Business Case: CBD Reliability

2025-30 Regulatory Proposal

Supporting document 5.3.12

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SA Power Networks

Empowering South Australia

Contents

Glossary

Acronym / term	Definition
AER	Australian Energy Regulator
ABA	Adelaide Business Area
Augex	Augmentation Expenditure
Capex	Capital Expenditure
CBD	Central Business District
DNSP	Distribution Network Service Provider
ESCoSA	Essential Services Commission of South Australia. Also referred to as 'the commission'.
EDC	Electricity Distribution Code of South Australia
HV	High Voltage
kV	Kilo-Volt
LV	Low Voltage
NEL	National Electricity Law
NER	National Electricity Rules
NPV	Net Present Value
Opex	Operating Expenditure
RCP	Regulatory Control Period
Repex	Replacement Expenditure
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCS	Standard Control Services
USAIDI	Unplanned System Average Interruption Duration Index
VCR	Value of Customer Reliability
LHS	Left Hand Side with reference to graph axis
RHS	Right Hand Side with reference to graph axis

1 About this document

1.1 Purpose

This document provides a business case to support forecast capital expenditure (**capex**) for the 2025-30 Regulatory Control Period (**RCP**) on a proposed program of works to bring the Adelaide Central Business District (**CBD**) back into line with jurisdictional reliability service standards set by the Essential Services Commission of South Australia (**ESCoSA**) in its Electricity Distribution Code (**EDC**). This program of works will include network asset replacement (**repex**) on cable replacement and network asset augmentation (**Augex**) on automated switch installation.

1.2 Expenditure category

- Network capex: replacement expenditure (cables)
- Network capex: augmentation expenditure (automated switches)

1.3 Related documents

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

- 5.3.1 – Network asset replacement expenditure – Business Case
- 5.3.10 - Hindley Street Substation 66kV Replacement - Business Case
- 5.8.5 – Augex Network Safety – Business Case
- 5.2.5 - Resourcing Plan for Delivering the Network Program
- 5.1.5 - SA Power Networks Value Framework
- 5.3.4 - SA Power Networks Repex Model Framework
- ESCoSA, Electricity Distribution Code review final decision – June 2023
- ESCoSA, Electricity Distribution Code Version: EDC/14.
- Frazer-Nash - CBD Cable Management Strategy Phase 2 Report (confidential)

2 Executive summary

This business case recommends spending $78 million[1] in capex to implement an optimised program, which includes replacing CBD high voltage cable assets ($55 million repex) and installing automated load switches in key CBD locations ($23 million augex) to meet jurisdictional network reliability standard targets for SA Power Networks' customers and the community.

The 'CBD' is the Adelaide Central Business District which includes significant commercial, government, residential, cultural and entertainment development. Reliability performance targets for the CBD are established by ESCoSA in the EDC.

SA Power Networks did not meet its CBD reliability standard targets for the duration and frequency of interruptions in 2017/18, 2019/20, and 2020/21. The decline in CBD performance is primarily being caused by underground cable failures and faults as the CBD network ages, with a large proportion of the high voltage cables being greater than 50 years old. Much of this network will reach the end of its life in the coming decades, with SA Power Networks having one of the lowest replacement rates in the National Electricity Market.

The Commission has reviewed the current EDC and decided in July 2023, that from 1 July 2025, the reliability performance targets for CBD feeders will be retained at their current levels. Therefore, without additional investment it is highly likely that we will not comply with the CBD reliability performance targets in the next RCP.

The Commission has stated the following in its Electricity Distribution Code Review final decision, June 2023:

> *"The Commission expects SA Power Networks to make sufficient investment to deliver minimum network performance standards for CBD feeders, and that the efficient expenditure required to do so will be included in SA Power Networks' regulatory proposal."* [2]

The recommended option in this business case (option 2) seeks an increase in replacement and augmentation expenditure through an optimised program of repex and augex solutions, to ensure that we meet our jurisdictional reliability performance targets in the CBD. This comprises of the following works for the 2025–30 RCP:

- replacement of ~23km of high voltage cables (~$55 million); and
- installation of 39 automated load switches (~$23 million).[3]

Option 2 is preferred to other options considered in this business case on the basis that:

- it has the highest benefits relative to costs in Net Present Value (**NPV**) terms;
- represents a more measured / gradual approach by which to address the underlying cause of the concern for reliability performance (i.e. the need to retire and replace poor condition cable assets), relative to option 1 which would solely involve cable replacement but at higher cost to consumers, and option 3 which would solely rely on automated switches and only effectively defer the need for cable replacement to future periods.

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1 All dollar figures throughout this document are in June $2022 real dollars. Values shown may not add to the totals shown due to rounding.

2 ESCoSA, *Electricity Distribution Code review - Final Decision - June 2023*, pg26.

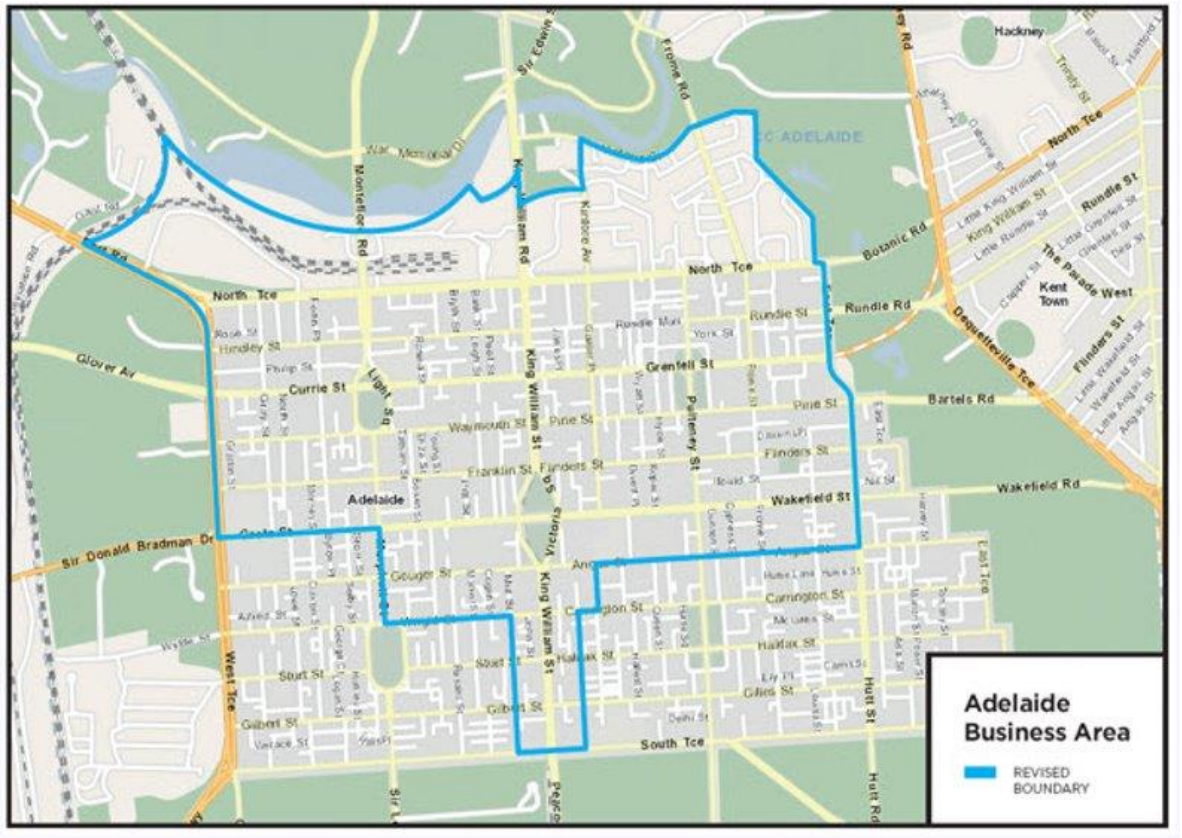
3 The reliability of the CBD is also contingent upon continued capex and opex including maintenance, replacement and augmentation of substation equipment and other distribution equipment. Other expenditure will be justified separately to this CBD Reliability business case, but the expenditure proposed is noted in this document for reference.

3 Background

3.1 The scope of this business case

This business case responds to the need to achieve jurisdictional network reliability standards[4] associated with the Adelaide CBD (CBD feeders), and so improve the reliability of supply to our customers served by these feeders. The scope of this business case is limited to the Adelaide CBD which is the geographic region bounded by East, West and South Terraces and the River Torrens to the North. The CBD encompasses the Adelaide Business Area (**ABA**) service standard region as shown in Figure 1 for which the Commission publishes targets.[5]

Figure 1: Adelaide Business Area



This document covers capex in the expenditure categories of augex and repex pertaining to SA Power Networks' electricity distribution network assets that are used to provide Standard Control Services (**SCS**).

The investment options that this business case considers are specifically focussed on the following two asset classes that form the backbone of the high voltage distribution network in the CBD.

- **Underground cables**: transmit electricity between substations and from substations to customers underground. There is ~195km of 11kV cables and ~26km of 33kV cables in the CBD.
- **Switching cubicles**: devices mounted on the ground that connect components of the underground cable network. Modern replacements for these devices enable remotely controlled connection and disconnection (i.e., switching) of cables and transformers for operational and maintenance purposes.

4 ESCoSA, *Electricity Distribution Code*, Version EDC/14, 1 July 2025, Section 2.

5 ESCoSA, *Electricity Distribution Code*, Version EDC/14, 1 July 2025, Section 2, p.14.

3.2 Our network reliability standard performance targets

The Commission has set specific reliability performance targets for the Adelaide CBD feeders. In recognition of the significant commercial, residential, cultural and entertainment developments within the CBD, targets for CBD feeders require better reliability than targets for other parts of the network.[6] Table 1 summarises the targets.

Table 1: Reliability measures

	CBD feeders	Urban feeders	Rural Short feeders	Rural long feeders
System Average Interruption Duration Index (SAIDI) Targets (average minutes off supply per customer per annum)	**15**	110	200	290
System Average Interruption Frequency Index (SAIFI) Targets (average number of supply interruptions per customer per annum)	**0.15**	1.15	1.65	1.75

The Commission has reviewed the current EDC and made a Final Decision in June 2023 on changes that will apply from 1 July 2025. The Final Decision is to retain reliability performance targets for CBD feeders at their current levels.

The Commission has stated the following in its Electricity Distribution Code Review, final decision June 2023:

> *"The Commission expects SA Power Networks to make sufficient investment to deliver minimum network performance standards for CBD feeders, and that the efficient expenditure required to do so will be included in SA Power Networks' regulatory proposal….*
>
> *…If a case arises where minimum network performance standards are not satisfied, the Commission will consider regulatory intervention having regard to matters such as the statutory framework, relevant licence and code conditions, the circumstances of the event and the actions taken by SA Power Networks (see the terms of the Commission's Enforcement Policy for further information)."*[7]

3.3 Our performance to date

As a Distribution Network Service Provider (**DNSP**), SA Power Networks has obligations to maintain the safety and reliability of the network. The network reliability standard targets are set by ESCoSA and the unplanned system average Interruption duration index (**USAIDI**) target has been set at 15 minutes for 2020-25.[8] Figure 2 shows the target of 15 minutes has not been met for the 2016/17[9], 2017/18, 2019/20 and 2020/21 regulatory years. While the target was achieved in the years 2021/22 and 2022/23, section 3.4 details how this compliance cannot be maintained without additional investment in network infrastructure.

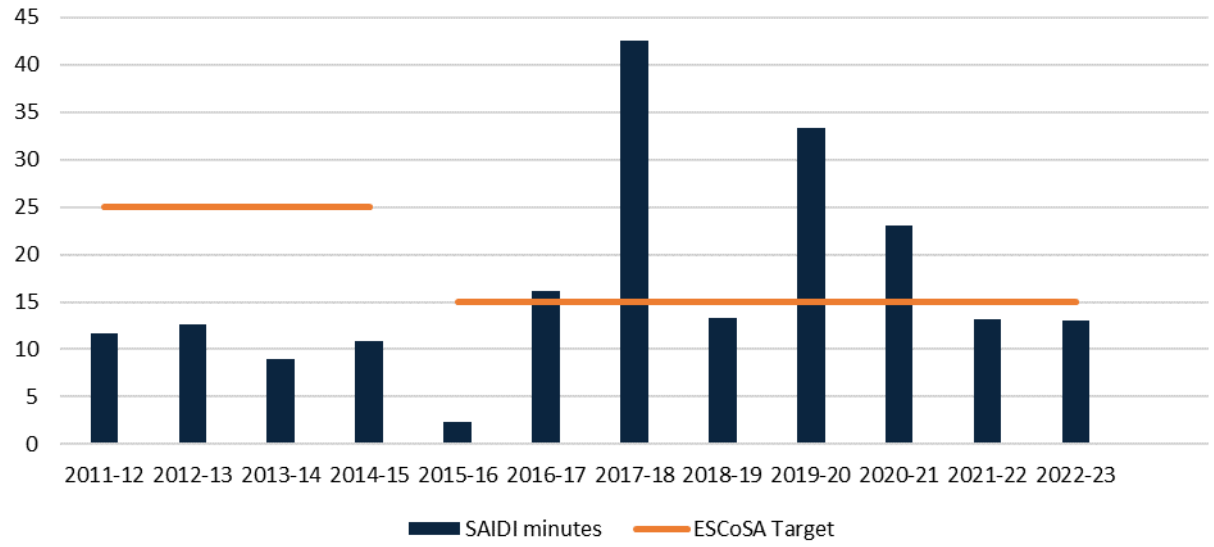
6 ESCoSA, *Electricity Distribution Code*, Version EDC/14, 1 July 2025, p.25.

7 ESCoSA, Electricity Distribution Code review - Final Decision, June 2023, p. 26

8 ESCoSA, *Electricity Distribution Code*, Version EDC/13, 1 July 2020, Section 2.

9 The 15 minute target would have been met in 2016/17 if the ABA boundaries current in 2023 had been applied in 2016/2017.

Figure 2: Historical SAIDI performance (SAIDI Minutes)



3.4 Drivers for change

The condition of the CBD HV cable network is deteriorating

SA Power Networks has one of the oldest electricity distribution networks in Australia with a large proportion of the network constructed in the 1950's and 1960's. The age profile of the cables is shown in Figure 3. The 33kV cable network consists mostly of cables that have been in service for over 60 years. The 11kV cables form the majority of the cable network and a significant proportion of the cables have been in service between 40 and 70 years. The cables have a technical design life of 30-40 years and a significant proportion of the cables have exceeded this age.

Figure 3: CBD cable age profile

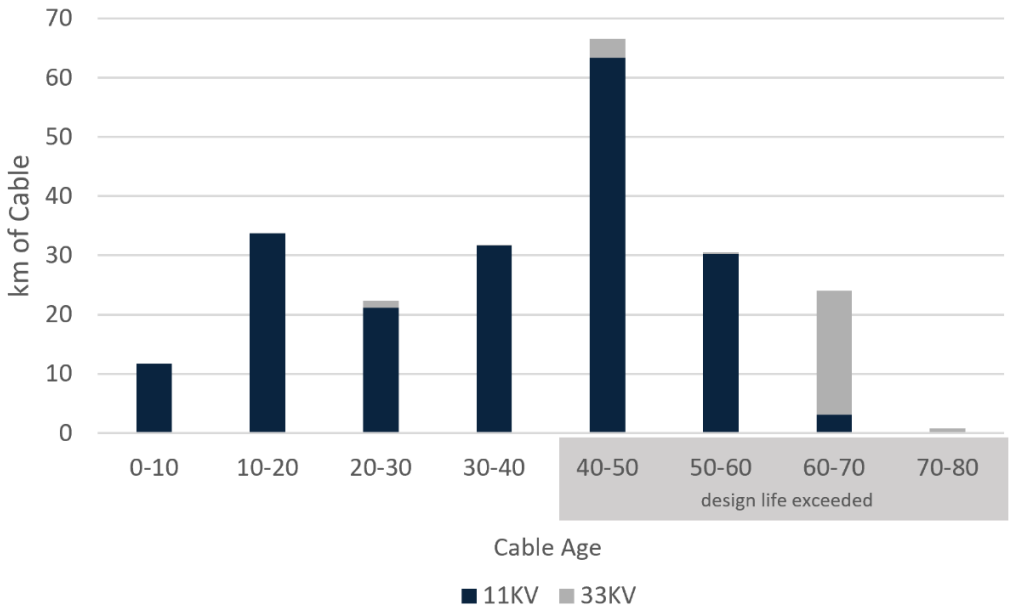
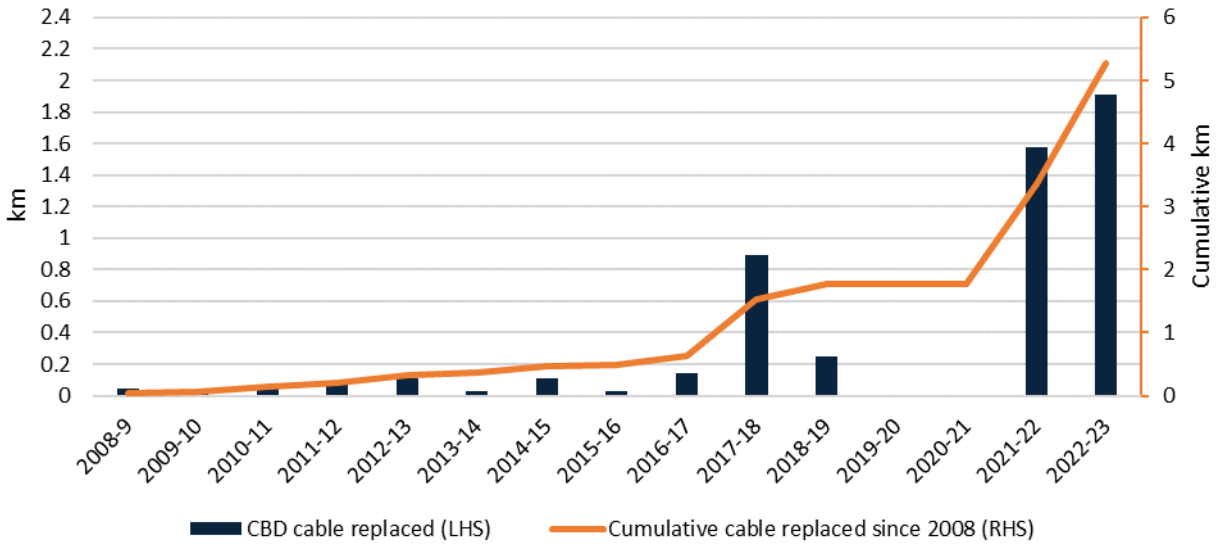


Figure 4 shows the historical cable replacement for the CBD where in the past 15 years, only 5.3km (2.4 percent) of cable has been replaced. The rate of cable replacement undertaken in the past 15 years is not high enough to maintain the condition of the network in the long term. At this replacement rate it would take over 400 years to replace the cables.

Figure 4: Historical CBD cable replacement rates



We are seeing an increase in the failure rate of our assets

An increase in the number of cable failures has been observed in the underground cable network since 2017. As shown in Figure 5, Cable faults have accounted for 64 percent of the outages in the CBD and are therefore the main driver for the inability to meet the reliability standard targets.

Figure 5: Contribution to SAIDI by outage cause (from Jan 2017 – May 2023)

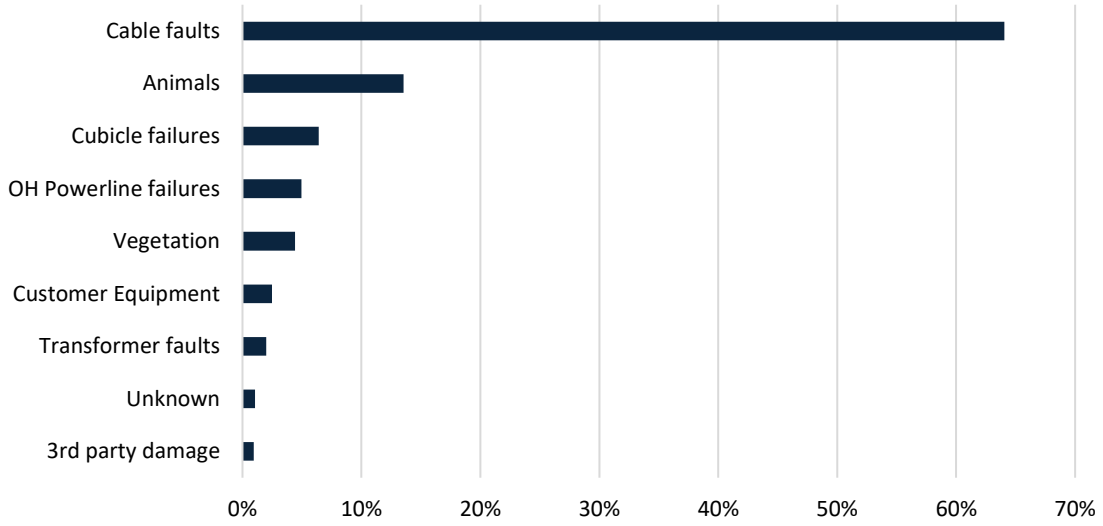
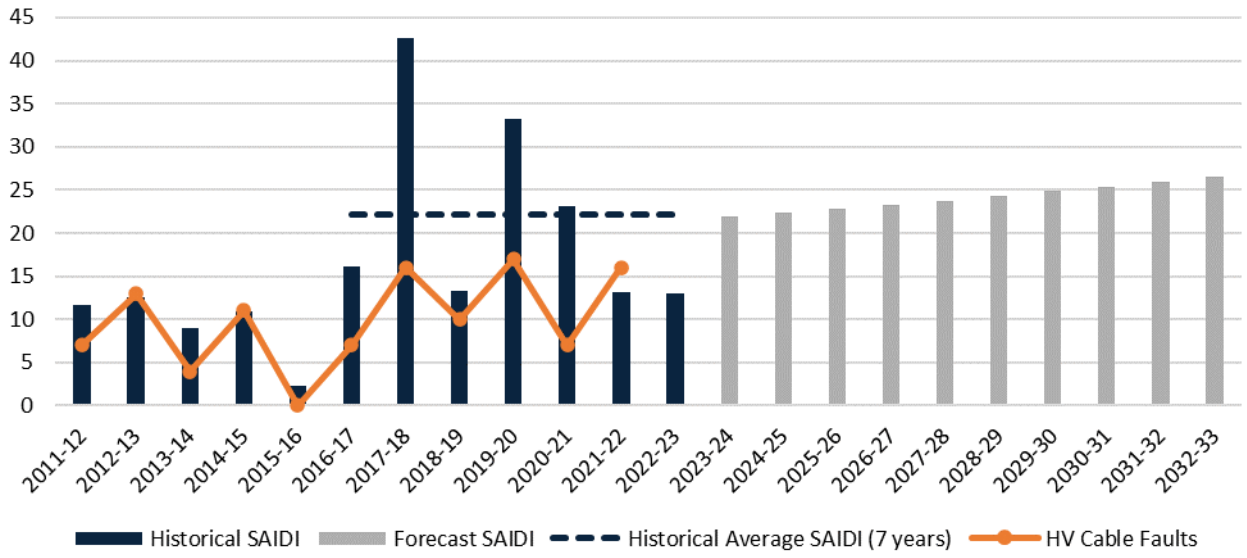


Figure 6 shows the actual and average SAIDI performance overlaid with the number of historical cable faults and a projection of how the SAIDI minutes in the CBD are forecast to increase if there is no uplift in cable replacement expenditure. This represents the outcome of the base case presented in this business case.

Figure 6: Historical and forecast CBD performance with historical cable faults (SAIDI minutes / cable faults)



The forecast uplift in SAIDI minutes has been calculated using a Risk Cost Model that we have developed to enable the risk to customer service performance of network assets, to be quantified and inform asset investment decisions. To do this, the Risk Cost Model assigns each cable section within the CBD the following values:

- probability of failure;
- consequence of failure (in line with the SA Power Networks Value Framework[10]); and
- estimated replacement cost (based on unit rates dollars per million).

An important aspect of the Risk Cost Model is that it is calibrated to historical real-world observations – in terms of failure numbers and observed risk outcomes (such as outages).

The probability of failure for cable sections in the CBD is a key input into the Risk Cost Model, and therefore an important metric to have high confidence in. SA Power Networks engaged consultants to estimate the probability of failure for each cable section using advanced modelling techniques.[11] This methodology incorporated available asset information[12], geospatial data, and failure history to determine a set of features representative of failure contributing factors. This was then used to calculate a health index for each cable section.

Because asset age alone has proven to be an unreliable indicator for asset condition, a 'conditional age'[13] was calculated by combining true age and the health index. When 'conditional age' was related to failure data, a probability of failure was able to be calculated for each cable section. This is a robust approach and there is now high confidence in the probability of failure data after undertaking this work.

10 Values relevant to CBD cables include unserved energy using the AER VCR and additional costs associated with unplanned replacements.

11 Frazer-Nash, CBD Cable Management Strategy Phase 2 Report (in confidence).

12 Includes cable type and asset age.

13 Conditional age is determined by adjusting the calendar age of an asset to be commensurate with its condition.

3.5 Our expenditure to date

Prior to the 2020-25 RCP there have been very limited cable replacement works undertaken in the CBD. Due to a significant number of cable faults in 2017/18 and the consequent failure to meet network service standard targets for CBD feeders, funding was sought in the 2020-25 Regulatory Proposal to replace aging cables in the CBD. The cable replacement expenditure forecast in our Regulatory Proposal for 2020-25 was $7.1 million, which the Australian Energy Regulator (**AER**) accepted when making its Distribution Determination for the 2020-25 RCP. It is anticipated that this will be fully expended by the end of the 2020-25 RCP.

For the funds available in the 2020-25 RCP, cable replacements have been targeted in areas where there are spare conduits or where existing conduits can be re-used. These projects are significantly less complex than the those requiring installation of new conduits and manholes in the city streets. The costings per unit length for the 2020-25 RCP are therefore not a reasonable reflection of the required costs of undertaking cable replacements such as those that need to be considered for 2025-30.

As explained in our separate **supporting document 5.3.1 - Network asset replacement expenditure – Business Case**, we have since 2016 been implementing a feeder automation program, effectively segregating the network into smaller segments such that a fault impacts a smaller number of customers. In this way, the reliability risk of asset failures is mitigated by reducing the reliability *consequence* of a failure rather than addressing the *probability* that an asset will fail (eg by replacing it). As of May 2023, 16 switches have been automated in the CBD.

3.6 Interactions considered with other CBD expenditure

Our Regulatory Proposal for 2025-30 contains, outside of the expenditure proposed in this CBD reliability business case, other expenditures to address separate identified needs related to the Adelaide CBD. These are shown in Table 1 for transparency.

However, it is important to note that these expenditures cannot directly address the forecast deterioration in reliability outcomes for customers that relate to underground cable condition in the Adelaide CBD, noting that:

- the repex asset replacements listed in Table 2 are assets that have been inspected for condition and present a future reliability risk that warrants intervention. Unlike cables, these assets have not been identified as a driving cause of the historical inability to meet the reliability service standards;
- the augex 33kV substation conversions are safety related and not driven by reliability concerns; and
- the Hindley Substation 66kV Switchgear business case proposes the replacement of substation assets which are in poor condition and will have a high impact upon reliability should they fail. The Hindley Street Substation addresses reliability risks which are distinct from the reliability risks that are addressed by this business case.

Table 2: Proposed CBD expenditure covered in other business cases ($ thousands)

Program	Expenditure
Repex	**$48,749**
CBD Switching Cubicle Replacements[14]	$3,500
CBD Transformer Replacements[14]	$1,500
Manhole Repairs and Link boxes[14]	$2,000
Substation Equipment Replacement (General)[14]	$13,800
Hindley Street Substation 66kV Switchgear[15]	$27,949
Augex	**$9,800**
CBD 33kV Substation Conversions[16]	$9,800
TOTAL	**$58,549**

4 The identified need

The underlying driver for investment action is that a significant portion of our network assets that are used to supply customers via feeders in the Adelaide CBD are ageing and deteriorating in condition. This is in part triggering consideration of the need to retire assets in the CBD region. The condition of the assets used to supply the Adelaide CBD has been driving poor reliability performance relative to our jurisdictional network reliability service standard for CBD feeders, and action is needed to ensure that we can comply with this standard over the 2025-30 RCP.

In considering potential responses to this driver, we engaged with our customers on their desired service level outcome balanced against price outcomes, and considered the regulatory framework under the National Electricity Rules (**NER**) and the National Electricity Law (**NEL**) and, in particular, the expenditure required to achieve the capex objectives and reasonably reflect the capex criteria having regard to the capex factors. We also considered our regulatory obligations and requirements under the NER and NEL and our jurisdictional instruments. As a result of these considerations, the identified need is as follows:

- to prudently and efficiently comply with applicable regulatory obligations / requirements,[17] in this case with specific reference to the service standard target set by ESCoSA in the EDC in relation to Adelaide CBD feeders;[18] and
- to respond to customers' concerns,[19] identified through our consumer and stakeholder engagement process, regarding their explicit service level recommendation that we invest sufficiently to bring reliability performance in the Adelaide CBD into line with our network reliability service standard target over the 2025-30 RCP.

[14] Included in the **Supporting Document 5.3.1 - Network Asset Replacement Expenditure - Business Case**

[15] Included in the **Supporting Document 5.3.10 - Hindley Street Substation 66kV Replacement - Business Case**

[16] Included in the **Supporting Document 5.8.5 – Augex Network Safety – Business Case**

[17] This is pursuant to Clause 6.5.7(a)(2) of the NER, which requires expenditure in order to comply with all appliable regulatory obligations or requirements associated with the provision of Standard Control Services.

[18] SA Power Networks is required by the EDC to use its best endeavours to achieve minimum network reliability targets during each and every regulatory year. For the Adelaide CBD feeders, the target has been set at 15 minutes (average minutes off supply per customer per annum) in relation to the duration of unplanned supply interruptions (excluding Major Event Days). ESCOSA, *Electricity Distribution Code (EDC), Version EDC/14*, 1 July 2025, p.8

[19] This is pursuant to Clause 6.5.7(c)(5A) of the NER, which requires regard to be had to the extent to which forecast capex seeks to address the concerns of distribution service end users identified by the distributor's engagement process.

5 Comparison of options

5.1 The options considered

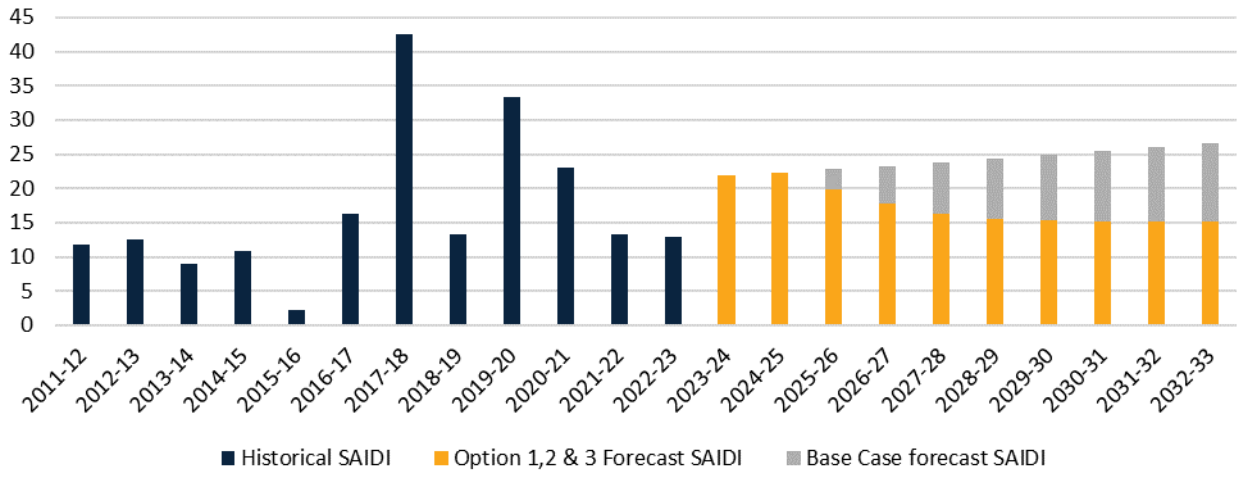
Table 3 shows the options considered to meeting the identified need.

Table 3: Summary of options considered

Option	Description
The base case	The base case is a Business-As-Usual (or do nothing materially different) scenario of keeping expenditure to the level of our expected actual expenditure over the 2020-25 RCP. • Replace 3.1km of cable in the CBD at a cost of $7.5 million • Install 5 automated switches for $3 million. If SA Power Networks continues with this level of expenditure; the reliability of the CBD will continue to decrease resulting in failure to meet the network reliability standard targets. For this reason, the base case is not considered credible.
Alternative options	
Option 1 -	Option 1 is to undertake planned cable replacements to meet the reliability target of 15 SAIDI minutes by 2030. • Replace 33.2km of 11kV cable in the CBD at a cost of $79.6 million • Replace 2km of 33kV cable in the CBD at a cost of $4.8 million.
Option 2 -	Option 2 is to undertake planned cable replacement and install automated switches to meet the reliability target of 15 SAIDI minutes by 2030. • Replace 20.9km of 11kV cable in the CBD at a cost of $50.1 million. • Replace 2km of 33kV cable in the CBD at a cost of $4.8 million. • Install 39 automated switches at a cost of $23.4 million.
Option 3 -	Option 3 is to install automated switches to meet the reliability target of 15 SAIDI minutes by 2030. • Install 121 automated switches at a cost of $72.6 million.

Options 1, 2 and 3 all aim to meet the network reliability service standard target of 15 SAIDI minutes by 2030. Figure 7 presents the forecasts that have been developed via our Risk Cost Model. The base case will see the SAIDI minutes continue to increase such that it is forecast to exceed 25 minutes by 2031. By investing in option 1, 2, or 3, it is forecast that the SAIDI performance target will be met by 2030.

Figure 7: SAIDI forecasts for investment options (SAIDI Minutes)



5.2 Options investigated but deemed non-credible

The option of achieving the reliability target by investing in non-network options such as the installation of localised generation and storage was considered and deemed to be not credible. Space restrictions in the CBD would render this option unfeasible. There are also significant, noise, logistical and pollution aspects that would render localised generation and storage unfeasible. The cost of meeting the identified need with non-network options would far exceed the options presented in this case.

5.3 Analysis summary and recommended option

5.3.1 Options assessment results

The forecast capex, operating expenditure (**opex**) and benefits have been evaluated to determine the net present value of the investment proposed in this business case. The benefits include the value of avoided unserved energy (measured by applying the AER Value of Customer Reliability or **VCR**) and the costs avoided by doing cable replacements in a planned instead of unplanned manner.

Table 4: Costs, benefits and risks of alternative options over the 40-year period ($ million, June 2022)

Option	Costs		Benefits[20]	NPV[21]	Ranking	Reliability level to be met by 2030
	Capex[22]	Opex[23]				
Option 0 (Base Case)	$10.500	-	$11.434	-$5.243	Not credible	26.6 SAIDI minutes
Option 1	$84.410	-	$64.030	-$55.301	3	15 SAIDI minutes
Option 2	$78.315	-	$52.575	-$52.664	1	15 SAIDI minutes
Option 3	$72.606	-	$28.020	-$53.985	2	15 SAIDI minutes

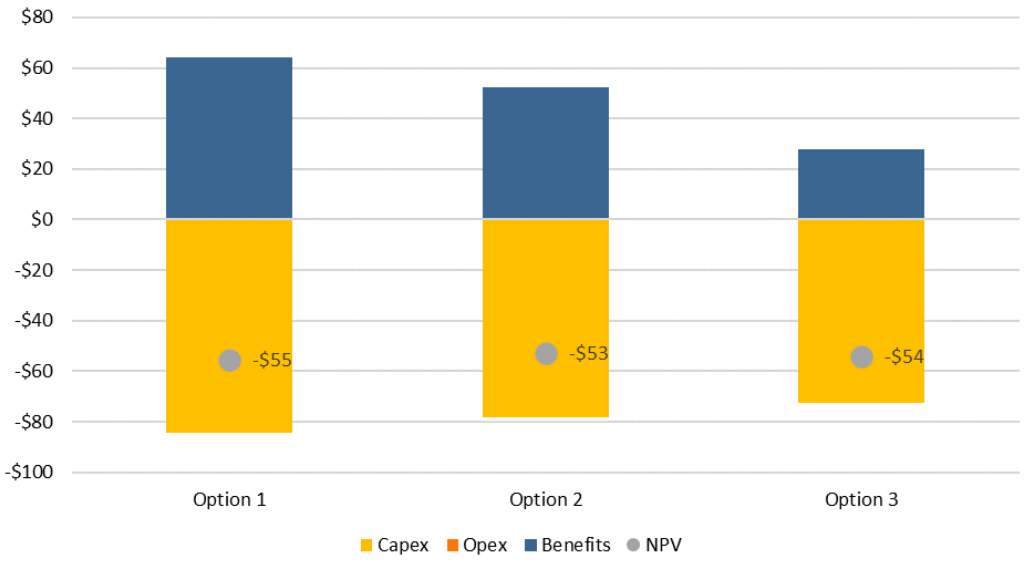
20 Represents the total capital and operating benefits, including any quantified risk reductions compared to the risk of Option 0 (base case), over 40-year cash flow period from 1 July 2025 to 30 June 2065 expected across the organisation as a result of implementing the proposed option.

21 NPV of the proposal over 40-year cash flow period from 1 July 2025 to 30 June 2065, based on a 3.73% discount rate.

22 Represents the total capex of the proposed option over the 40-year cash flow period from 1 July 2025 to 30 June 2065.

23 Represents the total opex increase associated with the proposed option above the current level of opex, over the 40-year cash flow period from 1 July 2025 to 30 June 2065.

Figure 8: Options comparison ($ million, June 2022)



5.3.2 Recommended option

Option 2 is the recommended option which is to undertake planned cable replacement and install automated switches to meet the reliability target of 15 SAIDI minutes by 2030. Option 0 is deemed not credible as it will not achieve compliance with our jurisdictional network reliability service standard target over the 2025-30 RCP.

Option 2 has the highest NPV result of all the assessed options. We note that the NPV results of the assessed options are not materially different to each other. However, in our assessment, option 2 is also the most prudent investment option, on the basis that:

- option 2 begins to take gradual and measured action towards addressing the underlying cause of the reliability performance concern, being the condition of the underground cables – which option 3 would not, effectively deferring all action to future periods; and
- while option 1 would fully address the underlying cause through greater levels of replacement, option 2 presents as a more measured means of addressing that underlying cause, by replacing poor condition cables over a longer period of time[24], by implementing an optimised program of cable repex and augex on automated switches, which serves to minimise costs to consumers at this point in time.

Replacement of cable in option 1 and 2 has the following benefits over option 3 which have not been quantified in the analysis of the options.

- Replacement of cable avoids extended outages that may result when secondary faults occur during the repair window of an existing fault.
- Replacement of cable removes public safety risk associated with cable failures in manholes (typically at cable joints).

[24] For example, replacing the ~55km of cables that have their design life exceeded by ≥50 years (refer Figure 3), option 1 would take 8 years and option 2 would take 12 years. This is assuming the replacement quantities proposed by each option are continued into future RCP's.

5.3.3 Assumptions

Only costs and benefits that influence the ranking of the options have been considered in the evaluation of the net present value of investments. The costs to keep the network at the network reliability service standard target beyond 2030 have not been considered as part of the evaluation because these costs and the associated benefits will not influence the ranking of the options.

5.4 Scenario and sensitivity analysis

Discount rates of 3.5 percent, 4.05 percent and 4.5 percent were tested across all options. Regardless of the discount rate applied, option 2 consistently retained its status as the most efficient choice, surpassing the next least cost option with a NPV which was higher than the next closest option by 4.8 percent, 2.5 percent, and 1.1 percent, respectively.

5.5 Base Case

5.5.1 Description

The base case is a Business-As-Usual (or do nothing materially different) scenario of keeping expenditure to the level of our expected actual expenditure over the 2020-25 RCP.

- Replace 3.1km of cable in the CBD at a cost of $7.5 million
- Install 5 automated switches for $3 million.

If SA Power Networks continues with this level of expenditure; the reliability of the CBD will continue to decrease resulting in failure to meet the network reliability standard targets. For this reason, the base case is not considered credible.

5.5.2 Costs

Table 5: Base Case Costs by Cost Type ($ million, June 2022)

Cost Type	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30
Capex	2.10	2.10	2.10	2.10	2.10	**10.50**
Opex	0.00	0.00	0.00	0.00	0.00	**0.00**
TOTAL COST	**2.10**	**2.10**	**2.10**	**2.10**	**2.10**	**10.50**

5.5.3 Quantified benefits

Table 6: Base Case Benefits by Benefit Type ($ million, June 2022)

Benefit Type	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025 - 30	Total 2030-65
Asset Terminal Value	0.00	0.01	0.01	0.01	0.01	**0.00**	**2.50**
Repair Cost Avoidance[25]	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.79**
Avoided unserved energy (VCR)	0.04	0.07	0.10	0.11	0.12	**0.44**	**7.67**
TOTAL COST	**0.04**	**0.08**	**0.10**	**0.12**	**0.13**	**0.44**	**10.96**

[25] This is the supply and restoration and asset repair costs that are avoided by proactively replacing the cables.

5.6 Option 1

5.6.1 Description

Option 1 is to undertake planned cable replacements to meet the reliability target of 15 SAIDI minutes by 2030.

- Replace 33.2km of 11kV cable in the CBD at a cost of $79.6 million
- Replace 2km of 33kV cable in the CBD at a cost of $4.8 million.

5.6.2 Costs

Table 7: Option 1 Costs by Cost Type ($ million, June 2022)

Cost Type	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30
Capex	16.88	16.88	16.88	16.88	16.88	**84.41**
Opex	0.00	0.00	0.00	0.00	0.00	**0.00**
TOTAL COST	**16.88**	**16.88**	**16.88**	**16.88**	**16.88**	**84.41**

5.6.3 Quantified benefits

Table 8: Option 1 Benefits by Expenditure Type ($ million, June 2022)

Benefit Type	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025 - 30	Total 2030-65
Asset Terminal Value	0.00	0.00	0.00	0.00	0.00	**0.00**	**26.54**
Repair Cost Avoidance	0.05	0.08	0.11	0.14	0.18	**0.56**	**10.74**
Avoided unserved energy (VCR)	0.05	0.16	0.23	0.32	0.41	**1.17**	**25.03**
TOTAL	**0.10**	**0.25**	**0.34**	**0.46**	**0.59**	**1.73**	**62.30**

5.7 Option 2

5.7.1 Description

Option 2 is to undertake planned cable replacement and install automated switches to meet the reliability target of 15 SAIDI minutes by 2030.

- Replace 20.9km of 11kV cable in the CBD at a cost of $50.1 million.
- Replace 2km of 33kV cable in the CBD at a cost of $4.8 million.
- Install 39 automated switches at a cost of $23.4 million.

5.7.2 Costs

Table 9: Option 2 Total Cost by Cost Type ($ million, June 2022)

Cost Type	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025 - 30
Capex	15.66	15.66	15.66	15.66	15.66	**78.31**
Opex	0.00	0.00	0.00	0.00	0.00	**0.00**
TOTAL COST	**15.66**	**15.66**	**15.66**	**15.66**	**15.66**	**78.31**

5.7.3 Quantified benefits

Table 10: Option 2 Benefits by Expenditure Type ($ million, June 2022)

Benefit Type	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30	Total 2030-65
Asset Terminal Value	0.00	0.00	0.00	0.00	0.00	**0.00**	**16.71**
Repair Cost Avoidance	0.04	0.06	0.07	0.09	0.11	**0.39**	**6.71**
VCR	0.15	0.26	0.32	0.37	0.42	**1.51**	**25.66**
TOTAL	**0.19**	**0.31**	**0.39**	**0.46**	**0.54**	1.90	49.08

5.8 Option 3

5.8.1 Description

Option 3 is to install automated switches to meet the reliability target of 15 SAIDI minutes by 2030.

- Install 121 automated switches at a cost of $72.6 million.

5.8.2 Costs

Table 11: Option 3 Total Cost by Cost Type ($ million, June 2022)

Cost Type	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30
Capex	14.52	14.52	14.52	14.52	14.52	**72.61**
Opex	0.00	0.00	0.00	0.00	0.00	**0.00**
TOTAL COST	**14.52**	**14.52**	**14.52**	**14.52**	**14.52**	**72.61**

5.8.3 Quantified benefits

Table 12: Option 3 Benefits by Expenditure Type ($ million, June 2022)

Benefit Type	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30	Total 2030-65
Asset Terminal Value	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
Repair Cost Avoidance	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
VCR	0.17	0.24	0.29	0.36	0.44	**1.50**	**26.52**
TOTAL	**0.17**	**0.24**	**0.29**	**0.36**	**0.44**	1.50	26.52

6 Deliverability of recommended option

We have developed a plan to ensure that we can deliver the CBD reliability program recommended in this business case together among all of the increased volume of work reflected in the programs that comprise our total network expenditure forecast in our Regulatory Proposal. This plan considers the detailed implications of our proposed overall uplift in total network expenditure for our required workforce and supporting internal services of information technology, feet, property and human resources.

With specific reference to the works covered in this business case, a significant portion of the cable replacement works require outsourcing to civil contractors to install the necessary manholes and conduits in the city streets for the cables to be routed in.

We consider that our plan is realistic and achievable over the 2025-30 RCP. The details of our approach are set out in our **supporting document 5.2.5 - Resourcing Plan for Delivering the Network Program**.

7 How the recommended option aligns with our consumer and stakeholder engagement

The service outcomes that are enabled by the expenditure and program recommended in this business case, is aligned to achieve outcomes that were directly supported by our customers as ultimately reflected in the recommendations of the People's Panel. This is noting that:

- the topic of service reliability was a key focus of our consumer and stakeholder engagement program. One of the four key themes that have framed our engagement under a desire to 'focus on what matters' to our customers has been the theme of 'a reliable, resilient, and safe electricity network';
- in engaging on this theme, and under the specific topic of 'reliability and bushfire safety' we undertook a series of deep-dive workshops called 'Focused Conversations' with a broad range of consumer, industry, government (state local) and regulatory body representatives (jurisdictional service regulator and technical regulator). In these Focused Conversations we sought recommendations on the service outcomes that customers prefer and expect;[26]
- with particular regard to CBD reliability, we engaged on the identified need by providing information on the age and condition of our CBD network assets and our current / historic replacement rates; our approach to modelling / forecasting service outcomes for customers from different spend scenario; forecasts of these services outcomes under counterfactual scenarios; trends in reliability performance and causes; the solutions to address CBD reliability and the challenges involved in undertaking this work within the environment of the CBD – in addition to the workshops we also provided stakeholders with a site tour of our CBD network;
- we then posed three scenarios of how we could respond to the identified need, to identify the service / price outcome that customers recommended: these included (1) 'basic' a base case of BAU set to current expenditure (2) 'maintain' a scenario of investing to meet the jurisdictional reliability service standard target (3) 'new value' investing further – with 3 sub options of further improving reliability, providing more system security, and further safety improvement;[27]
- while our customers and stakeholders were consistently mindful of energy affordability concerns, the Focused Conversation arrived at a clear consensus recommendation to the People's Panel as the next stage in our engagement program, that SA Power Networks should invest sufficiently in order to bring CBD reliability into line with the jurisdictional network reliability service standard target by the end of the 2025-30 RCP and thereby stop a further decline in reliability in the CBD;
- ultimately, the People's Panel deliberated on and affirmed the results of the Focused Conversations in their formal recommendation, and SA Power Networks has committed to taking this recommendation forward as reflected in the recommendation contained in this business case.[28] In arriving at its recommendation, the People's Panel noted this recommendation is important because:
  - the CBD is vital as a business hub for the state, this would be critically impacted by poor reliability for power;
  - critical and unique infrastructure is in the CBD, such as hospitals and headquarters;

[26] This was covered in workshop (1) and workshop (2) of the 'CBD Reliability' Focused Conversation stream. Materials presented at the Focused Conversations are available on our TalkingPower website under the page titled 'focused conversations'. [https://www.talkingpower.com.au].

[27] The recommendations of the Focused Conversation are contained in documents published on our TalkingPower website under the page titled 'focused conversations'. SAPN, final outputs and recommendations to the People's Panel for CBD reliability, October, 2023. Accessible on: [https://www.talkingpower.com.au].

[28] The recommendations of the People's Panel are contained in documents published on our TalkingPower website under the page titled 'people's panel'. SAPN, *SA Power Networks People's Panel Final Report – Balancing service and price*, March 2023.

- the CBD is part of the life of many SA residents, there would be significant impacts to our lived experience without CBD reliability. The assets are ageing which introduces additional operational risk of failure.[29]

Since conducting the People's Panel process, we published a Draft Proposal to play back how we have given effect to customer recommendations and to confirm that those recommendations remain valid given continued cost of living pressures and to obtain further input to refine our Regulatory Proposal. Submissions received on our Draft Proposal suggest that the recommendations of the People's Panel remain valid with respect to this repex forecast and the service levels it seeks to achieve for reliability and safety, noting that:

- members of the People's Panel affirmed that their recommendations, including in respect of repex outlined in this justification document, remain current;[30]
- some parties such as that from SACOSS[31] and the Department of Energy and Mining[32] generally urged further consideraiton of the overall magnitude of our forecat capital expenditure across in totality. However, these parties both went on to indicate that:
  - DEM supports improving CBD reliability
- SACOSS indicated that it supports SA Power Networks meeting its compliance obligations and noted its support for ESCoSA's expectations that we make sufficient investment to deliver the minimum network performance standards for CBD feeders; [33]
- the Asset Condition and Risk Sub-Committee of our Community Advisory Board who has been engaging with SA Power Networks over the long term on the need for repex, noted that it supports our repex forecast and the service outcomes it achieves including with respect to the CBD;
- the Small Business Commissioner of South Australia supported the CBD program and its combination of repex and augex upgrade inputs, which it deemed critical to small business stability and growth;[34] and
- the Energy and Water Ombudsman of South Australia supported the CBD program to meet jurisdictional service standards.

29 SAPN, *SA Power Networks People's Panel Final Report – Balancing service and price*, March 2023, p.19.

30 DemocracyCo, *Submission: SA Power Networks Draft Regulatory Proposal 2025-30*, 30 August 2023.

31 SACOSS, *South Australian Council of Social Service Submission on SA Power Networks' 2025-30 Draft Regulatory Proposal*, September 2023.

32 DEM, *South Australian Department of Energy and Mining – Submission*, October 2023.

33 DEM, *South Australian Department of Energy and Mining – Submission*, October 2023.

34 SMCSA, *Small Business Commissioner of South Australia – Consultation on SA Power Networks 2025-30 Draft Regulatory Proposal*, 1 September 2023.

8 Reasonableness of cost and benefit estimates and input assumptions

8.1 Cost estimates

Automated switch costs

The cost estimate for automated switches was determined using a unit rate derived from previous similar projects.

The number of switches proposed for installation in options 2 and 3 was determined by analyzing the way in which the network can be segmented to reduce the duration times and provide reliability benefits. This is explained in further detail in Section 8.2.

Cable replacement

The Risk Cost Model uses unit rates for asset replacement costs derived from historical data on cable replacement. The outputs of the Risk Cost Model for options 1 and 2 were a list of cables identified for replacement in 2025-30 to meet the reliability target. The identified cables for Option 2 were reviewed by asset management engineers to check their validity as projects and to complete desktop project cost estimations. The project cost estimations reflect the level of complexity that the projects present. (eg some projects already have spare conduits, some require new manholes and others require expensive reinstatement of pavements). The cost estimations for Option 2 were used to update the unit rates for cable replacement in the CBD and applied to generate the costs for Option 1.[35]

8.2 Benefit estimates

Automated switch benefits

The reliability benefit for the automated switches was determined by modelling how the switches would reduce both the duration and number of customers affected by outages forecast to occur on the network. The December 2022 AER published VCR was applied to calculate the benefit provided by the switches.

To calculate the benefits of the installation of automated switches, the following assumptions were made.

- That the number of segments a feeder can be divided into is limited to the locations of existing switches due to physical space restrictions in the CBD.
- That the number of segments a feeder can be divided into was equal to the number of switches available for automation.
- That the VCR is distributed evenly across each automation section.
- That switches would be installed progressively throughout the 2025-30 RCP.

The VCR impact of forecast outages was reduced by a factor of the number automated sections. An outage time of 1 minute was assumed for all customers on the feeder while the automated restoration takes place. A success rate for automation of 90 percent was assumed to account for times when automation is ineffective at segmenting the feeder.

[35] Our planned cable replacements to date have targeted easy to repair cables (e.g. no manhole replacements or re-trenching in city streets). They are therefore not representative of the true cost of cable replacement in the CBD – hence why we employed the approach described here in section 8.1.

Cable replacement benefits

The benefits are from reliability and cost avoidance by replacing cables in a planned manner instead of an unplanned manner.

The following approach was used to quantify the reliability benefits in terms of the December 2022 AER published VCR for each section of cable in the CBD.

- The customers impacted by a failure of the cable was modelled.
- Using meter data and the customer type, the distribution of load was determined to enable the application of the appropriate VCR rates.
- An average outage duration time (based on historical SAIDI) for cables was used to calculate the VCR for an outage of each cable section in the CBD.
- The probability of failure data was applied to calculate the reliability risk in terms of VCR.

With the reliability risk quantified for each cable section, the reliability risk could be calculated for the base case and the options in terms of VCR.

In Option 2, care was taken in the selection of cables for replacement to ensure that benefits counted for cable replacement were not also counted for switch replacement. Cables on feeders which have switches proposed were excluded from the proposed list of cable replacements to ensure this was the case. Those cables excluded from the proposed list were replaced with other cables such that the total reliability risk removed from the network remains the same so that the target can be met.

The financial risk for each cable is calculated as the additional cost incurred to restore operation of each cable, multiplied by the probability of failure of each cable. The financial risk benefit is the reduction in financial risk due to the supply and restoration and asset repair costs that are avoided by proactively replacing the cables.

8.3 Input assumptions

The amount of reliability risk (quantified by VCR) required to reduce the SAIDI to 15 minutes was a key input into the Risk Cost Model. The reliability risk modelled in the Risk Cost Model and the SAIDI performance are assumed to be proportional such that a percentage reduction of reliability risk will yield the same percentage reduction in SAIDI. SA Power Networks has confidence in this assumption because the reliability risk modelled by the Risk Cost Model and the SAIDI performance are proportionally related assuming the average feeder load and VCR rates remain constant. The average feeder load and VCR rates are kept constant in the modelling.