Addressing increasing risk of 11kV switchgear at Botany Zone substation

FINAL PROJECT ASSESSMENT REPORT



04 November 2026

Ausgrid

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Addressing increasing risk of 11kV switchgear at Botany Zone Substation

Final Project Assessment Report – 04 November 2026

Contents

DISCLAIMER 1

EXECUTIVE SUMMARY 3

1 INTRODUCTION 6

1.1 Role of this final report 6
1.2 Next steps and contact details for queries in relation to this RIT-D 6

2 DESCRIPTION OF THE IDENTIFIED NEED 7

2.1 Overview of the relevant network area 7
2.2 Summary of the identified need 8
2.3 Key assumptions underpinning the identified need 8

3 TWO CREDIBLE OPTIONS HAVE BEEN ASSESSED 10

3.1 Option 1 – Replace 11kV compound-insulated switchgear in-situ 10
3.2 Option 2 – Transfer load to Port Botany ZS and retire ageing 11kV switchgear 11
3.3 Social licence considerations 11
3.4 Options considered but not progressed 12

4 HOW THE OPTIONS HAVE BEEN ASSESSED 13

4.1 All options have been assessed against a 'base case' 13
4.2 General overview of the assessment framework 13
4.3 Ausgrid's approach to estimating project costs 13
4.4 Market benefits are expected from avoided unserved energy and avoided future distribution investment 14
4.5 Three different scenarios have been modelled to address uncertainty 15

5 ASSESSMENT OF THE CREDIBLE OPTIONS 16

5.1 Gross benefits 16
5.2 Estimated costs 17
5.3 Net present value assessment 17
5.4 Sensitivity analysis results 17

6 PROPOSED PREFERRED OPTION 20

APPENDIX A – CHECKLIST OF COMPLIANCE CLAUSES 21

APPENDIX B – PROCESS FOR IMPLEMENTING THE RIT-D 24

APPENDIX C – MARKET BENEFIT CLASSES CONSIDERED NOT MATERIAL 25

APPENDIX D – ADDITIONAL DETAIL ON THE ASSESSMENT METHODOLOGY 26

Executive Summary

The Botany 33/11kV Zone Substation (ZS) was commissioned in 1931 and is located in Ausgrid's Eastern Suburbs network area. The Botany ZS is currently supplied from the Bunnerong North Sub-transmission Substation (STS). It is equipped with one section of 11kV compound-insulated switchgear in a double busbar arrangement (Group 1), together with three sections of 11kV gas-insulated single-bus switchgear.

The 11kV compound-insulated switchgear is becoming less reliable and is approaching the end of its useful life. Without action, it poses an increased risk of customer outages.

To address known condition issues associated with 11kV compound-insulated switchgear, Ausgrid has been implementing a strategy to replace its entire fleet. As of the date of this report, only twelve substations across Ausgrid's network have this type of switchgear in service, with all remaining units planned for replacement or retirement within the next 10 years.

Ausgrid is therefore undertaking a Regulatory Investment Test for Distribution (RIT-D) to assess options for addressing the risk associated with the last and ageing section of 11 kV compound-insulated switchgear at the Botany ZS to ensure we continue to satisfy our reliability and performance standards. This Final Project Assessment Report (FPAR) represents the final step in the application of the RIT-D and follows publication of an Options Screening Notice.

The 'identified need' for this RIT-D is to ensure we continue to satisfy our reliability and performance standards for customers in the Eastern Suburbs

Ausgrid is obliged to comply with reliability and performance standards as part of its distribution license granted by the Minister for Industry, Resources and Energy under the *Electricity Supply Act 1995 (NSW)*. Reliability standards applied to distribution networks typically set maximums in relation to how long their electricity supply is off for - System Average Interruption Duration Index (SAIDI) - as well as how often their electricity supply is off - System Average Interruption Frequency Index (SAIFI).

The main concern this RIT-D is seeking to address relates to increasing customer supply risks derived from the condition of the remaining 11kV compound-insulated switchgear at Botany ZS. If action is not taken, the analysis shows that the unserved energy modelled will put these performance standards at risk.

Overall, by addressing the reliability concerns associated with the ageing switchgear, the preferred investment will deliver positive net market benefits for consumers. These benefits arise from a reduction in expected unserved energy (EUE), as well as through lower replacement costs for associated secondary systems (that will otherwise require future replacement on a standalone basis) and avoided safety risk costs and avoided maintenance and repair costs.

Two credible network options have been assessed

We have identified and assessed two credible options as part of our network planning activities:

- Option 1 – in-situ switchgear replacement – involves the replacement of the remaining 11 kV compound-insulated switchgear with modern equivalent technology, installed within the existing switchroom at Botany ZS, together with the replacement of the associated secondary systems; and
- Option 2 – switchgear retirement – involves transferring the associated 11 kV load to the neighbouring Port Botany ZS to enable retiring the remaining 11 kV compound-insulated switchgear (and therefore the associated secondary systems).

Each option has been developed following an assessment of the various potential choices for addressing both the ageing 11kV switchgear and secondary systems assets to ensure reliable supply of electricity to the Eastern Suburbs area.

Table E.1 – Capital cost of the credible network options, $M (2025/26)

	Labour	Materials	Contracted Services	Indirect cost	Total*
Option 1 – In-situ switchgear replacement	**3.3**	**1.9**	**1.9**	**2.3**	**9.5**
Option 2 – Load transfer and switchgear retirement	**1.3**	**0.1**	**10.9**	**0.7**	**13.0**

* Totals may differ due to rounding.

The higher estimated capital cost of Option 2 reflects the complexity of transferring load between Botany ZS and Port Botany ZS. The feeder route predominantly traverses busy roads that carry significant heavy vehicle movements, which also gives rise to a greater potential for unforeseen circumstances. Ausgrid therefore considers the cost estimate for Option 2 to be more uncertain. Specifically, we apply a cost accuracy of -10% to +50% to Option 2, compared to -10% to +30% for Option 1, for which the scope of works is relatively more certain given Ausgrid's detailed understanding of the configuration of Botany ZS following the recent replacement of the other sections of switchgear at the site.

The options also differ in how they affect the cost of replacing the associated secondary systems. Under the base case, the secondary systems would be replaced in 2029/30 as a standalone project at an estimated cost of $2.3 million. Replacing them together with the switchgear under Option 1 avoids duplicating labour and planning costs, reducing this cost to approximately $0.4 million (being only the cost of materials). Option 2 avoids the expenditure entirely by retiring the secondary systems. Ausgrid has captured these impacts as a 'differences in the timing of unrelated expenditure' benefits in this FPAR consistent with the RIT-D.

Non-network options and SAPS solutions are not considered viable for this RIT-D

Ausgrid has considered the ability of any non-network options (NNOs), as well as stand-alone power system (SAPS) solutions to assist in meeting the identified need.

An assessment regarding reducing the risk of unserved energy has shown that these alternatives are not expected to be able to cost effectively address the risk, compared to the two network options outlined above. This is driven primarily by the magnitude of the load reduction required and the likely cost of non-network solutions. These solutions would also not resolve the escalating safety risk costs and reactive maintenance costs associated with continued use of the switchgear.

Ausgrid has considered the impact of the Community Power Network (CPN) that is currently being developed for the Botany / Mascot area. The project will provide a coordinated operation of rooftop solar and network batteries, to assist in supporting evening peak load reductions, improve capacity and utilisation of the local network. However, it would not remove the need to replace the switchgear, noting also that it is not expected to conclude until after the optimal timing of the preferred option. Notwithstanding, Ausgrid considers the CPN as an initiative able to create opportunities for apartment dwellers and small shops with limited or no ability to install rooftop solar and/or batteries to share in local renewable generation.

Our assessment of non-network solutions is detailed further in the separate Options Screening Notice released in accordance with clause 5.17.4(d) of the National Electricity Rules (NER).

Three different scenarios have been modelled to deal with uncertainty

RIT-D assessments are required to be based on cost-benefit analysis that includes an assessment of 'reasonable scenarios', which are designed to test alternate sets of key assumptions and whether they affect identification of the preferred option.

The scenarios adopted for this RIT-D only differ by the demand forecasts, given this is the key driver of the level of expected unserved energy. Ausgrid has adopted equal weightings across scenarios as a proportionate approach for this RIT-D, as the NPV assessment found that the ranking of the options was the same across all of the scenarios.

How the results are affected by changes to other variables (i.e., the VCR, discount rate and capital costs) have been investigated in the sensitivity analysis.

Table E.2 – Summary of the three scenarios investigated

Variable	Scenario 1 – central demand scenario	Scenario 2 – high demand scenario	Scenario 3 – low demand scenario
Scenario weighting	1/3	1/3	1/3
Demand	Central forecast (POE50)	Low forecast (POE10)	High forecast (POE90)
VCR ($2025/26)		$37.45/kWh	
Discount rate		3.70%	

Option 1 is found to be the preferred option

Option 1 has the greatest estimated net market benefits of the two options across each of the scenarios investigated. Both options are commissioned at the same point in time and eliminate all involuntary load shedding and health and safety risks associated with the existing switchgear equally. While Option 2 delivers marginally higher gross benefits (as it avoids the

secondary systems replacement expenditure entirely), this is outweighed by its higher upfront capital cost, such that the differences in net market benefits are primarily driven by the cost differences between the options.

Table E.3 – Present value of net benefits relative to the base case by scenario and weighted, NPV $m

Option / scenario	Central demand	High demand	Low demand	Weighted	Rank
Scenario weighting	1/3	1/3	1/3	-	-
Option 1	**1.6**	**1.9**	**1.0**	**1.5**	**1**
Option 2	0.3	0.6	-0.4	0.2	2

Ausgrid considers that Option 1 is the preferred option that satisfies the RIT-D. The ranking of the options is found to be robust to a range of sensitivity tests investigated (covering assumed network costs, VCR values and discount rates).

The scope of works for Option 1 includes:

- installation of 11kV switchgear using modern equivalent technology;
- connection of new switchgear with existing 11kV switchgroups and transfer of loads to the new switchboard;
- secondary systems upgrades; and
- decommissioning of redundant 11kV compound-insulated switchgear and associated equipment from site.

The estimated capital cost of this option is approximately $9.5 million, comprising:

- $8.3 million for installing the new 11kV switchgear;
- $0.6 million for the load transfer to the new 11kV switchgear;
- $0.4 million for the replacement of secondary systems; and
- $0.2 million for the decommissioning of the redundant 11kV compound-insulated switchgear.

Planned routine network operating costs under this option are expected to be around $6,400/year once commissioned, which is approximately 46% lower than the current routine maintenance costs for the 11kV switchgear at Botany ZS.

Overall, Option 1 is the lowest cost of the two credible options assessed in this FPAR and delivers the greatest net benefits.

Ausgrid expects that construction would commence as soon as practicable after this RIT-D and end in 2028/29, with commissioning occurring at the beginning of 2029/30. Ausgrid considers that this FPAR and the accompanying detailed analysis identify Option 1 as the preferred option and that this satisfies the RIT-D. Ausgrid is the proponent for Option 1.

Next steps

This FPAR represents the final step in the application of the RIT-D to options for ensuring reliable electricity supply to the Eastern Suburbs load area. A Draft Project Assessment Report (DPAR) is not required for this RIT-D in line with clause 5.17.4(n) of the NER, i.e., since it has been determined that there will not be a non-network or SAPS solution that is a potential credible option, or that forms a significant part of a credible option, and the capital cost of the preferred option is less than the $14 million threshold.[1]

Under the NER, parties have 30 days from the date of this report to dispute the application of the RIT-D. Disputes are only able to be made on the grounds that Ausgrid has not applied the RIT-D in accordance with the NER, or that Ausgrid performed a manifest calculation error in applying the RIT-D. Disputing parties cannot dispute issues in this FPAR that the RIT-D treats as externalities, or relate to an individual's personal detriment or property rights. Clause 5.17.5 of the NER sets out the full process and requirements regarding a dispute of how the RIT-D has been applied.

Any queries in relation to this RIT-D should be addressed to:

James Moody
Head of Network Planning
Ausgrid
GPO Box 4009
Sydney 2001

Or

email to: assetinvestment@ausgrid.com.au

[1] AER, 2024 RIT and APR cost thresholds review: Final determination, November 2024, p 1.

1 Introduction

This Final Project Assessment Report (FPAR) has been prepared by Ausgrid and represents the final step in the application of the Regulatory Investment Test for Distribution (RIT-D) to options for ensuring reliable electricity supply to the Eastern Suburbs network area going forward. It follows the publication of an Options Screening Notice for this RIT-D.

The Botany 33/11kV Zone Substation (ZS) is located in the Eastern Suburbs network area. This substation was first commissioned in 1931, with some of the original assets still in service. It currently supplies nearly 7,500 customers in the area, with a summer forecast load of 26MVA. It is supplied from Bunnerong North Sub-Transmission Substation (STS) and comprises four 19 MVA 33/11kV tail-ended transformers, one section of 11kV compound-insulated switchgear in a double busbar arrangement (Group 1) and three sections of 11kV gas-insulated single-bus switchgear.

The compound-insulated switchgear at Botany ZS is becoming less reliable and is approaching the end of its useful life, giving rise to an increasing risk of customer outages. If no action is taken, the condition of the remaining 11kV compound-insulated switchgear is expected to deteriorate further, resulting in an increasing risk of prolonged customer outages.

Ausgrid is therefore undertaking a RIT-D to assess options for addressing risk with the ageing 11kV compound-insulated switchgear at Botany ZS, to ensure we continue to satisfy our reliability and performance standards.

Ausgrid has determined that non-network and stand-alone power system (SAPS) solutions are unlikely to form a standalone credible option, or form a significant part of a credible option, for this RIT-D, as set out in the separate Options Screening Notice released in accordance with clause 5.17.4(d) of the National Electricity Rules (NER).

1.1 Role of this final report

Ausgrid has prepared this FPAR in accordance with the requirements of the NER under clause 5.17.4. It is the final stage of the RIT-D process set out in the NER. The purpose of the FPAR is to:

- describe the need Ausgrid is seeking to address, including the assumptions used in identifying this need;
- provide a description of each credible option assessed;
- quantify relevant costs and market benefits for each credible option;
- describe the methodologies used in quantifying each class of cost and market benefit;
- explain why Ausgrid determined that some classes of market benefits or costs do not apply to options considered;
- present the results of a net present value (NPV) analysis of each credible option and explain these results; and
- identify the preferred option.

A Draft Project Assessment Report (DPAR) is not required for this RIT-D in line with clause 5.17.4(n) of the NER, i.e., since it has been determined that there will not be a non-network or SAPS solution that is a potential credible option, or that forms a significant part of a credible option, and the capital cost of the preferred option is less than the $14 million threshold.[2] The full RIT-D process is detailed in Appendix B.

1.2 Next steps and contact details for queries in relation to this RIT-D

This FPAR is the final step in the application of the RIT-D to options for ensuring reliable electricity supply to the Eastern Suburbs area. Under the NER, parties have 30 days from the date of this report to dispute the application of the RIT-D. Disputes are only able to be made on the grounds that Ausgrid has not applied the RIT-D in accordance with the NER, or that Ausgrid performed a manifest calculation error in applying the RIT-D. Disputing parties cannot dispute issues in this FPAR that the RIT-D treats as externalities, or relate to an individual's personal detriment or property rights. Clause 5.17.5 of the NER sets out the full process and requirements regarding a dispute of how the RIT-D has been applied.

Any queries in relation to this RIT-D should be addressed to:

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Sydney 2001

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email to: assetinvestment@ausgrid.com.au

[2] AER, 2024 RIT and APR cost thresholds review: Final determination, November 2024, p 1.

2 Description of the identified need

This section provides a description of the network area and the 'identified need' for this RIT-D, before presenting the key assumptions underlying the identified need.

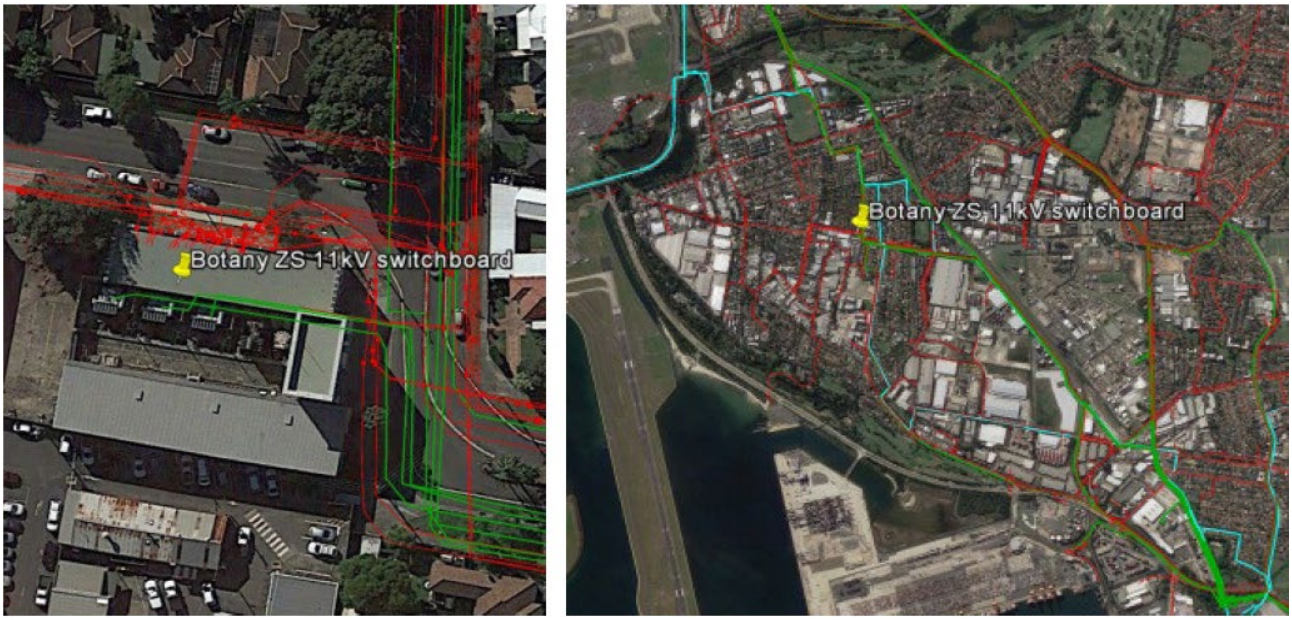
2.1 Overview of the relevant network area

The Botany ZS is a 33/11kV ZS that was commissioned in 1931 and is currently supplied by Bunnerong North STS via four paper-insulated feeders (346, 349, 350 and 353). It supplies approximately 7,500 residential, commercial and industrial customers and is equipped with:

- four 19 MVA 33/11kV tail-ended transformers; and
- four sections of switchgear, comprising:
  - three sections of 11kV gas-insulated switchgear (commissioned in 2020); and
  - one section of 11kV compound-insulated switchgear.

Botany ZS is summer peaking with a forecast load of 26MVA, which is below the substation's rating capacity of 31.2MVA. In the event of a total zone substation outage, 73 per cent of the load can be transferred away by switching to adjacent zone substations via the 11kV network after a time delay. A geographical overview of this area is shown in figure 2.1 below.

Figure 2.1 – Geographical overview of Botany ZS and service area



The 11kV compound-insulated switchgear at Botany ZS was commissioned in 1951 and is now approximately 75 years of age. This switchgear is approaching the end of its useful life and, as a result, has an increasing risk of failure.

The 11kV compound-insulated switchgear is also obsolete in modern electricity distribution networks, and Ausgrid has therefore developed and implemented a strategy to phase out this equipment across the network. As of the date of this report, only twelve substations across Ausgrid's network (including Botany ZS) still have 11kV compound-insulated switchgear in-service, with all remaining units planned for replacement or retirement within the next 10 years.

Botany ZS has been subject to a staged retirement of its 11kV compound-insulated switchgear. To date, three of the four sections of the 11kV compound-insulated switchgear have been replaced with modern gas-insulated switchgear (commissioned in 2020). This RIT-D addresses the remaining section of compound-insulated switchgear.

In addition, the secondary systems associated with the remaining 11kV compound-insulated switchgear have exceeded their typical useful life. In particular, the secondary systems collectively ensure the 11kV switchgear operates safely, reliably, and can be controlled and monitored from the control room.

Without action, the condition of the remaining 11kV compound-insulated switchgear and associated secondary systems is expected to continue to deteriorate, resulting in an increasing risk of prolonged customer outages and reactive expenditure.

2.2 Summary of the identified need

Ausgrid is obliged to comply with reliability and performance standards as part of its distribution license granted by the Minister for Industry, Resources and Energy under the *Electricity Supply Act 1995 (NSW)*. Under the license, reliability and performance standards are expressed in two measures:

- SAIDI[3] – which means the average derived from the sum of the durations of each sustained customer interruption (measured in minutes), divided by the total number of customers (averaged over the financial year); and
- SAIFI[4] – which means the average derived from the total number of sustained customer interruptions divided by the total number of customers (averaged over the financial year).

These capture two key sources of supply disruptions to electricity customers, i.e., how long their electricity supply is off for as well as how often their electricity supply is off. Customers experience better electricity service the lower these measures are. Reliability standards applied to distribution networks typically set maximums in relation to each of these two measures.

The main concern this RIT-D is seeking to address relates to increasing customer supply risks derived from the condition of the remaining 11kV compound-insulated switchgear at Botany ZS. If action is not taken, the analysis shows that the unserved energy modelled will put these performance standards at risk.

Overall, by addressing the reliability concerns associated with the ageing switchgear, the preferred investment will deliver positive net market benefits for consumers. These benefits arise from a reduction in expected unserved energy (EUE), as well as through lower replacement costs for associated secondary systems that need replacing otherwise and avoided safety risk costs and avoided maintenance and repair costs.

2.3 Key assumptions underpinning the identified need

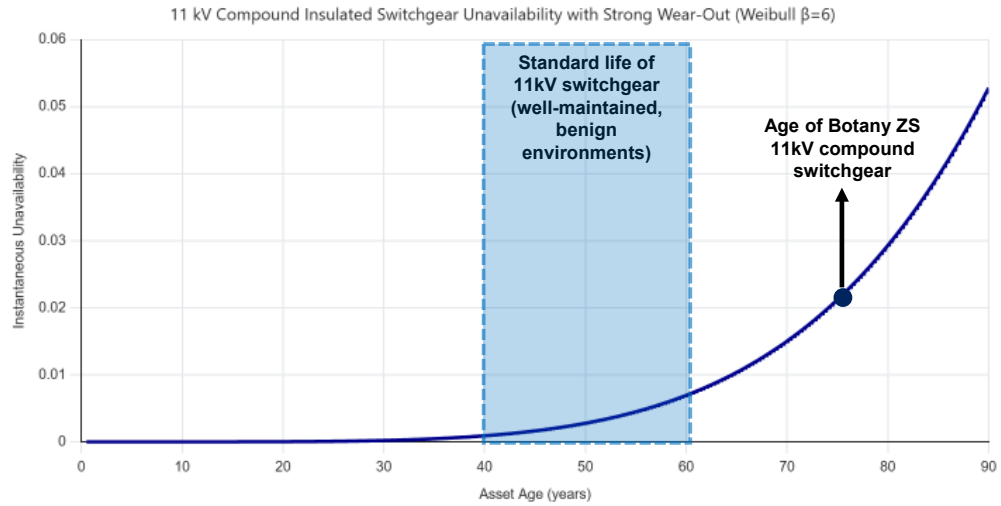
This section summarises the key assumptions underpinning the identified need for this RIT-D. Appendix D provides further details on the assumptions and methodologies applied to estimate costs and market benefits as part of this RIT-D.

2.3.1 Probability of assets failing increases with age

Ausgrid has adopted well-accepted models for each major class of network asset to estimate the probability of failure. In general, the probability of failure increases with asset age. This applies to both the 11kV compound-insulated switchgear and the associated secondary systems at Botany ZS, which we discuss below.

Figure 2.2 below illustrates unavailability plotted for 11kV compound-insulated switchgear, considering failure rate parameters that represent strong wear-out behaviour (i.e., ageing driven failures). It demonstrates robust performance in the early years of operation (very low unavailability), with an accelerated failure rate as the asset ages. As the 11kV compound-insulated switchgear at Botany ZS has been in service for 75 years, it has an increasing probability of failure.

Figure 2.2 – Unavailability of 11kV compound-insulated switchgear at Botany ZS



[3] System Average Interruption Duration Index.
[4] System Average Interruption Frequency Index.

The secondary systems associated with the remaining 11kV switchgear at Botany ZS have an average service life greater than 50 years. As such, they have exceeded their useful life (i.e., typically 15-25 years for electronic protection relays and 30-50 years for electromechanical relays) and are subject to an increasing probability of failure. Replacement of relevant equipment is required within the next 5 years.

Ausgrid has assumed that these replacement works would be commissioned in 2029/30 under the base case. This is a conservative assumption, considering that replacement work can be undertaken immediately and any time earlier than 2029/30 would increase the present value of cost savings associated with replacing secondary systems under this need.

2.3.2 Supply restoration takes time but load transfers are possible

The level of expected cost associated with any involuntary load shedding is dependent on underlying assumptions relating to supply restoration times. Ausgrid considers that the time required for restoration after a typical 11kV compound-insulated switchgear failure of the type in the Botany ZS can vary between 8.5 and 17 days depending on the type of failure. Detailed restoration assumptions are set out in Appendix D.

As part of restoring supply after an outage, Botany ZS has load transfer capabilities that can mitigate the severity of involuntary load shedding. Botany ZS has 11 kV interconnections with Green Square, Maroubra, Mascot, Matraville and Port Botany zone substations. In the event of a total loss of supply, approximately 73 per cent of the load can be recovered by switching to adjacent zone substations via the 11kV network after a time delay (i.e., by closing and opening normally open points on the network).

These load transfers can help mitigate any consequent unserved energy to customers following failures of assets at the Botany ZS. Ausgrid has factored the ability to transfer load into its assessment of forecast unserved energy. In addition, mobile generation sets can also be used to restore loads. Whilst load to many customers can be restored through switching operations in the 11 kV network combined with the use of mobile generation sets, the full incident recovery process can take several weeks (which may result in unserved energy over this period).

2.3.3 Three different load forecasts have been assumed

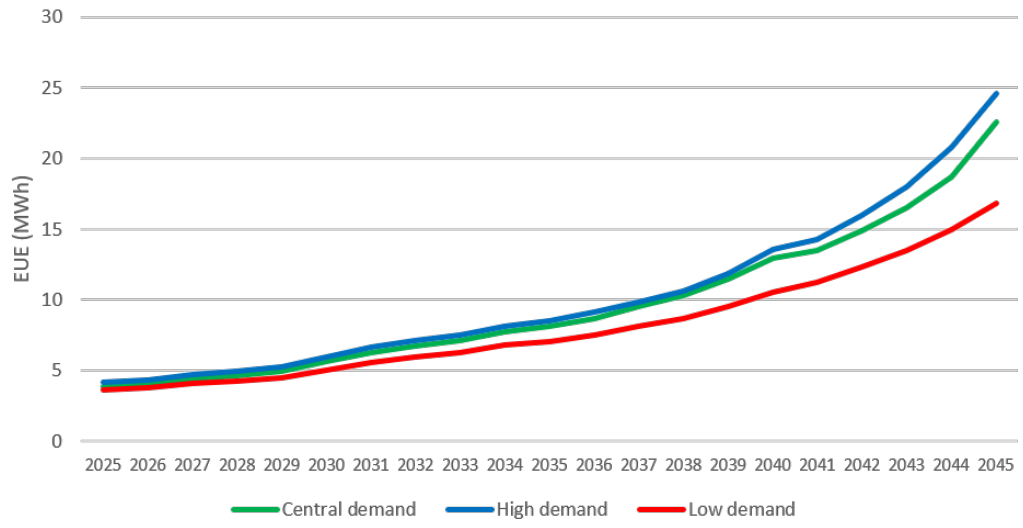
We have investigated how assuming different load forecasts going forward changes the EUE (and therefore net market benefits arising from avoided involuntary load shedding) under the proposed options.

In particular, we have investigated three future load forecasts for the area in question – namely a central forecast that represents expected load growth using our 50 per cent probability of exceedance ('POE50') forecasts, as well as a low forecast using the POE90 forecasts and a high forecast using the POE10 forecasts.

Figure 2.3 below shows the modelled levels of EUE, under each of the three underlying demand forecasts investigated, over the next twenty years. For clarity, this figure illustrates the MWh of EUE assumed under each load forecast if no credible option is commissioned (i.e. under the 'do nothing' base case for that load forecast).

Appendix D provides additional detail on the assumed load duration curve and how the probability of failure is modelled.

Figure 2.3 – Forecast EUE under each of the three demand forecasts (base case)



3 Two credible options have been assessed

This section outlines the two credible network options that Ausgrid has identified as part of its network planning activities. Each option has been developed following an assessment of various choices for addressing the ageing 11kV compound-insulated switchgear at Botany ZS. All costs and benefits presented are in 2025/26 dollars, unless otherwise stated.

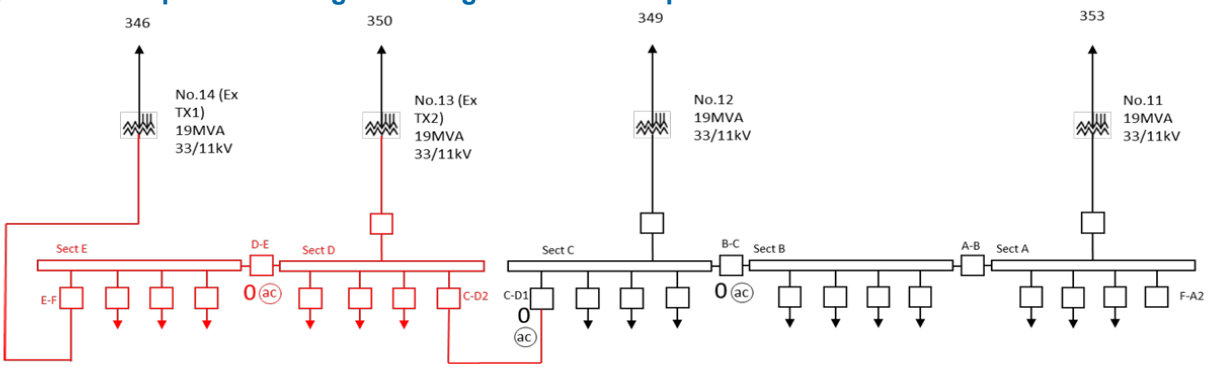
3.1 Option 1 – Replace 11kV compound-insulated switchgear in-situ

Option 1 involves replacing the existing 11kV compound-insulated switchgear with modern equivalent technology, installed within the existing switchroom at Botany ZS. The scope of works for Option 1 includes:

- installation of new 11kV switchgear, comprising two sections of single bus switchgear and 11 switchgear panels;
- connection of new switchgear with existing 11kV switchgroups and transfer of loads to the new switchboard;
- secondary systems upgrades; and
- decommissioning and removal of redundant 11kV switchgear and associated equipment from site.

The figure below illustrates Botany ZS proposed arrangement on a single-line diagram, showing the new switchgear in red.

Figure 3.1 – Proposed switchgear arrangement under Option 1



The estimated capital cost of Option 1 is $9.5million, which includes decommissioning costs of $0.2million and $0.4million in materials cost associated with the secondary systems replacement. As we discuss in section 4.4.2, the cost of secondary systems upgrades under Option 1 reflects a saving relative to the base case and has therefore been captured as a market benefit arising from differences in the timing of unrelated expenditure, rather than a cost item, to avoid double counting. Table 3.1 below shows the breakdown of the estimated construction capital costs across key cost categories for this option.

Table 3.1 – Breakdown of Option 1's expected construction capital cost, $m (2025/26)

	Labour	Materials	Contracted Services	Indirect cost	Total*
Option 1 - Replace 11kV compound-insulated switchgear in-situ	**3.3**	**1.9**	**1.9**	**2.3**	**9.5**

Table 3.2 below shows the breakdown of estimated construction capital costs by component and over time for this option.

Table 3.2 – Breakdown of expected capital cost over time for Option 1, $m (2025/26)

Component	2025/26	2026/27	2027/28	2028/29	Total*
New 11kV switchgear	**0.8**	**1.0**	**5.5**	**0.9**	**8.3**
Load transfer to new switchgear	-	-	-	**0.6**	**0.6**
Decommissioning cost	-	-	-	**0.2**	**0.2**
Secondary systems upgrade	-	-	-	**0.4**	**0.4**
Total	**0.8**	**1.0**	**5.5**	**2.1**	**9.5**

* Totals may differ due to rounding.

We note that the first year of capital costs above includes expenditure to-date on design costs, which has also been included in the first year of costs for Option 2 (discussed below). These costs do not affect the identification of the preferred option under the RIT-D. They are included for continuity with Ausgrid's wider regulatory cost recovery process. Overall, Option 1 construction work is expected to take three years to complete. Once commissioned at the beginning of 2029-30, it will require approximately $6,400/year in planned routine maintenance costs

3.2 Option 2 – Transfer load to Port Botany ZS and retire ageing 11kV switchgear

Option 2 involves retiring the existing 11kV compound-insulated switchgear at Botany ZS and transferring the associated 11kV load to the neighbouring Port Botany ZS, while retaining the existing gas-insulated switchgear in service.

The scope of works includes:

- installation of new ductline and associated 11kV cables to transfer loads from Botany ZS to Port Botany ZS; and
- decommissioning and removal of redundant 11kV switchgear and associated equipment from site.

By facilitating the retirement of the existing 11kV compound-insulated switchgear, Option 2 also allows for the retirement of the associated secondary systems. It follows that the cost of upgrading secondary systems is completely avoided under Option 2. As we discuss in section 4.4.2, the avoidance of secondary systems upgrades under Option 2 reflects a saving relative to the base case and has therefore been captured as a market benefit arising from differences in the timing of unrelated expenditure rather than a cost item.

The estimated capital cost of Option 2 is $13.0 million, which includes an estimated decommissioning cost of $0.2 million. Table 3.3 below shows the breakdown of the estimated construction capital costs across key cost categories for this option.

Table 3.3 – Breakdown of Option 2's expected construction capital cost, $m (2025/26)

	Labour	Materials	Contracted Services	Indirect cost	Total
Option 2 – retire 11kV compound-insulated switchgear	**1.3**	**0.1**	**10.9**	**0.7**	**13.0**

Table 3.4 below shows the breakdown of the estimated capital costs by component and over time for this option.

Table 3.4 – Breakdown of expected capital cost over time for Option 2, $m (2025/26)

Component	2025/26	2026/27	2027/28	2028/29	Total
Load transfer to Port Botany ZS	**0.8**	**0.8**	**4.0**	**7.2**	**12.8**
Decommissioning cost	-	-	-	**0.2**	**0.2**
Total	**0.8**	**0.8**	**4.0**	**7.4**	**13.0**

The relatively higher capital cost of Option 2, compared to Option 1, reflects the additional complexity involved in transferring load between Botany ZS and Port Botany ZS. The feeder route required for this transfer predominantly traverses busy roads carrying significant heavy vehicle movements associated with the surrounding port and industrial precinct, which increases the cost and disruption associated with the necessary civil works.

Undertaking load transfers in a live, heavily trafficked environment also gives rise to a greater potential for unforeseen circumstances and, consequently, cost overruns. Accordingly, Ausgrid considers the cost estimate for Option 2 to carry relatively greater uncertainty than that of Option 1, which we discuss further in section 4.3.

Overall, Option 2 is expected to take three years to complete. Once fully commissioned at the beginning of 2029/30, it will require approximately $1,300/year in planned routine maintenance costs, as cable maintenance requirements are minimal and maintenance costs of connecting switchgear can be bundled into existing maintenance works at Port Botany ZS.

3.3 Social licence considerations

Ausgrid expects the impact to the community will be minimal for Option 1 (the preferred option). The works under Option 1 would be undertaken within the existing substation site and would have very limited effect on neighbouring properties.

Conversely, the proposed load transfers under Option 2 would require work outside of the existing site to install new cables between Botany ZS and Port Botany ZS. These works are likely to have temporary construction impacts, including traffic management, footpath closure and construction noise for nearby residents and road users. While Ausgrid would manage impacts through its standard construction practices, the overall impact would be much greater than under Option 1.

The local community, Bayside Council and surrounding neighbours have been notified of the project and will continue to be updated as it progresses.

There are no material social licence costs for Option 1 (the preferred option) in this RIT-D. Whilst Option 2 would likely involve some social licence costs, it is not considered proportionate to estimate and include them as doing so would only further make Option 1 preferred.

3.4 Options considered but not progressed

Ausgrid also considered several other options that have not been progressed because they were found to be technically or economically infeasible. Table 3.5 below summarises Ausgrid's consideration and position on each of these options.

Table 3.5 – Options considered but not progressed

Description	Reason why option was not progressed
Commissioning a new greenfield ZS	The construction of a new ZS would cost orders of magnitude more than the credible options assessed, without providing a commensurate increase in expected market benefits, and is therefore considered to not be economically feasible under the RIT-D.
Replacement of switchgear in a new switchroom	The existing switchroom provides sufficient physical space to accommodate in-situ replacement of the 11kV compound-insulated switchgear. Given that the existing switchroom does not yet exhibit condition issues that would justify its replacement, this option would involve a materially higher cost without a commensurate increase in benefits. This option is therefore not considered economically feasible.
Using non-network solutions either in combination with, or in-place of, a network option.	Ausgrid has considered how non-network solutions other than the CPN project (i.e., demand management) could potentially defer the timing of the preferred network solution and whether the EUE could be cost effectively reduced. An assessment of the potential for non-network options has shown that these alternatives would not be cost effective due to the magnitude of the load reduction required. This result is driven primarily by the significant amount of EUE that the identified network options allow to be avoided, compared to the base case, and the likely cost of non-network solutions. In addition, these solutions would not resolve the escalating safety risk costs and reactive maintenance costs associated with continued use of the switchgear. This is detailed further in the separate Options Screening Notice released in accordance with clause 5.17.4(d) of the NER.
Community power network (CPN)	Ausgrid is progressing implementation of the CPN project in the Botany area. The project will provide a coordinated operation of rooftop solar and network batteries, to assist in supporting evening peak load reductions, improve capacity and utilisation of the local network. Ausgrid has assessed the impact of the CPN on the loads and required reliability from the 11kV compound-insulated switchgear at Botany ZS. Whilst the CPN is forecast to enable the Botany area to be self-sufficient for up to 30% of its load, it still relies on a constant connection with the grid. Therefore, the CPN project is not expected to be sufficient to allow for the retirement of the existing 11kV compound-insulated switchgear. It follows that the replacement of the switchgear, which is driven by asset condition and cost efficiency considerations (i.e., avoiding escalating safety risk costs and reactive maintenance costs), would still be required. Further, based on the timing, a CPN could not be implemented within a sufficient timeframe to address the identified need. In particular, the Botany CPN project is not expected to conclude until after the optimal timing of the preferred option (i.e., 2029/30), with the results remaining uncertain for a period of time thereafter. For these reasons, a CPN has not been considered as a credible option. Notwithstanding, Ausgrid considers the CPN project at Botany to be a valuable initiative, capable to create opportunities for apartment dwellers and small shops with limited or no ability to install rooftop solar and/or batteries to share in local renewable generation.
Transferring and/or connecting customers to SAPS	Ausgrid has considered the feasibility of SAPS, informed by its trial of SAPS with selected customers living in fringe-of-grid areas of Ausgrid's network. Based on Ausgrid's trial, the cost of SAPS would limit the number of customers available to reduce demand given the deferral funds available and consequently, the reduction in demand would not be sufficient to defer or postpone the network solution. In addition, these solutions would not resolve the escalating reactive maintenance costs associated with continued use of the ageing switchgear. This is detailed further in the separate Options Screening Notice released in accordance with clause 5.17.4(d) of the NER.

4 How the options have been assessed

This section outlines the methodology that Ausgrid has applied in assessing market benefits and costs associated with the credible options considered in this RIT-D. Appendix D presents additional detail on the assumptions and methodologies employed to assess the options.

4.1 All options have been assessed against a 'base case'

All costs and benefits for each credible option have been measured against a 'business as usual' base case.

Under this base case, Ausgrid will:

- experience an increasing risk of failure for the 11 kV compound-insulated switchgear and secondary systems at Botany ZS, resulting in an increasing risk of prolonged unserved energy in the Eastern Suburbs network area, as well as escalating reactive maintenance and safety risk costs;
- incur increasing planned routine maintenance and refurbishment costs given the ageing assets;[5] and
- replace the secondary systems associated with the 11kV compound-insulated switchgear in 2029/30 (at a cost of $2.3 million).

Overall, the base case is not a realistic state of the world, given Ausgrid's reliability obligations. The base case has instead only been defined and used to align with the RIT-D framework.

4.2 General overview of the assessment framework

The RIT-D analysis has been undertaken over a 20-year period, from 2025/26 to 2044/45.

Ausgrid considers that a 20-year period is appropriate as it takes into account the size, complexity and expected life of the relevant credible options to provide a reasonable indication of the market benefits and costs of the options.

Where the capital components of the credible options have asset lives that extend beyond the end of the assessment period, Ausgrid has taken a terminal value approach to incorporate capital costs, so that the capital cost of long-lived options is appropriately captured in the assessment period. This approach ensures that all options have their costs and benefits assessed over a consistent period, irrespective of option type, technology or asset life. The terminal values have been calculated as the undepreciated value of capital costs at the end of the analysis period and can be interpreted as a conservative estimate for benefits (net of operating costs) arising after the analysis period.

Ausgrid has adopted a real, pre-tax discount rate of 3.70% as the central assumption for the NPV analysis. This represents Ausgrid's opportunity cost for its capital investments. As non-network or SAPS options have been found to be not viable, Ausgrid considers that the appropriate discount rate is the regulated cost of capital.

To test the results against variations in the discount rate, an upper value sensitivity of 10% has been adopted to align with the parameters prepared and consulted on by AEMO in the 2025 Inputs, Assumptions and Scenarios Report.[6] For a lower value sensitivity for this RIT-D, we have applied 3.61% based on the latest AER Final Decision for a DNSP's regulated weighted average cost of capital (WACC) at the time of preparing this FPAR.[7]

4.3 Ausgrid's approach to estimating project costs

Ausgrid has estimated capital costs by considering the scope of works necessary under the credible options together with costing experience from previous projects of a similar nature. Where possible, Ausgrid has also estimated capital costs using supplier quotes or other pricing information.

All cost estimates are prepared in real, 2025/26 dollars based on the information and pricing history available at the time that they were estimated. The cost estimates do not include or forecast any real cost escalation for materials.

Ausgrid does not generally apply the Association for the Advancement of Cost Engineering (AACE) international cost estimate classification system to cost estimates. Doing so for this RIT-D would involve additional costs, which would not provide a corresponding increase in benefits compared with using standard estimates and so this has not been undertaken.

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[5] These are assumed to be $11,858 in 2026/27 and increase at 2% each year in real terms.

[6] AEMO, *2025 Inputs, Assumptions and Scenarios Report*, Final report, August 2025, p 158.

[7] Specifically, the 2026/27 pre-tax real WACC for Powercor, see: AER, *SCS PTRM – Final Decision – Powercor distribution determination 2026-31*, 30 April 2026, 'WACC' tab.

Different levels of cost accuracy apply for Option 1 and Option 2 due to the difference in scope of works. Specifically, a cost accuracy of -10% to +30% applies to Option 1, while a cost accuracy of -10% to +50% applies to Option 2. As discussed in section 3.2, this difference reflects greater uncertainties associated with load transfer works under Option 2, which must be carried out over busy roads near Port Botany, where heavy vehicle movements associated with the port and industrial precinct give rise to a greater risk of latent conditions. In contrast, the scope of works under Option 1 are considered to be relatively more certain, as there is a better understanding of existing conditions at Botany ZS, given the recent switchgear replacement works undertaken at the site.

The upper bound cost range for Option 1 (i.e., +30%) is higher than what has typically been included in our RIT-D assessment (i.e., +25%) and reflects the material increases in labour costs that Ausgrid has experienced since the cost estimates were prepared. Given the considerable time and effort required to develop revised cost estimates, Ausgrid considers testing a higher sensitivity for the Option 1 capital cost to be a proportionate approach for this RIT-D.

Annual reactive and routine maintenance costs are based on a fleet level assessment of assets and works of similar nature. These are included in the assessment period from the time options are commissioned, as well as in the base case.

4.4 Market benefits are expected from avoided unserved energy and avoided future distribution investment

Ausgrid considers that the only relevant categories of market benefits prescribed under the NER for this RIT-D relate to changes in involuntary load shedding and differences in the timing of unrelated expenditure (i.e., the future secondary systems work required).

The options also provide avoided maintenance cost benefits compared to the base case (i.e., reduced corrective maintenance costs and lower planned routine maintenance costs), as well as avoided safety risk costs. These are not considered 'market benefits' under the NER but have also been estimated in the NPV assessment.

The approach Ausgrid has adopted to estimate the financial impact of avoided unserved energy and reduced unrelated expenditure is outlined in sections 4.4.1 and 4.4.2 below. Further details on the assumptions are presented in Appendix D.

In addition, Appendix C summarises the market benefit categories that Ausgrid considers are not material for this RIT-D, and the reasons for this conclusion.

4.4.1 Avoided unserved energy

Involuntary load shedding is where a customer's load is interrupted from the network without their agreement or prior warning. Ausgrid has forecast load over the assessment period and has quantified the EUE by comparing forecast load to network capabilities under system normal and network outage conditions. A reduction in involuntary load shedding expected from a credible option, relative to the base case, results in a positive contribution to market benefits for the credible option being assessed.

The benefit from avoided involuntary load shedding for each option is derived by the estimated quantity in MWh of involuntary load shedding avoided under the base case, compared to the case with the option in place, multiplied by the Value of Customer Reliability (VCR). The VCR is measured in dollars per KWh and is used as a proxy to evaluate the economic impact of unserved energy on customers under the RIT-D.

Ausgrid has applied a central VCR estimate of $37.45/kWh, reflecting a customer load weighted average VCR for the load in question, drawing on the most recent VCR estimates published by the AER, escalated from October 2025 to June 2026 dollars using actual monthly CPI data published by the ABS. [8] Table 4.1 below presents the calculation of the customer load weighted average VCR.

Table 4.1 – Customer load weighted average VCR

Customer type	Load (MWh)	Weighting (%)	AER VCR ($/kWh, October 2025)	AER VCR ($/kWh, June 2026)
Residential (NSW)	35,149	28.52	39.99	40.81
Commercial	58,982	47.86	35.70	36.43
Industrial	29,115	23.62	34.77	35.48
Customer load weighted VCR			**36.70**	**37.45**

Sources: AER, Values of Customer Reliability 2025 – Annual Adjustment Summary, December 2025, p 2; ABS, Consumer Price Index, Australia, March 2026, Series A130393720C.

[8] ABS, *Consumer Price Index, Australia*, June 2026, Series A130393720C.

We have also undertaken sensitivity analysis on the VCR, using values that are 30% lower and 30% higher than the central load-weighted rate, consistent with the AER's most recently specified +/- 30% confidence interval.[9]

4.4.2 Differences in the timing of unrelated expenditure

Under the base case, the secondary systems associated with the existing 11kV compound-insulated switchgear are replaced as a standalone project in 2029/30 at a cost of $2.3 million.

While the timing of this work is advanced by one year under Option 1, the capital requirement is reduced significantly. The labour and planning costs associated with replacing secondary systems at Botany ZS through a standalone project would essentially replicate the equivalent costs required to replace the 11kV compound-insulated switchgear. Accordingly, where these replacement works are combined into a single coordinated program, Ausgrid can avoid the duplication of labour and planning costs. It follows that, under Option 1, Ausgrid estimates that the replacement of secondary systems at Botany ZS would only cost approximately $0.4 million (i.e., an 83 per cent reduction relative to the base case), reflecting only the cost of materials.

Option 2 allows for the retirement of the existing 11kV compound-insulated switchgear – and therefore, the associated secondary systems – at Botany ZS. It follows that Option 2 avoids the need to replace secondary systems in 2029/30.

As discussed in section 2.3.1, Ausgrid considers that the 2029/30 timing for secondary systems replacement is conservative on the basis any alternative timing (which would occur prior to 2029/30), would result in a higher present value cost of replacement under the base case, and, therefore, a higher present value benefit of reducing or avoiding this expenditure under the options cases.

4.5 Three different scenarios have been modelled to address uncertainty

RIT-D assessments are required to be based on cost-benefit analysis that includes an assessment of 'reasonable scenarios', which are designed to test alternate sets of key assumptions and whether they affect identification of the preferred option.

While load forecasts are not a determinant of the identified need (since the reliability standards expected to be put at risk relate to the *duration* and *frequency* of supply interruptions), they are the key driver of the level of EUE. Ausgrid has investigated how assuming different load forecasts going forward changes the expected net market benefits under the options.

The scenarios adopted for this RIT-D only differ by the demand forecasts. How the results are affected by changes to other variables (i.e. the VCR, discount rate and capital costs) have been investigated in the sensitivity analysis.

A summary of the key variables in each scenario is provided in Table 4.2 below.

Table 4.2 – Summary of the three scenarios investigated

Variable	Scenario 1 – central demand scenario	Scenario 2 – high demand scenario	Scenario 3 – low demand scenario
Demand	Central forecast (POE50)	Low forecast (POE10)	High forecast (POE90)
VCR	$37.45/kWh across all scenarios		
Discount Rate	3.70% across all scenarios		

Ausgrid has weighted each of the demand scenarios equally in the NPV assessment. Option 1 is found to be preferred across all scenarios and so the weightings do not influence the RIT-D outcome. Ausgrid therefore considers that adopting equal weightings is a proportionate approach for this RIT-D.

[9] AER, *Values of Customer Reliability – Final Report on VCR values*, December 2019, p. 84. While the AER re-estimated its VCR values in 2025, we note that no confidence level was provided. We have therefore continued to apply the previous confidence level stipulated in the 2019 AER VCR report.

5 Assessment of the credible options

This section summarises the results of the NPV analysis, including the sensitivity analysis undertaken. All credible options assessed as part of this RIT-D have been compared against a 'do nothing' base case (as outlined in section 4.1).

5.1 Gross benefits

Table 5.1 below summarises the gross benefit of the credible options relative to the base case in present value terms. The gross benefit has been calculated for each of the three demand scenarios outlined in section 4.5 and is also provided on a weighted basis.

Option 2 delivers the greatest estimated gross market benefits of the two credible options in each of the scenarios investigated (and therefore also on a weighted basis). This is entirely driven by the difference in the extent to which expenditure related to replacing secondary systems is avoided under each option. As noted in section 4.4.2, Option 2 avoids this expenditure completely, while Option 1 reduces it (albeit significantly). Beyond this difference, both options are commissioned at the same point in time (i.e., 2029/30) and eliminate all involuntary load shedding and health and safety risk associated with the existing 11kV compound-insulated switchgear.[10]

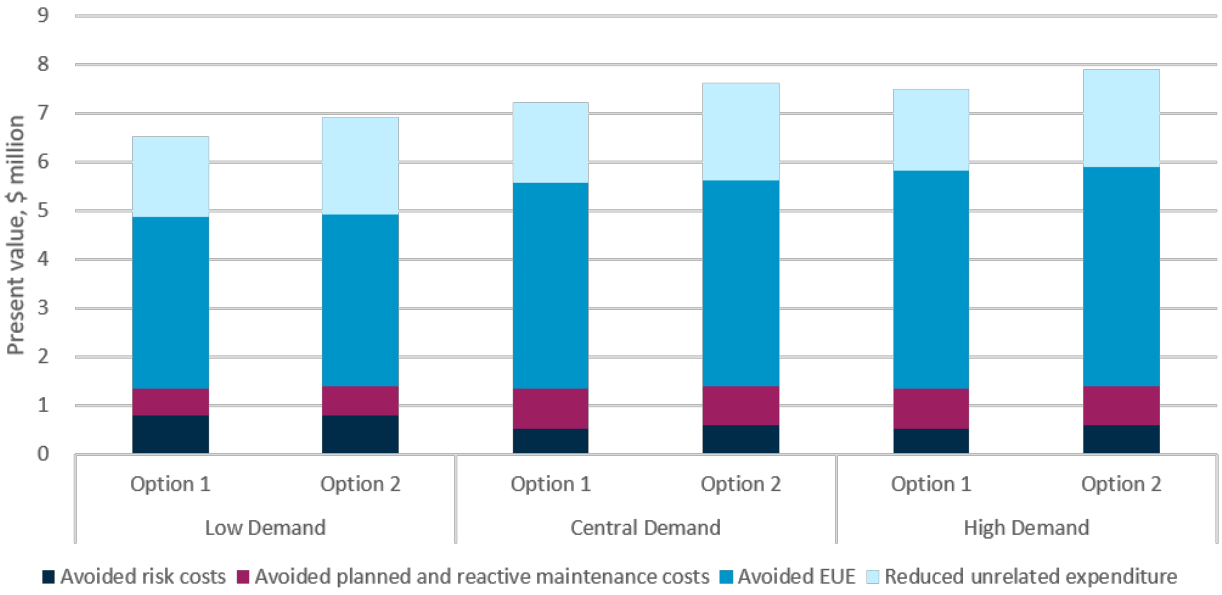
Table 5.1 – Present value of gross benefits of credible options relative to the base case, $m (2025/26)

Option / scenario	Central demand	High demand	Low demand	Weighted benefits *
Scenario weighting	1/3	1/3	1/3	-
Option 1	6.7	7.0	6.0	6.5
Option 2	7.0	7.3	6.3	6.9

* Totals may differ due to rounding.

Figure 5.1 below provides a breakdown of all benefits relating to each credible option. For clarity, we have combined in this chart the 'market benefits' under the RIT-D (i.e., reduced involuntary load shedding and reduced unrelated expenditure) with avoided safety risk costs and avoided maintenance cost benefits (i.e., reduced corrective maintenance costs and avoided planned routine maintenance costs).

Figure 5.1 – Breakdown of benefits of each credible option relative to the base case



[10] Option 2 also results in lower routine maintenance costs, which equates to a cost saving of approximately $5,100 per year. However, this difference is negligible in present value terms.

5.2 Estimated costs

Table 5.2 summarises the cost of the credible options relative to the base case in present value terms. Option costs comprise capital costs and ongoing operating and maintenance costs.

Option costs do not vary across demand scenarios. Variations in capital costs have been tested in the sensitivity analysis.

Table 5.2 – Present value of costs of the credible options relative to the base case, PV $m (2025/26)

Option / scenario	Central demand	High demand	Low demand	Weighted costs
Scenario weighting	1/3	1/3	1/3	-
Option 1	(5.0)	(5.0)	(5.0)	(5.0)
Option 2	(6.7)	(6.7)	(6.7)	(6.7)

5.3 Net present value assessment

Table 5.3 below summarises the net market benefit for the credible options under each scenario. The net market benefit is the gross benefit (as set out in table 5.1) minus the costs of the option (as set out in table 5.2), all in present value terms.

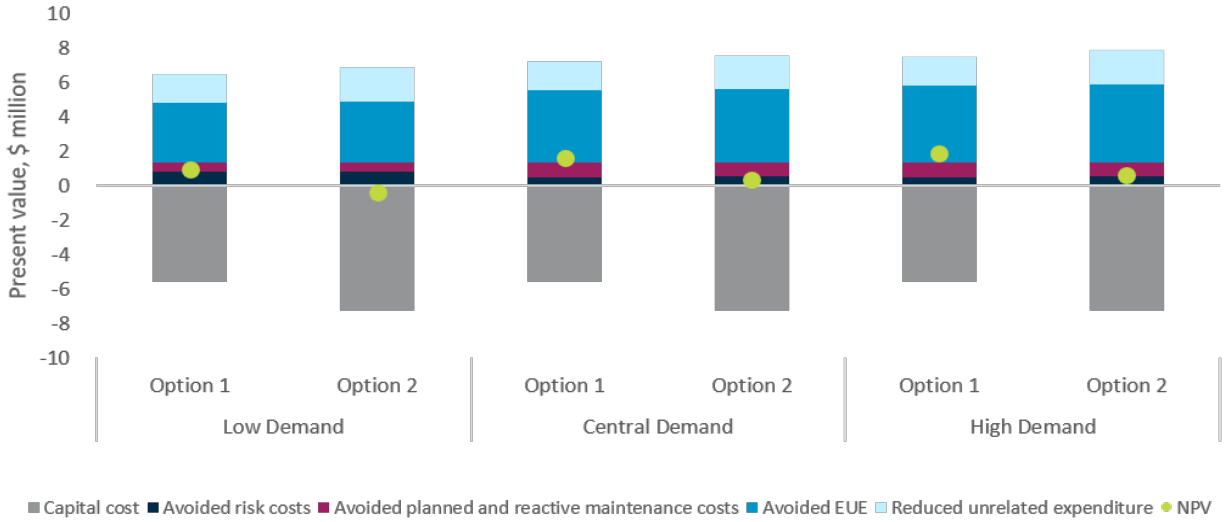
Option 1 has the greatest estimated net market benefits of the two credible options in each of the scenarios investigated (and therefore also on a weighted basis). The differences in net market benefits are primarily driven by the cost differences between the options. That is, despite Option 2 delivering marginally higher gross benefits in each scenario due to its complete avoidance of secondary systems replacement expenditure, this is outweighed (in present value terms) by its higher upfront capital cost. Therefore, Option 1 delivers a higher net economic benefit compared to Option 2.

Table 5.3 – Present value of net benefits relative to base case by scenario, NPV $m (2025/26)

Option / scenario	Central demand	High demand	Low demand	Weighted	Rank
Scenario weighting	1/3	1/3	1/3	-	-
Option 1	**1.6**	**1.9**	**1.0**	**1.5**	**1**
Option 2	0.3	0.6	-0.4	0.2	2

Figure 5.2 provides a breakdown of the net present value assessment by costs and benefits.

Figure 5.2 – Breakdown of net present value assessment



5.4 Sensitivity analysis results

Ausgrid has undertaken a sensitivity testing exercise to understand the robustness of the RIT-D assessment to underlying assumptions about key variables.

In particular, we have undertaken two tranches of sensitivity testing – namely:

- step 1 – testing the sensitivity of the optimal timing of the project ('trigger year') to different assumptions in relation to key variables; and

- step 2 – once a trigger year has been determined, testing the sensitivity of the total NPV benefit associated with the investment proceeding in that year, in the event that actual circumstances turn out to be different.

That is, having assumed to have committed to the project by the dates determined in Step 1, Ausgrid has also looked at whether the ranking of the options changes when key assumptions are varied under Step 2 of the sensitivity testing.

We outline how each of these two steps has been applied to test the sensitivity of the key findings.

5.4.1 Step 1 – Sensitivity testing of the assumed optimal timing for the credible options

Ausgrid has estimated the optimal timing for each option according to when the expected annual benefit from the proposed option exceeds its annualised cost, consistent with the AER guidance on how to determine the economically prudent and efficient timing for asset retirement.[11] This process was undertaken for both the central set of assumptions (i.e., the central scenario) as well as a range of alternative assumptions for key variables.

The optimal timing of Option 1 is found to be invariant to the assumptions of:

- a 10% decrease in the assumed network capital costs;
- a 30% increase in the assumed network capital costs;
- a 30% increase/decrease in the assumed operating costs;
- a 30% increase/decrease in the assumed health and safety risk costs;
- a 30% higher/lower VCR; and
- a lower and higher discount rate assumption (3.61% and 10%, respectively).

Overall, the optimal commissioning date for Option 1 under all the sensitivities is 2029/30 (as illustrated in figure 5.3 below), which is the timing that has been assumed in the core net benefits assessment.

Figure 5.3 – Option 1's distribution of optimal project commissioning years under each sensitivity



Similarly, the optimal timing of Option 2 is found to be invariant to all the assumptions tested. The only difference in assumptions relative to Option 1 is that the high capital cost scenario applies a 50% increase to capital costs for Option 2 (rather than the 30% escalation applied to Option 1). As we explain in section 4.3, this difference reflects the greater execution complexity and uncertainty associated with the load transfer works between Botany ZS and Port Botany ZS proposed under Option 2.

[11] AER, *Industry practice application note – Asset replacement planning*, January 2019, pp 36-37. The optimal timing is defined as the point in time where if the option were to be commissioned in that specific year, the net operating benefits would exceed the annualised cost.

Figure 5.4 – Option 2's distribution of optimal project commissioning years under each sensitivity



5.4.2 Step 2 – Sensitivity of the overall net market benefit

Ausgrid has also conducted sensitivity analysis on overall net market benefits, based on the assumed option timing established in step 1.

Specifically, Ausgrid has investigated the same sensitivities under this second step as in the first step, i.e.:

- a 30% increase and a 10% decrease in the assumed network capital costs for Option 1;
- a 50% increase and a 10% decrease in the assumed network capital costs for Option 2;
- a 30% increase/decrease in the assumed network operating costs;
- a 30% increase/decrease in the assumed risk costs;
- 30% higher/lower VCR ($48.69/kWh and $26.22/kWh, respectively); and
- a lower and higher discount rate assumption (3.61% and 10%, respectively).

The results of the sensitivity tests are presented in table 5.4 below and show that Option 1 remains the top-ranked option (reflected across all the general sensitivities modelled.

Table 5.4 – NPV results from sensitivity tests, weighted across demand scenarios ($m, 2025/26))

Sensitivity	Option 1	Option 2
Core weighted results	**1.5**	0.2
High capital costs[12]	**(0.2)**	(3.4)
Low capital costs (-10%)	**2.1**	0.9
High operating costs (+30%)	**1.7**	0.4
Low operating costs (-30%)	**1.3**	0.0
High risk costs (+30%)	**1.7**	0.4
Low risk costs (-30%)	**1.3**	(0.0)
High VCR (+30%)	**2.7**	1.4
Low VCR (-30%)	**0.3**	(1.0)
High discount rate (10%)	**(2.6)**	(4.6)
Low discount rate (3.61%)	**1.6**	0.3

We do not find any realistic boundary values for the above key variables that would make Option 2 preferred over Option 1.

[12] Different levels of cost accuracy exist for Option 1 and Option 2 due to the difference in scope of works proposed under each option. Specifically, a cost accuracy of +30% applies to Option 1, while a cost accuracy of +50% applies to Option 2. This difference reflects the greater execution complexity and uncertainty associated with the load transfer works under Option 2.

6 Proposed preferred option

Ausgrid considers that Option 1 is the preferred option that satisfies the RIT-D. It involves replacing the remaining section of 11kV compound-insulated switchgear at Botany ZS with modern equivalent technology within the existing switchroom.

Option 1 is the top ranked option across a range of general sensitivity tests investigated (covering assumed network costs, VCR values and discount rates).

The scope of works for Option 1 includes:

- installation of 11kV switchgear using modern equivalent technology, comprising two sections of single bus switchgear and 11 switchgear panels;
- connection of new switchgear with existing 11kV switchgroups and transfer of loads from the existing 11kV compound-insulated switchgear to the new switchboard;
- secondary systems upgrades; and
- decommissioning and removal of redundant 11kV compound-insulated switchboards, control panels and associated equipment.

The estimated capital cost of this option is approximately $9.5 million, comprising:

- $8.3 million for installing the new 11kV switchgear;
- $0.6 million for the load transfer to the new 11kV switchgear;
- $0.4 million for the replacement of secondary systems; and
- $0.2 million for the decommissioning of the redundant 11kV compound-insulated switchgear.

Planned routine network operating costs under this option are expected to be around $6,400/year once commissioned, which is approximately 46% lower than the current annual routine maintenance costs for the 11kV compound-insulated switchgear at Botany ZS.

Overall, Option 1 is the lowest cost of the two credible options assessed in this FPAR and delivers the greatest net benefits.

Ausgrid expects that the necessary construction would commence as soon as practicable after this RIT-D and end in 2028/29, with commissioning occurring at the beginning of 2029/30.

Ausgrid considers that this FPAR, and the accompanying detailed analysis, identify Option 1 as the preferred option and that this satisfies the RIT-D. Ausgrid is the proponent for Option 1.

Impact to the community is anticipated to be minimal as the works will be undertaken within the existing substation site.

Appendix A – Checklist of compliance clauses

This table below sets out a compliance checklist that demonstrates the compliance of this FPAR with the requirements of clause 5.17.4(r) of the NER version 255.

Clause	Summary of requirements	Section in the FPAR
5.17.4(r)	The matters specified as requirements for the DPAR, as outlined below in clause 5.17.4(j).	See below
	A summary of any submissions received on the DPAR and the RIT-D proponent's response to each such submission	NA
5.17.4(j)	(1) a description of the identified need for the investment	2
	(2) the assumptions used in identifying the identified need	2.3
	(3) if applicable, a summary of, and commentary on, the submissions on the non-network options report	NA
	(4) a description of each credible option assessed	3
	(5) where a DNSP has quantified market benefits, a quantification of each applicable market benefit for each credible option	5.1
	(6) a quantification of each applicable cost for each credible option, including a breakdown of operating and capital expenditure	5.2
	(7) a detailed description of the methodologies used in quantifying each class of cost and market benefit	4 & Appendix D
	(8) where relevant, the reasons why the RIT-D proponent has determined that a class or classes of market benefits or costs do not apply to a credible option	Appendix C
	(9) The results of a net present value analysis of each of credible option and accompanying explanatory statements regarding the results	5
	(10) the identification of the proposed preferred option	6
	(11) for the proposed preferred option, the RIT-D proponent must provide: (i) details of technical characteristics; (ii) the estimated construction timetable and commissioning date (where relevant); (iii) the indicative capital and operating cost (where relevant); (iv) a statement and accompanying detailed analysis that the proposed preferred option satisfies the RIT-D; and (v) if the proposed preferred option is for reliability corrective action and that option has a proponent, the name of the proponent	6
	(12) Contact details for a suitably qualified staff member of the RIT-D proponent to whom queries on the draft report may be directed.	1.2
	(13) if the estimated capital cost of the proposed preferred option is greater than $100 million (as varied in accordance with a cost threshold determination), include the RIT reopening triggers applying to the RIT-D project.	NA

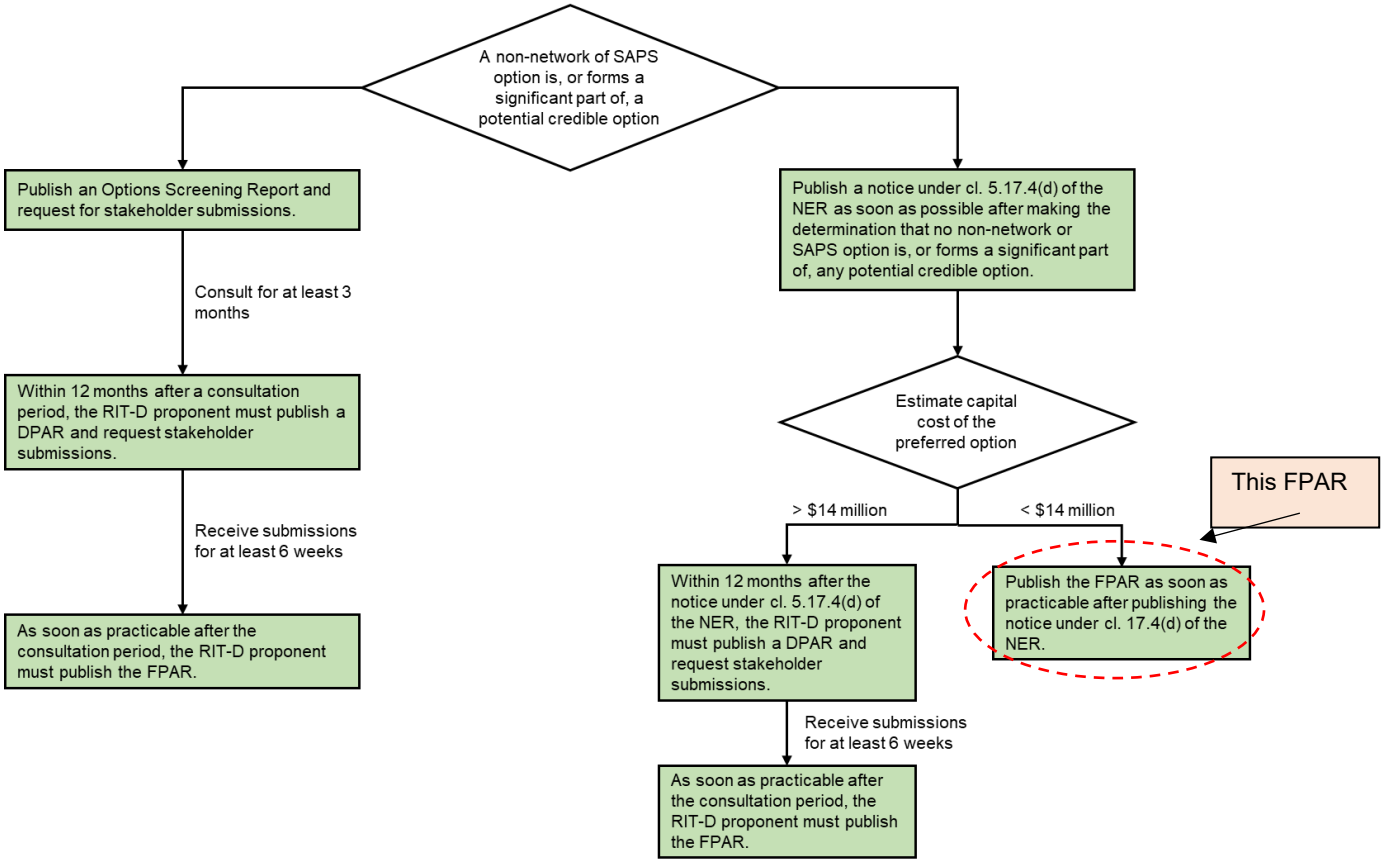
In addition, the table below outlines a separate compliance checklist demonstrating compliance with the binding guidance in the latest AER RIT-D guidelines relating to cost estimation (i.e., the new requirements added from the AER's review of the guidelines following the MCC Rule change).

Guidelines section	Summary of requirements	Section in the FPAR
3.2.5	A RIT-D proponent must consider social licence issues in the identification of credible options.	3.3
3.5A.1	Where the estimated capital costs of the preferred option exceeds $100 million (as varied in accordance with a cost threshold determination), a RIT–D proponent must, in a RIT-D application: • outline the process it has applied, or intends to apply, to ensure that the estimated costs are accurate to the extent practicable having regard to the purpose of that stage of the RIT-D • for all credible options (including the preferred option), either – apply the cost estimate classification system published by the AACE, or – if it does not apply the AACE cost estimate classification system, identify the alternative cost estimation system or cost estimation arrangements it intends to apply, and provide reasons to explain why applying that alternative system or arrangements is more appropriate or suitable than applying the AACE cost estimate classification system in producing an accurate cost estimate	NA
3.5A.2	For each credible option, a RIT-D proponent must specify, to the extent practicable and in a manner which is fit for purpose for that stage of the RIT-D: • all key inputs and assumptions adopted in deriving the cost estimate • a breakdown of the main components of the cost estimate • the methodologies and processes applied in deriving the cost estimate (e.g. market testing, unit costs from recent projects, and engineering-based cost estimates) • the reasons in support of the key inputs and assumptions adopted and methodologies and processes applied • the level of any contingency allowance that have been included in the cost estimate, and the reasons for that level of contingency allowance	3 & 4.3 3.1 & 3.2
3.5.5	The RIT-D proponent is required to provide the basis for any social licence costs in their RIT-D reports and may choose to refer to best practice from a reputable, independent and verifiable source.	NA –no material social licence costs are anticipated to be required
3.4.4 & 3.7.3	Where calculating the benefit from changes in Australia's greenhouse gas emissions, a RIT-D proponent is required to: • include the following emissions scopes, unless the change relative to the base case can be demonstrated to be immaterial to the RIT outcome: o direct emissions from generation o direct emissions other than from generation, e.g. sulphur hexafluoride. • estimate the change in annual emissions between the base case and the credible option, and multiplying this change by the annual VER to arrive at the annual benefit from changes in Australia's greenhouse gas emissions. A RIT-D proponent is required to use the prevailing VER under relevant legislation or, otherwise, in any administrative guidance that we may have published for assessing the changes in Australia's greenhouse gas emissions benefit class.	NA – see Appendix C

	Where emissions beyond CO2 are changed by a credible option, the RIT-D proponent is required to convert alternative forms of emissions to CO2-e.	
3.8.1	Where the estimated capital cost of the preferred option exceeds $100 million (as varied in accordance with an applicable cost threshold determination), a RIT-D proponent must undertake sensitivity analysis on all credible options, by varying one or more inputs and/or assumptions.	NA
3.9.4	If a contingency allowance is included in a cost estimate for a credible option, the RIT-D proponent must explain: • the reasons and basis for the contingency allowance, including the particular costs that the contingency allowance may relate to, and • how the level or quantum of the contingency allowance was determined.	NA
3.11.2	For a proposed concessional finance agreement to be included in the RIT stage of a project, a proponent is required to have, and provide, reasons and evidence to explain why they are confident the agreement is likely to be executed. The proponent is required to also provide details about the benefit to be shared with consumers, including about how the sharing of that benefit will occur, along with supporting evidence and information to substantiate these matters. If a proponent seeks to include an unexecuted concessional finance agreement in the RIT-D, they must undertake sensitivity testing for the scenario the agreement doesn't eventuate.	NA
4.1	RIT-D proponents are required to describe in each RIT-D report: • their assessment of the requirement for community engagement, including reasons for that assessment, and • as applicable: – how they have engaged with community stakeholders and sought to address any relevant concerns identified through this engagement – how they plan to engage with these stakeholder groups	3.3

Appendix B – Process for implementing the RIT-D

For the purposes of applying the RIT-D, the NER establishes a typical three-stage process: (1) the Non-Network Options Report (or notice circumventing this step); (2) the DPAR; and (3) the FPAR. This process is summarised in the figure below.



Appendix C – Market benefit classes considered not material

The market benefits that Ausgrid considers will not materially affect the outcome of this RIT-D assessment include:

- changes in voluntary load curtailment;
- changes in costs to other parties;
- changes in load transfer capacity and capacity of embedded generators to take up load;
- option value;
- changes in electrical energy losses; and
- changes in Australia's greenhouse gas emissions.

The reasons why Ausgrid considers that each of these categories of market benefit is not expected to be material for this RIT-D are outlined in the table below.

Table C.1 – Market benefit categories under the RIT-D not expected to be material

Market benefits	Reason for excluding from this RIT-D
Changes in voluntary load curtailment	The level of voluntary load curtailment currently present in the National Electricity Market is limited. Where the implementation of a credible option affects pool price outcomes, and in particular results in pool prices reaching higher levels on some occasions than in the base case, this may have an impact on the extent of voluntary load curtailment. None of the options in this RIT-D are expected to affect the pool price and so there is not expected to be any changes in voluntary load curtailment.
Costs to other parties	This category of market benefit typically relates to impacts on generation investment from the options. The options in this RIT-D will not affect the wholesale market and so we have not estimated this category of market benefit.
Changes in load transfer capacity and embedded generators	Under Option 1, there is no material change in load transfer capacity or capacity of embedded generators to take up load. Under Option 2, new 11kV cables would be installed between Botany ZS and Port Botany ZS, which would keep the capacity of the 11kV network but reduce capacity at Botany ZS as the old switchgear would be retired. As this option is taking advantage of existing surplus capacity at Port Botany ZS, no additional benefits (or disbenefits) are created in this network area.
Option value	Option values arise where there is uncertainty regarding future outcomes, the information that is available in the future is likely to change, and the credible options considered have sufficiently flexible to respond to that change. The credible options assessed do not involve stages or any other flexibility and so we do not consider that option value is relevant.
Changes in electrical energy losses	Ausgrid does not expect that the credible options considered will lead to significant changes in network losses and so have not estimated this category of market benefits.
Changes in Australia's greenhouse gas emissions	Whilst non-sulphur hexafluoride (SF6) switchgear will be installed at Botany ZS under the preferred option, none of the options are expected to result in materially different levels of greenhouse gas emissions (including sulphur hexafluoride (SF6) emissions), as they do not affect either the pattern of generator dispatch in the wholesale market or the level of expected SF6 leakages from network assets.

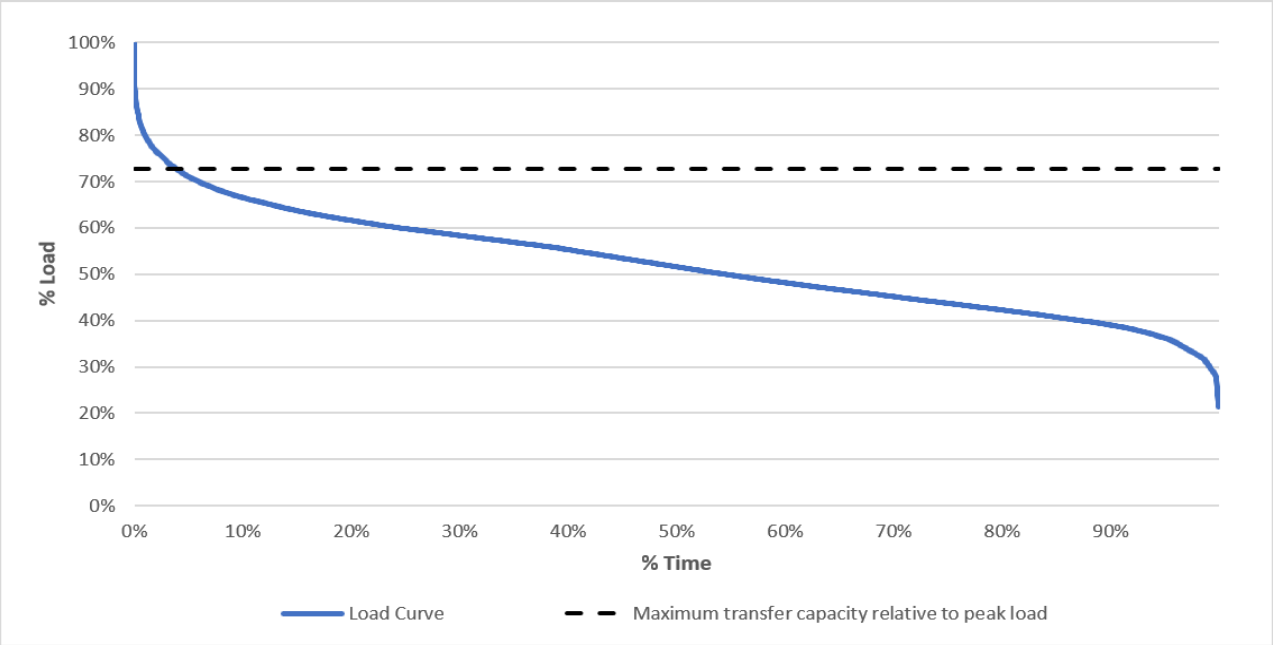
Appendix D – Additional detail on the assessment methodology

This appendix provides additional detail on assumptions used in the evaluation of the base case and the credible options.

D.1 Characteristic load duration curve

The load duration curve used in the analysis is presented in the figure below. It is assumed that the load types supplied will not change substantially into the future and therefore the load duration curve will maintain its characteristic shape.

Figure D.1 – Load duration curve



D.2 Load transfer capacity and supply restoration

Botany ZS load area is classified as urban and has 11kV interconnections with Green Square, Maroubra, Mascot, Matraville and Port Botany zone substations. In the event of a total loss of supply to Botany ZS, approximately 73 per cent of peak load can be recovered within days via the load transfer capacity of the existing network.

In the event of an equipment outage, the network may be returned to a normal configuration by one of the following actions:

- repairing the failed equipment
- initiating a contingency plan
- replacing the failed equipment with spares.

The assumed supply restoration actions and the time taken to implement the action are detailed in the table below. These actions are the most likely actions for the contingencies considered in this planning study.

Table D.1: Equipment outage assumptions

Equipment outage	Action	Outage duration (Days)
Transformer/Feeder Panel	Time between failure and access	1
	Time to undertake causal analysis	1
	Time to engineer solution (T&D Engineering)	1
	Time to manufacture/repair engineered solution	6
	Time to implement engineered solution	6
	Ancillary Work - testing etc.	2
	Total - MAJOR FAILURE	**17**
	Total - MINOR FAILURE	**8.5**

D.3 Safety risk assumptions

Safety risk costs are predicated on the consequence of a severe safety event occurring, the probability of exposure to the consequence of a severe safety event, and the probability of failure.

Ausgrid estimates the consequence of a severe safety event occurring to be $5.87 million for an event (Value of Statistical Life updated by the Australian Government in January 2026, escalated to 2025/26 dollars), which reflects the severe consequence of an explosive failure of switchgears at Botany ZS that would lead to a number of fatalities. A gross disproportion factor of 6 is used, which is accepted practice for balancing workers and public safety risks.

The probability of exposure to a severe event is estimated to be 0.0137 annually. This is made up of 150 site visits for eight-hour periods each (1,200 hours annually), which translates to a probability of 0.1370 and given that only 10 per cent of the exposure is categorised as severe, the resulting probability of exposure to a severe event is 0.0137 annually. This probability of exposure is multiplied by the probability of occurrence of equipment failure described below.

D.4 Probability of failure

Ausgrid has adopted probability models to estimate expected failure of different network assets. A summary of the models adopted, and the key parameters used are summarised in the table below.

Table D.2 – Summary of failure probability models used to estimate failure probability.

Network asset type	Failure probability model	Key parameters
11kV switchgear	Weibull analysis	Age of switchboard. Age of functional failure of failed switchboard. Age of retirement for switchboard that were retired before the point of failure.

The failure rate of the switchgear equipment is expressed in terms of the Weibull distribution parameters given below.

Table D.3 – Parameters for the Weibull analysis

Equipment	Condition	Shape	Scale
11kV compound-insulated switchgear	Poor	6.06	90.3

The following equation is used to calculate the yearly major failure rates based on the Weibull parameters.

Equation 1

$$f = \left(\frac{\beta}{\mu}\right) \times \left(\frac{t}{\mu}\right)^{(\beta-1)}$$

Where:

f is the failure rate
t is the age (in years)
β is the shape parameter
μ is the scale parameter

Equation 2 shows how the failure rate is used to calculate unavailability for failures.

Equation 2

$$U = \frac{f \times MTTR_{weeks}}{52 + f \times MTTR_{weeks}}$$

Where:

f is the failure rate
$MTTR_{weeks}$ is the mean time to repair (in weeks)

Unavailability of each network element is calculated for pre and post switching scenarios, by using Equations 3 and 4.

Equation 3

$$Pre - switching\ unavailability = \frac{8760 \times f \times r_s}{f \times r_r + 8760}$$

Equation 4

$$Post - switching\ unavailability = \frac{8760 \times f \times (r_r - r_s)}{f \times r_r + 8760}$$

Where:

f is the failure rate
r_s is the switching time (in hours)
r_r is the repair time (in hours)]

D.5 Direct costs of equipment failures

For the purposes of estimating reactive maintenance (repair) costs, it is assumed that equipment outages have direct costs as per the table below. All costs have been escalated to 2025/26 real dollars for the purposes of this RIT-D.

For switchboard failures, these costs are based on the estimated cost of implementing the contingency plans described above. This cost includes 11 kV feeder connections, protection and earthing designs, delivery costs and labour rates.

Table D.4: Direct costs of equipment outages

Equipment outage		Direct cost ($)
Feeder Panel	Time between failure and access	2,320
	Time to undertake causal analysis	8,000
	Time to engineer solution (T&D Engineering)	8,640
	Time to manufacture/repair engineered solution	16,800
	Time to implement engineered solution	71,040
	Ancillary Work - testing etc.	70,000
	Return to Service (RTS)	5,120
	Total - MAJOR FAILURE	**181,920**
	Total - MINOR FAILURE	**90,960**


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