 1 July 2005 to 30 June 2020 average performance and the reporting threshold.

Table 25: Barossa, Mid-North and Yorke Peninsula reliability performance

Barossa, Mid-North and Yorke Peninsula	2023/24	Historic Ave.	Reporting threshold
USAIDIn	228	209	236
USAIFIn	1.08	1.52	1.78

The poorer USAIDIn performance in 2023-24 was impacted by several severe weather events in December 2023. The there were three severe weather events which occurred on 11 and 12 December, 25 and 26 December, and 28 and 29 December 2023. Two of these days were MEDs with the remainder contributing about 50 minutes to USAIDIn. These events occurred after the two MEDs on the 11 and 28 December 2023.

Figure 36 - Barossa, Mid-North & Yorke Peninsula region reliability performance



Conclusion

The historic performance of the Barossa, Mid-North and Yorke Peninsula has been maintained. While USAIDIn is marginally worse than the historic average it is better than the reporting threshold. The USAIFIn performance is better than the historic average performance and there is a gradual improvement in overall reliability performance since the 2005-06 regulatory year.

8.8 Eastern Hills Region

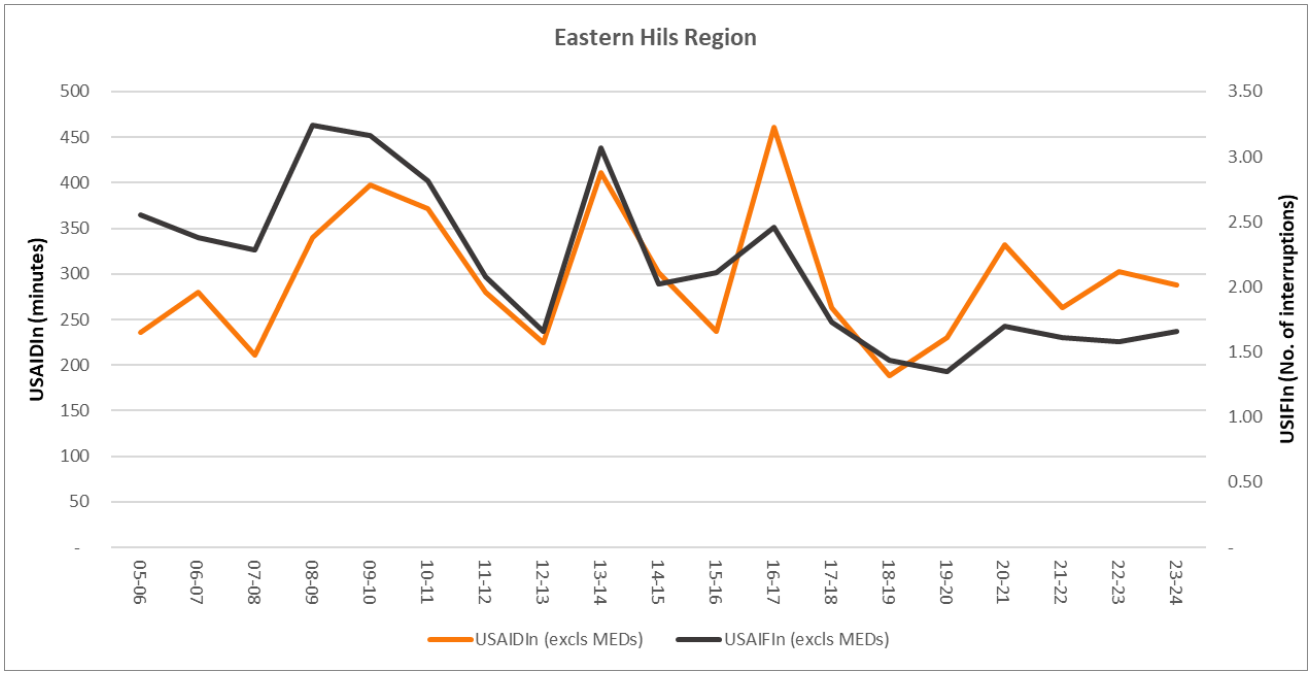
About 32,000 customers are supplied in the Eastern Hills region (which exclude customers in Stirling/Bridgewater and Mt Barker townships areas). Figure 37 below shows that the reliability performance has had significant variation and there has been no decline since the 2005/06 regulatory year.

Table 26 below highlights the performance of USAIDIn and USAIFIn for 2023-24, the historic 15-year period 1 July 2005 to 30 June 2020 average performance and the reporting threshold.

Table 26: Eastern Hills region reliability performance

Eastern Hills	2023/24	Historic Ave.	Reporting threshold
USAIDIn	289	295	371
USAIFIn	1.66	2.29	2.81

Figure 37 - Eastern Hills Region reliability performance



Conclusion

The historic performance of the Eastern Hills Region has been maintained. USAIDIn and USAIFIn performance for the 2023-24 regulatory year were better than the historic average performance and there is a gradual improvement in reliability performance since the 2005-06 regulatory year.

8.9 Eyre Peninsula Region

About 16,000 customers are supplied in the Eyre Peninsula region which excludes selected HV feeders[37] in the cities of Pt Lincoln and Whyalla. There has been a significant increase in 'other causes' (eg third party), interruptions over the last two years. This has increased USAIDIn by around 65 minutes.

Figure 38 (next page) shows that the reliability performance has improved since the 2005-06 regulatory year.

Table 27 below highlights the performance of USAIDIn and USAIFIn for 2023-24, the historic 15-year period 1 July 2005 to 30 June 2020 average performance and the reporting threshold.

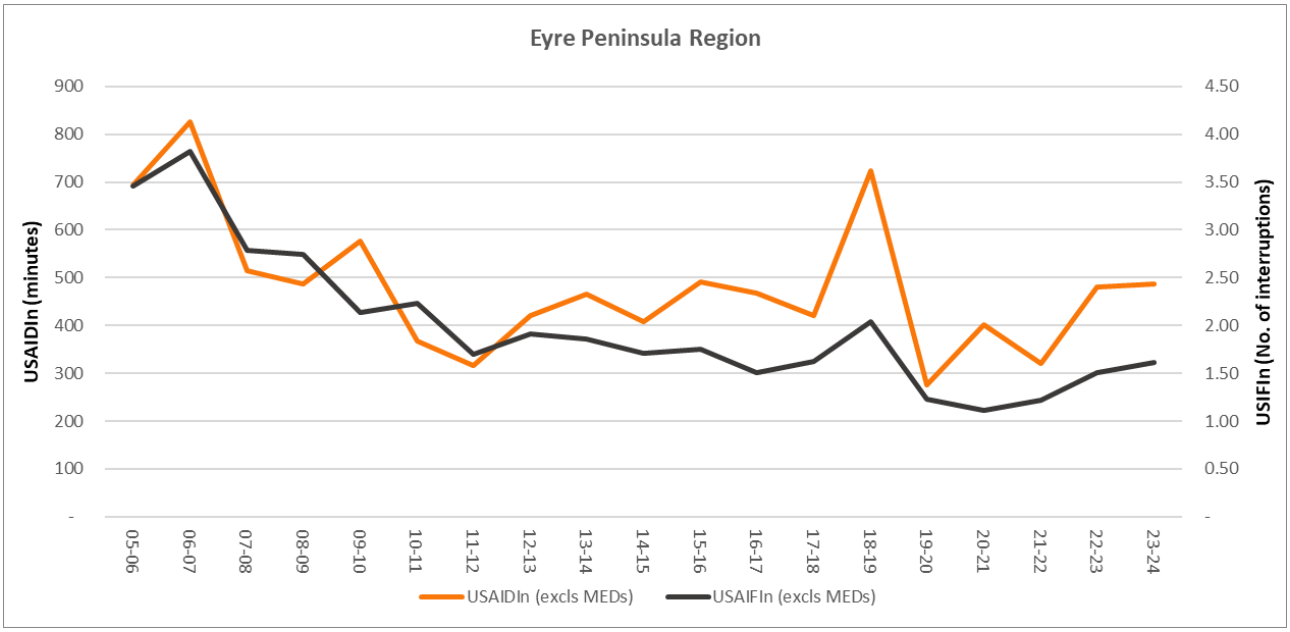
Table 27: Eyre Peninsula region reliability performance

Eyre Peninsula	2023/24	Historic Ave.	Reporting threshold
USAIDIn	488	497	577
USAIFIn	1.61	2.17	2.74

There has been a significant increase in 'other causes' (eg third party), interruptions over the last two years. This has increased USAIDIn by around 65 minutes.

[37] Selected HV feeders in the Cities of Pt Lincoln and Whyalla are included in MRC.

Figure 38 - Eyre Peninsula Region reliability performance



Conclusion

The historic performance of the Eyre Peninsula has been maintained as the USAIDIn and USAIFIn performance for the 2023-24 regulatory year were better than the historic average performance and there is a gradual improvement in reliability performance since the 2005-06 regulatory year.

8.10 Fleurieu Peninsula

About 35,000 customers are supplied in the Fleurieu Peninsula region (including Kangaroo Island). Figure 39 (next page) shows that the reliability performance has improved since the 2005-06 regulatory year, however our performance declined in 2023-24.

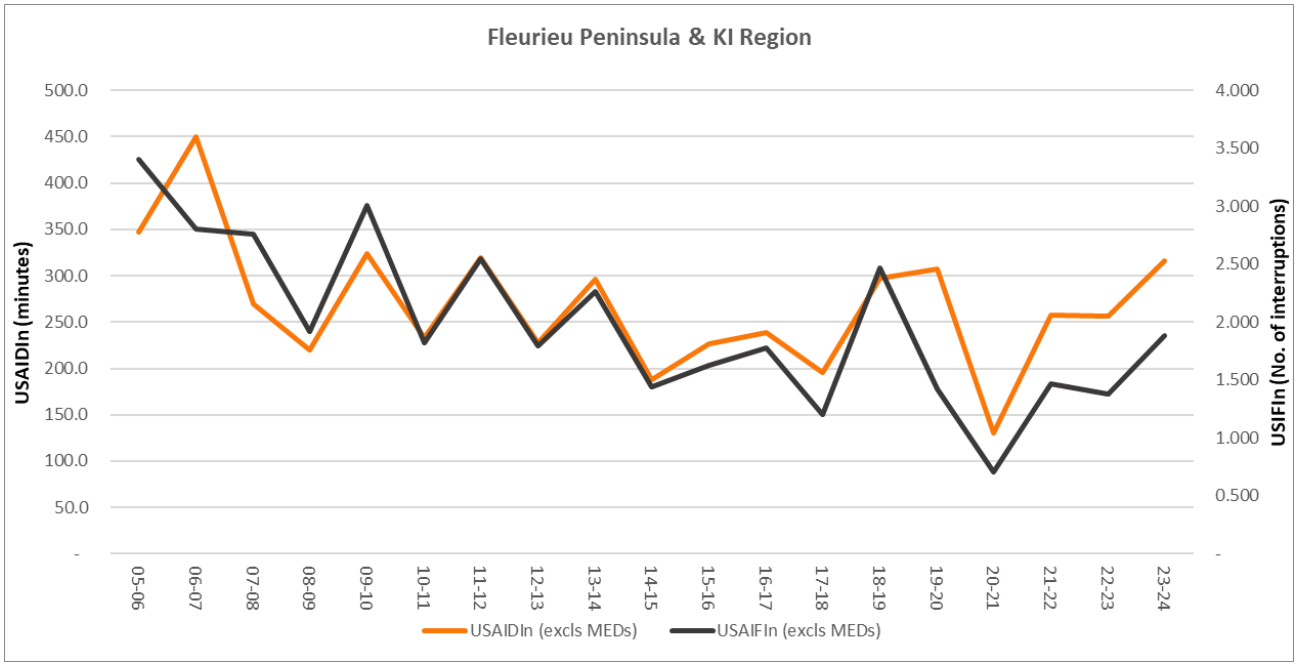
Table 28 highlights the performance of USAIDIn and USAIFIn for 2023-24, the historic 15-year period 1 July 2005 to 30 June 2020 average performance and the reporting threshold.

Table 28: Fleurieu Peninsula reliability performance

Fleurieu Peninsula	2023/24	Historic Ave.	Reporting threshold
USAIDIn	316	276	319
USAIFIn	1.88	2.15	2.76

The USAIDIn performance in 2023-24 was worse than the historic average due to the severe weather event over the period 10-12 December 2023, with the 11 December being a MED. This event contributed 34 minutes to USAIDIn (excluding the 11 December 2024 event). Another severe weather event occurred on 7 July 2023 which contributed 31 minutes to USAIDIn.

Figure 39 - Fleurieu Peninsula & KI Region reliability performance



Conclusion

The historic performance of the Fleurieu Peninsula has been maintained as the USAIFIn performance for the 2023-24 regulatory year was better than the historic average performance. While the USAIDIn performance was slightly worse in 2023-24, there is a gradual improvement in reliability performance since the 2005-06 regulatory year.

8.11 Riverland and Murrayland Region

About 39,000 customers are supplied in the Riverland and Murrayland region, which excludes selected HV feeders[38] in the City of Murray Bridge. Figure 41 (next page) shows that the reliability performance has improved since the 2005-06 regulatory year.

Table 29 highlights the performance of USAIDIn and USAIFIn for 2023-24, the historic 15-year period 1 July 2005 to 30 June 2020 average performance and the reporting threshold.

Table 29: Riverland and Murrayland region reliability performance

Riverland & Murrayland	2023/24	Historic Ave.	Reporting threshold
USAIDIn	313	222	257
USAIFIn	1.57	1.40	1.59

The poor reliability performance in 2023-24 was the result an increase in weather related outages (mainly due to localised SWEs), and 'Other' caused outages (see Figure 40 below), compared to the historic average, which contributed an additional 90 minutes to USAIDIn and 0.15 interruptions to USAIFIn. On the positive side, the contribution from 'Asset failures' has returned to about the historic average.

[38] Selected HV feeders in the City of Murray Bridge are included in MRC.

Figure 40 - Riverland & Murrayland - USAIDIn by cause.

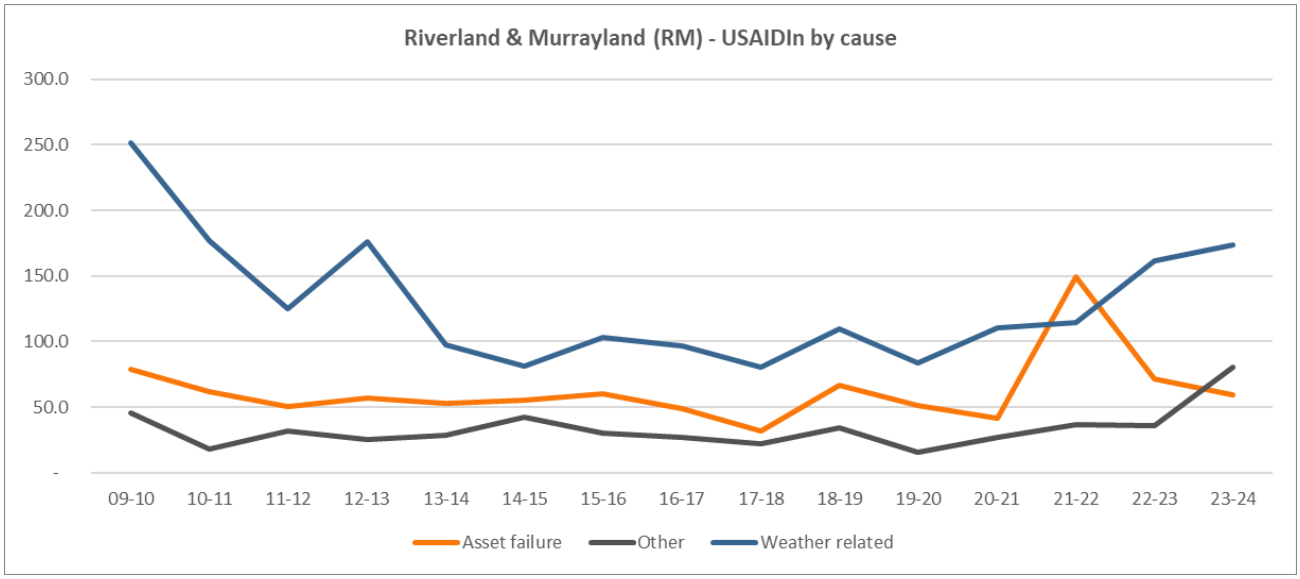
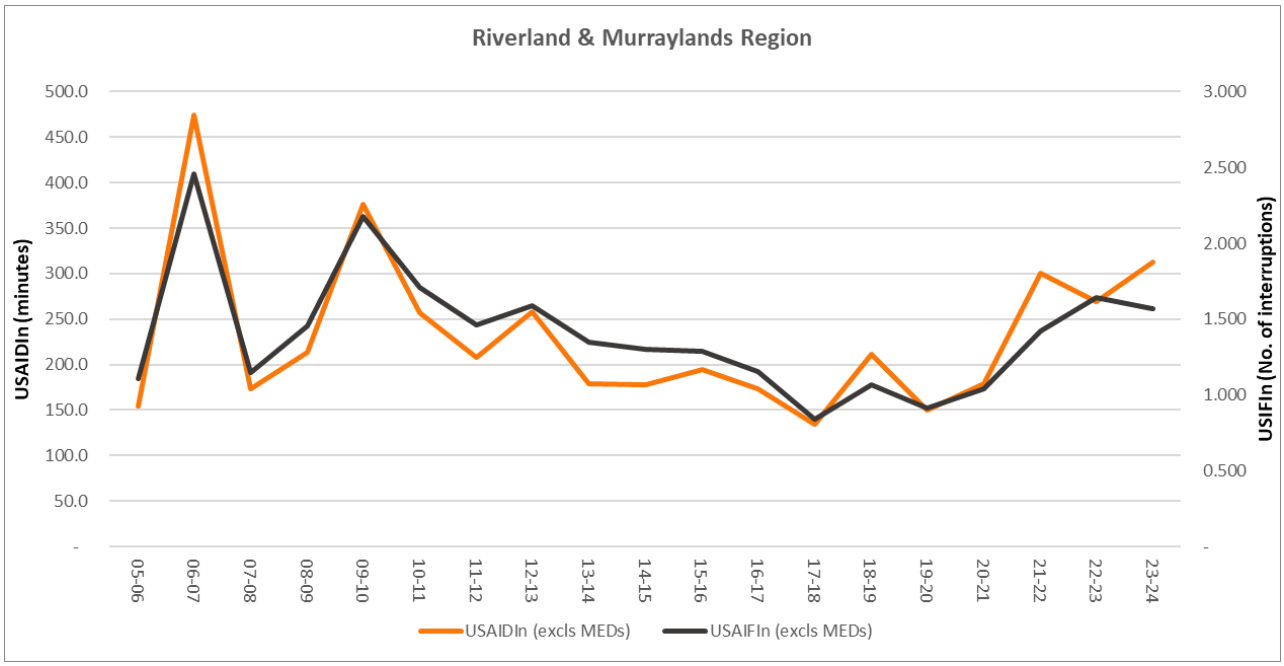


Figure 41 below highlights the poor performance over the last three years but is still with normal bounds of reliability performance since 2005-06.

Figure 41 - Riverland & Murraylands Region reliability performance



Conclusion

The USAIDIn performance over the last three years has been poor but not due to a systemic declined in one specific cause, nor is it outside of the normal bounds of reliability. The 'Asset failure' category returned to historic average levels in 2023-24. Consequently, the reliability performance has not declined compared to the historic performance.

8.12 Southeast region

About 29,000 customers are supplied in the Southeast region, which excludes selected HV feeders[39] in the City of Mt Gambier. Figure 43 below shows that the reliability performance has improved since the 2005-06 regulatory year. Reliability performance in the four years to 2020-21 was impacted by severe weather events (mainly lightning strikes), and possum issues on sections of 33kV sub-transmission feeders. In response, we have installed lightning resistant insulators on selected sections of the 33kV sub-transmission system and installed possum guards on affected sections of lines to prevent possums climbing our Stobie poles.

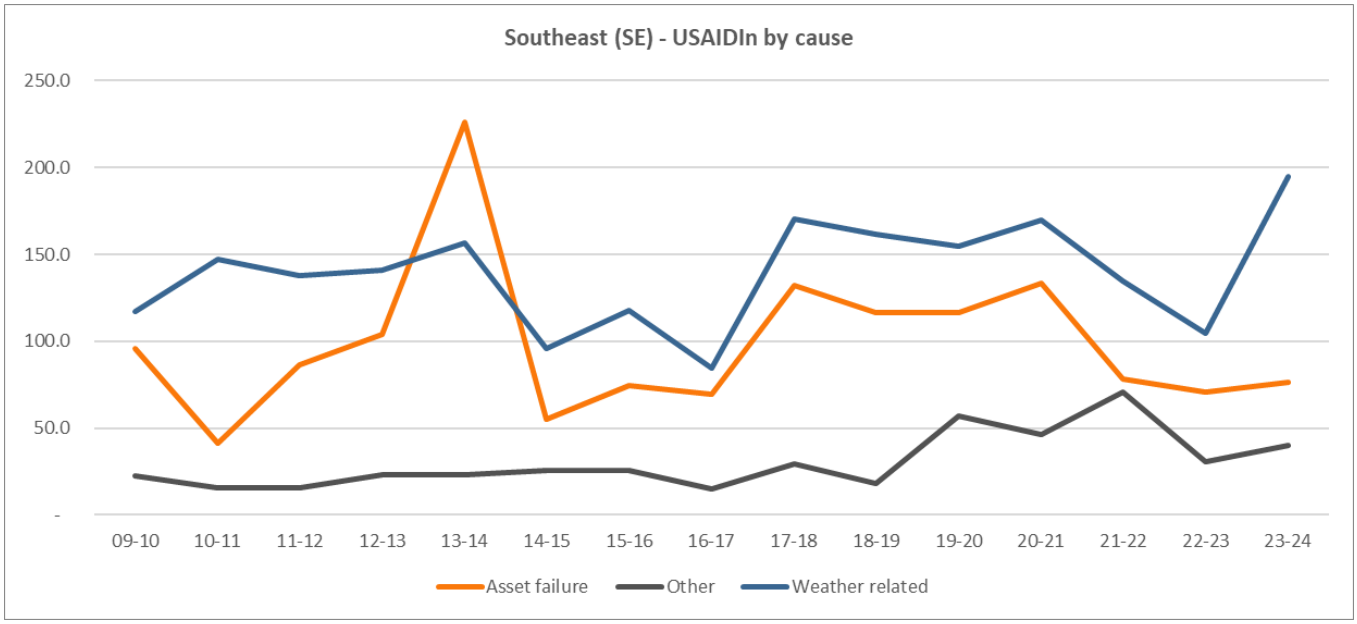
Table 30 highlights the performance of USAIDIn and USAIFIn for 2023-24, the historic 15-year period 1 July 2005 to 30 June 2020 average performance and the reporting threshold.

Table 30: Southeast region reliability performance

Southeast	2023/24	Historic Ave.	Reporting threshold
USAIDIn	311	271	328
USAIFIn	2.17	2.03	2.20

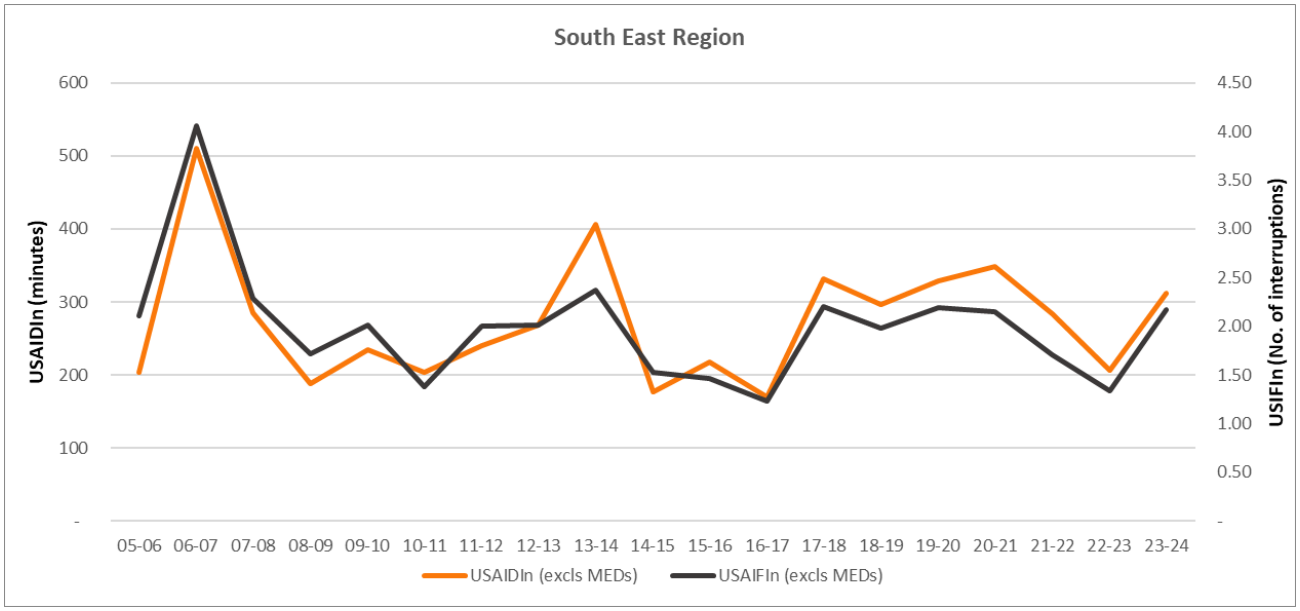
Figure 42 below highlights that USAIDIn due to the cause asset failure has been lower than the recent historic performance. However, it also shows the increase in both 'Other' (mainly third party and animals) related interruptions and weather related caused interruptions. The poor performance in 2023-24 was mainly due to weather which contributed about 60 mins and 'Other' causes which contributed about 20 mins.

Figure 42 - Southeast USAIDIn by cause



[39] There are selected HV feeders in Mt Gambier are included in the MRC.

Figure 43 - South East Region reliability performance



Conclusion

Overall the historic performance of the Southeast has been maintained as the USAIDIn and USAIFIn performance is better than the historic average. SA Power Networks has proposed additional funding in the 2025-30 RCP to improve the reliability performance in the Southeast.

8.13 Upper North Region

About 12,000 customers are supplied in the Upper North region, which excludes selected HV feeders[40] in the Cities of Pt Augusta and Pt Pirie.

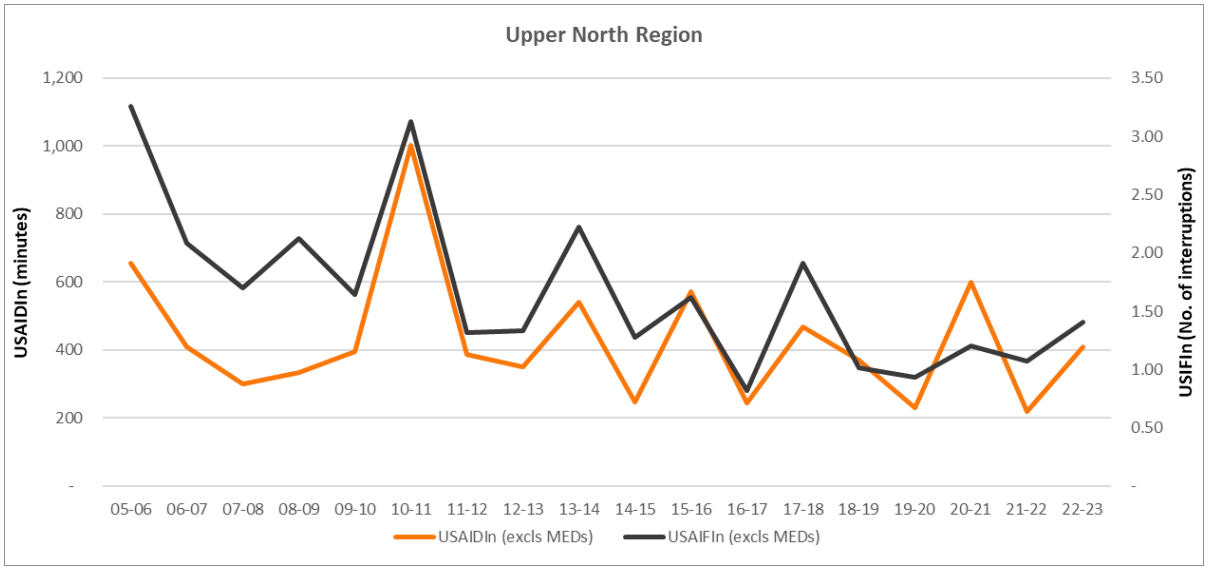
Table 31 highlights the performance of USAIDIn and USAIFIn for 2023-24, the historic 15-year period 1 July 2005 to 30 June 2020 average performance and the reporting threshold.

Table 31: Upper North region reliability performance

Upper North	2023/24	Historic Ave.	Reporting threshold
USAIDIn	389	434	540
USAIFIn	1.57	1.76	2.12

[40] There are selected HV feeders in the Cities of Pt Augusta and Pt Pirie are included in the MRC.

Figure 44 - Upper North Region reliability performance



Conclusion

The historic performance of the Upper North has been maintained as both the USAIDIn and USAIFIn were better than the historic average in 2023-24. The figure above highlights that there is a gradual improvement in the performance of the Upper North Region.

9. Reliability Improvements

SA Power Networks prepares a Reliability Management Plan annually, with the aim of maintaining reliability performance and achieving the EDC reliability targets. The Plan details the initiatives that SA Power Networks undertakes to maintain reliability performance, and where cost effective, to improve reliability, in response to the AER's STPIS. Further it aims to minimise customer inconvenience and reliability GSL payments.

SA Power Networks has a Reliability Operational Group which:

- Reviews interruptions on a daily basis to identify areas of poor performance or potential systemic causes of interruptions to initiate actions to remedy where warranted; and
- Annually prepares reliability improvement projects for the following calendar year.

The reliability improvement actions contribute to two basic outcomes which are:

- Reducing the number of interruptions experienced by customers by:
    - Installing mid-line reclosers and sectionalisers (which reduces the numbers of customers affected by a fault);
    - Installing spur fuses (meaning that only a small proportion of a feeder's customers experience a sustained interruption arising from some faults);
    - 'No Cause Found' patrols for interruptions affecting more than 500 customers (which reduce in some cases future interruptions);
    - 'Reclose' Patrols for switchgear reclose events affecting more than 1,000 customers (which reduce in some cases future interruptions);
    - Replacing lightning-damaged insulators in lightning prone areas (including adjacent insulators in the area) with improved lightning resistant insulators;
    - Removing trees (where possible) that result in multiple interruptions;
    - Installing powerline covering where outages are caused by tree limbs and debris; and
    - Implementing a 'Switched on whilst switching' campaign (which highlights the importance of employees being attentive whilst switching to avoid interruptions that result from switching errors); and
- Improving response times of field crews to interruptions by:
    - Implementing 'find the cause' training, tools and performance reporting for field crews;
    - Network protection training;
    - Application of an 'Isolate and Restore Half First' policy (which requires crews to isolate the affected section of the network before restoring supply to customers supplied from the unaffected section of the network); and
    - Promotion of 'Time to Arrive' reporting and focus (being the time taken for crews to arrive at the location of the outage and commence patrols, permitting us to assess both the time to arrive and the time taken to then restore supply, to better determine if further improvements can be identified and implemented).

Appendix A – Classifying Major Event Days

Section 3.5 of IEEE 1366™-2012 states:

"3.5 Major Event Day classification"

The following process—2.5 Beta Method—is used to identify Major Event Days (MED), provided that the natural log transformation of the data closely resembles a Gaussian (normal) distribution. Its purpose is to allow major events to be studied separately from daily operation, and in the process, to better reveal trends in daily operation that would be hidden by the large statistical effect of major events. For more technical detail on derivation of the methodology, refer to Annex B.

A MED is a day in which the daily system SAIDI exceeds a threshold value, T_{MED}. The SAIDI index is used as the basis of this definition since it leads to consistent results regardless of utility size and because SAIDI is a good indicator of operational and design stress. Even though SAIDI is used to determine the MEDs, all indices should be calculated based on removal of the identified days.

In calculating daily system SAIDI, any interruption that spans multiple days is accrued to the day on which the interruption begins.

The MED identification T_{MED} value is calculated at the end of each reporting period (typically one year) for use during the next reporting period, as follows:

a) Collect values of daily SAIDI for five sequential years, ending on the last day of the last complete reporting period. If fewer than five years of historical data are available, use all available historical data until five years of historical data are available.

b) Only those days that have a SAIDI/Day value will be used to calculate TMED (do not include days that did not have any interruptions).

c) Take the natural logarithm (ln) of each daily SAIDI value in the data set.

d) Find α (Alpha), the average of the logarithms (also known as the log-average) of the data set.

e) Find β (Beta), the standard deviation of the logarithms (also known as the log-standard deviation) of the data set.

f) Compute the MED threshold, T_{MED}

$$T_{MED} = e(\alpha + 2.5\beta)$$

g) Any day with daily SAIDI greater than the threshold value T_{MED} that occurs during the subsequent reporting period is classified a major event day.

Activities that occur on days classified as major event days should be separately analysed and reported."