



Supporting
document 5.25

Reliability and Resilience Performance Management Strategy

2020-2025
Regulatory Proposal
January 2019





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Reliability & Resilience Management Strategy 2020 to 2025

Asset Plan 2.1.01

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www.sapowernetworks.com.au

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OWNERSHIP OF STANDARD

Name of Standard/Manual: **AMP 2.1.01 Reliability and Resilience Management Strategy**

Standard/Manual Owner Title: Manager Network Standards & Performance

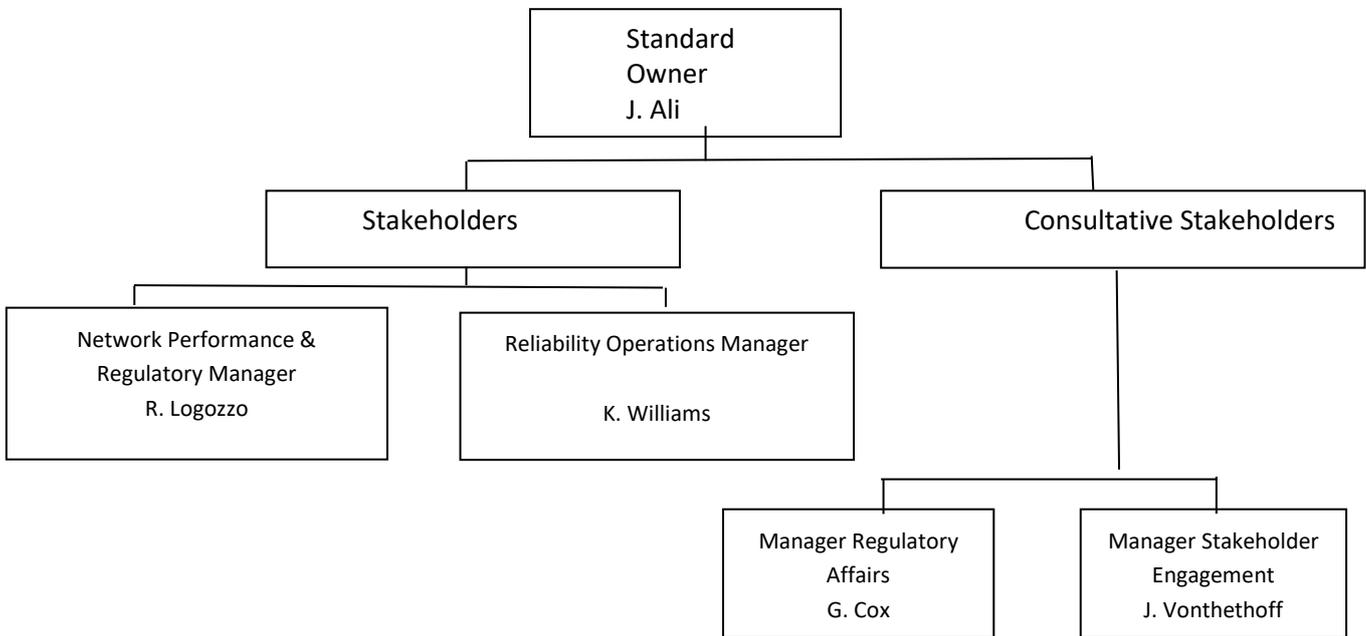
Name: Jehad Ali

Standard Last Issued: January 2019

Review Period: 5 Years

Next Review Due: August 2023 *(ie. When the next review process is due to commence)*

STANDARD/MANUAL OWNERSHIP STRUCTURE



OTHER RELATED MANUALS

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COMMENTS

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1 EXECUTIVE SUMMARY

The purpose of this Reliability & Resilience Management Strategy (RRMS) is to describe SA Power Networks current strategy for managing the distribution network to comply our distribution license condition – in that we are required to use best endeavors to achieve network reliability targets specified in the Electricity Distribution Code (EDC). Further, it identifies how we will identify areas of poor performance (e.g. via customer enquiries or complaints) and manage negative reliability trends (e.g. declining performance due to an increase in severe weather events).

The Strategy has been developed with the objective of establishing a clear overarching strategy to maintain compliance with the EDC reliability Service Standards and address the identified high priority electricity consumer needs for maintaining reliability performance and managing customer service performance, in the most prudent and cost-efficient manner.

This also includes prudently managing the risks associated with current and forecast weather trends in South Australia as identified in the Bureau of Meteorology's report "Climate extremes analysis update for South Australian Power Network operations" published in 2017/18.

The RRMS is reviewed and updated (as required), following an annual reliability performance review. This includes a review of actual performance against reliability targets and historical network reliability performance trends and other emerging issues.

The main key strategy elements in the RRMS for the period 2020 to 2025 are:

- Maintaining underlying network reliability performance to comply with the EDC reliability service standards (i.e. maintain recent historic reliability performance)
- Focusing targeted programs for guarding against extended outages during Major Event Days
- (MED's) and addressing Low Reliability Feeders (LRF's) and their worst served customers
- Network Reliability Performance enhancements to address consumer needs and concerns as per AER requirement in NER Clause 6.8.2 (c1) (2)
- To maintain the performance and level of risk of Protection and Control. Refer to the Protection and Control Asset Plan 3.2.14 for further details.

The present 2010-2018 reliability performance trends are summarised below:

- The overall reliability performance that customers experience has two components which comprises of interruptions on MEDs and non-MEDs. Customers are experiencing longer duration outages on MEDs due to the increased severity of the storms on those days whilst the underlying reliability performance (i.e. non-MEDs) is being managed against the EDC reliability service standard targets.
- The impact of storm related interruptions due to vegetation from outside the legislated clearance zone causing faults on the SA Power Networks' network is increasing.
- SA Power Networks' customers are experiencing an additional 41 minutes off supply during MEDs on average per year for the current regulatory period, in comparison to the previous regulatory period 2010 to 2015.
- GSL Duration payments have significantly escalated with the increased intensity of interruption activity during and around MEDs. Despite the change in the reliability GSL duration payment regime for the 2020-25 RCP, MEDs will still likely make a significant contribution to the number and value of the reliability total duration GSL payments.
- The overall performance of feeders classified as long-term Low Reliability Feeders (LTLRF) and their worst served customers, is escalating and worsening. Customers on LRFs experience on average twice the total interruption duration of other customers supplied in their respective region.
- The Bureau of Meteorology report "Climate extremes analysis update for South Australian Power Network operations" predicts future increases in severe weather events (frequency and severity) which is likely to further impact network performance.

During the recent customer and stakeholder engagement process designed to assist with the development of the SA Power Networks Regulatory Proposal for 2020 to 2025, electricity customers discussed electricity reliability in South Australia, and agreed the following:

- Network reliability and resilience is a very high priority for customers, particularly regional and rural customers, especially those in the Adelaide Hills and on the Eyre Peninsula
- Reliability standards should not be lowered

The key reasons customers gave for ensuring reliability is maintained and in some places, improved, were:

- Electricity is an essential service
- For business it is central to risk management, confidence and potential growth; and
- Protecting assets, maintenance and upgrades to secure supply, needs to be a priority, especially in regions.

Community engagement participants highlighted the need to consider cost-benefit analyses when considering improving reliability for regional and worst served customers.

In discussing specific reliability initiatives, the majority of engagement participants, including electricity customers, councils, and business advocacy groups such as Business SA and the SA Wine Industry Association strongly supported targeted programs to improve reliability for storm-prone and worst-served areas of the network. Organisations representing vulnerable customers, whose focus is generally on electricity affordability, did not support these programs.

Extreme weather in 2016-17 (and previously in 2010/11 and 2013/14) caused significant network damage and outages and consequently significant numbers of customers lost their electricity supply for an extended period of time. The scale and impact of these extreme weather events, in terms of network damage and customer impact, exceeded anything previously experienced in South Australia. This has focused attention on the capability of the distribution network to withstand these types of extreme weather events, how SA Power Networks responds to these events, and the timeliness and accuracy of communications with customers during these types of events.

The Essential Services Commission of South Australia, identified these same concerns relating to these types of extreme weather events in their review of the services standards that will apply to us for the 2020-25 RCP.

To mitigate escalating reliability trends and to incorporate electricity consumers' expectations, business cases have been prepared for the following specific Reliability Enhancement Programs (REPs) for the period 2020-25:

- Network Reliability
 - Low Reliability Feeders / worst served customers / acceptable reliability for all customers
 - Improve performance to regional and worst served customers who repeatedly experience reliability performance significantly worse than EDC service standard targets
- Network Resilience
 - Hardening the network to improve its resilience to extreme weather events (e.g. MEDs)
 - Reduce extended outage durations to our customers during major storms and reduce significant network interruptions, typically at repeat locations, during major weather event days

These specific programs, in conjunction with maintaining underlying reliability performance, will provide medium to long term outcomes of:

- Reducing interruptions to customers who consistently receive poor reliability performance
- Reducing significant outage durations and interruptions during severe weather events

Reliability projects included in the Reliability Enhancement Programs (REPS) are only included where the net present value of the customer benefit (in terms of Value of Customer Reliability (VCR)) exceeds the cost.

Following the 2018 ESCoSA survey indicating a limited willingness to pay for improvement, we reduced these REPS by \$5.2M for the period 2020-25.

Overall Reliability Expenditure including maintaining underlying reliability performance and the Reliability Enhancement Programs (REPS) for the period 2020-2025 is included below:

| 2020-2025 Proposed Reliability Enhancement Programs | Customer Service Level Improvement | 2015-20 Reset Determination 2017 \$ Incl OH | 2015-20 Forecast Expenditure 2017 \$ Incl OH | 2020-25 Submission 2017 \$ Incl OH | Net Benefit Based on VCR 15 years NPV |
|---|--|--|---|---------------------------------------|---------------------------------------|
| Maintain underlying reliability performance | Maintain underlying performance to targets | \$33.3M | \$34.5M | \$36.0M | - |
| Hardening the Network | Approx. 2 hours p.a. interruption reduction for over 53,000 customers | \$17.2M | \$16.6M | \$16.2M | \$46.2m (VCR NPV) |
| Low Reliability Feeders | Approx. 3 hours p.a. interruption reduction for over 16,700 worst served customers | \$8.6M Proposed not approved | \$ 1.2M | \$15.6M | \$10.8m (VCR NPV) |
| Total | | \$50.5M | \$52.3M | \$67.8M | \$57.0M |

The difference between our 2020-25 proposal of \$67.8m and our forecast 2015-20 spend of \$52.3m is essentially the Low Reliability Feeders program.

2 INTRODUCTION

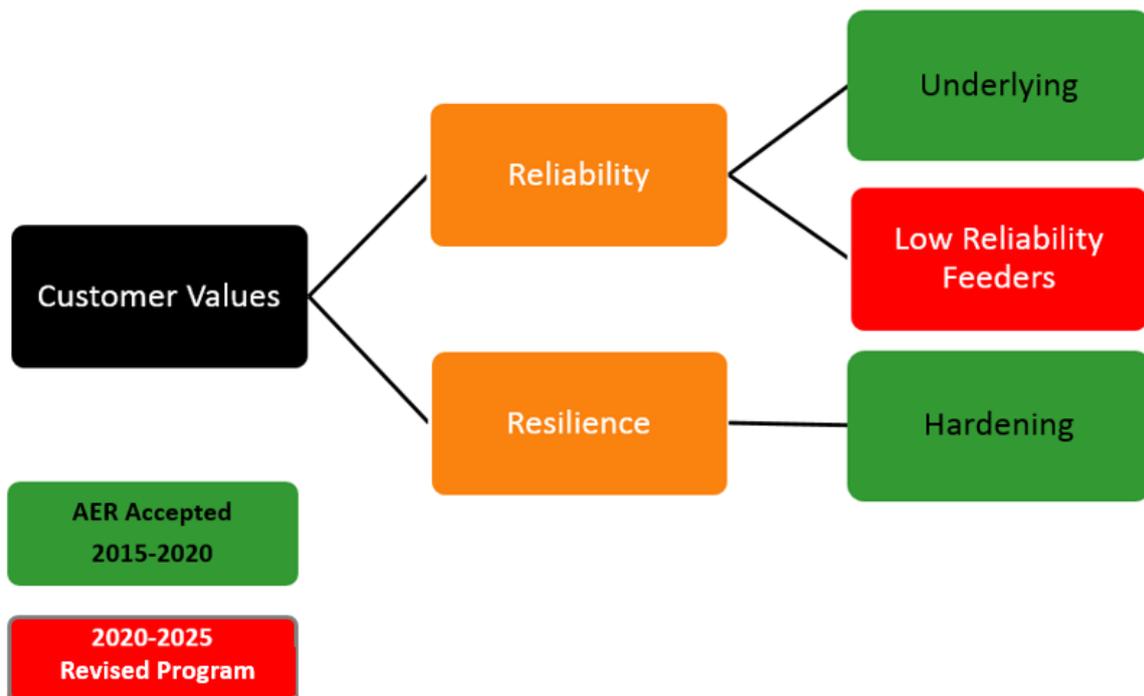
Purpose

The purpose of this Reliability & Resilience Performance Management Strategy (the 'Strategy') is to describe SA Power Networks current approach for managing network reliability performance in the period 2020 – 25.

The strategy is to maintain reliability performance to the required targets and minimise customers off supply for long durations. The three main focus areas are:

- Maintaining underlying performance to 2020-25 targets
- Hardening the network against storms
- Low Reliability Feeders supplying worst served customers.

These programs address different factors as depicted below



Scope

The Strategy details all the activities that SA Power Networks undertakes for managing network reliability performance such as:

- Systems and processes to manage network reliability performance to meet performance targets
- Performance measurements to monitor and report in relation to reliability performance
- Capital expenditure (Capex) associated with RRMS
- Key reliability management procedures
- Reliability communication, culture, education and employee engagement plans
- Reliability information to our customers
- Reviewing network performance for continuous improvement
- Ongoing daily reliability management activities.

However, this Strategy does not include the following functions as they are managed separately in other Asset Plans:

- Asset maintenance related issues as asset replacement activities are addressed separately in other asset management plans (Note: the goal of REPEX is to maintain the overall asset risk, hence minimal reliability benefits are gained)
- Network capacity / security
- Quality of Supply, relating to voltage quality and interference.

3 OBLIGATIONS & REQUIREMENTS

Regulatory Obligations

The Plan has been developed with the objective of establishing a clear overarching strategy to maintain compliance with the EDC reliability Service Standards and address the identified high priority electricity consumer needs for maintaining reliability performance and managing customer service performance, in the most prudent and cost-efficient manner.

SA Power Networks must comply with the following:

- National Electricity Rules (NER) relating to system security and performance standards (Chapters 4 & 5)
- National Electricity Objective (NEL, section 16 (1) (a),

i.e. “...to promote efficient investment in, and efficient operation and use of electricity services for the long term interests of consumers of electricity with respect to:
 - *Price, quality, safety, reliability and security of supply of electricity; and*
 - *The reliability, safety and security of the national electricity system.”*
- ESCoSA Jurisdictional Service Standards (i.e. Electricity Distribution Code)
 - The Electricity Act details that ESCoSA cannot set lower targets for reliability than at the time of privatisation
 - The 2018 review will inform ESCoSA on what customers believe to be acceptable levels of reliability
- National Electricity Rules (NER) in relation to STPIS.
- NER obligation to provide evidence to the AER (to accompany regulatory proposals) that SA Power Networks has “engaged with electricity consumers and has sought to address any relevant concerns identified as a result of that engagement” (NER Clause 6.8.2 (c1) (2)).

Reliability Service Standards

The Essential Services Commission of South Australia reviews the jurisdictional service standards that apply to SA Power Networks every five years, prior to the commencement of a new RCP. The Commission’s standards, established under the Electricity Act 1996, set reliability performance requirements for SA Power Networks. The review will establish the reliability standards for SA Power Networks for the 2020-25 period.

ESCoSA in its final decision¹ on the reliability service standards that will be applied to SA Power Networks, include:

- establishing reliability service standard targets for each feeder category (ie CBD, Urban, Rural Short and Rural Long) based on the average of recent average historical performance;
- amending the reliability GSL regime to focus it more on customers who receive poor performance, by basing reliability duration on the total time a customer is without supply for the regulatory year;
- requiring us to use ‘best endeavours’ to meet the service standard targets for each year ending 30 June;
- reporting on extreme severe weather events;
- requiring us to report on LRF and reliability performance for 10 regions as defined by ESCoSA, with the expectation that the performance of each of the regions will not decline over the 2020-25 RCP.

Our current Reliability and Guaranteed Service Standards for the 2015-20 RCP are detailed below:

| | USAIDI _n (average minutes off supply per customer per annum) | USAIFI _n (average no. of supply interruptions per customer per annum) |
|---------------------|--|---|
| CBD Feeders | 15 | 0.15 |
| Urban Feeders | 120 | 1.30 |
| Short Rural Feeders | 220 | 1.85 |
| Long Rural Feeders | 300 | 1.95 |

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

- (a) any planned supply interruptions and supply interruptions of a duration less than one minute; and
- (b) any unplanned supply interruptions that qualify as MEDs.

¹ ESCoSA’s SA Power Networks reliability review – Final Decision January 2019

Thresholds and payment amounts – frequency of interruptions

| | Threshold 1 | Threshold 2 | Threshold 3 |
|---|-------------|-------------|-------------|
| Number of interruptions in a regulatory year ending 30 June | >9 and ≤12 | >12 and ≤15 | >15 |
| Payment | \$100 | \$150 | \$200 |

Thresholds and payment amounts – duration

| | Threshold 1 | Threshold 2 | Threshold 3 | Threshold 4 | Threshold 5 |
|----------------|-------------|-------------|-------------|-------------|-------------|
| Duration (hrs) | >12 and ≤15 | >15 and ≤18 | >18 and ≤24 | >24 and ≤48 | >48 |
| Payment | \$100 | \$150 | \$200 | \$405 | \$605 |

Payments in relation to the frequency of interruptions will be made in the quarter directly following the regulatory year (ending 30 June). Payments in relation to the duration of interruptions will be made within three months of the event occurring. Payments will be made in respect of the **supply address**, not the customer.

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) interruptions of a duration less than one minute; and
- (iii) planned interruptions.

Service Target Performance Incentive Scheme (STPIS)

SA Power Networks is subject to the AER's service target performance incentive scheme (STPIS). The STPIS rewards improvement in performance and penalized declines in performance. It ensures that any rewards earned under the Efficiency Benefit Sharing Scheme (EBSS) or Capital Efficiency Sharing Scheme, both of which provide rewards for a reduction in expenditure, do not result from a decline in performance.

Our current STPIS targets for the 2015-20 RCP are detailed below:

| | value |
|--------------------|--------|
| CBD | |
| SAIDI | 12.48 |
| SAIFI | 0.132 |
| Urban | |
| SAIDI | 121.50 |
| SAIFI | 1.353 |
| Rural short | |
| SAIDI | 231.06 |
| SAIFI | 1.930 |
| Rural long | |
| SAIDI | 311.70 |
| SAIFI | 2.027 |

4 CUSTOMER EXPECTATIONS

To ensure that expenditures are prudent, efficient, and in the long-term interests of customers, service levels should reflect customer preferences and priorities. Customer engagement provides an opportunity for customers to be made aware of service and cost implications that relate to providing a certain level of reliability performance and provide feedback accordingly.

The National Electricity Rules (NER) requires SA Power Networks to engage with its customers directly and demonstrate how customer concerns have been taken into account in developing its revenue proposal for the AER. SA Power Networks has undertaken a comprehensive stakeholder engagement program to obtain a greater understanding of the concerns, issues, wants and needs of our customers now and in the future. This engagement program involved extensive customer research, conducting focus groups, engagement with targeted groups such as vulnerable and culturally diverse customers, online engagement and workshops in a number of locations across the State. Early in the engagement program, the reliability and resilience of the network emerged through research as an important priority for customers and become one of the central themes of the engagement program. It was subsequently discussed through all engagement activities and the results of these discussions are outlined below.

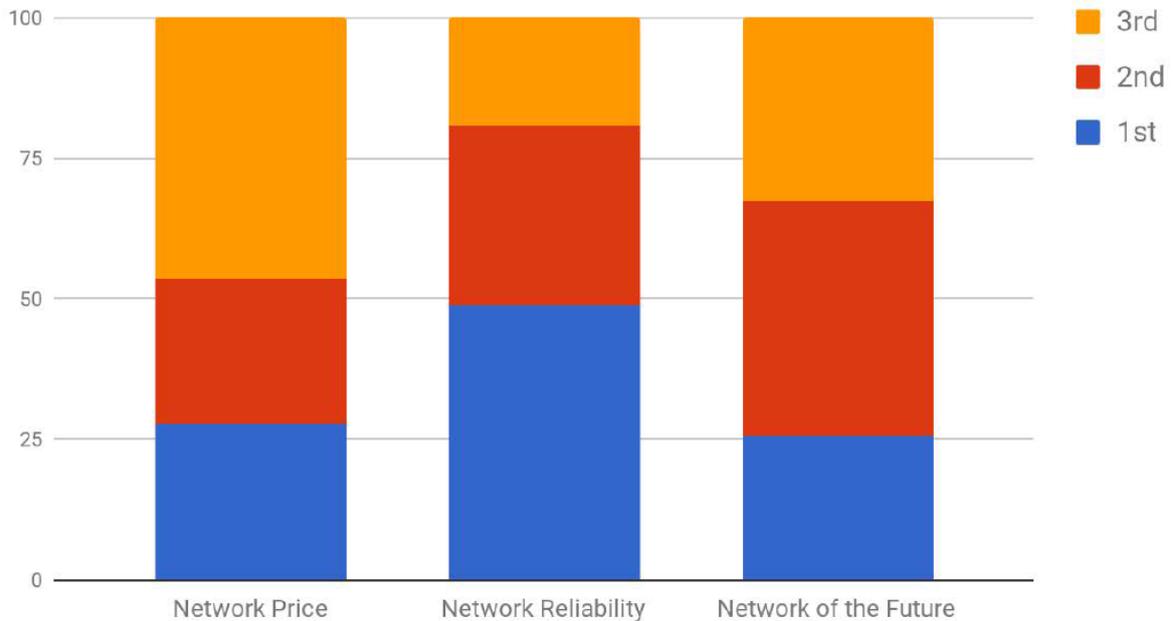
This engagement program was developed in consultation with the Essential Services Commission of South Australia (ESCoSA) which had representatives attend several of the workshops.

In a series of 'Directions' workshops held around the State in the early stages of engagement, customers were provided with detailed information on key topics and were asked to prioritise what was most important to them. The results, summarised below, are included in Supporting Document 0.7 MDC Planning and Directions Workshop Report:

- Network reliability and resilience is a very high priority for customers, particularly regional and rural customers, especially those in the Adelaide Hills and on the Eyre Peninsula
- Reliability standards should not be lowered
- It is important to ensure acceptable levels of reliability for all customers, and regional customers would benefit from having reliability standards more aligned to metropolitan customers.
- Different sectors have different expectations and needs in terms of reliability of supply and customers are looking for a system that can accommodate this.

The table below shows the priorities of the 102 customers that attended the workshops across South Australia. After aggregating the data (where all participants had an equal weighting), the results show that 'Network reliability and resilience' was ranked first preference by half of the participating customers.

Ranking aggregated



The order of priority was:

1. Network reliability and resilience
2. Network price
3. Network of the future

The key reasons participants gave for ranking 'Network reliability and resilience' at number one can be summarised as:

- Reliability underpins price and future network;
- Electricity is an essential service; and
- For business it is central to risk management and confidence; and protecting assets, maintenance and upgrades to secure supply, needs to be a priority, especially in regions.

When these results were discussed with metropolitan-based stakeholders, there was a view that reliability was prioritised in regional areas due to numerous recent extended outages caused by severe weather and the State-wide black-out in September 2016. The view of vulnerable customer advocates especially was that in other circumstances, network price would be the priority for most customers. The workshop results also confirmed:

- Network price is paramount for those representing vulnerable residential customers and those representing business/government customers.
- Regional variations reflected customers experiences of existing and past localised network challenges, such as extended power outages (Port Lincoln and Adelaide Hills), irrigation industry price expectations (Riverland), bushfire management (Adelaide Hills), and closure of a power plant (Port Augusta).
- Residential customers were more likely to rank Network reliability and resilience over Network price.
- Business customers were more likely, but not exclusively, to prioritise Network price over other options. This was most true in Renmark.

Specific themes to emerge from Directions Workshop engagement:

Reliability standards

There was widespread support for the proposition that standards should not be lowered.

More participants spoke about the need to improve the standards for business and regional areas. Some participants wanted to see reliability improved but did not necessarily wish to pay more for this to occur.

Acceptable level of reliability for all customers

This topic had most support, except for workshops in Adelaide and Mount Gambier (which has historically good reliability performance).

Regional and worst served customers

This topic received the most support after acceptable levels of reliability for all. The key themes on this topic were:

The need for a cost benefit analysis to guide decision-making and set priorities;

- The need to be able to respond to regional specific issues (e.g. Port Lincoln, Ceduna);
- The importance of considering industry specific impacts (e.g. farming, fisheries, tourism) and value to State economy; and
- An expectation SA Power Networks should explore opportunities created with new technologies (e.g. microgrids, batteries) and potential for incentives and partnerships.

Hardening the network

A preparedness to spend a little more for a hardening of the network in priority areas was expressed in the majority of the workshops. A small number of participants suggested those requiring higher reliability should pay more for it to occur.

Reliability standards in regional areas

There was broad support of improvements in reliability standards in regional areas, to bring them more into alignment with urban areas although views on this issue varied across the workshops.

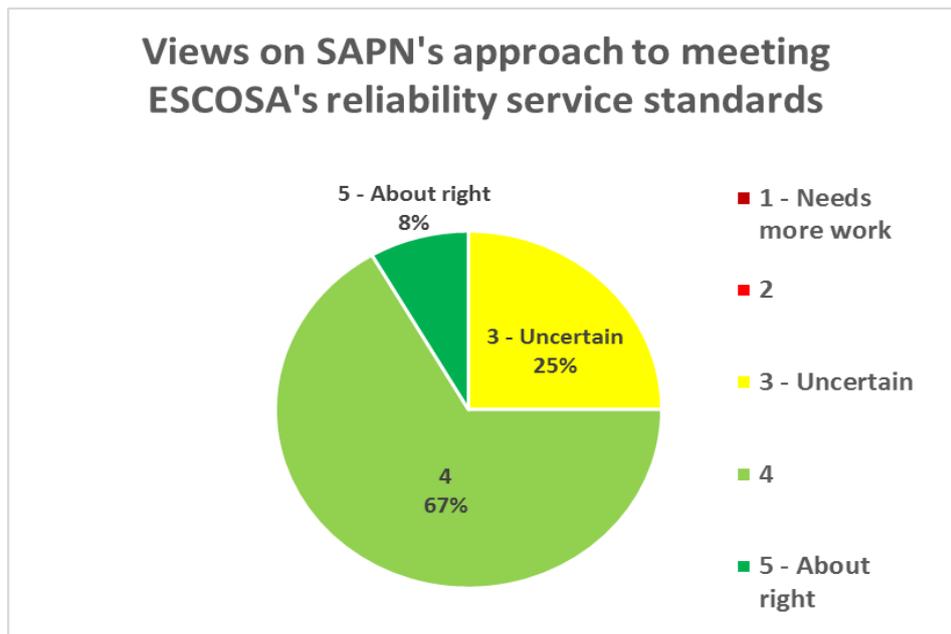
These engagement themes and outcomes were considered by the business when developing preliminary expenditure forecasts in November 2017. The business responded to the strong feedback to deliver reliability improvements to areas that most need it and balanced this with the need to keep network prices down.

The result was three proposed reliability programs – one to maintain current reliability levels, and two other minor reliability enhancement programs which address declining reliability performance where it is most needed across the State. These preliminary expenditure forecasts were used as the basis for discussion through a series of ‘deep dive’ workshops with stakeholders in early 2018.

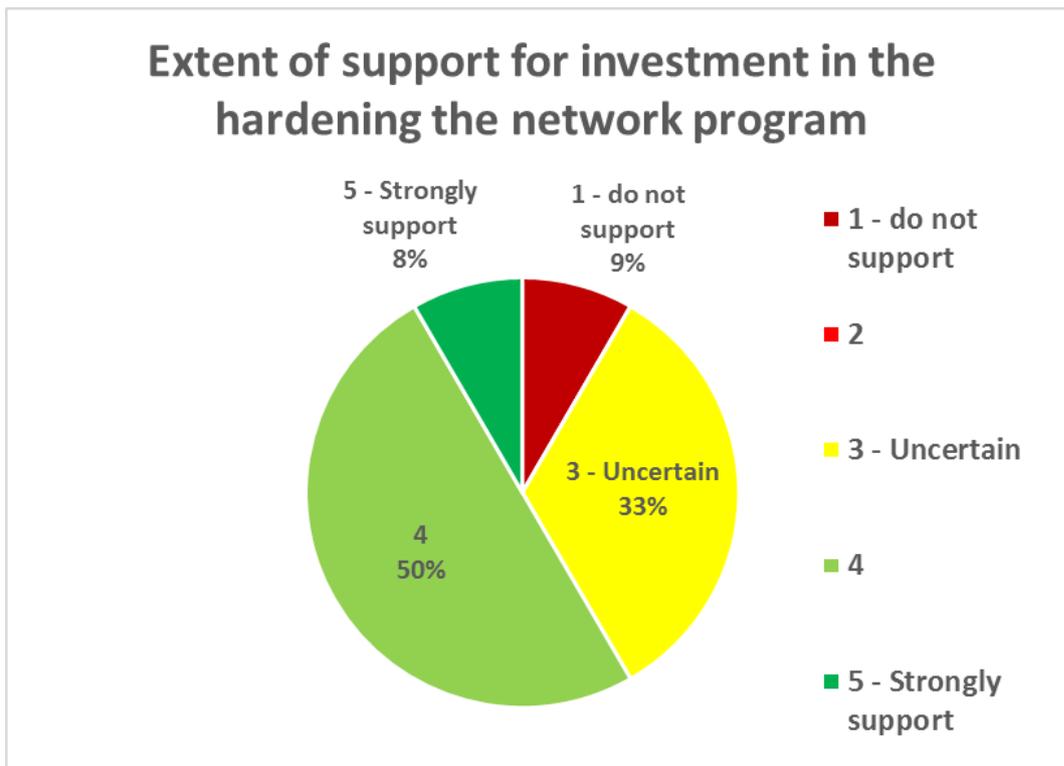
Capital expenditure (capex) Deep Dive Workshops

SA Power Networks conducted two Capex deep dive workshops as part of the consultation process. In those workshops a number of questions were asked to gather specific feedback on preliminary expenditure forecasts. The questions and the responses relating to reliability expenditure are presented below. Full details can be found in Supporting Document 0.13 Ann Shaw Rungie Capex Deep Dive Workshops Report.

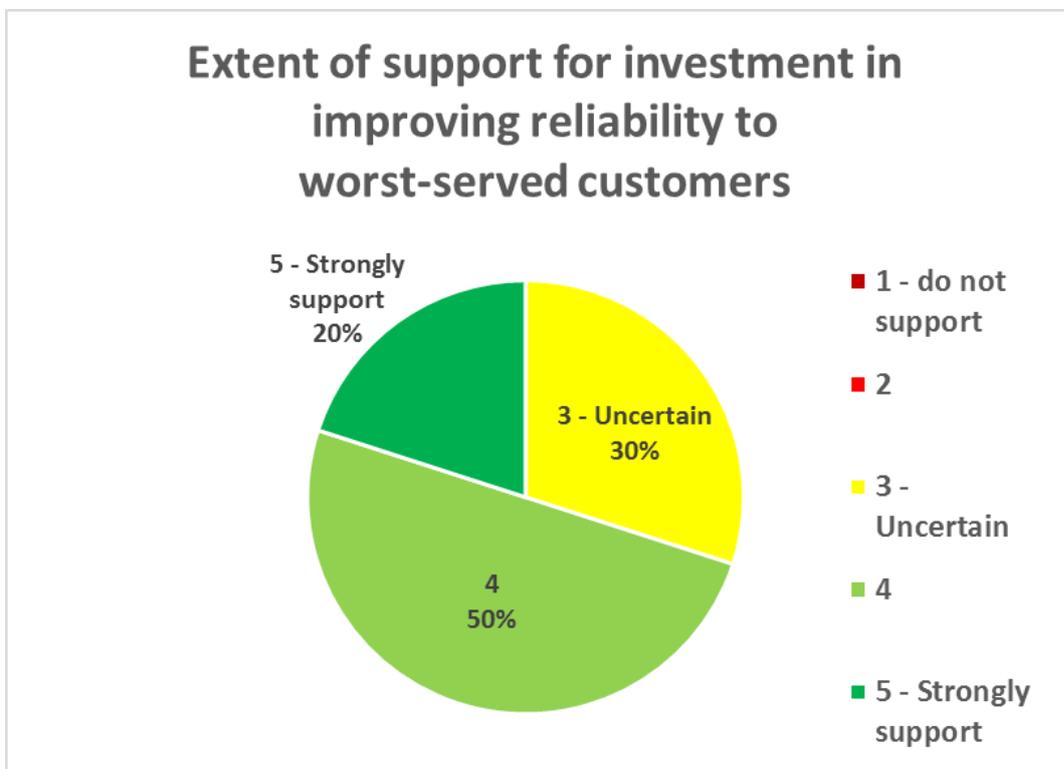
How comfortable are you with SA Power Networks’ approach to meeting ESCoSA’s reliability service standards?



To what extent do you support investment in the hardening the network program?



To what extent do you support investment in improving reliability to worst-served customers?



A summary of the Capex deep dive workshops surveys is tabled below

| Capital Deep Dive Survey results | Strongly Support | Support | Uncertain | | Do not Support |
|--|------------------|---------|-----------|---|----------------|
| Rating | 5 | 4 | 3 | 2 | 1 |
| SA Power Networks approach to meeting ESCoSA's Services Standards | 67% | 8% | 25% | | |
| Support investment in improving reliability to poorly-served customers | 20% | 50% | 30% | | 9% |
| Support investment in the Hardening the Network program | 8% | 50% | 33% | | 9% |

While two organisations representing vulnerable customers didn't support the three proposed reliability programs in our 2020-2025 Draft Plan consultation, these programs were supported by:

- Business SA
- SA Wine Industry Association
- Nine regional councils.

5 SA POWER NETWORKS RELIABILITY MANAGEMENT

Reliability Management Team

The Network Standards & Performance department, within the Network Management department, is responsible for achieving the regulatory service standards and targets and to monitor and address emerging reliability performance issues.

Reporting to the Manager Network Performance & Standards, the primary managers responsible for the delivery of the required reliability outcomes are the Reliability Operations Manager and Network Performance & Regulatory Manager.

The Manager Network Performance & Standards and Manager Regulatory Affairs have a joint obligation to maintain SA Power Networks' regulatory obligations.

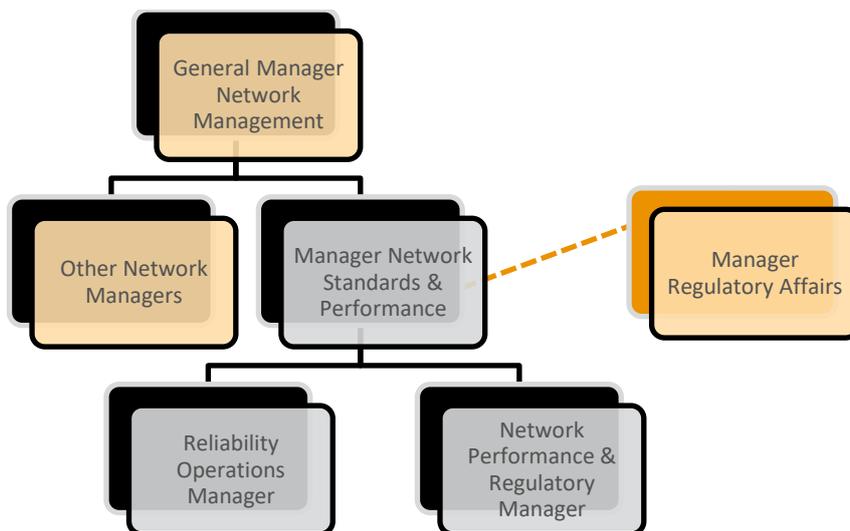


Figure 1: Organisational Structure of the Reliability Management Team

In addition, a steering committee meets monthly to review performance and to ensure strategies and the program delivery are addressing any arising performance issues. The committee has representation from across the business including Field Services through to Corporate Strategy.

Independent Reliability Statistical Analysis

To ensure SA Power Networks invests allocated reliability management funds in the most efficient, effective and prudent manner, to meet reliability performance standards and outcomes for our customers, we regularly engage an independent statistician to analyze reliability performance data.

This independent analysis confirmed that:

- there was a high level of assurance that we are addressing the right feeders / causes
- vegetation, unknown and lightning are the major causes of interruptions
- the average rate of interruptions was lower after reliability solutions were implemented (the level of reduction depending on the solution class)
- reliability solutions are highly effective when considering the impact at specific locations
- reliability solutions are sometimes not as effective when factoring all faults at all locations (as they can be impacted by faults at other random locations).

6 RELIABILITY PERFORMANCE EXTERNAL FACTORS

External Factors

External factors can cause an escalation of network outages and increase the number of power interruptions to our customers. Unforeseen emerging issues within a regulatory period do arise that need to be addressed to mitigate escalating customer issues and complaints. Recent examples of escalated unforeseen interruption causes include the migration of Grey-headed Flying Foxes (bats) into South Australia and an increase in farm machinery hitting our poles as a result of the increasing use of GPS steering technology.

Changing Environmental Conditions

Extreme weather in 2016-17 (and previously in 2010/11 and 2013/14) caused significant network outages and substantial loss of electricity supply. The scale and impact of extreme weather, in terms of network damage and customer impact, exceeded anything previously experienced in South Australia. This has focused attention on the capability of the distribution network to withstand extreme weather, the way SA Power Networks responds when outages occur, and the timeliness and accuracy of communications with customers.

The Essential Services Commission of South Australia, as part of its 2018 Services Standards review, has identified issues that relate specifically to the performance of the distribution network through engagement processes, one of which, is the impact of extreme weather in 2016-17, which caused significant network outages and substantial loss of electricity supply. The scale and impact of extreme weather, in terms of network damage and customer impact, exceeded anything previously experienced in South Australia.

This has focused attention on the capability of the distribution network to withstand extreme weather, the way SA Power Networks responds when outages occur, and the timeliness and accuracy of communications with customers.

Climate extremes analysis for South Australian Power Network operations

SA Power Networks commissioned the Bureau of Meteorology to carry out analyses of trends and variability of climate and weather parameters known to impact South Australia Power Networks operations across various regions of operation. The results are included in the report “Climate extremes analysis update for South Australian Power Network operations” published in 2017/18.

This report analyses trends and variability of climate and weather parameters known to impact South Australia Power Networks operations across various regions of operation. Where possible, connections with major modes of climate variability that influence South Australian climate are highlighted, heat, lightning, extreme rainfall, wind and fire weather trends and variability and with climate change projections up to 2030.

An additional independent report commissioned by the Premier of South Australia following the extreme weather event on 28 September 2016, titled “Independent Review of the Extreme Weather Event South Australia 28 September – 5 October 2016” (refer extract below)².

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) and BoM have reported that 2016 was a year of extreme weather events, wetter than average overall, and the fourth warmest on record for Australia and that there is significant evidence that climate change will increase the frequency and intensity of extreme weather events (CSIRO & Bureau of Meteorology, 2016).

As the global climate system has warmed, changes have occurred to both the frequency and severity of extreme weather.

Extreme rainfall events are likely to increase in intensity by the end of the century across most of Australia

(CSIRO & Bureau of Meteorology, 2016).

All indications are that, increased frequency and severity of severe weather events are part of the ‘new normal’, and the SA emergency services sector will need to adapt to ensure that prevention, preparedness, response and recovery activities are sustainable in the long-term.

During 2018, we also experienced turbulent weather conditions which caused significant outages which is becoming a common occurrence.

Higher temperatures

Analysis across the South Australian agricultural areas, and at individual weather stations, clearly indicate a warming trend in the last few decades of about 1°C in both average daytime and night-time temperatures, consistent with trends observed for Australia. Average Daily Temperatures (ADT = (Max temp + Min temp)/2) greater than 32.5°C are known to impact SAPN operations, and the frequency of such events has generally doubled since 2000. With further temperature rises likely over the next 5 to 10 year timeframe, this trend to greater numbers of days with extreme temperatures is likely to continue. The impact of predicted further temperature rises is likely to result in increases of cable failures, vegetation interruptions and animal migration causing an escalation of interruptions on the network.

Rainfall

2016 was an unusually wet year for all regions of operation for SAPN, under the Negative (wetter) phase of the Indian Ocean Dipole climate influence. Numbers of extreme rain days were approximately double the average number for the Yorke Peninsula/Mid-North, Adelaide and South-eastern South Australian regions. Annual rainfall and number of extreme rainfall days were the highest in 10-20 years for all regions, apart from Eyre Peninsula and Central South Australia.

Variability on a year to year basis can inform Bureau of Meteorology outlooks for major climate influences. While long-term climate change projections indicate more extreme rainfall events are to be expected in coming decades, currently there is no statistically significant increasing trend apparent in this analysis across SAPN operational areas.

The impact of more extreme rainfall events is likely to result in increases in vegetation interruptions through tree root failure where whole trees fall onto powerlines from outside the prescribe clearance zone and more branches from outside the prescribed clearance zone fall onto our assets.

² Independent Review of the Extreme Weather Event South Australia 28 September – 5 October 2016

Increased fire risk

Along with increasing temperatures, the number of Severe/Extreme Fire Danger Rating days (days with maximum FFDI 50-99) each financial year has increased over the last 20 years for stations in the Adelaide Hills and at Port Lincoln. These increases are calculated to be statistically significant only at one of the examined locations (Kuitpo). This observed increased fire risk is likely to remain or increase further with increased temperatures over the next 5 to 10-year timeframe.

Observed year to year variability can be associated with different phases of the major climate influences, with less extreme fire conditions in La Niña and Negative Indian Ocean Dipole years, and more extreme conditions in El Niño and Positive IOD years. Bureau of Meteorology outlooks provide intelligence of expected climate influences through each year.

Lightning activity

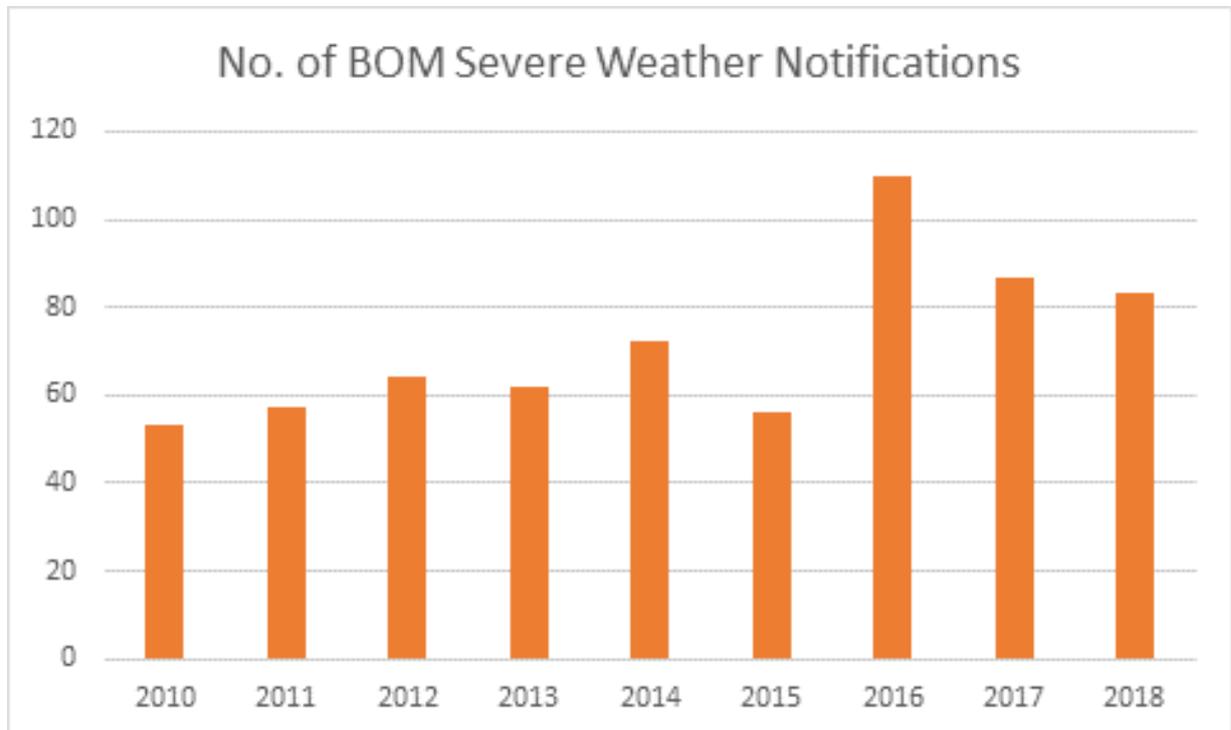
Accurate records of lightning activity are only available from 2005 onwards. Significant variability in numbers of lightning strikes, and numbers of days with large numbers of strikes, is apparent, but difficult to correlate with major climate influences. Bearing this in mind, in 2016 under the strong Negative Indian Ocean Dipole (IOD) climate influence there were large numbers of strikes for most regions. Numbers of days with high numbers of strikes for the year were the highest for any year since 2005 for the Yorke Peninsula/Mid-North, Adelaide, Riverland, and Kangaroo Island regions. While an important year to year pattern of variability as seen in the impact in 2016, while IOD events are expected to become more intense under climate change the frequency of occurrence is not expected to change.

The impact of more extreme lightning events is likely to result in increases of Network lightning damage causing an escalation of widespread interruptions across the rural network.

Wind events

2016 was one of the windiest years on record for available stations across the Adelaide and Adelaide Hills region. This was due to the weather patterns resulting from the Negative Indian Ocean Dipole climate influence. The length of record of wind is not long enough to be conclusive about associations between IOD events and wind each year, but weather patterns typically seen in Negative IOD events are conducive to stronger winds. Slight increases in wind speed can be seen in available data over the last 20 to 30 years, with statistically significant increases in average daily wind speeds at Adelaide Airport, Kuitpo and Mount Crawford. In general, no significant trend in the number of wind gust events is seen. This is consistent with available climate change projections. Significant increases in average wind speeds particularly in the Adelaide Metro and Hills areas is likely to result in increases of vegetation related outages and equipment damage.

The chart below outlines the increasing trend in annual number of BOM forecasts for severe weather, which a proportion develop into Major Event Days.



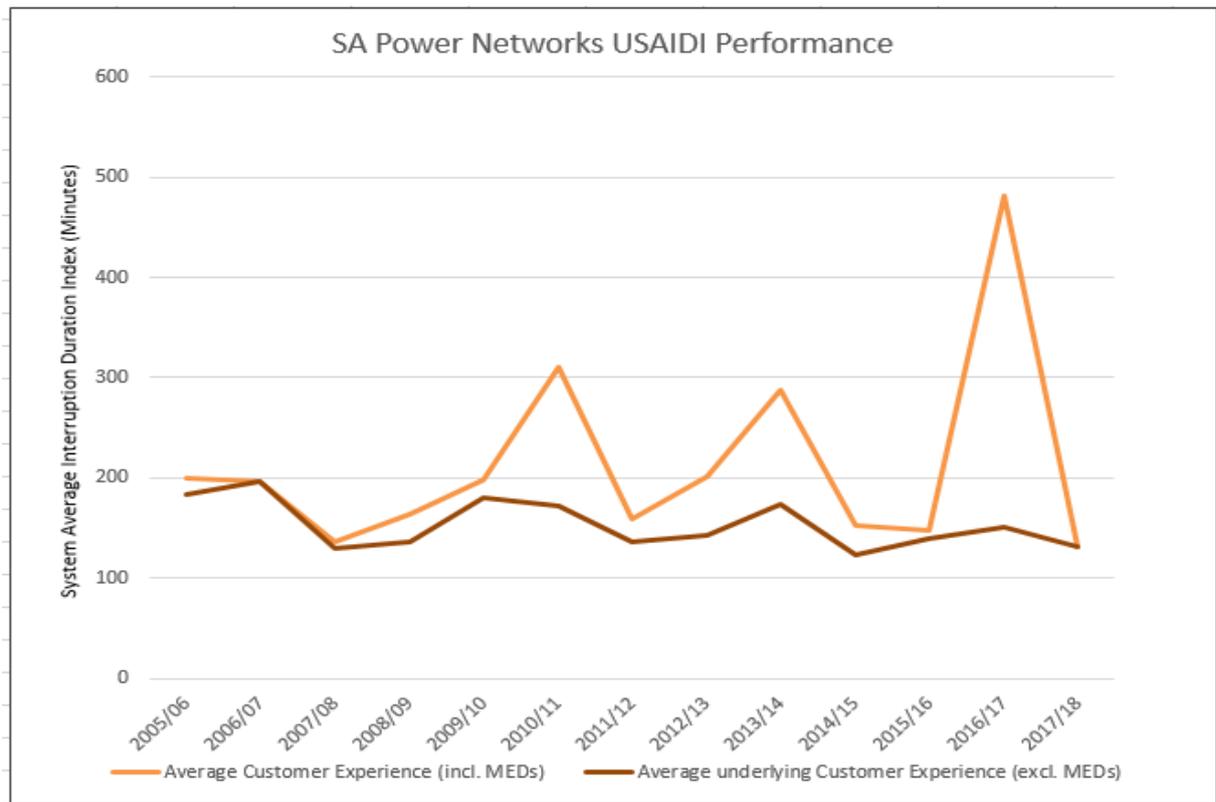
Number of Severe Weather Warnings issued by the Bureau of Meteorology (Source: BOM)

In summary, the Bureau of Meteorology report “Climate extremes analysis update for South Australian Power Network operations” predicts future increases in severe weather events (frequency and severity) which is likely to further impact network performance.

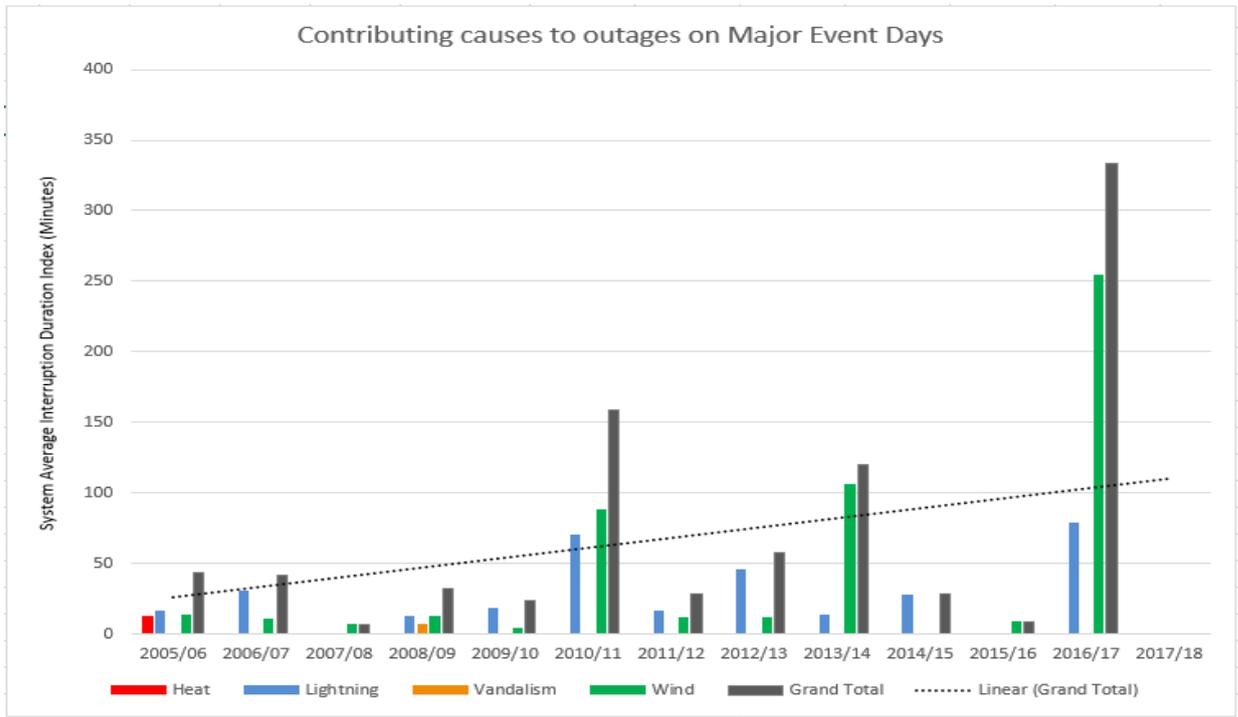
7 RELIABILITY PERFORMANCE TRENDS

Overall Performance (including MED's)

SA Power Networks and customers have experienced a marked deterioration in overall performance of the network during Major Event Days since 2010. The increasing trend can be seen from the chart below.

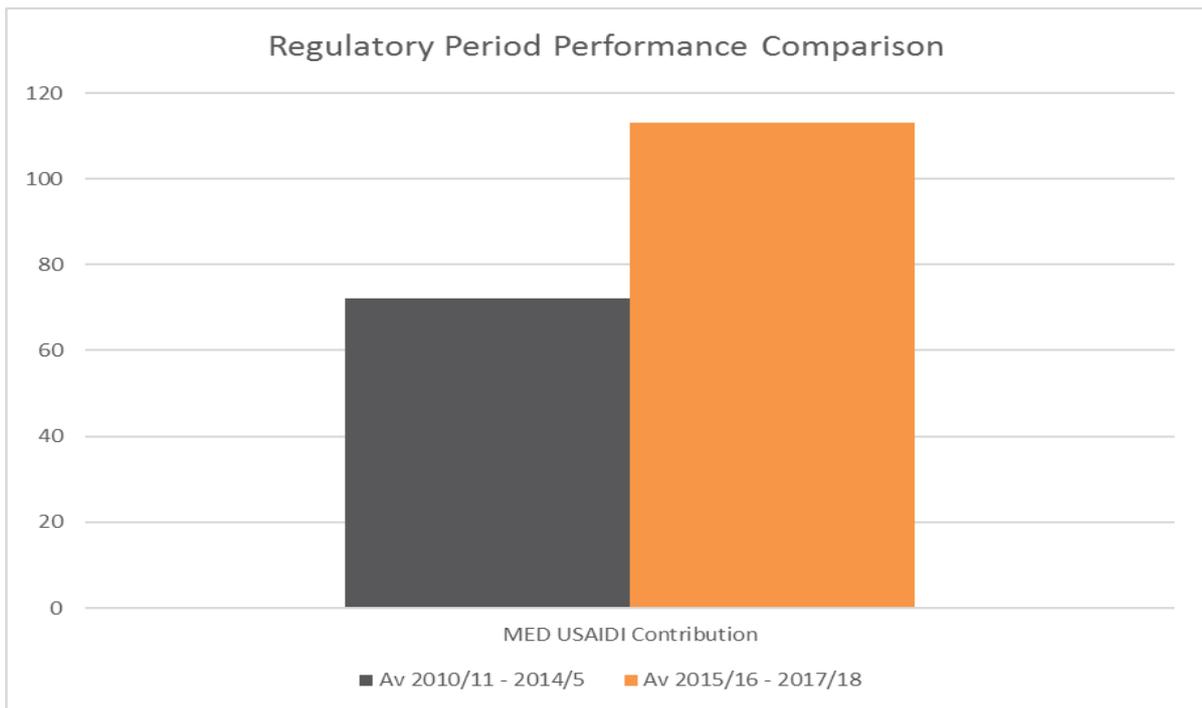


The graph below shows the major causes of outages during MEDs and their contribution to the Unplanned System Average Interruption Duration Index (USAIDI).



The increasing trend observed with MEDs is related to the significantly greater intensity of storm events shows that performance experienced by customers is severely impacted due to extreme weather conditions.

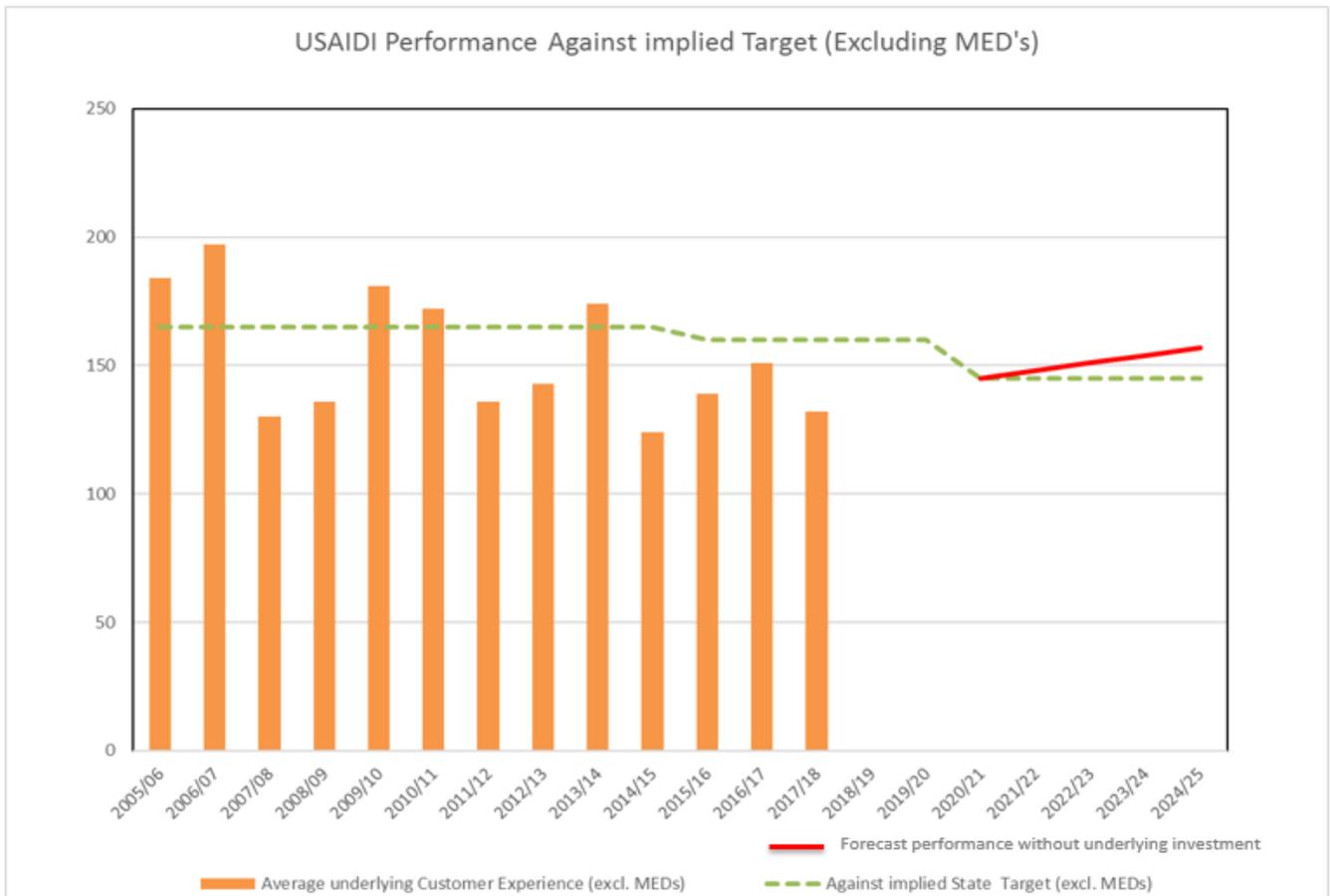
As a consequence, customers experienced an additional 41 minutes off supply per year on average for the current regulatory period in comparison to the previous regulatory period associated with MEDs (refer chart below).



This can be attributed to a step increase in major storm events and their intensity such as strong winds and lightning, since 2010, which has resulted in a deterioration of overall reliability performance and customer service.

Underlying Performance (excluding MED's)

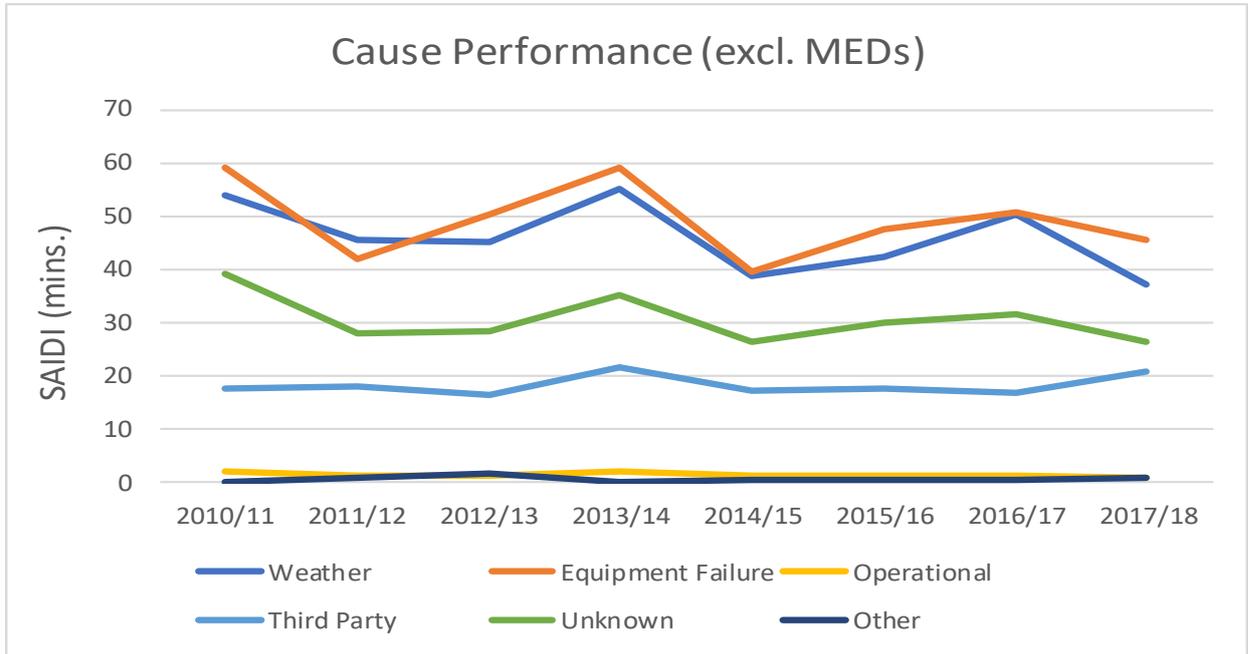
For the purpose of evaluating underlying distribution network reliability performance, the accepted national practice is to “normalise” results to remove the variable impact of significant weather events. Excluding Major Event Days, underlying reliability performance remains consistent with performance in the previous five years as shown below. The chart also shows what our implied state target is likely to be in the 2020-25 regulatory period based on historical performance. As can be seen, our State SAIDI target for 2020-25 will be much tougher (harder to meet) due to our good performance in the last few years



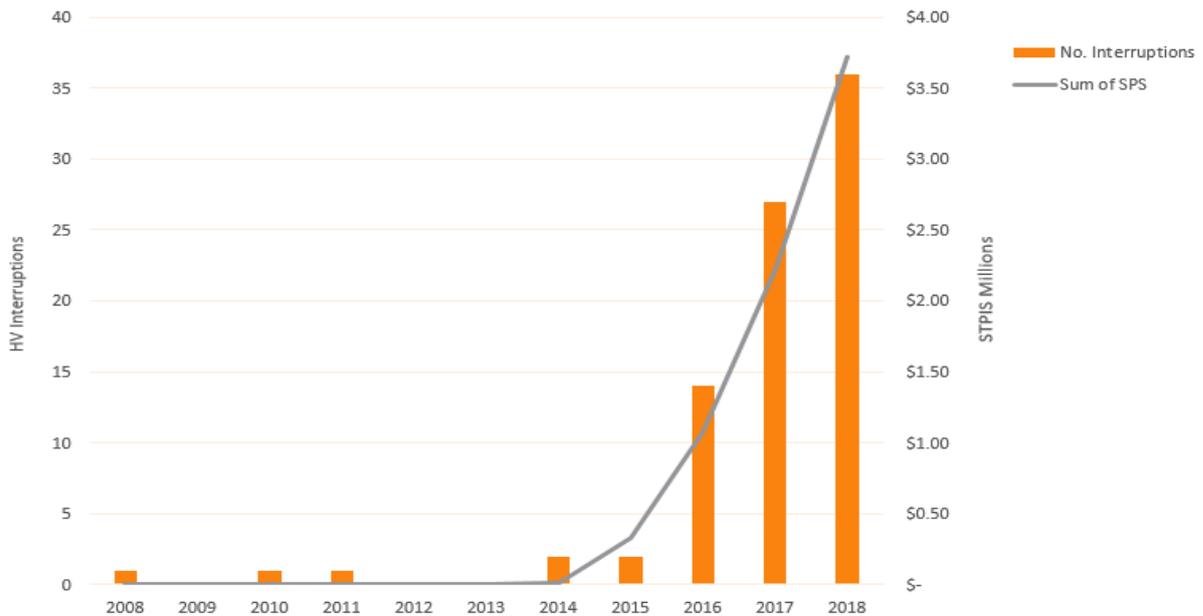
SA Power Networks has been successful in maintaining the average reliability performance at historical levels, demonstrating that the 2010-2020 expenditure allowance to maintain underlying reliability is prudent and efficient to meet its reliability obligations and customer service.

Underlying reliability performance contributing causes (excluding MEDs) are summarised below.

SAIDI cause contribution (excl MEDs) (2010–11 to 2017–18)

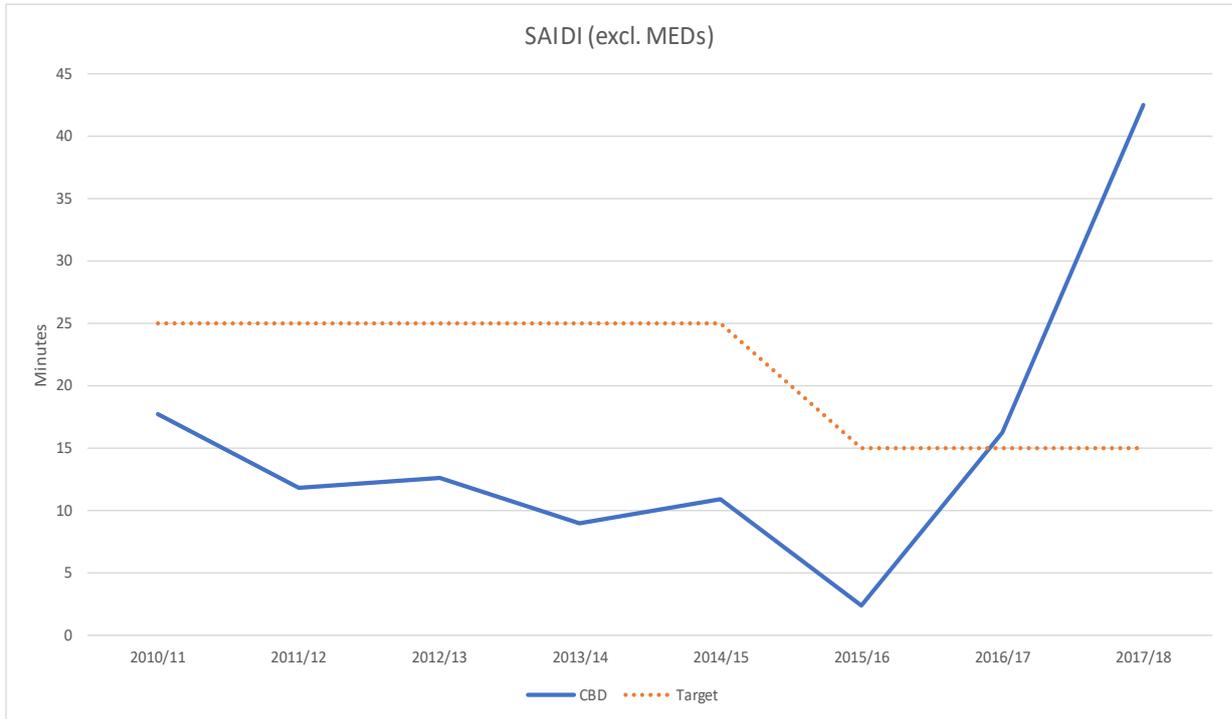


Most causes have remained stable with the exception of Third Party causes. As an example, a significant increase in interruptions has resulted from the growing population of bats in South Australia. Based on the South Australian governments Science Department for Environment forecasting an increase in the bat population, interruptions are forecast to continue to increase, (refer to the graph below) in coming years. Suitable mitigation strategies will need to be implemented.

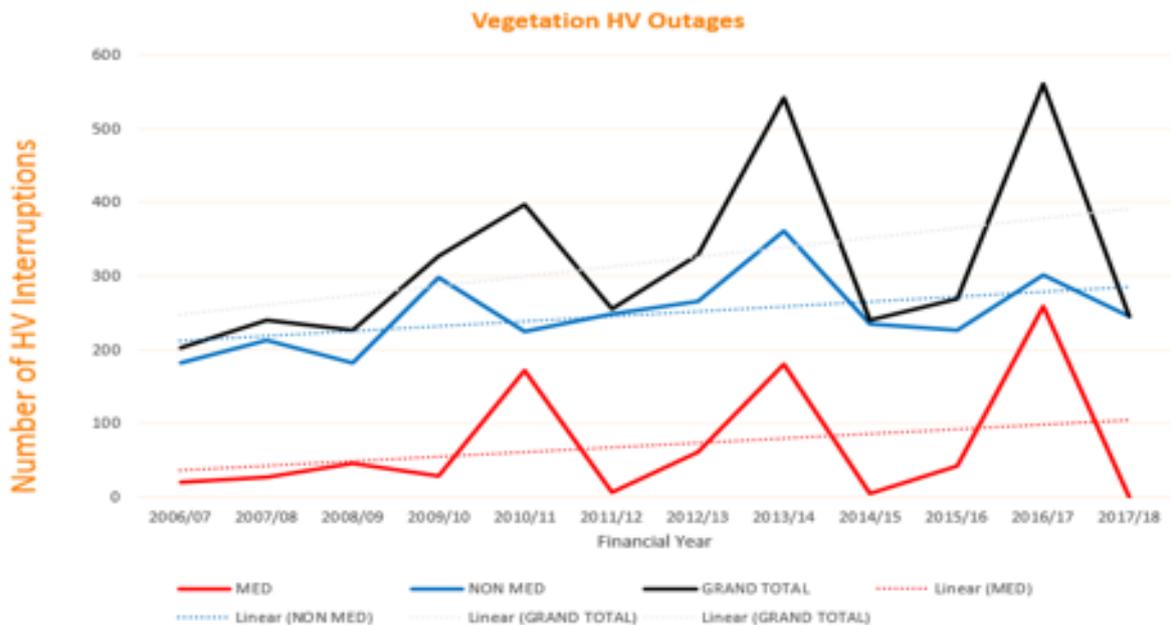


- Increase in outages and impact in last three years corresponding with local population growth

In addition, CBD feeder performance has recently deteriorated as a result of difficult to locate underground cable faults (refer to the graph below).



Another large contributing cause that impacts reliability performance that is trending upwards is the number of non-MED interruptions through vegetation from outside the legislated clearance zone (refer to the graph below).



Our strategy is to ensure that these emerging causes are mitigated, so as not to significantly impact both our performance and service to our customers.

Feeder Category Performance

The table below shows that SA Power Networks has met the ESCoSA reliability service standards in the current regulatory period. However, the 2016/17 SAIDI actual result for the CBD was marginal and 2017/18 SAIDI actual was well above the CBD reliability target primarily due to several 11kV underground cable faults.

| Feeder | 2015-20 ESCoSA Target | | 2015/16 Actual | | 2016/17 Actual | | 2017/18 Actual | |
|---------------------------|-----------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | USAIDI _n | USAIFI _n | USAIDI _n | USAIFI _n | USAIDI _n | USAIFI _n | USAIDI _n | USAIFI _n |
| CBD feeder | 15 | 0.15 | 2 | 0.02 | 16* | 0.11 | 43* | 0.41* |
| Urban feeder | 120 | 1.30 | 98 | 1.04 | 111 | 1.12 | 96 | 1.06 |
| Short rural feeder | 220 | 1.85 | 175 | 1.48 | 230* | 1.71 | 155 | 1.20 |
| Long rural feeder | 300 | 1.95 | 289 | 1.70 | 264 | 1.43 | 269 | 1.48 |
| Implied state-wide | 165 | 1.50 | 139 | 1.20 | 151 | 1.24 | 132 | 1.14 |

ESCoSA 2015–2020 supply restoration and reliability standards vs actual performance

* SA Power Networks was assessed by ESCoSA as having used best endeavours in attempting to meet targets ('best endeavours' means to act in good faith and use all reasonable efforts, skill and resources).

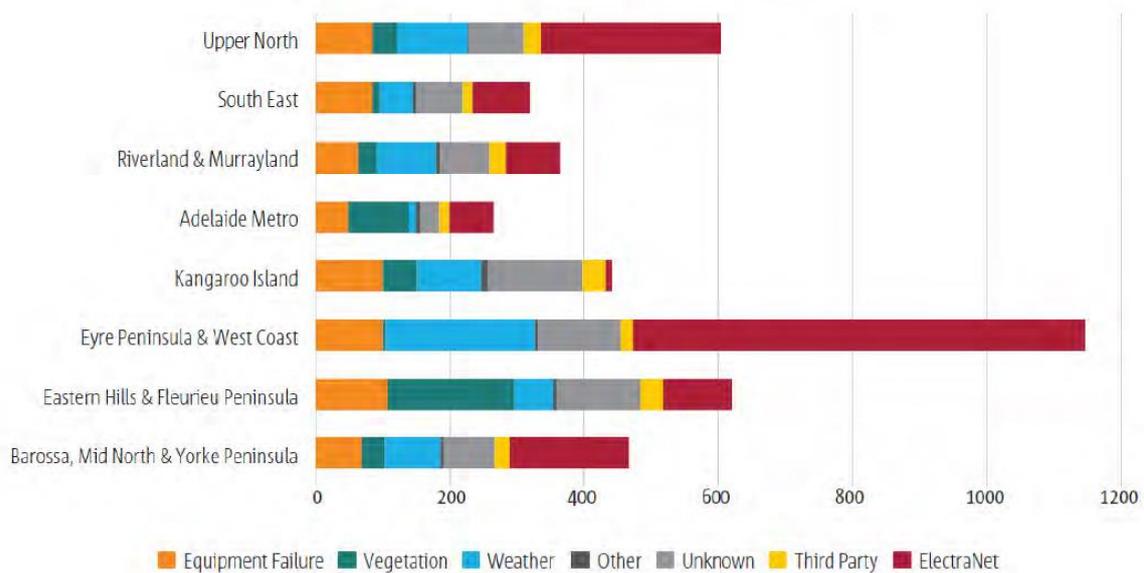
Regional Performance

Performance including MED’s and Electra Net outages to detail the average customer experience in each region is summarised below

Customer Outage Experience Cause by region*

60

Average Minutes Off Supply by Cause 2012–2017



*Includes ElectraNet

Confidential

Though network reliability has always varied across South Australia, concern about regional variation has increased since the last review with the Eyre Peninsula and the Adelaide Hills areas of concern.

ESCoSA in its final decision highlighted that it will be monitoring regional reliability performance to ensure that there is no long-term decline in performance in each region.

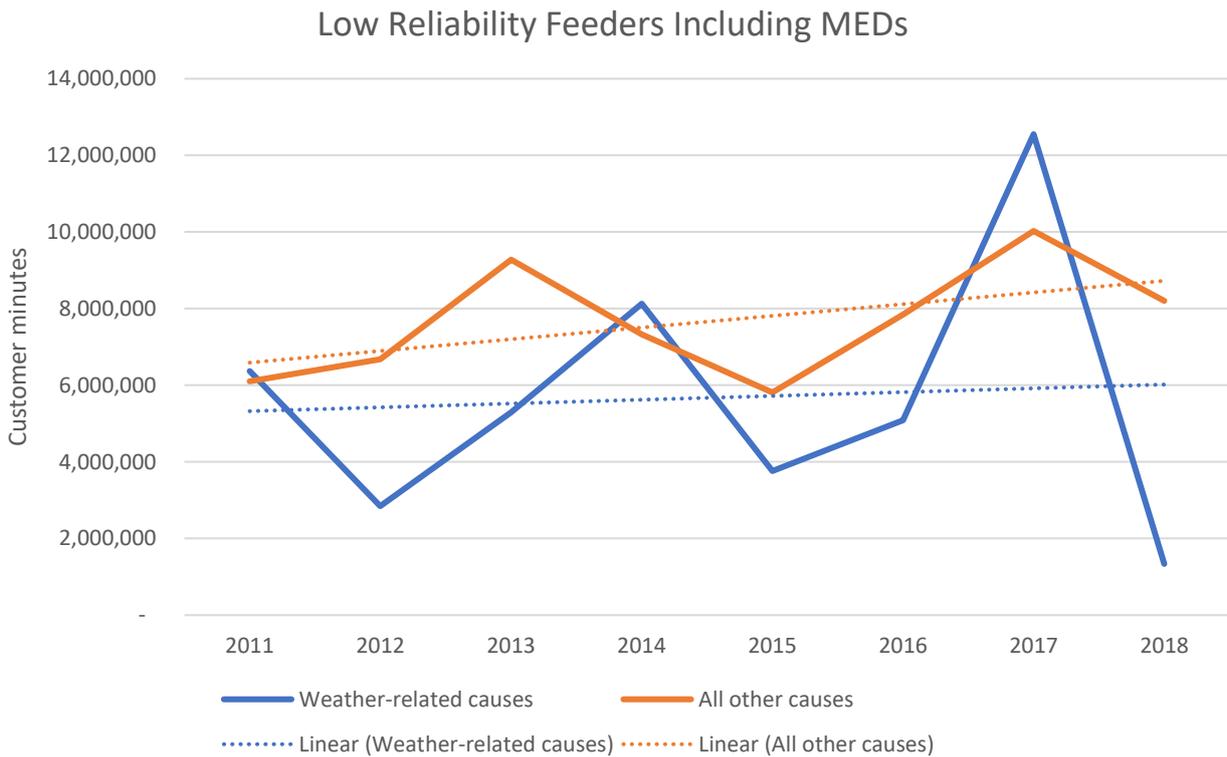
Low Reliability Feeders Performance

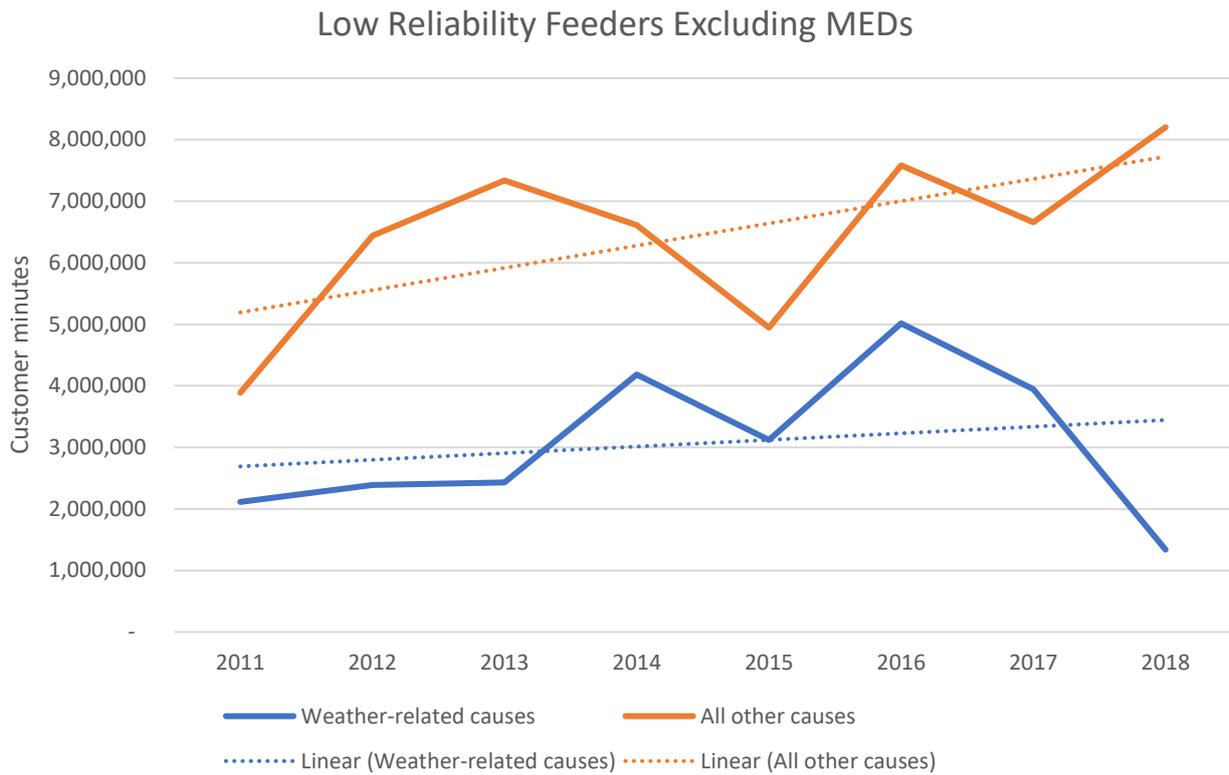
A number of feeders have been identified whose performance has been consistently far worse than the regional targets prescribed in the South Australian Electricity Distribution Code.

A total of 158 feeders have been identified as long term Low Reliability Feeders (in-line with ECoSA’s proposed regional based definition), that have appeared on the list for 3 years out of 5 years running, representing approximately 10% of the total number of feeders in the network supplying a total approx. 2% of SA Power Networks customers.

Over the period from 2010 to date, the overall performance of the long term Low Reliability Feeders and worst served customers has been escalating and the overall performance of these feeders relative to average performance has been worsening. This declining performance is negatively impacting the service levels of our worst served customers, increasing the economic cost of this poor performance, and in turn increasing the need for corrective action.

This recent decline in performance is shown below:





The charts show that performance is deteriorating for long term Low Reliability Feeders both excluding and including major events days.

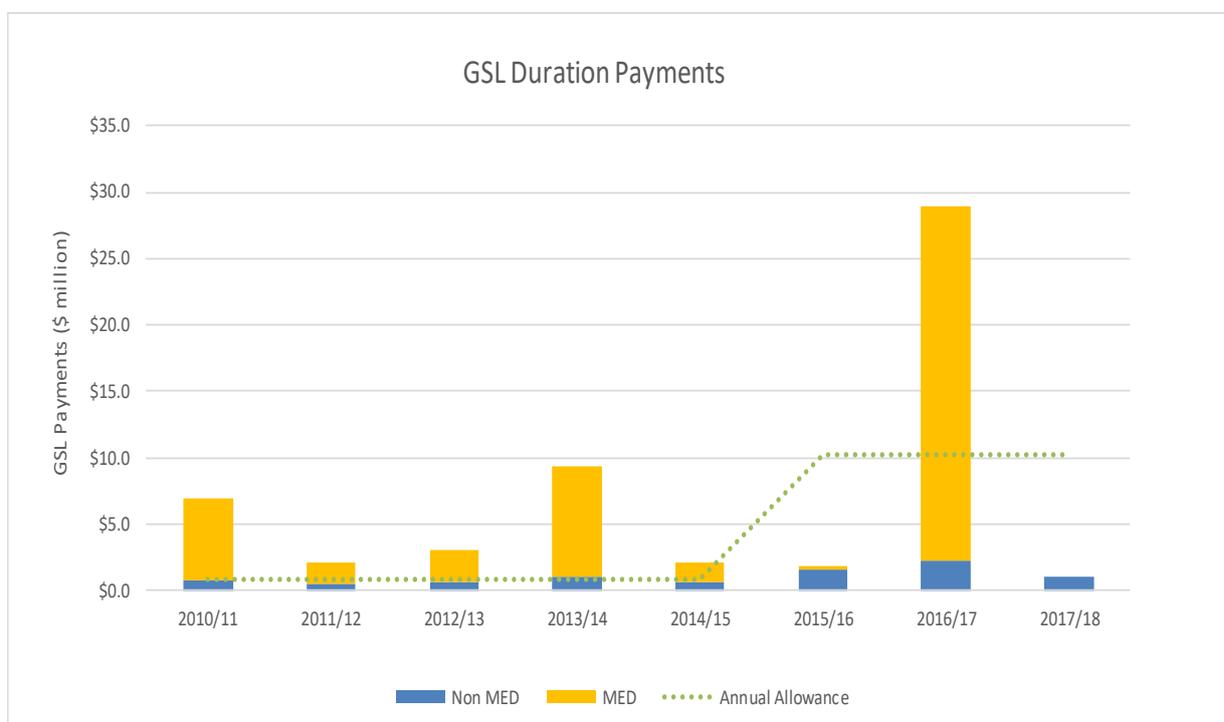
Our analysis demonstrated that the increase in customer minutes shown in these charts has been driven by storm-related interruptions and non-weather related outages on both Major Event Days and non-Major Event Days.

Guaranteed service level payments

Two types of guaranteed service level (GSL) payments are made for interruptions to electricity supply:

- **Duration of interruption:** payments to customers who experience an excessively long interruption to their supply.
- **Frequency of interruptions payment:** payments to customers affected by 10 or more interruptions in one regulatory year.

The majority of GSL payments are related to duration of interruptions



Because of severe weather events and the accompanying asset damage, customers have been experiencing long duration interruptions resulting in an increase of GSL duration payment to customers, the cost of which in the long term is borne by all South Australian electricity customers (refer to the graph above, which shows that the majority of GSL payments are mainly due to the impact of MEDs).

ESCoSA in its final decision³ on the reliability service standards that will be applied to SA Power Networks for the period 2020-25, includes amending the reliability GSL regime to refocus it on customers with ongoing, persistent reliability issues, by replacing the current one-off duration of interruption GSL payments with total annual duration of interruption payments.

³ ESCoSA's SA Power Networks reliability review – Final Decision January 2019

Despite the change in the reliability GSL duration payment regime for the 2020-25 RCP, MEDs will still likely make a significant contribution to the number and value of the reliability total duration GSL payments. GSL scheme costs are expected to fall by approximately 40% with the new scheme.

Extreme weather has focused attention on the capability of the distribution network to withstand extreme weather (i.e. network resilience), the way SA Power Networks responds when outages occur, and the timeliness and accuracy of communications with customers.

Reliability Performance Trend Summary

The present 2010-2018 reliability performance trends are summarised below:

- The overall reliability performance that customers experience has two components which comprises of interruptions on MEDs and non-MEDs. Customers are experiencing longer duration outages on MEDs due to the increased severity of the storms on those days whilst the underlying reliability performance (i.e. non-MEDs) is being managed against the EDC reliability service standard targets.
- The impact of storm related interruptions due to vegetation from outside the legislated clearance zone causing faults on the SA Power Networks' network is increasing.
- SA Power Networks' customers are experiencing an additional 41 minutes off supply during MEDs on average per year for the current regulatory period, in comparison to the previous regulatory period 2010 to 2015.
- GSL Duration payments have significantly escalated with the increased intensity of interruption activity during and around MEDs. Despite the change in the reliability GSL duration payment regime for the 2020-25 RCP, MEDs will still likely make a significant contribution to the number and value of the reliability total duration GSL payments.
- The overall performance of feeders classified as long-term Low Reliability Feeders (LTLRF) and their worst served customers, is escalating and performance is worsening. Customers on LRFs experience on average twice the total interruption duration of other customers supplied in their respective region.

8 Underlying Reliability Performance Management Program

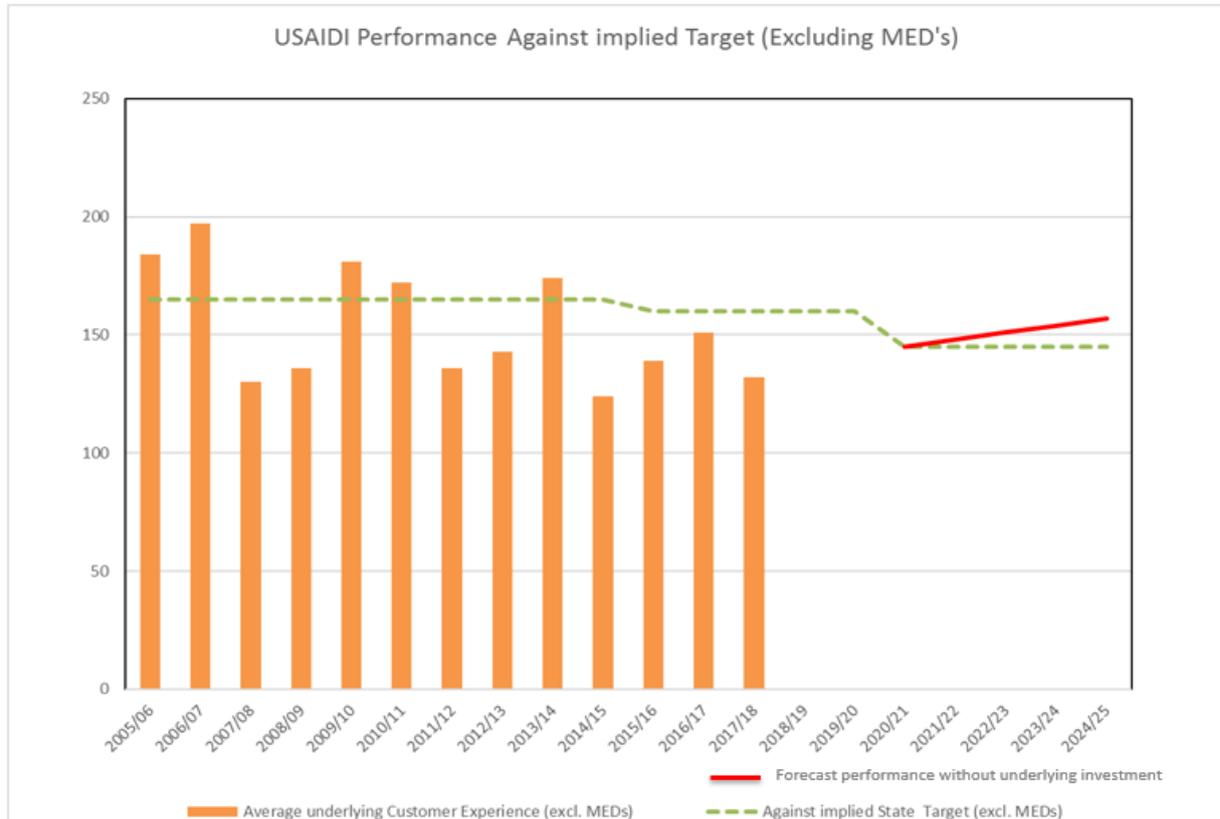
As the average underlying performance remains consistent, the current allocated regulatory expenditure targeted for reliability performance management projects is essential to maintain underlying reliability performance, to achieve minimum performance standards for all indices as detailed in the Service Standard Framework as defined within the SA Distribution Code.

Underlying performance is also subject to being adversely impacted by the condition of assets (not addressed here but is addressed in other separate asset management plans), the network configuration, changes to network standards and operational and safety procedures, third party activity and weather and environmental patterns.

The possible effects of weather on underlying reliability can occur in South Australia owing to factors outside of the control of SA Power Networks. Although MED exclusions will negate this impact to some extent, it may not be eliminated.

Underlying performance management funding is mainly required to address emerging issues (through implementing reliability enhancements) within the regulatory period that arise such as to address escalating customer issues and complaints, a deterioration of “localised” feeder performance and/or the escalation of causes such as the migration of Bats / Corellas, non-MED vegetation related interruptions and CBD interruptions.

The chart below demonstrates our State SAIDI target for 2020-25 will be much tougher (harder to meet). Without underlying performance investment is expected to deteriorate and exceed targets.



These network reliability enhancements refer to projects required to maintain underlying performance by either:

- Preventing the interruption from occurring
- Minimising the number of customers impacted
- Reducing supply restoration times

Projects typically include the following solutions:

- Vegetation solutions (network enhancements to mitigate vegetation related outages)
- Animal guards
- Switch installations
- Line Fault Indicators

SA Power Networks will continue to investigate measures that manage and maintain underlying reliability and implement measures that are cost effective.

To underpin SA Power Networks underlying reliability performance, expenditure is necessary to continue to maintain average underlying reliability performance to:

- Achieve minimum performance standards for all indices as detailed in the Service Standard Framework as defined within the SA Distribution Code
- Manage GSL payments and potential GSL payment risks
- Manage emerging issues such as declining reliability due to external causes
- Address escalating customer issues.

To achieve this, the Annual Reliability Management Plans includes:

- Network enhancements to manage underlying reliability performance
- Introducing and improving key procedures
- A reliability communication, culture, education and employee engagement plan
- Improving information to our customers and customer contacts
- Reviewing network performance for continuous improvement
- New technology, innovation and research projects
- Ongoing daily reliability management activities

The scope of this underlying performance expenditure is not related to addressing any asset maintenance related issues - asset replacement activities are addressed separately in other asset management plans (Note: the goal of repx is to maintain the overall asset risk, hence minimal reliability benefits are expected).

Overall reliability expenditure for maintaining underlying reliability performance for the period 2020-2025 is included below.

| 2020-2025 Proposed Reliability Program | Customer Service Level Improvement | 2015-20 Reset Determination 2017 \$ Including OH | 2015-20 Forecast Expenditure 2017 \$ Including OH | 2020-25 Submission 2017 \$ Including OH | Net Benefit Based on VCR 15 years NPV |
|---|--|---|--|--|---------------------------------------|
| Maintain underlying reliability performance | Maintain underlying performance to targets | \$33.0M | \$34.5M | \$36.0M | - |

The slight increase in maintaining underlying performance from \$34.5m (2015-20 forecast expenditure) to \$36.0m (2020-25 submission) is because we anticipate a slight increase in spend due to rising unforeseen / emerging issues such as an increase in the colony of Bats into South Australia, rising customer expectations and to manage performance in an increased number of new regional categories.

9 Hardening the Network Program

The overall reliability performance that customers have experienced with Major Event Days (MEDs) included, demonstrates that customers are experiencing increased outages and longer duration interruptions.

This strategy was developed to address reliability performance during MEDs. Customers are experiencing a significant increase in extended interruptions as a result of our assets repeatedly being damaged (at the same location typically) by severe weather events and our inability in some cases to gain safe access to restore supply. Concerns have been expressed by consumers who support our program of continuing to harden the network in priority areas.

The need for the hardening programme to continue through to 2025 has been identified through customers support and a review and prediction of network and weather-related performance trends and risks as identified by The Bureau of Meteorology report “Climate extremes analysis update for South Australian Power Network operations,” which predicts future increases in severe weather events which is likely to further impact network performance.

SA Power Networks has undertaken the first stage of hardening the network during the 2015-20 regulatory period. The severe weather events of 2016/17 have heightened customer expectations for adequate action to be taken to reduce the adverse impact on customers from long duration outages during these severe weather events.

Scope:

The scope of the project is to harden the most vulnerable sections of the distribution network against storms and lightning to reduce the escalating impact to customers during Major Event Days.

This will be achieved by a combination of strategies including:

- Alternative network asset configuration / standards to minimise the chance of vegetation related outages from outside the prescribed clearance zone
- Installing mid line switches to reduce the number of customers interrupted by storm related interruptions.
- Re-insulating vulnerable sections of overhead lines to minimise the possibility of insulator failures due to lightning

Selection Criteria:

Feeders considered for hardening between 2020-25 are those that have contributed the most customer minutes on MED's between the eight year period 2010/11 to 2017/18.

Sections of these 173 feeders repeatedly damaged by storms (at the same location typically), were analyzed by identifying historical interruptions that could have been mitigated if hardening augmentations were in place and then the Value of Customer Reliability (VCR) benefit calculated based of the interruptions saved.

37 projects have been selected for the proposed 2020 -2025 Hardening the Network Program where the Value of Customer Reliability (VCR) benefit of the project most exceeded the cost of the recommended hardening augmentation.

The overall 2020 -2025 Hardening the Network expenditure proposal aligns with 2015-2020 historical hardening expenditure allowances as customers expressed a preparedness to invest only a little more for a hardening of the network in priority areas.

Hardening the Network Program Benefits:

The proposed option is the least cost approach using proven cost-effective technology that is capable of addressing reliability performance during MEDs.

The analysis of the proposed 2020-2025 Hardening the Network plan is summarised in the tables below.

Reliability targets will need to be adjusted accordingly to account for the forecast annual SPS benefit indicated below.

Hardening the Network Program expenditure and Customer Value

| Proposed Improvement | 2015-20 Reset Determination 2017 \$ Including OH | 2015-20 Forecast Expenditure 2017 \$ Including OH | 2020-25 Submission 2017 \$ Including OH | Net Benefit Based on VCR 15 years NPV |
|--------------------------------------|---|--|--|---------------------------------------|
| 37 Hardening Projects VCR + SPS – | \$17.2M | \$16.6M | \$16.2M | \$46.2m (VCR NPV) |

Hardening the Network Performance Benefit for Feeders / Customers targeted

| Feeders Targeted for Hardening | Customers Benefited by Hardening | Av Outage Duration reduction (pa) |
|--------------------------------|----------------------------------|-----------------------------------|
| 35 | Approx. 53,795 | Approx. 2 hrs |

Overall network performance benefit (assuming benefits are adjusted by half the ultimate improvement to reflect that the program will be progressively implemented over the 2020-25 RCP).

| State SAIDI Benefit PA Inc MED | State SAIDI Benefit PA Exc MED | SPS Benefit (pa) Including MED Threshold adjustment |
|--------------------------------|--------------------------------|---|
| 5.3 Minutes | 0.4 Minutes | \$0.3M |

| 8-year period 2010/11 to 2017/18 | Performance Without Hardening | Performance With Hardening |
|-----------------------------------|-------------------------------|----------------------------|
| Overall Av. SAIDI (incl. MEDs) | 318 | 199 |
| Underlying Av. SAIDI (excl. MEDs) | 97 | 88 |

Recommended option:

The recommended option is to invest a total of \$16.2 M over the 2020 to 2025 regulatory period to harden the network against the effects of storms and lightning to address the deteriorating reliability performance and manage customer service during MEDs.

Performance incentive schemes (i.e. STPIS) excludes major storm event interruptions and therefore there is little financial incentive for SA Power Networks to invest in mitigation of MED excluded interruptions.

As mentioned earlier, the scope of this expenditure is not related to addressing any asset maintenance related issues - asset replacement activities are addressed separately in other asset management plans (Note: the goal of Repex is to maintain the overall asset risk, hence minimal reliability benefits are expected).

The overall 2020 -2025 Hardening program expenditure proposal is in line with 2015-2020 historical Hardening expenditure allowances and customer expectations as customers have expressed a preparedness to invest only a little more for a hardening of the network in priority areas.

The hardening programme will reduce extended customer interruptions.

Refer to the individual 5.26 2020-25 Reliability & Resilience Programs - Hardening the Network program justification for further detailed information.

10 Low Reliability Feeders Program

Over the period from 2010 to date, the overall performance of long term Low Reliability Feeders and worst served customers has been escalating and the performance of these feeders relative to average has been worsening. This declining performance is negatively impacting the service levels of our worst served customers, increasing the economic cost of this poor performance, and in turn increasing the need for corrective action.

Each year, SA Power Networks is required to publicly report to ESCoSA on actions taken to improve the reliability of supply to Low Reliability Feeders, however, there is no direction or funding allocation to address Low Reliability Feeder performance.

It is likely that performance of Low Reliability Feeders will continue to deteriorate through the predicted escalation of weather events (both MED and non-MED) over the coming regulatory period. Both customers and ESCoSA have expressed support for ensuring acceptable levels of reliability for all customers, in particular regional and worst served customers and communities.

Our expenditure submission for the 2020-25 period therefore includes measures to meet the requirements being placed on us by ESCoSA to maintain reliability at current levels for Low Reliability Feeders by addressing deteriorating performance of feeders supplying customers and communities who repeatedly experience extremely poor reliability performance significantly worse than ESCoSA targets.

The proposal includes NPV positive projects only where the economic benefit of the program exceeds the cost, based on the Value of Customer Reliability (VCR) benefit.

Our customers and key stakeholders have provided the greatest level of support for ensuring acceptable levels of reliability for all customers, in particular, regional and worst served customers.

Scope:

The scope of the project is to address performance to customers who repeatedly experience extremely poor reliability performance significantly worse than targets. This will be achieved by a combination of strategies including:

- Re-insulating vulnerable sections of overhead lines to minimise the possibility of insulator failures due to lightning
- Alternative network asset configuration / standards to minimise the chance of vegetation outages from outside the prescribed clearance zone
- Installing mid-line switches to reduce the number of customers interrupted by storm related interruptions.

Selection Criteria:

ESCoSA proposes to define ‘Low Reliability Distribution Feeders’ as feeders in a particular region which have exceeded 2.0 times the duration of the interruption regional service standard (USAIDI) for two consecutive financial years.

Additional long term Low Reliability Eyre Peninsula Feeders have also been included, as the new regional definition proposed by ESCoSA resulted in these feeders not meeting the qualification criteria (an unintended consequence as the Eyre regional SAIDI target is significantly high). The reliability performance of Eyre Peninsula has also been the subject of an ESCoSA inquiry, hence the need to address performance for customers in this area.

| | Number of Long term LFR Feeders 3 out of 5 years | Number of Customers |
|--|---|-------------------------------------|
| Eyre Peninsula Worst served customers | 17 | 2,939 |
| Recurring ESCoSA Low Reliability Distribution Feeders | 141 | 36,800 |
| Combined Total of ESCoSA / Eyre Peninsula Low Reliability Distribution Feeders | 158 | 39,739 |
| 2020 -2025 Network Performance Reinforcement Low Reliability Feeders program (i.e. VCR positive) | 97 | 16,708 (inc. upstream customers) |

All 158 Low Reliability Feeders have been assessed for augmentation identifying historical interruptions that could have been mitigated if augmentation were in place and then the Value of Customer Reliability (VCR) benefit calculated based of the interruptions saved.

97 feeders have been selected for the 2020 -2025 proposed Network Reinforcement Low Reliability Feeders program where the Value of Customer Reliability (VCR) benefit of each project exceeded the cost of the recommended augmentation.

The overall 2020 -2025 the Low Reliability Feeders program expenditure proposal addresses declining performance of Low Reliability Feeders in particular, regional and worst served customers and takes into account the issue of the cost-benefit analysis needing to be considered when approaching increased reliability for regional and worst served customers.

Low Reliability Feeders Program Benefits:

The proposed option is the least cost approach using proven cost-effective technology that can address the performance of Low Reliability Feeders supplying worst served customers.

The analysis of the proposed 2020-25 Low Reliability Feeders / Worst Served Customers Program are summarised in the tables below.

Reliability targets will need to be adjusted accordingly to account for the forecast annual SPS benefit indicated below.

LFR 2020-25 Program expenditure and Customer Value

| Proposed Improvement | 2015-20 Reset Determination 2017 \$ Including OH | 2015-20 Forecast Expenditure 2017 \$ Including OH | 2020-25 Submission 2017 \$ Including OH | Net Benefit Based on VCR 15 years NPV |
|--|---|--|--|---------------------------------------|
| 104 Projects on 97 Feeders VCR + SPS – | \$0 (Not approved, \$8.6M) | \$1.2M | \$15.6M | \$10.8M (VCR NPV) |

LFR 2020-25 Performance Benefit for Feeders / Customers targeted

| Feeders Targeted for LFR/WSC | Customers Benefited by LFR/WSC | Av Outage Duration reduction (pa) |
|------------------------------|--|-----------------------------------|
| 97 | 16,708 including upstream customers | Approx. 3 hrs |

Overall Network Performance Benefit (assuming benefits are adjusted by half the ultimate improvement to reflect that the program will be progressively implemented over the 2020-25 RCP)

| State SAIDI Benefit (pa) Including MEDs | State SAIDI Benefit (pa) Excluding MEDs | SPS Benefit (pa) Including MED Threshold adjustment |
|---|---|---|
| 1.7 Minutes | 1.3 Minutes | \$0.8 million |

| 8-year period 2010/11 to 2017/18 | Performance Without LFR/WSC | Performance With LFR/WSC |
|--|--------------------------------|--------------------------------|
| Overall Average. SAIDI (including. MEDs) | 420 | 252 |
| Underlying Average. SAIDI (excluding. MEDs) | 309 | 193 |

Recommended Option:

The recommended option is to invest a total of \$15.6 M over the 2020 to 2025 regulatory period to address the deterioration of Low Reliability Feeder performance supplying worst served customers and communities.

Performance incentive schemes (i.e. STPIS) provide insufficient incentive for SA Power Networks to invest to mitigate Low Reliability Feeders supplying worst served customers as feeder customer numbers and STPIS Incentives are low.

The proposal includes NPV positive projects only where the economic benefit of program exceeds cost, based on the Value of Customer Reliability (VCR) benefit.

The overall 2020 -2025 Low Reliability Feeders program expenditure proposal is to meet the requirements being placed on us by ESCoSA to maintain reliability at current levels for Low Reliability Feeders and takes into account cost-benefit analysis for reliability augmentation for Low Reliability Feeders.

The proposed Low Reliability Feeders / Worst Served Customers program aims to manage and reinforce the performance of feeders that consistently fail to meet the reliability targets in the Electricity Distribution Code to address the performance to customers who repeatedly experience extremely poor reliability performance significantly worse than ESCoSA targets returning performance closer to Electricity Distribution Code target levels.

Refer to the individual 5.27 2020-25 Reliability & Resilience Programs – Low Reliability Feeders program justification for further detailed information.

11 NEW TECHNOLOGY, INNOVATION AND ANALYSIS

Analysis of how our network performs and the effectiveness of past reliability augmentation identifies where we can further improve our reliability performance.

Network reliability enhancement projects as detailed within the Reliability Management Plan targets and mitigates repeat problems and the highest impacted sections of the network with relatively straightforward and effective solutions. Once we complete planned network solutions, most of the 'low hanging fruit' will have disappeared, so to continue to manage our reliability performance, we must look further into additional innovative ways to manage our reliability performance.

Included in the Reliability Management Plan is research and development into new technologies to allow for continuous improvement into the future.

From the analysis and development carried out, we will be ready to implement further innovations and new technologies to deliver further management of reliability performance.

SA Power Networks is on a number of industry committees, which provides insight into the most effective and efficient reliability solutions being applied by Distribution companies.

Current areas considered for further development are:

- Lightning mitigation solutions
- The use of real time lightning strike information
- Alternate vegetation solutions
- Recloser Dead Time Trial
- Trip and Fuse Savers
- Portable Line Fault Indicators – remote indication
- Review of specific equipment and designs impacting network performance

12 CULTURE

Engaging the entire workforce is key to managing reliability performance.

SA Power Networks philosophy is aimed at aligning our organisation in support of a performance culture that will drive and sustain a step-change improvement with shared responsibilities for leading and implementing our corporate strategies.

It is always important to ensure employees across the whole of SA Power Networks are focused, informed and engaged on our reliability performance to deliver quality service to our customers.

We need to ensure our employees are set up to succeed and gain the value of employees contributing to our business.

Over the years, some of the most effective reliability initiatives implemented have been as a result of ideas received while educating our front-line employees. For example:

- Portable line fault indicators were brought to our attention by a Trade Skilled Worker
- The 'Find the Cause' road shows, education and initiatives delivered improvements in finding the cause of outages

These are just two examples of very successful reliability initiatives recently implemented which highlight the importance of engaging and educating our front-line employees to ensure we have capable and committed staff to deliver results with a can-do attitude.

We recognise the importance of maintaining accurate and timely communications with our customers, employees and stakeholders. We will continue to focus on sharing our knowledge and reinvigorate our employees who deal directly with our customers and stakeholders.

Included within the RMP is the continuation of current culture building projects as well as new projects to continue focus on and reinforce the importance of managing reliability and providing timely and accurate information to customers and stakeholders.

13 ONGOING RELIABILITY MANAGEMENT ACTIVITIES

Also included within the Reliability Management Plan are details of ongoing reliability management activities as listed below:

- Reliability performance reporting
- SPS Steering Committee
- Asset Performance Review Committee
- Daily Interruption review, analysis and actions
- Network Duty Officers
- Repeat Fault Finding Procedure
- Restoration Time Policy
- Feeder and Substation Offload checks
- Reliability cause analysis
- Cause trends
- Identification, investigation and rectification of worst performing feeders and equipment
- Prioritisation of asset restoration and preventative maintenance works
- Planned interruption management
- Annual Protection Management Plan
- Transformer and LV Load Management
- Reliability performance education
- Reliability Management Best Practices

Refer to the Reliability Management Plan (RMP) for further detailed information.

14 CAPEX FORECAST

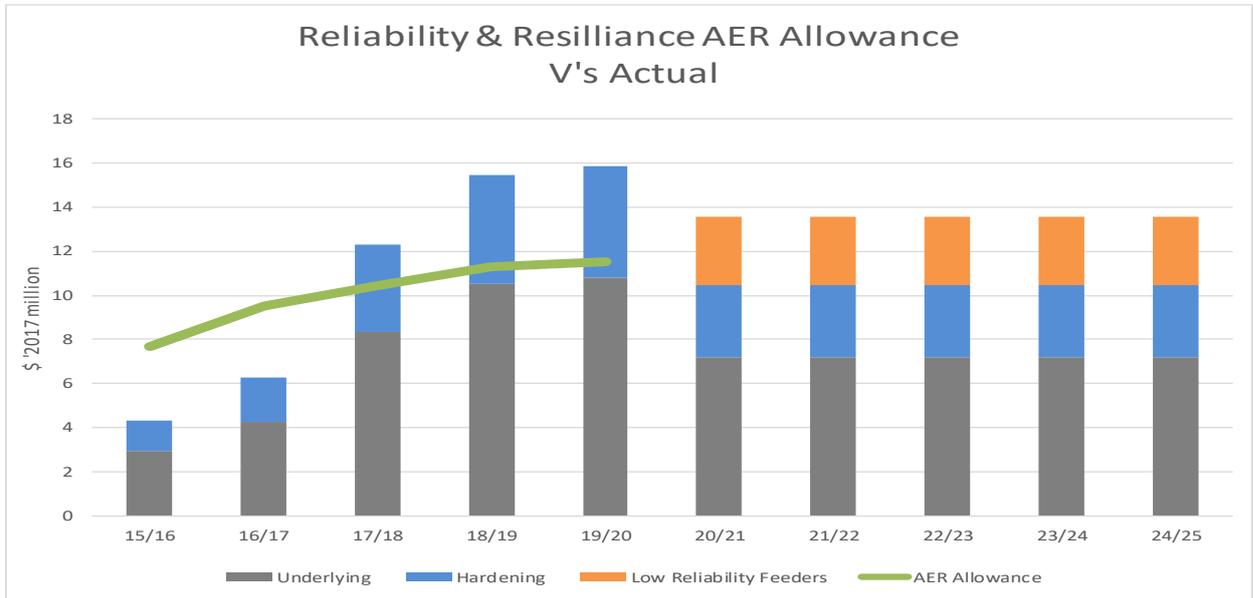
Capex Forecasting Methodology

The costs estimated to achieve the projects within this Strategy document represent efficient and prudent expenditure to meet the National Electricity Rules expenditure objectives as detailed below.

| National Expenditure Criteria | Activity |
|---|--|
| Efficient cost of achieving the objective(s) | <ul style="list-style-type: none"> • All estimated costs have been calculated based on actual historical costs. • Where possible competitive prices have been obtained. • Costs are considered to be efficient based on historical expenditure. |
| Cost of a prudent operator | <ul style="list-style-type: none"> • Comparison of costs from other DNSPs are not generally readily available but feedback obtained from the AER's benchmarking of NSP's seems to be favourable for SA Power Networks. • SA Power Networks' employees are also members of numerous electricity industry working groups and attend industry conference / seminars to ensure our practices are generally in-line with industry practice. |
| Realistic expectation of forecast and cost impact | <ul style="list-style-type: none"> • Forecast reliability outcomes and STPIS benefits have been estimated by analysing our reliability performance since 2010/11 and assessing the improvement that would have occurred if the proposed programs had been in place across this period. |

Capex Forecast

The expenditure profiles demonstrating actual versus allowance for the 2015-20 RCP and comparable comparison to the proposed 2020-25 RCP, acknowledging an extra program, is shown below:



Maintaining Underlying Performance

| | 2020/21 | 2021/22 | 2022/23 | 2023/24 | 2024/25 | Total |
|------------------------------|---------|---------|---------|---------|---------|--------|
| Total Costs \$,000 (\$ 2017) | 7,200 | 7,200 | 7,200 | 7,200 | 7,200 | 36,000 |

Hardening the Network Against Lightning and Storms

| | 2020/21 | 2021/22 | 2022/23 | 2023/24 | 2024/25 | Total |
|------------------------------|---------|---------|---------|---------|---------|--------|
| Total Costs \$,000 (\$ 2017) | 3,240 | 3,240 | 3,240 | 3,240 | 3,240 | 16,200 |

Low Reliability Feeders / Worst Served Customers

| | 2020/21 | 2021/22 | 2022/23 | 2023/24 | 2024/25 | Total |
|------------------------------|---------|---------|---------|---------|---------|--------|
| Total Costs \$,000 (\$ 2017) | 3,120 | 3,120 | 3,120 | 3,120 | 3,120 | 15,600 |

15 DOCUMENT REFERENCES

This Plan references the following documents:

- National Electricity Law
- National Electricity Rules
- Electricity Distribution Code
- AER Service Target Performance Incentive Scheme - 2018 amendment
- ESCOSA - SA Power Networks Reliability Standard Review 2020 to 2025
- Asset Management Plan (Manual 15)
- Reliability Management Plan
- Protection and Control Asset Plan 3.2.14

Program Justifications:

- 5.26 2020-25 Reliability & Resilience Programs - Hardening the Network
- 5.27 2020-25 Reliability & Resilience Programs - Low Reliability Feeders