Addressing increased customer demand in the Circular Quay load area

DRAFT PROJECT ASSESSMENT REPORT

02 June 2023

Ausgrid

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Addressing increased customer demand in the Circular Quay load area

Draft Project Assessment Report – June 2023

Contents

Executive Summary

This report represents the second step in the application of the RIT-D to address an expected capacity constraint in the Circular Quay load area

Forecast electricity demand in the Circular Quay load area has increased significantly in recent years as the Sydney CBD goes through a period of substantial change and regeneration. In tandem with this changing demand, the Dalley St Zone Substation (ZS), which is currently one of the zone substations supplying the Circular Quay load area, is due to be decommissioned in December 2024 due to its age and deteriorating condition.

Given the increasing electricity demand in the Circular Quay load area, both current and forecast, Ausgrid considers that if action is not taken, there will be significant load that cannot be supplied following the decommissioning of Dalley St ZS.

Ausgrid has therefore commenced this Regulatory Investment Test for Distribution (RIT-D) to assess options for meeting the changing customer requirements in the Circular Quay load area going forward.

This Draft Project Assessment Report (DPAR) has been prepared by Ausgrid and represents the second step in the application of the RIT-D to options for ensuring reliable electricity supply to the Circular Quay load area in the Sydney CBD. It follows publication of the Options Screening Notice for this RIT-D.

The 'identified need' for this RIT-D is to ensure reliable supply to, and connect new customers in, the Circular Quay area

A critical assumption underpinning the identified need for this RIT-D is the changing load in and around Circular Quay. Specifically, there are a number of newly connected loads, committed loads and forecast loads in the area that are driving the need for investment, as summarised in the table below.[1]

Table E-1 – Key drivers of increased load in the Circular Quay area – forecast substation load

Distribution Substation location	Load (MVA)	Connection/anticipated date
	Commissioned loads	
Pitt Street & Rugby Place	1.65	June 2022
Pitt Street & Rugby Place	1.65	June 2022
	Committed loads	
Pitt Street & Rugby Place	1.53	March 2024
Dalley & Pitt streets	1.82	December 2024
Dalley & Pitt streets	1.82	December 2024
	Forecast loads	
Site 1	3.09	December 2027
Site 2	1.54	December 2027
Site 3	3.09	December 2027
Site 4	3.10	December 2027

Ausgrid is required to connect customers under section 5.2.3(d) of the National Electricity Rules (NER), which state that "A Network Service Provider must:

> (1) Review and process applications to connect or modify a connection which are submitted to it and must enter into a connection agreement…
> (6) Permit and participate in commissioning of facilities and equipment which are to be connected to its network in accordance with rule 5.8;"

The timing of the identified need for this RIT-D, and so the required timing for credible options to address the need, is determined by when the load requiring connection is expected to exceed the existing network capacity. This is currently anticipated to be 2024/25, based on the planned connection of already committed loads.

We consider the identified need for this investment to be a 'reliability corrective action' under the RIT-D since investment is required to comply with the above NER obligations.

[1] Please note that this table shows total load forecast at a number of specific substation sites (i.e., as opposed to the underlying spot load developments themselves) and that all forecast loads have had their names and locations redacted due to confidentiality.

Two credible options have been assessed

Ausgrid has identified two credible network options during the planning stage to address the identified need. The options involve the installation of new circuits connected to the City North ZS in different configurations. The two credible options we have assessed are summarised below in Table E-2.

Table E-2 – Credible network option assessed, $2022/23

Option	Description	Capital cost	Commissioning
Option 1	Construct three new circuits	$15.0m	2024/25
Option 2	Construct two new circuits initially (followed by a third circuit later if required)	$13.1m $3.2m for a third circuit	2024/25 for the two circuits 2027/28 for the third circuit

Ausgrid also considered other network options, but they were found to be technically or economically unfeasible.

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

Ausgrid has considered the ability of non-network and stand-alone power system (SAPS) solutions to assist in meeting the identified need. Specifically, an analysis of non-network options and SAPS considered how demand management could defer the timing of the preferred network solution and whether the estimated unserved energy at risk could be cost effectively reduced. An assessment of demand management options has shown that non-network 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 unserved energy that the identified network option allows to be avoided, compared to the base case, and the cost of demand management solutions. This is detailed further in the separate Options Screening Notice released in accordance with clause 5.17.4(d) of the NER.

Three demand forecast 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.

Ausgrid has assessed three alternative future load demand scenarios – namely:

- high demand scenario – commissioned and committed loads at proposed dates, as well as forecast loads at the proposed dates with a 51% forecasting scaling factor;
- central demand scenario – commissioned and committed loads at proposed dates, as well as forecast loads at the proposed dates with a 31% forecasting scaling factor; and
- low demand scenario – commissioned and committed loads at proposed dates but no forecast load over the assessment period.

The scenarios only differ by the demand forecasts given this is the key parameter that may affect the ranking of the credible options. How the results are affected by changes to other variables (i.e., the discount rate and capital costs) have been investigated in the sensitivity analysis. A summary of the key variables in each scenario is provided in the table below.

Table E-3 – Summary of the three scenarios investigated

Variable	Scenario 1 – central demand scenario	Scenario 2 – low demand scenario	Scenario 3 – high demand scenario
Demand	Central demand forecast (as outlined in section 2.4.1)	Low demand forecast (as outlined in section 2.4.1)	High demand forecast (as outlined in section 2.4.1)
VCR	$68.40/kWh across all scenarios		
Discount Rate	3.44% across all scenarios		

Option 1 is the preferred option that satisfies the RIT-D at the draft stage

Ausgrid considers that Option 1 is the preferred option that satisfies the RIT-D. Ausgrid is the proponent for Option 1.

In all scenarios, both options have near-identical estimated net market benefits. On a weighted basis, the difference in the net benefits between the options is only $290,000 or 0.06 per cent of the net market benefits for Option 1.[2]

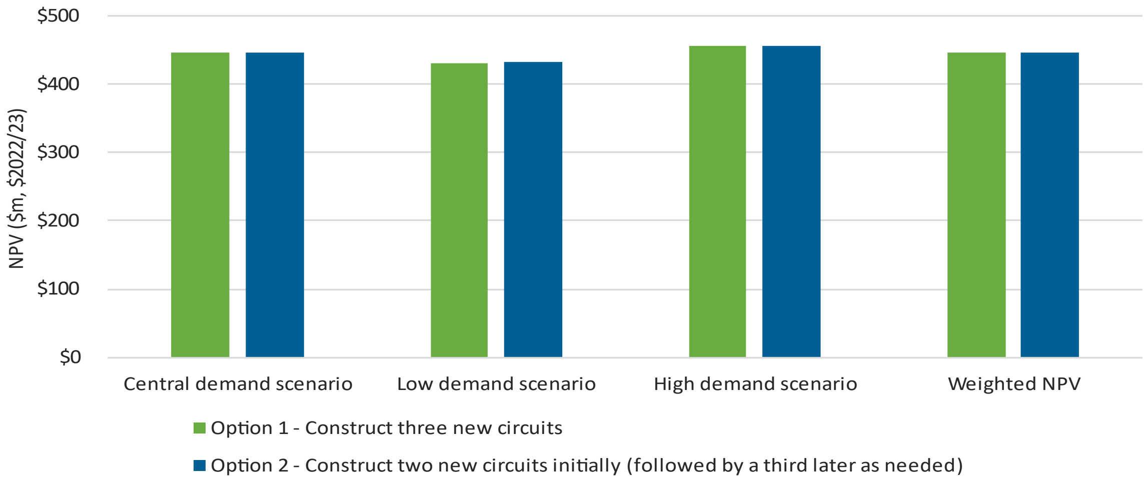
The results of the Net Present Value (NPV) assessment for the two credible options on a scenario-weighted basis are presented below in Table E-4.

Table E-4 – Summary of the NPV assessment weighted across the scenarios

Option	PV benefits	PV costs	Net benefits	Rank
Option 1	461.1	-13.7	447.5	1
Option 2	461.1	-14.0	447.2	2

The results of the NPV assessment for the two credible options for each scenario are shown in the figure below.

Figure E-1: Present value of net benefits by scenario, $m 2022/23



Overall, Option 1 is considered the proposed preferred option for this RIT-D since, in addition to a marginally higher net market benefit on a weighted basis, it provides several benefits over Option 2 that have not been directly captured in the RIT-D assessment but are none the less important. These qualitative benefits include:

- minimised disruption in the CBD from excavation and road closures as a result of the simultaneous installation of all three circuits;
- the ability to supply large CBD loads earlier, thereby reducing the risk that a third circuit will not be available when needed (e.g., if forecast loads request to connect sooner than currently expected); and
- the capacity to supply an increase in demand above the current commissioned and committed loads, which is likely needed given there are currently multiple forecast loads in the CBD area.

In addition, additional threshold testing undertaken as part of this DPAR finds that:

- the low demand scenario would need to be given a scenario weighting of at least 28.8 per cent for Option 2 to have the same net market benefits as Option 1 on a weighted basis; and
- under the low demand scenario, Option 2 is preferred to Option 1 by approximately $1.7 million in present value terms. This difference represents 25MWh of avoided EUE, or approximately 0.05 per cent of the additional load forecast under the central demand scenario. Therefore, only a small amount of additional forecast load would be required for Option 1 to be preferred to Option 2 under the low demand scenario.

These tests highlight that Option 1 should be considered preferred over Option 2. Specifically, applying such a high weighting to the low demand scenario seems unrealistic given how advanced the four forecast loads are and, irrespective of increasing the weighting applied to this scenario, only a small amount of forecast load is required to connect in order for Option 1 to be preferred.

The estimated capital cost of Option 1 is $15.0million, and commissioning is assumed in 2024/25. Planned maintenance costs are expected to be minimal (approximately $10,000 per year) since the circuits are located underground.

[2] The quoted difference in net benefits here takes account of the 'capped' avoided unserved energy (outlined in section 2.4.1). If the uncapped avoided unserved energy is used, the percentage difference between the two options is even less.

How to make a submission and next steps

This DPAR represents the second step in the application of the RIT-D to options for ensuring reliable electricity supply to the Circular Quay load area.

Ausgrid welcomes written submissions on this DPAR. Submissions are due on 14 July 2023 and should be addressed to:

Matthew Webb
Head of Asset Investment
Ausgrid
GPO Box 4009
Sydney 2001

Or

email to: assetinvestment@ausgrid.com.au

Submissions will be published on the Ausgrid website. If you do not want your submission to be publicly available, please clearly stipulate this at the time of lodgement.

The next step of this RIT-D involves publication of a Final Project Assessment Report (FPAR). The FPAR will update the assessment of the net benefit associated with different investment options, in light of any submissions received on this DPAR. Ausgrid intends to publish the FPAR as soon as practicable after submissions are received on this DPAR.

1 Introduction

This Draft Project Assessment Report (DPAR) has been prepared by Ausgrid and represents the second step in the application of the Regulatory Investment Test for Distribution (RIT-D) to options for addressing increased customer demand in the Circular Quay load area in the Sydney CBD. It follows publication of the Options Screening Notice for this RIT-D.

Forecast electricity demand in the Circular Quay area has increased in recent years as the Sydney CBD goes through a period of substantial change, compounded by planning changes which have resulted in an increase in the height of developments permitted. The City of Sydney's *Central Sydney Planning Strategy* recognises the CBD's role in the continued growth and economic success of wider Sydney and notes changes to:[3]

- introduce a new planning pathway for building heights and densities above established maximum limits; and
- increase building height limits from 80 to 110 metres along the western edge of the CBD.

In addition, the Sydney Metro (with CBD services scheduled for 2024) has enabled 'over station' developments that include commercial precincts and residential premises[4], which are expected to add electricity demand in the coming years.

In tandem with this changing demand, the Dalley St Zone Substation (ZS), which is one of the substations supplying the Sydney CBD, is due to be decommissioned in 2024 due to its deteriorating condition. A RIT-D undertaken by Ausgrid in 2018 to address condition issues at Dalley St and City East ZS's (commissioned in 1969 and 1964, respectively) concluded that the preferred option was to decommission both, and transfer load to Belmore Park and City North ZS's.

If action is not taken, there will be load that cannot be supplied following the decommissioning of Dalley St ZS. Ausgrid has commenced this RIT-D to assess options for meeting changing customer demand in the Circular Quay area going forward.

Ausgrid has determined that non-network or 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 draft report

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

- describe the identified 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 has determined that classes of market benefits or costs do not apply to the 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 at this draft stage.

The next (and final) stage of this RIT-D involves publication of a Final Project Assessment Report (FPAR). The FPAR will update the quantitative assessment of the net benefit associated with the investment options, in light of any submissions received on this DPAR. The entire RIT-D process is detailed in Appendix B.

1.2 Submissions and quieries

Ausgrid welcomes written submissions on this DPAR. Submissions are due on 14 July 2023 and should be addressed to:

Matthew Webb
Head of Asset Investment
Ausgrid
GPO Box 4009
Sydney 2001

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email to: assetinvestment@ausgrid.com.au

Submissions will be published on the Ausgrid website. If you do now want your submission to be publicly available, please clearly stipulate this at the time of lodgement.

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[3] City of Sydney, *Central Sydney Planning Strategy: 2016 to 2035*, Updated 15 March 2022, pages 13 and 19 (see: https://www.cityofsydney.nsw.gov.au/strategic-land-use-plans/central-sydney-planning-strategy).

[4] For example, see: https://www.planning.nsw.gov.au/assess-and-regulate/state-significant-projects/sydney-metro/pitt-street-over-station-developments/pitt-street-north-over-station-development, accessed 15 May 2023.

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 a number of key assumptions underlying the identified need.

2.1 Overview of the Circular Quay load area and existing supply arrangements

The Circular Quay network area is part of Ausgrid's 11 kV Sydney CBD network that serves customers in the area bounded between Barangaroo, Sydney Harbour, Darling Harbour, Central Railway Station and the Domain. The Sydney CBD is the commercial heart of Sydney and contains a significant concentration of office buildings, commercial businesses and apartments that all use substantial amounts of electricity. The peak demand for the Sydney CBD area is currently approximately 350 MVA in the summer, driven predominantly by air-conditioning.

The Sydney CBD load area is currently served by six ZS, the oldest two of which are in the process of being decommissioned (as outlined below). A summary of each ZS is provided in Table 2-1 below.

Table 2-1: Summary of ZS serving Sydney CBD

ZS	Voltage (kV)	Capacity (MVA)	Commissioning year	Retirement date
City North	132/11	168	2010	-
City Central	132/11	128	2002	-
City South	132/11	130	1976	-
Belmore Park	132/11	126	2013	-
City East	33/11	71	1964	March 2024
Dalley St	132/11	124	1969	December 2024

Sydney CBD ZS are supplied via Transgrid's Haymarket bulk supply point (BSP) and the Beaconsfield BSP, together with Ausgrid's Inner Metropolitan Transmission network that includes supply from Rozelle and Lane Cove sub-transmission substation (STSS).

Ausgrid is currently in the process of decommissioning the Dalley St ZS and City East ZS due to deteriorating condition issues associated with assets reaching the end of their serviceable lives. Specifically:

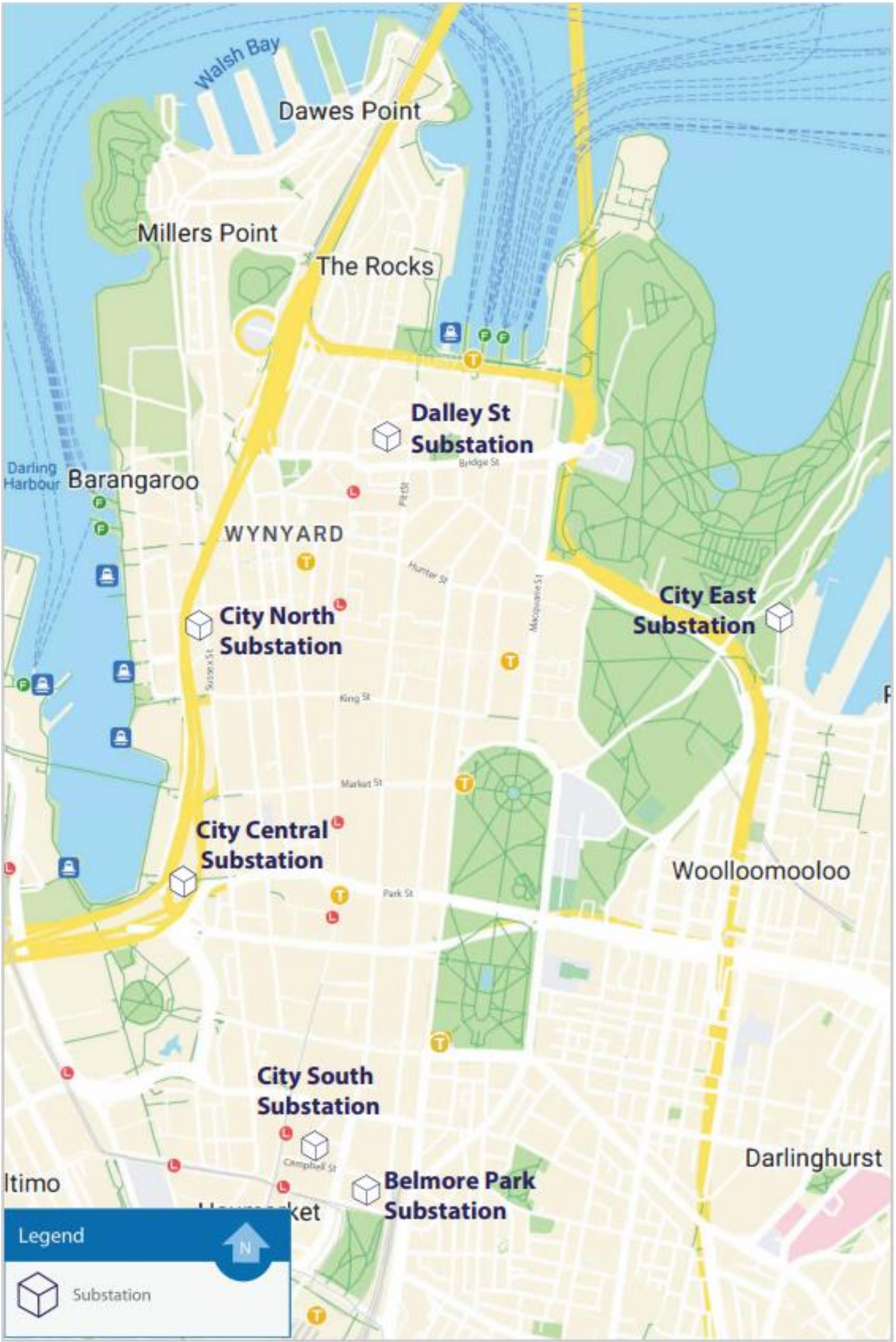
- Dalley St ZS utilises aging compound filled insulted switchgear that has exhibited poor performance including failure. Further, many other components in the substation are reaching the end of their serviceable lives and consist of obsolete technology, increasing the difficulty of remediation in event of failure; and
- City East ZS utilises obsolete oil and bitumen insulated technology and the substation is exposed to fire-related risk in the event of failure.

In 2018, in response to condition issues and the increasing probability of loss of supply to customers, Ausgrid undertook a RIT-D to investigate options for ensuring reliable supply in the Sydney CBD area.[5] The preferred option identified consisted of load transfers from the Dalley St ZS and City East ZS to the Belmore Park ZS through the installation of new copper cables, and subsequent decommissioning of the Dalley St ZS and City East ZS. Decommissioning of the Dalley St ZS and City East ZS is currently underway and is expected to be complete by March 2024 and December 2024, respectively.

An overview of the current Sydney CBD network area is presented in Figure 2-1 below.

[5] Ensuring reliability requirements in the Sydney CBD – Final Project Assessment Report, 8 June 2018.

Figure 2-1: Overview of the current Sydney CBD network area



2.2 Changing customer requirements in the Circular Quay network area

In recent years, there has been extensive redevelopment in the Circular Quay load area and a resulting increase in customer loads on feeders currently supplied from the Dalley St ZS.

Ausgrid has observed an increase in the number and scale of large customer load connection applications, with up to two substations now being installed in buildings where previously only one would have been typical. This trend can generally be attributed to the redevelopment of buildings that surpass the height of their predecessors with this trend expected to continue given Sydney CBD's natural containment.

The City of Sydney's *Central Sydney Planning Strategy* notes changes to:[6]

- introduce a new planning pathway for building heights and densities above established maximum limits; and
- increase building height limits from 80 to 110 metres along the western edge of the CBD.

Both changes in the planning arrangements have resulted in greater expected electricity demand in the Circular Quay load area.

In addition, the development of the Sydney Metro (with CBD services scheduled for 2024) and its stations have resulted in several 'over station' developments that include large commercial precincts and residential premises.[7] These developments have started to add significant electricity demand in the Circular Quay load area, which is expected to continue in the near future.

Due to increased load from newly connected customers and new committed developments, Ausgrid has determined that under a 'do-nothing' base case, there will be insufficient capacity to supply several distribution substations under normal operating conditions (i.e., under N conditions) following the retirement of, and consequent reduction in capacity available from, the Dalley St ZS. In addition, we consider that if action is not taken, there will be an inability to meet projected future loads that may also request to connect.

Ausgrid has therefore initiated this RIT-D to investigate, and consult on, how to most efficiently provide supply to the Circular Quay network area in light of forecast demand and the retirement of the Dalley ST ZS.

2.3 Summary of the 'identified need'

The addition of several newly connected customers and new committed developments, as well as further potential forecast loads, is driving the identified need for this RIT-D. The following section details these load developments, and the Expected Unserved Energy (EUE) if no action is taken (i.e., under a 'do-nothing' base case) under different demand scenarios.

Ausgrid is required to connect customers under section 5.2.3(d) of the National Electricity Rules (NER), which state that "A Network Service Provider must:

> (1) Review and process applications to connect or modify a connection which are submitted to it and must enter into a connection agreement…
> (6) Permit and participate in commissioning of facilities and equipment which are to be connected to its network in accordance with rule 5.8;"

We therefore consider the identified need for this investment to be a 'reliability corrective action' under the RIT-D since investment is required to comply with the above NER obligations.

The timing of the identified need for this RIT-D, and so the required timing for credible options to address the need, is determined by when the load requiring connection is expected to exceed the existing network capacity. This is currently anticipated to be 2024/25, based on the connection of already committed loads.

2.4 Key assumptions underpinning the identified need

This section summarises the key assumptions underpinning the identified need for this RIT-D.

[6] City of Sydney, *Central Sydney Planning Strategy: 2016 to 2035*, Updated 15 March 2022, pages 13 and 19 (see: https://www.cityofsydney.nsw.gov.au/strategic-land-use-plans/central-sydney-planning-strategy).

[7] For example, see: https://www.planning.nsw.gov.au/assess-and-regulate/state-significant-projects/sydney-metro/pitt-street-over-station-developments/pitt-street-north-over-station-development, accessed 15 May 2023.

2.4.1 Forecast load

A critical assumption underpinning the identified need for this RIT-D is the changing load in and around Circular Quay. Specifically, there are a number of newly connected loads, committed loads and forecast loads in the area that are driving the need for investment, as summarised in Table 2-2 below.

Please note that Table 2-2 below shows *total load forecast* at a number of specific substation sites (i.e., as opposed to the underlying spot load developments themselves) and that all forecast loads have had their names and locations redacted due to confidentiality.

Table 2-2 – Key drivers of increased load in the Circular Quay area – forecast substation load

Distribution Substation location	Load (MVA)	Connection/anticipated date
	Commissioned loads	
Pitt Street & Rugby Place	1.65	June 2022
Pitt Street & Rugby Place	1.65	June 2022
	Committed loads	
Pitt Street & Rugby Place	1.53	March 2024
Dalley & Pitt streets	1.82	December 2024
Dalley & Pitt streets	1.82	December 2024
	Forecast loads	
Site 1	3.09	December 2027
Site 2	1.54	December 2027
Site 3	3.09	December 2027
Site 4	3.10	December 2027

The two commissioned loads consist of commercial developments currently serviced from the Dalley St ZS. They were connected at a time when the detailed design and engineering work to decommission the ZS was nearly complete and undergoing final approval.

The three committed loads listed in the table above are also commercial developments and meet the NER criteria to be considered as committed. All proponents have either commenced construction works or there is a firm connection date that has been provided to Ausgrid.

The four forecast loads represent separate customers/developments. Two of these are 'over station' metro developments, while the other two are separate commercial developments. While the loads do not yet meet the NER criteria to be considered as committed or anticipated loads at this stage, Ausgrid considers that there is a high likelihood that these loads will develop in the future.

The key uncertainty for this RIT-D relates to the four forecast loads noted above. While these developments have a high chance of occurring, their ultimate load take-up is uncertain at this point in time. We have therefore reflected this uncertainty in the demand scenarios used for this RIT-D, which is discussed further in Section 4.5 and can be summarised as follows:

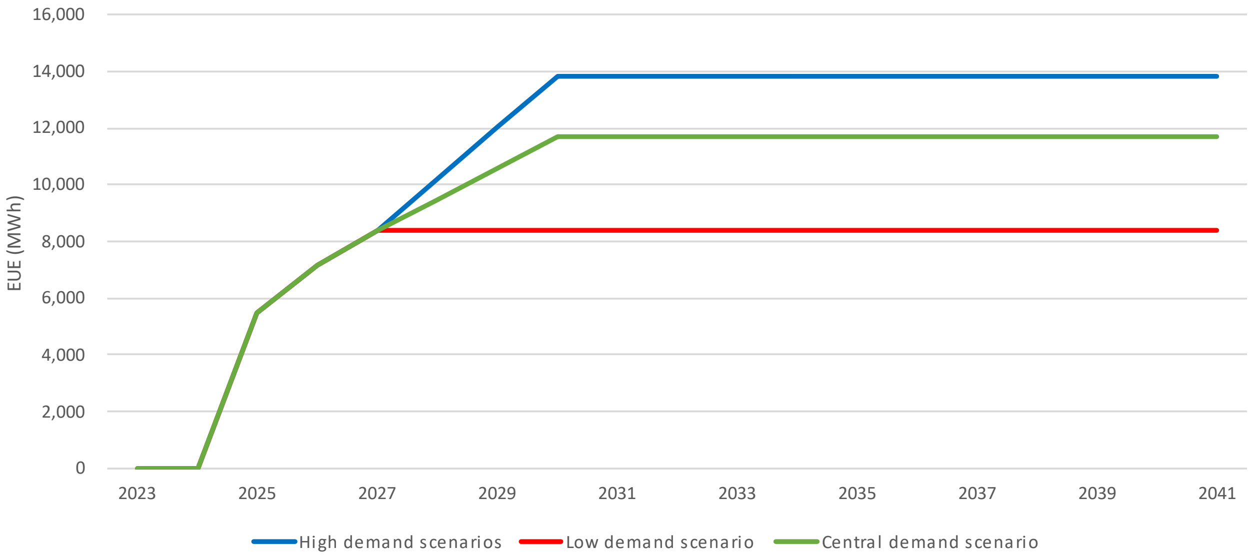
- high demand scenario – commissioned and committed loads at proposed dates, as well as forecast loads at the proposed dates with a 51% forecasting scaling factor;
- central demand scenario – commissioned and committed loads at proposed dates, as well as forecast loads at the proposed dates with a 31% forecasting scaling factor; and
- low demand scenario – commissioned and committed loads at proposed dates but no forecast load over the assessment period.

In Ausgrid's experience, developments similar to the forecast loads typically ramp up over a period of three years. A ramp up of three years has therefore been assumed for these loads in the modelling in this DPAR for the central and high demand scenarios.

The low demand scenario is considered a conservative forecast and assumes that none of the forecast loads connect. This forecast tests the sensitivity of the preferred option to the level of forecast customer demand included in the demand scenarios.

The figure below shows the assumed levels of EUE in the base case under each of the three underlying demand scenarios investigated over the next twenty years. For clarity, this figure illustrates the MWh of unserved energy if no investment is undertaken (i.e., a 'do-nothing' base case), as these loads will not be able to be supplied following the decommissioning of the Dalley St Zone Substation in December 2024.

Figure 2-2 – Forecast EUE in the base case under each of the three demand scenarios



Ausgrid considers that a base case that reflects a 'do nothing' approach with significant volumes of EUE is unrealistic since action would have been taken to provide a solution. However, this base case forms the point of reference under the RIT-D against which options are assessed.

3 Two credible options have been assessed

This section provides details of the credible options that Ausgrid has identified as part of its network planning activities to date. All costs and benefits presented in this DPAR are in $2022/23, unless otherwise stated.

3.1 Option 1 – Construct three new circuits

Option 1 involves forming three new circuits at the City North ZS in the vicinity of George and Alford Streets to cater for loads on Pitt Street. This option includes installing three circuits simultaneously to meet future forecasts of customer load and minimises the disruption to residents and businesses in the CBD.

Specifically, the scope of this option includes the following civil works:

- install a 16x125mm ductline from City North ZS to High Voltage (HV) Pit.50268 in Hickson Road;
- install a 16x125mm ductline from HV Pit.27979 in Hickson Road to Substation 6062 at Barangaroo Point, and from HV Pit.50014 in Hickson Road to the vicinity of Substation 4793 Hickson Road/Windmill Street;
- install an 8x125mm ductline from HV Pit.50015 in Hickson Road to HV Pit.50003 at Windmill Steps; and
- install an 8x125mm ductline from HV Pit.50004 at the top of the Windmill Steps to HV Pit.50125 in Argyle Street near Substation 6869 Cumberland Street/Argyle Street.

The combined length of these ductlines is 1.2kms. In addition, the following bulk cable laying works are required:

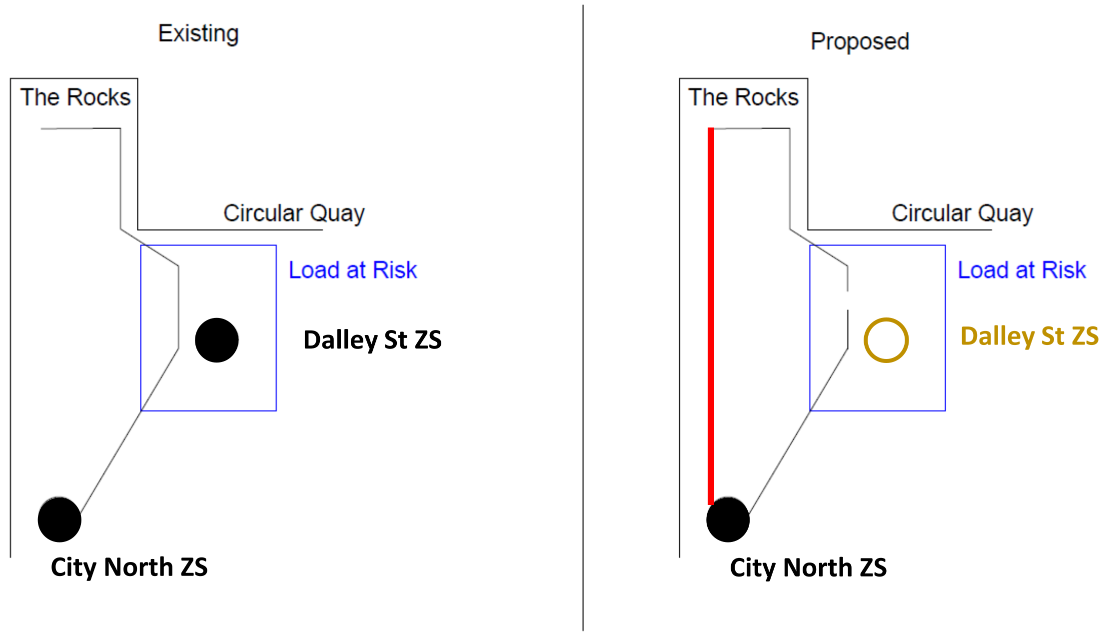
- lay 9x300mm2 Cu triplex cables and inter-lock pilots from City North ZS to HV Pit.50014; and
- lay 6x300mm2 Cu triplex cables and inter-lock pilots from HV Pit.50014 to HV Pit.50125.

After that, connection works will be undertaken to form three new circuits (66KLM, 67KLM and 68ABC), and reconfiguration work to circuits 64ABC and 62KLM at City North via Hickson Road to enable the transfer of circuits 33KLM and 37DEF at Dalley St ZS to City North ZS.

This option takes advantage of Barangaroo Central and the Sydney Metro developments under construction so that this area will have less traffic (road and pedestrian), and reduced reinstatement and traffic control costs.

A schematic diagram of the proposed option is presented in the figure below, with the new circuits shown in red.

Figure 3-1: Schematic diagram of proposed new circuits



Note: This example is not to scale, the feeder routes and equipment locations shown are to illustrate the project.

The estimated capital cost of this option is $15.0 million, and commissioning is assumed in 2024/25. Planned maintenance is expected to be minimal since all circuits are underground. An estimate of $10,000 per year is considered to cover switching operations.

3.2 Option 2 – Construct two new circuits initially and a third later if required

This option involves the installation of two new circuits at the City North ZS, with a third circuit (i.e., circuit 68 ABC) installed later. The scope is identical to Option 1 except for the timing of circuit 68ABC, to allow for the benefits from deferring the building of one circuit to be compared to the efficiency savings from building all three circuits simultaneously.

The trigger for a third feeder is the connection of forecast load, which depends on the demand scenario considered. For instances:

- under the low demand scenario, a third feeder is never required since all commissioned and committed loads at Circular Quay can be accommodated by two circuits;
- under the central demand scenario, a third feeder is required by 2027/28 since this is the point at which the two circuits are unable to serve additional forecast load under this scenario; and
- under the high demand scenario, a third feeder is required in 2027/28 since this is the point at which the two circuits are unable to serve additional forecast load under this scenario.

The initial capital cost of this option is $13.1 million, and commissioning is assumed in 2024/25. The third feeder has an expected cost of $3.2 million (with the timing of the third feeder depending on the scenario, as outlined in section 2.4). Initial planned maintenance costs are estimated at $15,000 per year for Option 2, which are marginally higher under this option than Option 1 since switching operations are slightly more complicated under a two-circuit configuration. Once the third feeder is installed, planned maintenance costs are reduced to $10,000 per year (i.e., the same as for Option 1).

Ausgrid considers that a significant drawback of this option is the negative community impact from increased disruption due to excavation and road closures if the third feeder is installed at a later date than the first two. After a decade of developments in the area, it is recognised that there is widespread community fatigue from continued construction.

3.3 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. The table below summarises Ausgrid's position on each of these potential options.

Table 3-1 – Options considered but not progressed

Option	Description	Reason why option was not progressed
Maintain a ZS at Dalley Street to accommodate new loads.	Refurbish the existing ZS, or build a new ZS to avoid transferring loads	Costs are substantially higher than credible options with no corresponding increase in benefits. The refurbishment costs would be similar to build a new substation (the 2018 RIT-D estimated this cost to be $155 million) and would require considerable time to be delivered. Therefore, this option is not considered commercially feasible.
Install new feeders from another zone substation	Transfer loads to Belmore Park ZS	Costs are substantially higher than credible options with no corresponding increase in benefits (preliminary costing show an approximate capital cost of $50 million). This option is therefore not considered to be economically feasible.
Non-network options	Using non-network solutions either in combination with, or in-place of, a network option.	Ausgrid has considered the ability of non-network solutions to meet the identified need. An analysis considered how demand management could defer the timing of the network solution and whether the EUE could be cost effectively reduced. The assessment has shown that non-network alternatives would not be cost effective due to the magnitude of the load reduction required. This is detailed further in the Options Screening Notice released in accordance with clause 5.17.4(d) of the NER.
SAPS options	Transferring and/or connecting customers to SAPS	Based on a trial of SAPS with selected customers living in fringe-of-grid areas of Ausgrid's network, the cost of SAPS would limit the number of customers available to reduce demand given deferral funds available and consequently, the reduction in demand would not be sufficient to defer the network solution. This is detailed further in the 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.

4.1 General overview of the assessment framework

All costs and benefits for each credible option have been measured against a 'do-nothing' base case. Under this base case, Ausgrid will have the inability to supply several distribution substations even with all assets in service (i.e., under N conditions), which is expected to result in substantial EUE based on current and committed loads alone.

The RIT-D analysis has been undertaken over a 20-year period, from 2022-23 to 2041-42. Ausgrid considers that a 20-year period 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 greater than 20 years, Ausgrid has taken a terminal value approach to incorporate capital costs in the assessment, which ensures that the capital cost is appropriately captured in the 20-year assessment period. This ensures that costs and benefits are assessed over a consistent period. The terminal value has been calculated as the undepreciated value of capital costs at the end of the analysis period.

Ausgrid has adopted a real, pre-tax discount rate of 3.44% for the NPV analysis. This represents Ausgrid's opportunity cost for its capital investments, based on the guidelines provided in the AER rate of return instrument. As no non-network options have been found to be viable, Ausgrid considers that appropriate discount rate is the regulated cost of capital.

To test the results against variations in the discount rate, a value of 2.34% has been adopted for the lower bound discount rate sensitivity, to reflect the average of the latest AER Final Decision for a DNSP's regulated weighted average cost of capital (WACC) at the time of preparing this DPAR.[8] This is approximately 32% lower than the central discount rate assumption. For the upper bound discount rate sensitivity, the value of 5.50% is adopted, in line with the estimate prepared and consulted on by AEMO for the 2022 Integrated System Plan (ISP).

4.2 Ausgrid's approach to estimating project costs

Ausgrid has estimated capital costs by considering the scope of works necessary under the credible option 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. Where costs for design work have been incurred prior to 2022-23, we have adjusted these costs to reflect the opportunity cost of this expenditure using Ausgrid's regulated cost of capital.

We note that recent 11 kV cable installations undertaken in the vicinity of Circular Quay have experienced significant cost increases due to construction work having to be mostly limited to night hours, archaeological findings, site contamination and excavation within rock. For this RIT-D, we therefore consider that a wider range of cost sensitivities should be investigated as part of the RIT-D and so have tested an asymmetric +40% and -20% sensitivity to reflect greater upside risk to capital costs (as opposed to the standard symmetric +/-25%). Further, we note that for this RIT-D, the estimated civil works component (i.e., contracted services to external providers) are likely to be more than 80% of the total costs, as these works are impacted by market conditions (i.e., availability of accredited service providers and/or concurrent similar works). In this case, cable procurement/installation is a small fraction of the overall cost.

Operating and maintenance costs have been determined by comparing the operating and maintenance costs with the option in place to the operating and maintenance costs without the option in place. These costs are included for each year in the planning period.

4.3 Market benefits are expected from reduced involuntary load shedding

Ausgrid considers that the only relevant category of market benefits prescribed under the NER for this RIT-D relate to changes in EUE.

The approach Ausgrid has adopted to estimating reductions in EUE are outlined in section 4.3.1 below. Further details on the assumptions and methodology used are presented in Appendix D.

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

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[8] Specifically, we take a straight average of the real, pre-tax WACCs for the Victorian DNSPs (since they represent the latest Final Decision(s) by the AER).

4.3.1 Reduced involuntary load shedding

Involuntary load shedding occurs when a customer's load is interrupted from the network without their agreement or prior warning. This relates to the availability of network connectivity and design configuration at the substation. It also arises from the unavailability of network elements and the resulting reduction in network capacity to supply the load.

The EUE is the probability weighted average amount of load that customers request to utilise but would need to be involuntarily curtailed due to loss of network connectivity or a network capacity limitation.

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 EUE from the option, relative to the base case, results in a positive contribution to market benefits of the credible option being assessed.

Figure 2-2 earlier shows the estimated EUE in the base case under each of the three demand scenarios.

As part of the DPAR assessment, this EUE has been capped to avoid a situation where a significant amount of EUE skews the results (noting that this approach does not affect identification of the preferred option).[9] Specifically:

- we have capped the level of EUE in all scenarios in the NPV assessment at 25 per cent of the forecast amounts shown above from 2025 to 2028; and
- avoided EUE benefits have been assumed to be zero from 2029 onwards since, at this point, both options are assumed to be fully commissioned and so both avoid the same level of EUE.

This capping of EUE is not reflected in Figure 2.2 (which shows the full EUE forecasts).

The market benefit that results from reducing the involuntary load shedding with a network solution is estimated by multiplying the quantity of EUE in MWh by the Value of Customer Reliability (VCR). The VCR is measured in dollars per MWh and is used as a proxy to evaluate the economic impact of unserved energy on customers under the RIT-D.

Ausgrid has applied a VCR estimate of $68.40/kWh, reflecting a load weighted value for the affected load at the Dalley St ZS calculated using the NSW VCR estimates (for residential, commercial and industrial load) derived by the AER in its VCR Final Report.[10] A breakdown of how the load weighted VCR has been calculated is provided in Appendix D.

4.4 Option value has been captured through the use of scenarios

Option value arises 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 extent of future spot load is a key uncertainty for this RIT-D. Option 2 is a flexible option that defers the building of the third circuit until the time that the spot load becomes committed. We have captured the option value associated with this flexibility under Option 2 implicitly through considering a scenario in which the third feeder is not required (i.e., the low demand scenario), as well as scenarios in which it is required, but where its timing can be deferred (the central demand and high demand scenarios). The scenarios adopted are discussed further below.

This approach is consistent with the AER guidance on the treatment of option value. We consider that a wider option value modelling exercise would be disproportionate to any option value that may be identified for this specific RIT-T assessment.

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.

Ausgrid has elected to assess three alternative future scenarios – namely:

- low demand scenario – Ausgrid has adopted a scenario that reflects a lower demand forecast to represent a conservative future state of the world with no additional spot load in the Circular Quay area. Under this scenario,

[9] Ausgrid notes that the approach of capping EUE was commented on and supported by Dr Darryl Biggar in his review of the modelling undertaken for the Powering Sydney's Future RIT-T. See: Biggar, D., An Assessment of the Modelling Conducted by TransGrid and Ausgrid for the "Powering Sydney's Future" Program, May 2017, available at: https://www.aer.gov.au/system/files/Biggar%2C%20Darryl%20-%20An%20assessment%20of%20the%20modelling%20conducted%20by%20TransGrid%20and%20Ausgrid%20for%20the%20%20Powering%20Sydney%20s%20Future%20%20program%20-%20May%202017.pdf

[10] AER, 2022 VCR Annual Adjustment, December 2022.

only connected load and committed load is included in the demand forecasts (i.e., no forecast load is assumed to connect).

- central demand scenario – the central scenario consists of load assumptions that reflects commissioned and committed load (i.e., the same as in the low demand scenario), plus the connection of all forecast load at the proposed dates with a 31% forecasting scaling factor; and
- high demand scenario – this scenario reflects higher forecast load to investigate the impact of higher demand on the ranking of the options. This scenario assumes that the commissioned and committed loads connect at the proposed dates, as well as forecast loads at their proposed dates, but applies a higher 51% forecasting scaling factor to forecast loads.

The scenarios only differ by the demand forecasts, given this is the key parameter that may affect the ranking of the credible options. How the results are affected by changes to other variables (e.g., the discount rate and capital costs) have been investigated in the sensitivity analysis.[11]

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

Table 4-1 – Summary of the three scenarios investigated

Variable	Scenario 1 – central demand scenario	Scenario 2 – low demand scenario	Scenario 3 – high demand scenario
Scenario weighting	50 per cent (1/2)	16.7 per cent (1/6)	33.3 per cent (1/3)
Demand	Central demand forecast (as outlined in section 2.4.1)	Low demand forecast (as outlined in section 2.4.1)	High demand forecast (as outlined in section 2.4.1)
VCR	$68.40/kWh across all scenarios		
Discount Rate	3.44% across all scenarios		

Ausgrid has weighted the scenarios consistent with its confidence in the forecast loads in each scenario proceeding, based on experience with past developments and information available to date.

The consideration of the relevant scenario weights has resulted in the central scenario receiving a weight of 50 percent, as it is considered the most likely, with the other 50 per cent being split 2/3 to the high demand scenario and 1/3 to the low demand scenario. Ausgrid considers that the low demand scenario reflects a very conservative future state of the world since it only includes currently connected or committed loads despite the recent trend of increased building redevelopment in the Sydney CBD, and the multiple enquiries received from potential new spot loads.

We have also considered the sensitivity of the RIT-D outcome to the weightings applied to the scenarios (in particular the low scenario, under which the third circuit would not be required).

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[11] This represents a change in approach to previous Ausgrid RIT-Ds and reflects additional guidance provided by the AER in November 2022 in the context of the RIT-T (that we consider is also relevant for the RIT-D). Specifically, the guidance provided in the AER's determination on the North West Slopes and Bathurst, Orange and Parkes RIT-T disputes.

5 Assessment of the credible options

This section provides the assessment of the credible network options Ausgrid has identified as part of its network planning activities to date. The options are compared against the base case 'do nothing' option. We note that a 'do nothing' base case does not itself reflect a credible option, since Ausgrid would be in breach of its obligations to supply currently connected and committed load under normal operating conditions, as discussed in section 2.

5.1 Gross market benefits estimated for the credible option

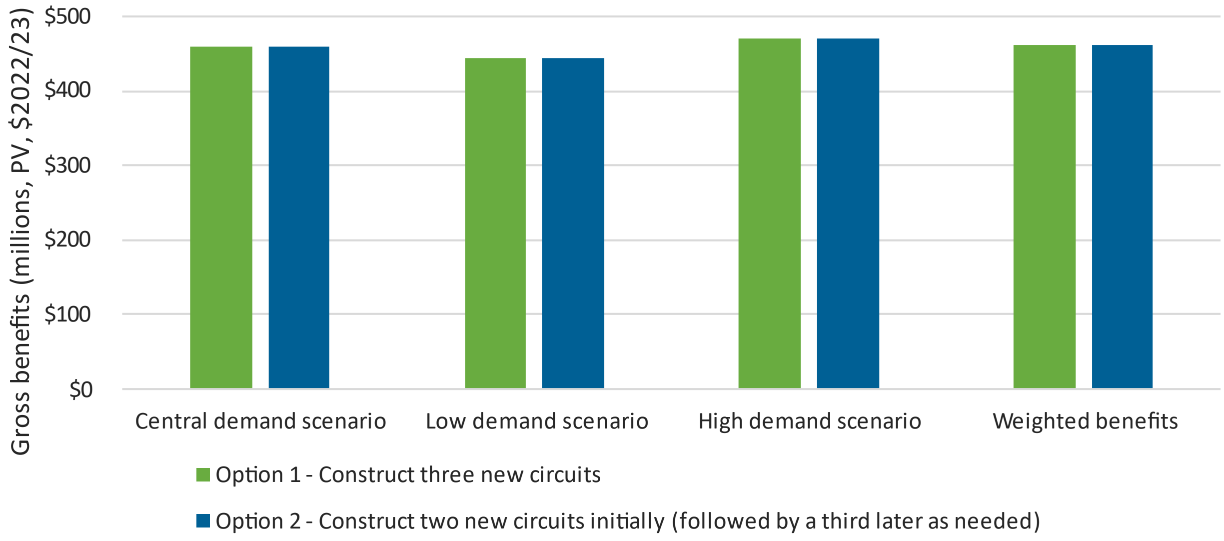
The table below summarises the gross market benefit of the credible options relative to the base case in present value terms. The gross market benefit for the options compared to the base case has been calculated for each of the three scenarios outlined in the section above and is also provided on a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

Table 5-1 – Present value of gross benefits of credible options relative to the base case, $m 2022/23

Option	Central demand scenario	Low demand scenario	High demand scenario	Weighted benefits
Scenario weighting	50.0%	16.7%	33.3%	
Option 1 – Construct three new circuits	$460.4	$444.5	$470.6	$461.1
Option 2 – Construct two new circuits initially (followed by a third later as needed)	$460.4	$444.5	$470.6	$461.1

The gross market benefits are identical for the options under each scenario since all customer demand is met under either option configuration, i.e., there is no difference in avoided EUE between the options. Gross benefits are highest under the high demand scenario since a greater volume of EUE is avoided from the installation of the proposed options under this set of demand assumptions.

Figure 5-1 – Gross benefits of credible options relative to the base case, $m 2022/23



We note that if forecast loads were commissioned earlier than currently expected, excess capacity on circuits under Option 1 could provide additional market benefits compared to Option 2. However, we have not modelled this as a benefit under the scenarios in this RIT-D.

5.2 Estimated costs for the credible option

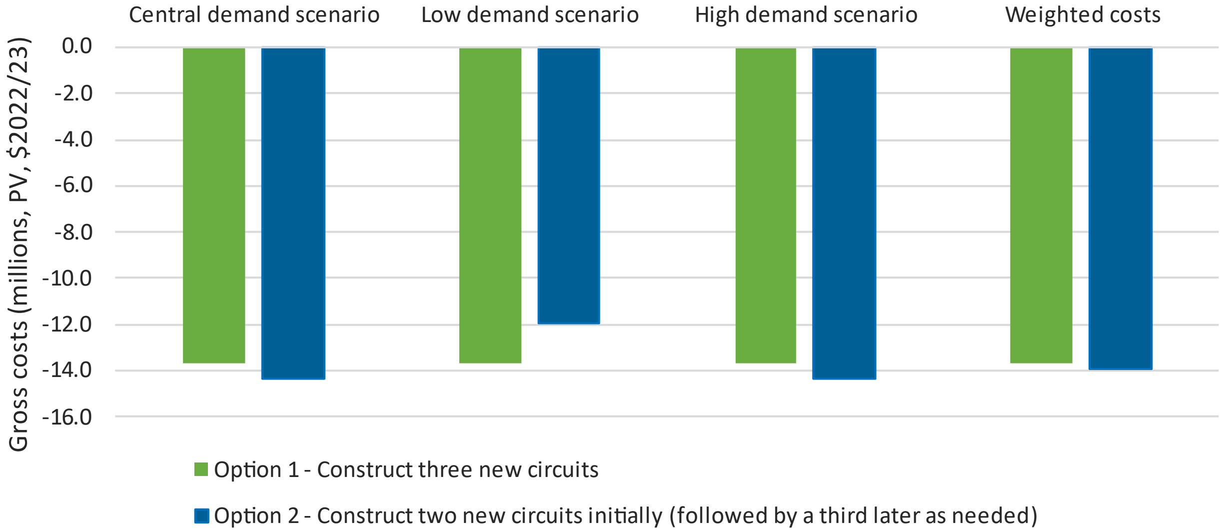
The table 5-2 summarises the capital costs and incremental annual planned maintenance costs for the credible options in present value terms across the demand scenarios, as well as on a weighted basis.

Table 5-2 – Present value of costs of credible options relative to the base case, NPV $m 2022/23

Option	Central demand scenario	Low demand scenario	High demand scenario	Weighted costs
Scenario weighting	50.0%	16.7%	33.3%	
Option 1 – Construct three new circuits	-$13.7	-$13.7	-$13.7	-$13.7
Option 2 – Construct two new circuits initially (followed by a third later as needed)	-$14.3	-$12.0	-$14.3	-$14.0

Option 1 has a lower cost under the high and central demand scenarios due to capital cost savings from installing all three circuits simultaneously. However, Option 2 has a lower cost ($1.7 million lower in present value terms) under the low demand scenario since the third circuit is never required under this scenario.

Figure 5-2 – Gross costs of credible options relative to the base case, $m 2022/23



On a weighted basis, Option 1 is approximately $290,000 less expensive than Option 2. Annual planned maintenance costs represent an insignificant portion of total costs, comprising approximately 1 per cent of cost for each option.

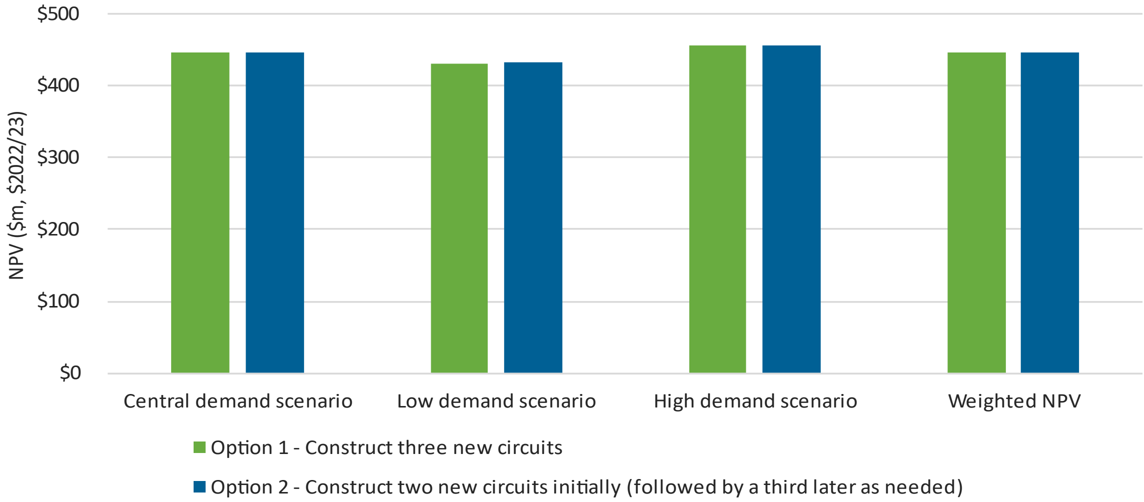
5.3 Net present value assessment outcomes

The table below summarises the net market benefit for the credible options under each scenario. The net market benefit is the gross market benefit (as set out in Table 5-1) minus the cost of the option (as set out in Table 5-2), all in present value terms. In general, the option with the highest net market benefit is considered the preferred option under the RIT-D since it maximises market benefits while accounting for the costs of implementing the proposed options.

Table 5-3 – Present value of net benefits relative to the base case by scenario, $m 2022/23

Option	Central demand scenario	Low demand scenario	High demand scenario	Weighted NPV	Rank
Scenario weighting	50.0%	16.7%	33.3%		
Option 1 – Construct three new circuits	$446.7	$430.9	$456.9	$447.5	1
Option 2 – Construct two new circuits initially (followed by a third later as needed)	$446.0	$432.6	$456.2	$447.2	2

Figure 5-3: Present value of net benefits by scenario, $m 2022/23



Option 1 has marginally greater estimated net benefits in the central and high demand scenarios, i.e., in scenarios that assume additional loads connect beyond the existing commissioned and committed loads. Option 2 has marginally higher net benefits in the low demand scenario (where no forecast load connects) due to the lower capital costs that arise under the low scenario since a third circuit is never required.

However, in all scenarios, both Option 1 and Option 2 demonstrate near-identical net market benefits. On a weighted basis, the difference in the net benefits between the options is approximately $290,000 or 0.06 per cent of the net market benefits for Option 1.[12]

Overall, Option 1 is the proposed preferred option for this RIT-D since, in addition to a marginally higher net market benefit on a weighted basis, it provides several benefits over Option 2 that have not been directly captured in the RIT-D assessment but are none the less important. These qualitative benefits include:

- minimised disruption in the CBD as a result of the simultaneous installation of all three circuits;
- the ability to supply large CBD loads earlier, thereby reducing the risk that a third circuit will not be available when needed (e.g., if forecast loads request to connect sooner than currently expected); and
- the capacity to supply an increase in demand above the current commissioned and committed loads, which is likely needed given there are currently multiple forecast loads in the CBD area.

5.4 Sensitivity analysis

Ausgrid has undertaken a range of sensitivity tests to understand the robustness of the RIT-D assessment to the underlying assumptions around key variables.

We have undertaken two tranches of sensitivity testing, namely:

- **step one** – testing the sensitivity of the NPV results to different assumptions in relation to key variables (e.g., variances in capital costs and discount rates); and
- **step two** – conducting threshold analysis to add further insight to the robustness of the conclusion that Option 1 is preferred.

We outline how these steps have been applied to test the sensitivity of the key findings in the subsections below.

5.4.1 Step 1 - Sensitivity testing of the overall net market benefit to changes in key variables

Ausgrid has undertaken a range of sensitivity tests to determine the robustness of the preferred option to changes in key variables. Specifically, Ausgrid has tested the overall NPV results to:

- a 40 per cent increase and 20 decrease in the assumed network capital costs; and
- higher (5.5 per cent) and lower (2.34 per cent) discount rates.

[12] The quoted difference in net benefits here takes account of the 'capped' avoided unserved energy (outlined in section 4.3.1). If the uncapped avoided unserved energy is used, the percentage difference between the two options is even less.

The results of these sensitivity tests are outlined in Table 5-4 below. The results show that the ranking of options and the preferred option is robust to variances in all the sensitivities modelled.

Table 5-4 – Net present value outcome from sensitivity tests under the weighted scenario

Sensitivity	Option 1	Option 2	Preferred Option
Baseline weighted outcome across scenarios	**$447.5**	**$447.2**	**Option 1**
High capital costs (+40%)	$442.1	$441.7	Option 1
Low capital costs (-20%)	$450.2	$449.9	Option 1
High discount rate (5.50%)	$415.5	$415.2	Option 1
Low discount rate (2.34%)	$466.0	$465.7	Option 1

No sensitivity to assumed planned operating and maintenance has been investigated given there is only a marginally different level of these costs between the two options. We have also not run a sensitivity on the assumed VCR given both options avoid the exact same amount of EUE (and so varying the assumed VCR will affect each option equally).

5.4.2 Step 2 – Threshold analysis on the preferred option to changes in key variables

Additional threshold testing finds that:[13]

- the low demand scenario would need to be given a scenario weighting of at least 28.8 per cent for Option 2 to have the same net market benefits as Option 1 on a weighted basis; and
- under the low demand scenario, Option 2 is preferred to Option 1 by approximately $1.7 million in present value terms. This difference represents 25MWh of avoided EUE, or approximately 0.05 per cent of the additional load forecast under the central demand scenario. Therefore, only a small amount of additional forecast load would be required for Option 1 to be preferred to Option 2 under the low demand scenario.

These tests highlight that Option 1 should be considered robustly preferred over Option 2. Specifically, applying such a high weighting to the low demand scenario seems unrealistic given how advanced the four forecast loads are and, irrespective of increasing the weighting applied to this scenario, only a small amount of forecast load is required to connect in order for Option 1 to be preferred.

We also investigated capital cost and discount rate thresholds and do not find that there are any realistic changes to these variables that would result in Option 2 being preferred over Option 1.

[13] We note that these threshold tests apply the uncapped EUE.

6 Proposed preferred option

Ausgrid considers that Option 1 is the preferred option that satisfies the RIT-D at this draft stage of the process. It involves the construction of three new circuits connected to City North ZS in the vicinity of George and Alford Streets to supply newly connected customers and additional committed loads in the Circular Quay area. This option involves the simultaneous installation of three circuits to meet future customer load forecasts.

While the NPV evaluation demonstrates near-identical net benefits for both options, Option 1 is the proposed preferred option for this RIT-D since, in addition to a marginally higher net market benefit on a weighted basis, it provides several benefits over Option 2 which have not been directly captured in the RIT-D assessment but which are none the less important. These qualitative benefits include:

- minimised disruption in the CBD from excavation and road closures as a result of the simultaneous installation of all three circuits;
- the ability to supply large CBD loads earlier, thereby reducing the risk that a third circuit will not be available when needed (e.g., if forecast loads request to connect sooner than currently expected); and
- the capacity to supply an increase in demand above the current commissioned and committed loads, which is likely needed given there are currently multiple forecast loads in the CBD area.

The estimated capital cost of Option 1 is $15.0 million, and commissioning is assumed in 2024/25. Additional planned maintenance costs are expected to be minimal (approximately $10,000 per year) since the circuits are located underground.

Ausgrid considers that this DPAR, 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.

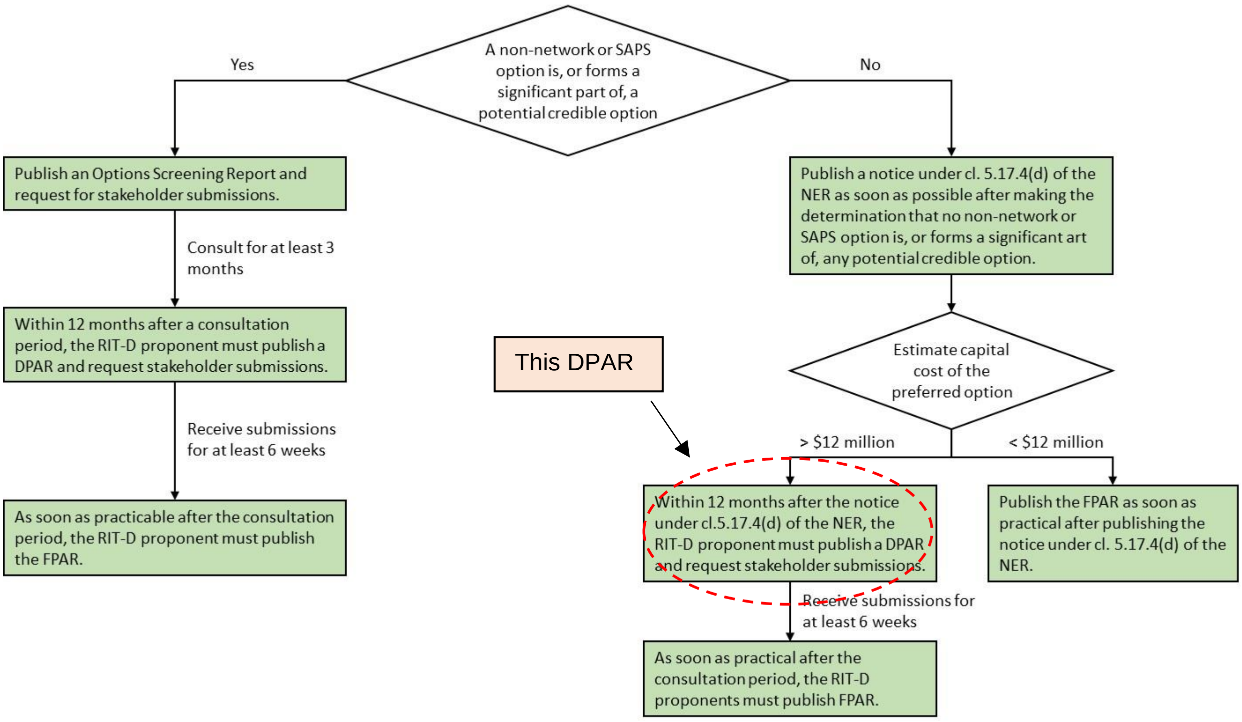
Appendix A – Checklist of compliance clauses

This section sets out a compliance checklist that demonstrates the compliance of this DPAR with the requirements of clause 5.17.4(r) of the National Electricity Rules version 199.

Clause	Summary of requirements	Section in the DPAR
5.17.4(r)	A summary of any submissions received on the draft project assessment report 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	2.3
	(2) the assumptions used in identifying the identified need	2.4
	(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
	(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 regulatory investment test for distribution; 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

Appendix B – Process for implementing the RIT-D

For the purposes of applying the RIT-D, the NER establishes a 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 relevent

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

- changes in the timing of unrelated expenditure;
- changes in voluntary load curtailment;
- changes in costs to other parties;
- changes in load transfer capability and capacity of embedded generators to take up load;
- option value; and
- changes in electrical energy losses.

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
Timing of unrelated expenditure	Ausgrid does not expect the project will have any effect on unrelated expenditures in other parts of the network. Accordingly, Ausgrid considers the market benefit from changes in timing of unrelated expenditure is not material.
Changes in voluntary load curtailment	Ausgrid notes that the level of voluntary load curtailment currently present in the National Electricity Market (NEM) 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. Ausgrid notes that the options are not 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 option. Ausgrid notes that the option 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	Load transfer capacity between substations is predominantly limited by the high voltage feeders that connect substations. Whilst the option under consideration is effectively transferring some of the load (i.e., commissioned loads) to another zone substation, this is proposed because the existing substation site is soon to be decommissioned, and the committed cable installation works undertaken to offload Dalley ST ZS to Belmore Park ZS cannot accommodate the incremental loads. Therefore, these works are unlikely to materially change load transfer capacity between remaining zone substations in the Sydney CBD network area. Further, the option is unlikely to enable embedded generators in Ausgrid's network to be able to take up load given the size and profile of the load serviced by network assets currently considered for replacement. Consequently, Ausgrid has not attempted to estimate any benefits from changes in load transfer capacity and embedded generators.
Changes in electrical energy losses	Ausgrid does not expect that the credible option considered will lead to significant changes in network losses and so have not estimated this category of market benefits.

Appendix D – Additional detail on the assessment methodology and assumptions

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

D.1 Calculation of EUE

For the spot loads characterised in section 2 of this DPAR, the main assumption in this analysis is that they cannot be supplied following the decommissioning of Dalley St ZS. As a result, all the loads will be unserved.

The EUE is calculated by using the following equation:

EUE = Load (MVA) x 8760 (hours/year) x 0.95 Power Factor x 0.119 (risk duration factor)

A risk duration factor of 0.119 is considered to estimate the EUE. This value is derived from the following equation:

$$0.119 = (8/24) * (5/7) * 0.5$$

This factor considers the risk is present for approximately 8 hours per day, 5 days out of the week for half of the year.

All loads consider three years to reach the targeted value, commencing from actual commissioning dates or proposed connection dates. The resulting ramp-up rate is therefore 33% in year 1, 67% in year 2 and 100% in year 3.

For forecast loads, scaling factors are used to differentiate the values in the central and high demand scenarios. The values of 31% and 51% used respectively for the central and high demand scenarios are adopted to assess proposed connection applications.

D.2 Calculation of central VCR estimate for Dalley St ZS

The table below provides a breakdown as to how the central VCR estimate for load served from the Dalley St ZS has been derived.

Table D-1: Breakdown of the central VCR estimate for the Dalley St ZS

	Unit	Residential	Small non-residential	Large non-residential (LV)	Large non-residential (HV)
Annual consumption	MWh	2	17	749	1,252
Percentage of annual consumption	%	0.6%	22.4%	74.9%	2.2%
2022 AER VCR estimate	$/kwh	$32.57	$75.99	$66.37	$69.94
Load-weighted VCR for Dalley St	$68.40				

The underpinning assumptions for the calculation of the VCR for Dalley St ZS are:

- Dalley St ZN location is 8-14 Dalley Street, Sydney NSW 2000.
- For residential loads, VCR value is determined by using the postcode for Dalley St in the AER spreadsheet for residential VCRs.
- Small non-residential loads are considered to be small businesses, for which the VCR for commercial small-medium businesses is applied.
- Large non-residential (LV) loads are considered to be a mix of small industrial and large commercial loads, so an average VCR of those two categories is applied.
- Large non-residential (HV) loads are considered to be large industrial businesses, so the VCR for industrial large businesses is applied.

Ausgrid