Meeting demand growth in the Western Sydney Aerotropolis 'Priority Growth Area'

RIT-T Project Assessment Conclusions Report

Issue date: 1 August 2025

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Executive summary

This Regulatory Investment Test for Transmission (RIT-T) is a joint planning initiative between Transgrid and Endeavour Energy. It covers options for ensuring reliable supply to the Western Sydney Aerotropolis 'Priority Growth Area' considering demand growth from the development of the Western Sydney International (Nancy Bird Walton) Airport and surrounding metropolitan, commercial and industrial precincts (collectively referred to as the 'Aerotropolis precinct'). Publication of this Project Assessment Conclusions Report (PACR) represents the final step in the RIT-T process, following the Project Specification Consultation Report (PSCR) published on 7 May 2024 and the Project Assessment Draft Report (PADR) published on 4 March 2025.

Transgrid has worked with Endeavour Energy and determined that the expected increase in demand from developments in the Aerotropolis precinct will result in power flows exceeding the capacity of the Macarthur 132 kV transmission Bulk Supply Point (BSP) potentially from 2026/27 under transformer outage conditions. This may lead to load shedding under contingency conditions at the Macarthur 132 kV BSP, after Endeavour Energy completes the first phase of its supply network upgrades in the area.[1]

This PACR has been prepared in conjunction with Endeavour Energy (as the relevant distribution network service provider).[2]

Identified need: relieving network constraints to facilitate the connection of load and provide net market benefits

Together, we have identified the opportunity to improve network supply capacity to the Aerotropolis precinct, which is expected to provide significant net market benefits by eliminating the need for load shedding. This will result in an overall increase in net benefits to participants in the National Electricity Market (NEM) and is considered a 'market benefits' driven RIT-T (i.e., as opposed to a 'reliability corrective action').

No submissions received in response to the PADR and there have been no material developments

We published a PADR on 4 March 2025 and invited written submissions on the material presented within the document. No submissions were received in response to the PADR.

In addition, no additional credible options were identified during the consultation period following publication of the PADR. No other material changes have occurred since the PADR.

On 21 November 2024, the requirements set out in the Australian Energy Regulator's Regulatory Investment Test for Transmission (RIT-T) Application Guidelines were amended. The amended guidelines now expect a RIT-T proponent to explicitly consider community engagement and social licence during the RIT-T process.

[1] Endeavour Energy completed a Regulatory Investment Test for Distribution (RIT-D) in January 2022 to address network limitations caused by increasing demand in the Aerotropolis area. This RIT-D identified the construction of a 26.5km 132 kV underground feeder with 275MVA capacity that spans between South Erskine Park zone substation (ZS) to the Bringelly ZS as the preferred option. The project is expected to be in place by 2024/25 and will support the various new distribution substations in the region designed to accommodate the increase in demand.

[2] Consistent with the joint-planning requirements in the National Electricity Rules.

The amended guidelines mean that Transgrid must consider social licence principles in the identification of credible options. Transgrid considers that through early engagement we can begin to build relationships and trust to gain communities input into the planning of a project during the early design phase as part of the RIT-T. When considering an option, Transgrid will undertake an assessment of community and stakeholder benefits and impacts to determine the appropriate level of stakeholder and community consultation. Any findings and feedback will be used to determine the most likely cost and delivery timeline for the option, and uncover opportunities that can deliver sustainable social legacy outcomes, informed by community engagement.

Transgrid is a strong supporter of involving community in the option design process to better gain community acceptance for the option and reduce the risk of delay to project timelines due to community disagreement. Through earlier engagement we can quantify prudent and efficient social licence initiatives and mitigate impacts on project timing.

The new guideline requirements do not apply to any RIT-T project where a PSCR was published prior to 21 November 2024. Since the PSCR for this RIT-T was published before this date, this RIT-T is not subject to the new requirements. However, this provides an excellent opportunity for Transgrid to engage with communities through other existing approval processes.

Given the location and scope of the preferred option, the potential impacts to the surrounding community appear to be relatively low. Should the preferred option materialise Transgrid will undertake community and stakeholder engagement to ensure project impacts are minimised.

Transgrid is committed to continuing community engagement post the RIT-T through these alternative approval processes, ensuring that community input remains a vital part of our project planning and execution.

Credible options considered

We consider that there are two feasible options from a technical, commercial, and project delivery perspective that can be implemented in sufficient time to meet the identified need. These are summarised in Table E-1.

Table E-1 Summary of the credible options

Option	Description	Capital cost ($m)		
		Transgrid	Endeavour Energy	Total
Option 1	New BSP next to the Kemps Creek substation	$111.7m	$25.0m	$136.7m
Option 2	New Airport South BSP supplied from cut-in to Line 39	$161.0m	$102.1m	$263.1m

For both options, all works are estimated to take six years to complete and the new BSP has an expected commissioning date of 2029/30.

Non-network options are not expected to be able to assist with this RIT-T

We do not consider that there will be a non-network solution, or group of solutions, that forms a potential credible option on a standalone basis, or that forms a significant part of a potential credible option for this RIT-T. This is due to the network augmentation being required to facilitate substantial new loads, i.e., the

investment is being built solely for greenfield load developments (and the magnitude of these developments is such that realistic non-network solutions cannot alter the timing or scope of the expected network investment). Additionally, we did not receive any submissions in relation to non-network options in response to the PSCR or PADR.

Three reasonable scenarios have been assessed

The credible options are assessed under three scenarios as part of this PACR assessment. Within this assessment, the only market benefit likely to be material is changes in involuntary load shedding. As a result, the three PACR scenarios differ only through their assumed local demand forecasts, as this is the key parameter influencing the ranking of the credible options.

Given that wholesale market benefits are not relevant for this RIT-T, the three scenarios implicitly assume the expected most likely scenario for the 2024 ISP (i.e., the 'Step Change' scenario).

Option 1 is the preferred option

Option 1 is the preferred option at this final stage because it is the credible option that maximises the net present value of the net economic benefit. Option 1 results in a weighted average NPV of approximately $600 million, in present value terms, across the scenarios used in this RIT-T.

In addition, unlike Option 2, Option 1 will not add extra loading to the already heavily loaded Line 39, which may lead to network constraints causing a reduction in renewable generation available from the southern Sydney area.

This PACR therefore finds that Option 1 is the preferred option to supply the expected increase in demand from developments in the Greater Western Sydney Aerotropolis 'Priority Growth Area'. Option 1 involves the commissioning of a new BSP next to the existing Kemps Creek substation.

The capital cost of this option is approximately $136.7 million, which is comprised of $111.7 million in Transgrid costs and $25.0 million in Endeavour Energy costs. Routine operating and maintenance costs are estimated at $904,600/year (approximately 1 per cent of total capital expenditure) for Transgrid and $100,000/year (approximately 0.4 per cent of total capital expenditure) for Endeavour Energy.

All works are estimated to take six years to complete and the new BSP has an expected commissioning date of 2029/30.

Please note that the costs and scope as detailed in this document for Endeavour Energy are for the initial exiting of capacity from the proposed Bulk Supply Point and do not comprehensively cover the scope of distribution network works required to supply the broader Aerotropolis growth area. Further works to be undertaken by Endeavour Energy will be covered by future RIT-Ds.

Next steps

This PACR represents the final step of the consultation process in relation to the application of the RIT-T process undertaken by Transgrid.

Parties wishing to raise a dispute notice with the AER may do so prior to 3 September 2025 (30 days after publication of this PACR). Any dispute notices raised during this period will be addressed by the AER within

40 to 100 days, after which the formal RIT-T process will conclude. Further details on the RIT-T can be obtained from Transgrid's Regulation team via regulatory.consultation@transgrid.com.au. In the subject field, please reference 'Western Sydney Aerotropolis Priority Growth Area PACR'.

Contents

1. Introduction

This Regulatory Investment Test for Transmission (RIT-T) is a joint planning initiative between Transgrid and Endeavour Energy. It covers options for ensuring reliable supply to the Western Sydney Aerotropolis 'Priority Growth Area' in light of demand growth from the development of the Western Sydney International (Nancy Bird Walton) Airport and surrounding metropolitan, commercial and industrial precincts (collectively referred to as the 'Aerotropolis precinct'). Publication of this Project Assessment Conclusions Report (PACR) represents the final step in the RIT-T process, following the Project Specification Consultation Report (PSCR) published on 7 May 2024 and the Project Assessment Draft Report (PADR) published on 4 March 2025.

Endeavour Energy completed a Regulatory Investment Test for Distribution (RIT-D) in January 2022 to address network limitations caused by increasing demand in the Aerotropolis area. This RIT-D identified the construction of a 26.5 km 132 kV underground feeder with 275 MVA capacity that spans between South Erskine Park zone substation (ZS) to the Bringelly ZS as the preferred option. The project is expected to be in place by 2024/25 and will support the various new distribution substations in the region designed to accommodate the increase in demand.

Endeavour Energy has and will continue to conduct separate RIT-D processes for zone substations in the Western Sydney Aerotropolis area. However, the capital investment required by Endeavour Energy to enable the augmentation of the Bulk Supply Points (BSP) covered in this RIT-T will not have a separate RIT-D process applied to it and is being jointly planned with Transgrid through this RIT-T process.

Transgrid completed a RIT-T for a separate need in the area in 2024, to meet expected demand and connection point reliability, maintaining reliable supply to Western Sydney.[3]

Transgrid has worked with Endeavour Energy and determined that the expected increase in demand from developments in the Aerotropolis precinct will result in power flows exceeding the capacity of the Macarthur 132 kV transmission BSP potentially from 2026/27 under transformer outage conditions. This may require load shedding under contingency conditions at the Macarthur 132 kV BSP after Endeavour Energy completes the first phase of its supply network upgrades in the area.

Together, we have identified the opportunity to improve network supply capacity to the Aerotropolis precinct, which is expected to provide significant net market benefits by eliminating the need for load shedding. This will result in an overall increase in net benefits to participants in the National Electricity Market (NEM) and is considered a 'market benefits' driven RIT-T (i.e., as opposed to a 'reliability corrective action').

This PACR has been prepared in conjunction with Endeavour Energy (as the relevant distribution network service provider).[4]

Transgrid's revenue determination for the 2023-2028 regulatory period includes a transmission augex project to serve rapid localised demand growth in the Western Sydney Aerotropolis Priority Growth Area.[5] The AER's final determination for Endeavour Energy over 2024-2029 also includes approval for its

[3] Project Assessment Conclusions Report (PACR) for this project was published on 15 November 2024.
[4] Consistent with the joint-planning requirements in the National Electricity Rules.
[5] The AER's draft decision for Transgrid's 2023-2028 revenue determination approved our proposed augex project for meeting demand growth in the Western Sydney Priority Growth Area. See: Transgrid, *2023-28 Revised Revenue Proposal*, December 2022, p. 5

proposed total net forecast capex, including the proposed augex for augmentation projects associated with the Aerotropolis precinct.[6]

1.1. Purpose of this report

The purpose of this PACR[7] is to:

- confirm the identified need for the investment, and describe the assumptions underlying this need;
- describe the options being assessed under this RIT-T;
- set out the basis on which the costs of the credible options have been estimated at this stage of the RIT-T process;
- identify and confirm the market benefits assessed from the various credible options;
- summarise our approach to modelling the net market benefits for each credible option assessed, and present the results of this analysis;
- describe the key drivers of the NPV results, as well as the assessment that has been undertaken to ensure the robustness of the conclusion; and
- provide details of the overall proposed preferred option at this stage of the process to meet the identified need.

Overall, this report provides transparency into the planning considerations for investment options to ensure continuing reliable supply to Transgrid and Endeavour Energy's customers. A key purpose of this PACR, and the RIT-T more broadly, is to provide interested stakeholders the opportunity to review the analysis and assumptions, provide input to the process, and have certainty and confidence that the preferred option has been robustly identified as optimal.

1.2. Next steps

This PACR represents the final step of the consultation process in relation to the application of the RIT-T process undertaken by Transgrid.

Parties wishing to raise a dispute notice with the AER may do so prior to 3 September 2025 (30 days after publication of this PACR). Any dispute notices raised during this period will be addressed by the AER within 40 to 100 days, after which the formal RIT-T process will conclude. Further details on the RIT-T can be obtained from Transgrid's Regulation team via regulatory.consultation@transgrid.com.au. In the subject field, please reference 'Western Sydney Aerotropolis Priority Growth Area PACR'.

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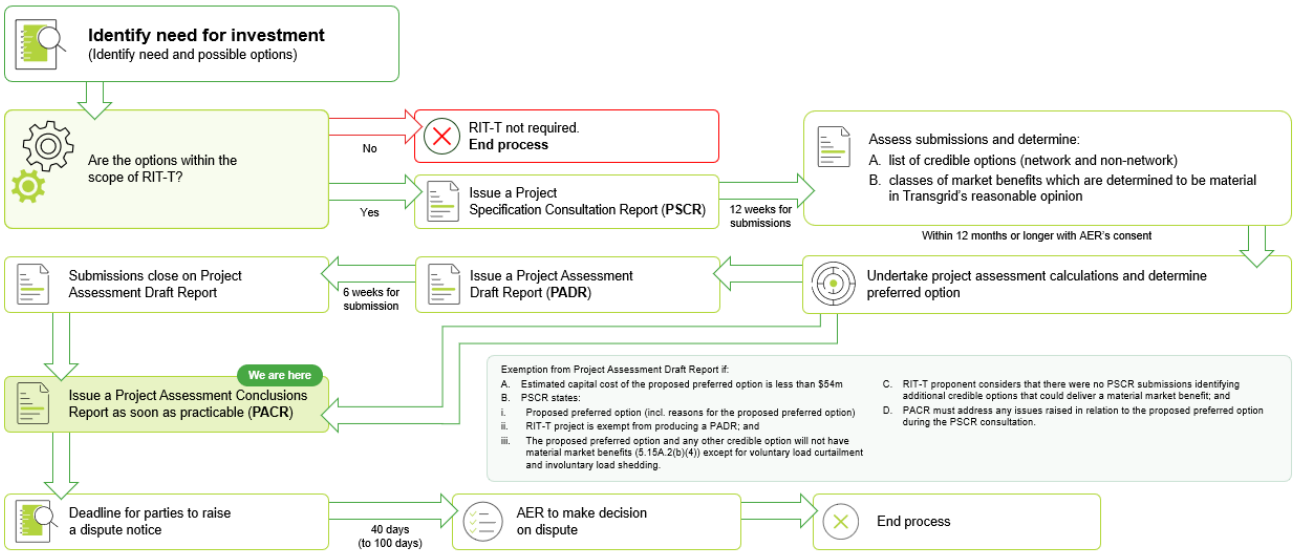
7 The AER's draft decision for Endeavour Energy's latest revenue determination approved the proposed augex project for meeting demand growth in the Western Sydney Priority Growth Area. See: AER, *Endeavour Energy electricity distribution determination 2024 to 2029 – Attachment 5: Capital expenditure*, Draft decision.

7 See Appendix A for the National Electricity Rules requirements.

Figure 1-1 This PACR is the final stage of the RIT-T process[8]



[8] AEMC, Replacement expenditure planning arrangements, Rule determination, 18 July 2017.

2. The identified need

This section outlines the identified need for this RIT-T, as well as the assumptions and data underpinning it. It first sets out background information related to the Western Sydney Aerotropolis Priority Growth Area.

2.1. Background

The Greater Western Sydney area is expected to experience significant growth over the coming years due to development of:

- Western Sydney International (Nancy Bird Walton) Airport;
- the Sydney Metro-Western Sydney Airport line;
- the establishment of Sydney's third city, Bradfield;
- road infrastructure (including the M12 motorway);
- new industries including agribusiness, transport and logistics, defence, aerospace, education and advanced manufacturing; and
- several data centres planning to locate in the area.

A number of these new loads are under construction and close to being complete. For example:

- more than 80 per cent of the Western Sydney Airport is now complete;[9] and
- tunnel boring almost complete for the Sydney Metro – Western Sydney Airport line.[10]

All of the above loads are captured within the NSW Government's Western Sydney Aerotropolis 'Priority Growth Area'.[11]

The region is currently supplied by Transgrid primarily via three Bulk Supply Points (BSPs) – the Macarthur BSP, the Sydney West BSP and the Liverpool BSP.

Under system normal conditions, the single Macarthur 330/132 kV transformer presently supplies:

- Nepean transmission substation;
- Bringelly ZS;
- Oran Park 132/11 kV ZS;
- North Leppington 132/11 kV ZS,
- South Leppington 132/11 kV ZS; and
- a large customer installation at Smeaton Grange supplied at 132 kV.

In the future it will also supply additional proposed ZSs including initial supplies to the proposed Aerotropolis core 132/22 kV ZS.

[9] Prime Minister press release on Western Sydney Airport available from https://www.pm.gov.au/media/new-agreement-keeps-sydney-metro-western-sydney-airport-jobmaker-project-track

[10] Prime Minister press release on Metro to Western Sydney Airport available from https://www.pm.gov.au/media/tunnel-boring-near-complete-sydney-metro-rail-western-sydney-airport-creating-14000-local

[11] https://www.planning.nsw.gov.au/plans-for-your-area/priority-growth-areas-and-precincts/western-sydney-aerotropolis

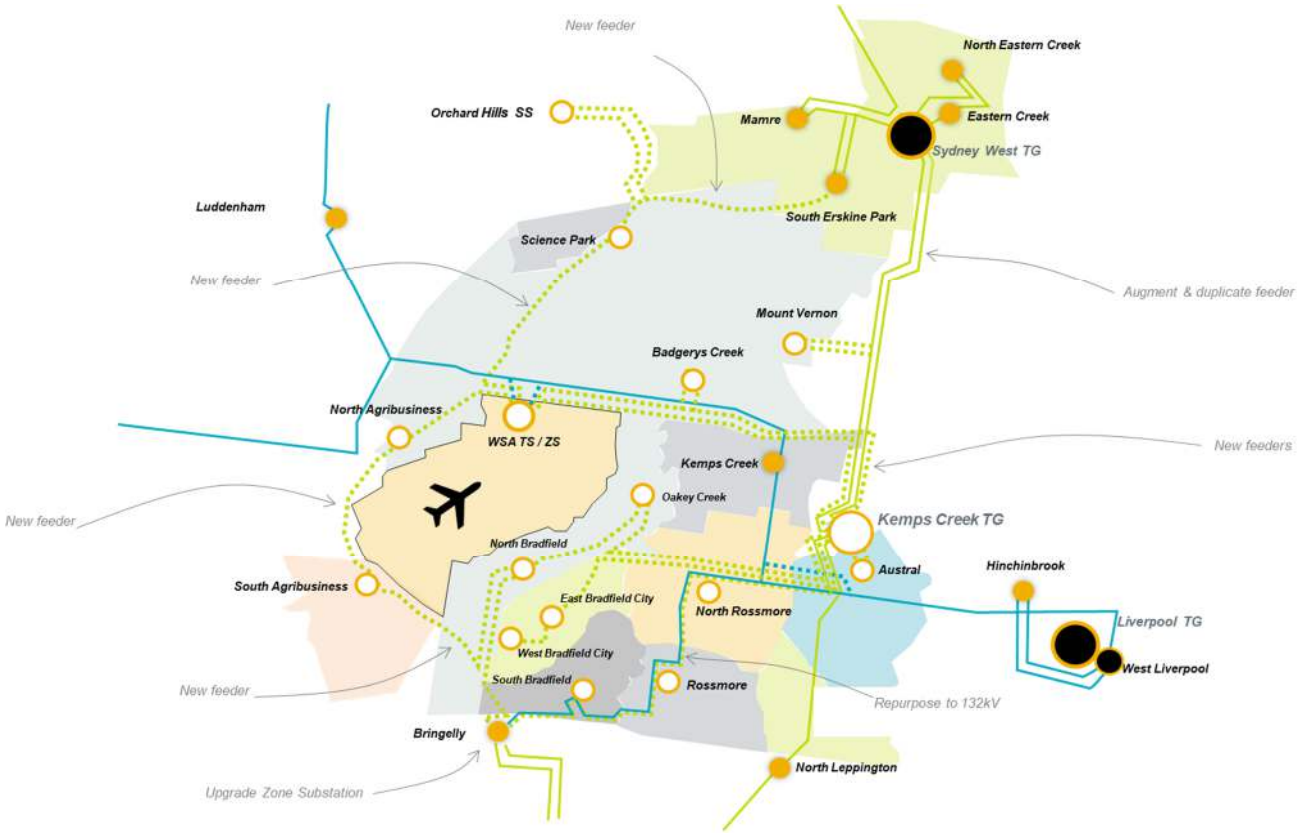
Under system normal conditions, the two Macarthur 330/66 kV transformers presently supply:

- Ambarvale ZS;
- Appin ZS;
- Campbelltown ZS;
- Kentlyn ZS;
- Menangle Park ZS; and
- Multiple significant large customer installations.

In the future they will also supply proposed additional ZSs in the Greater Macarthur growth area (notably at Mt Gilead, West Appin and Wilton New Town).

Figure 2-1 below shows the existing electricity network supplying this area.

Figure 2-1 Overview of the electricity network supplying the Western Sydney Aerotropolis Priority Growth Area



Combined system studies by Endeavour Energy and Transgrid show that Endeavour Energy's existing ZS at Luddenham, Bringelly and Kemps Creek are able to provide sufficient capacity for small developments initially, but there is insufficient sub-transmission and distribution system capacity to sustain development beyond the next two to four years.

The expected increase in demand due to these developments will result in power flows exceeding the capacity of the Macarthur 132 kV BSP potentially from 2026/27 under transformer outage conditions. This

may require extensive load shedding if action is not taken under contingency conditions at the Macarthur BSP after Endeavour Energy completes the first phase of its supply network upgrades in the area.

2.2. Description of the identified need

The identified need for this RIT-T is to increase overall net economic benefits in the NEM through avoiding load shedding that would otherwise be required if action is not taken, due to the network being constrained as a result of demand growth. Our assessment indicates that the market benefits from relieving these constraints are expected to far exceed the cost of doing so.

2.3. Assumptions underpinning the identified need

This section sets out a number of key assumptions we consider underpin the identified need. These relate to the quantum of forecast expected unserved energy (EUE) that is expected to occur if no action is taken.

2.3.1. Load forecasts

Endeavour Energy estimates demand according to a mixture of developable land areas or building floor space, if known, as well as known spot loads. Estimates are ultimately refined through discussions with developers as they negotiate the planning system. The development rates provided by developers are assessed by Endeavour Energy and adjustments are made based on Endeavour Energy's experience connecting load, including applying load realisation factors to represent the probability of actual load appearing on the network.

As noted in section 2.1, the Greater Western Sydney area is expected to experience significant growth over the coming years due to development of:

- Western Sydney International (Nancy Bird Walton) Airport;
- the Sydney Metro-Western Sydney Airport line;
- the establishment of Sydney's third city, Bradfield;
- road infrastructure (including the M12 motorway); and
- new industries including agribusiness, transport and logistics, defence, aerospace, education and advanced manufacturing.

Each of these loads has been reflected in Endeavour Energy's three demand forecasts in the same manner (in terms of their timing), but with slight differences across the three forecasts in terms of the assumed load realisation factor (reflecting Endeavour Energy's professional experience with the connection of commercial and industrial loads).

In addition to the broad-based growth in customer demand over the entire Western Sydney Priority Growth area, Endeavour Energy is currently in receipt of a number of data centre connection applications and enquiries in this part of their network. A connection 'application' is considered more certain than a connection 'enquiry' and ultimately, once a firm application is received, for the purpose of the load forecast, it would be considered equivalent to a 'committed project' as defined in the NER.

Endeavour Energy's approach in taking data centre load into its demand forecast is to apply a load realisation factor to the connected load values for all data centre loads as follows:

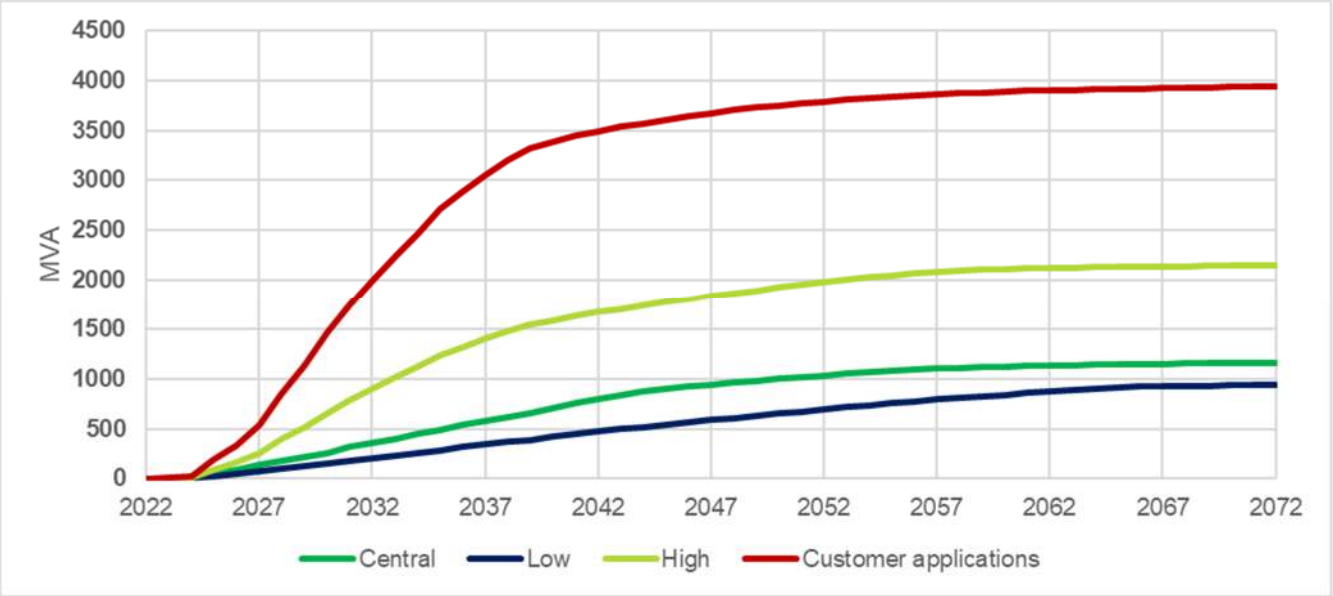
- the central demand forecast – only data centre applications are included (at an assumed load realisation factor of 40 per cent);[12]
- the low demand forecast – only data centre applications are included (at a lower assumed load realisation factor of 25 per cent); and
- the high demand forecast – data centre applications are included (at an assumed load realisation factor of 40 per cent consistent with the central demand forecast), as well as data centre enquiries (at a load realisation factor of 20 per cent to account for the fact that some enquiries may not turn into applications).

All three demand forecasts assume ramp rates of 15 years for data centre loads.

A diversity factor has also been reflected in all three forecasts (and in the same way) to reflect the expectation that not all loads will be peaking at the same time. This applies to both data centre load and non-data centre load.

Figure 2-2 below summarises the aggregate demand under each of the three demand forecasts developed by Endeavour Energy (which have not changed since the PSCR or PADR). In addition, it shows the demand forecast if load from all customer applications (i.e., not just data centres) were realised. Additional detail regarding individual load assumptions has not been provided to maintain confidentiality. In the early years prior to commissioning of the BSP, the majority of this load (approximately 87 per cent) will be supplied from Sydney West BSP and the remainder from Macarthur BSP.

Figure 2-2 Demand forecasts for the Western Sydney Aerotropolis Priority Growth Area



2.3.2. Expected pattern of use

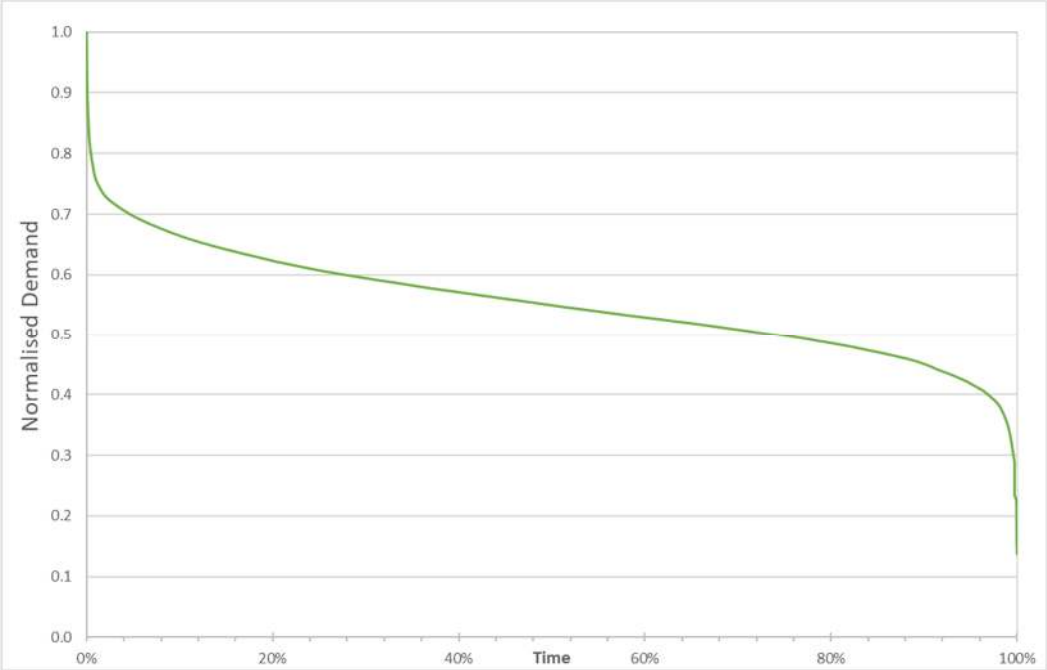
Since the forecast loads are yet to connect, we have assessed the identified need using a composite demand profile, created by scaling an existing load profile that we expect will have similar demand characteristics as the forecast load (e.g. time and seasonal demand variations).

[12] Assumed load realisation factors based off historical data.

Specifically, the composite demand profile has been developed from the load profile for the existing Sydney West BSP and normalised to account for the expected load make-up at the new BSP. The existing supply capacity to the area has been included in our assessment of the identified need.

Figure 2-3 below presents the normalised load duration curve (LDC) assumed for the Western Sydney Aerotropolis Priority Growth Area load based on the composite demand profile.

Figure 2-3 Normalised LDC assumed for the Western Sydney Aerotropolis Priority Growth Area



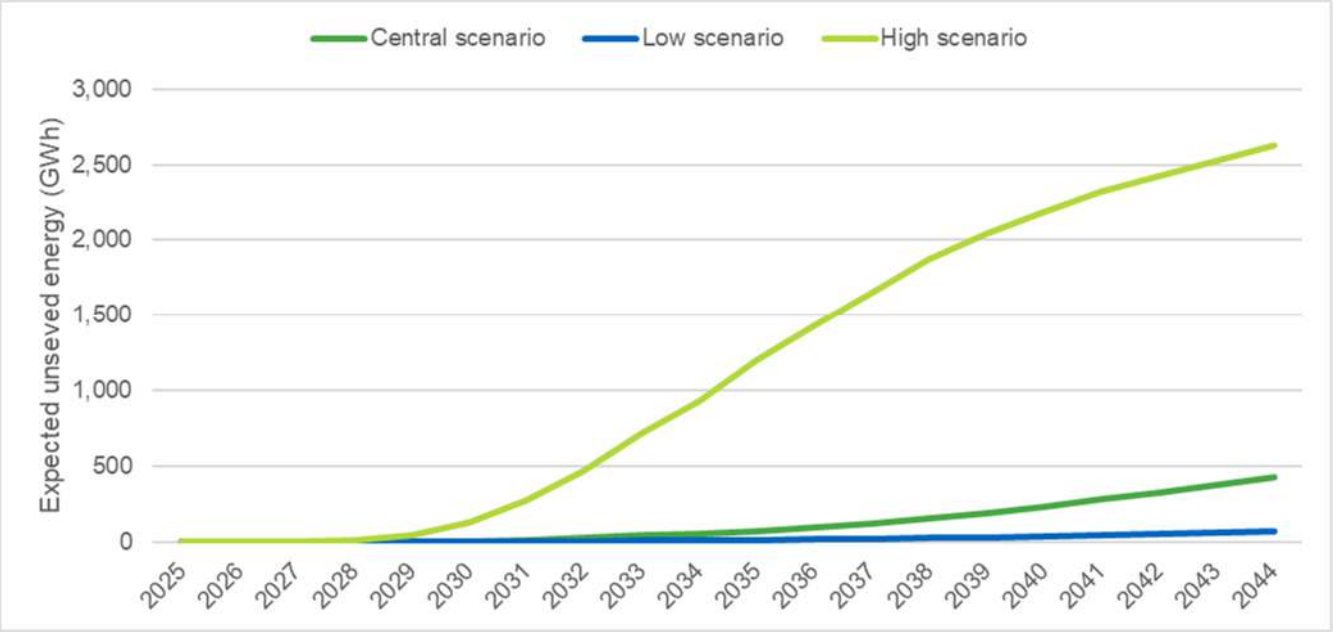
2.3.3. Forecast unserved energy if action is not taken

The forecast increase in demand will result in power flows exceeding the capacity of the Macarthur 132 kV BSP potentially from 2026/27 under transformer outage conditions. Our studies also show that the forecast load growth may require load shedding under contingency conditions at the Macarthur BSP after Endeavour Energy completes its supply network upgrades in the area (scheduled for 2024/25). We note also that Endeavour Energy has no planned load transfer schemes for this part of their network that could assist with minimising the extent of load shedding.

In the event of an outage of the Macarthur 132 kV transformer, all of the load for this catchment area would need to be initially supplied from the Macarthur 66 kV transformer until load can be transferred away. This means that for the duration of the switching time (assuming load can be switched away), the Macarthur 66 kV transformer will see an additional load equivalent to the load previously on the 132 kV transformer. This presents a significant load jump on this smaller transformer, and it is unlikely that this load will be sustained for the duration of the switching operations. In fact, it is likely to severely overload the transformer and cause significant loss of availability.

Transgrid and Endeavour Energy have assessed the peak load at risk based on Endeavour Energy's distribution load forecasts. Figure 2-4 shows the expected unserved energy projections using the same three load forecasts outlined in section 2.3.1 above.

Figure 2-4 Expected EUE under the base case for each load forecast



2.3.4. Value of customer reliability

The value of unserved energy is calculated using the AER's Value of Customer Reliability (VCR), which represents an estimate of the value electricity consumers place on a reliable electricity supply.

We have estimated a load-weighted VCR for this RIT-T using the expected composition of commercial, industrial and residential load. Specifically, we have applied the load composition set out in Table 2-1, which is from Endeavour Energy's 'Aerotropolis Foundation Supply' RIT-D.[13] We consider this reasonably reflects the mix of customers supplied in the Western Sydney Aerotropolis Priority Growth Area.

Table 2-1 Breakdown of forecasts load types at major connection points

Connection Points	Commercial	Industrial	Residential
Sydney Science Park	80%	-	20%
Northern Gateway & USyd Employment Lands	80%	20%	-
Adams Rd Precinct	40%	60%	-
Western Sydney Airport	100%	-	-
Sydney Metro	100%	-	-

We have also adjusted the AER's VCR estimates[14] for inflation to arrive at a load-weighted VCR of $36,892/MWh.

We note that the VCR applied in this PACR is lower than in the PADR on account of the latest (2024) AER commercial and industrial VCR estimates being lower than the previous (2023) estimates.

[13] Endeavour Energy, *RIT-D Final Project Assessment Report, Aerotropolis Foundation Supply*, 12 January 2022, p 19.
[14] See the AER's most recently published VCR estimates here: AER, 2024 *Values of customer reliability annual adjustment*, December 2024.

3. Options that meet the identified need

This section describes the options we have investigated to address the need, including the scope of each option and the associated costs.

We consider that there are two feasible options from a technical, commercial, and project delivery perspective that can be implemented in sufficient time to meet the identified need. Both options have been designed to meet the identified need, which is to avoid forecast EUE by improving network supply capacity to the Western Sydney Aerotropolis Priority Growth Area.

Three other options were considered but not progressed for various reasons that are outlined in Table 3-5.

All costs presented in this PACR are in 2024/25 dollars,[15] unless otherwise stated. Besides this presentational change, the costs of the options have not been updated since the PADR. While both Transgrid and Endeavour Energy are progressing detailed designs in parallel to the PACR, both businesses consider that the costs presented in this PACR are appropriate for this point in time.

3.1. Base case

Consistent with the RIT-T requirements, the assessment undertaken will compare the costs and benefits of each option to a base case. The base case is the (hypothetical) projected case if no action is taken, i.e.:[16]

> *"The base case is where the RIT-T proponent does not implement a credible option to meet the identified need, but rather continues its 'BAU activities'. 'BAU activities' are ongoing, economically prudent activities that occur in absence of a credible option being implemented."*

Under the base case, no proactive investment is made to meet the identified need to supply capacity in the Western Sydney Aerotropolis Priority Growth Area in accordance with expected demand growth. This is expected to increasingly require Transgrid to load shed during contingency events due to the large increase in demand expected from the development in the area (as outlined in section 2.3.1 above).

While we note that the forecast unserved energy is not expected to breach the IPART reliability standards by the proposed date for investment, they would be breached over the longer-term under the base case if action is not taken, due to the exponential demand growth forecast. While we would never plan for this situation to eventuate, the RIT-T requires the credible options to be assessed against a common base case representing a state of the world where action is not taken to address the long-term need. In reality, we are planning to have the most efficient long-term solution (which will be identified through this RIT-T process) to continue to provide reliable supply to the load in question.

3.2. Option 1 – New BSP next to the Kemps Creek substation

Option 1 involves the commissioning of a new BSP next to the existing Kemps Creek substation.

Specifically, Option 1 involves Transgrid:

[15] Costs are expressed in 2023/24 dollars in the PSCR and PADR. To convert to 2024/25 dollars, we have escalated by the RBA's year-on-year CPI inflation forecast for June 2025 (2.1 per cent). See: https://www.rba.gov.au/publications/smp/2025/may/.

[16] AER, *Regulatory investment test for transmission application guidelines – November 2024,* p 21.

- constructing a new Kemps Creek BSP with two 375 MVA 330/132 kV transformers and associated 132 kV bays and connecting these back into Transgrid's existing Kemps Creek 500/330 kV substation via new 330 kV switchbays; and
- adding a new 375 MVA 330/132 kV transformer and a 330 kV bay at the existing Macarthur BSP.

Option 1 also involves Endeavour Energy and associated work for Transgrid:

- establishing a new 132 kV feeder from Kemps Creek BSP to Badgerys Creek ZS;[17]
- repurposing existing feeder 512 (built at 132 kV and currently energised at 33 kV) from Bringelly including 1.8km of new underground cable to Kemps Creek BSP;
- augmenting Bringelly ZS by:
  - > removing existing 33/11 kV 19 MVA transformer No.1 and 33 kV feeder 512 bay;
  - > extending 132 kV bus-section;
  - > installing a 132/11 kV 45 MVA power transformer and a 132 kV circuit breaker;
  - > installing a 132 kV feeder bay;
  - > installing a 132 kV bus-section breaker between the new bus-section and bus-section 2;
- ring existing 132 kV feeder 93X into Kemps Creek BSP, creating a new feeder to adjoining substations;[18]
- undertaking Macarthur BSP connection works comprising:
  - > upgrading the existing 66 kV line 85L to a 132 kV line, including any associated 132 kV and 66kV works to address resultant network constraint;
  - > upgrading line 9L1 and 9L2[19] to match the new Transgrid transformer rating of 375 MVA; and
  - > increasing the rating for cables/lines between the new Kemps Creek BSP and South Erskine Park.

The estimated capital cost of this option is $136.7 million, which is comprised of $111.7 million (including property) in Transgrid costs and $25.0 million in Endeavour Energy costs.

The new BSP under Option 1 will be located on vacant property. Transgrid recently finalised a strategic land acquisition, and the cost of this land has been included in the cost estimate for this option in accordance with the AER RIT-T Guidelines.[20]

Table 3-1 shows the breakdown of the estimated capital costs for this option.

[17] The scope of work included here reflects an *incremental* scope and cost to connect to Kemps Creek BSP only. The remaining scope and cost of this feeder was included in Endeavour Energy's Badgerys Creek FPAR.
[18] Final destinations to be advised pending network configuration at time of commissioning of the BSP – likely destination of North Kemps Creek ZS or a High Voltage Customer in a northward direction, and a new feeder to Austral ZS or North Leppington ZS in a southward direction.
[19] New proposed line number when 85L is upgraded to 132 kV.
[20] AER, *Regulatory investment test for transmission application guidelines – November 2024,* p 27-28.

Table 3-1 Breakdown of Option 1's expected capital cost, $m[21]

Component	Labour	Materials	Expenses	Land[22]	Total
Transgrid					
New Kemps Creek Substation (including 2 x 375 MVA 330/132 kV transformers)	$9.6m	$20.4m	$35.5m	$20.9m	$86.4m
Existing Kemps Creek Substation Modifications	$1.8m	$3.1m	$4.8m	-	$9.7m
Transmission Line Works	$0.8m	$1.4m	$2.3m	-	$4.6m
New 375 MVA 330/132 kV transformer at the existing Macarthur BSP	$1.9m	$3.6m	$5.5m	-	$11.0m
Total capital cost – Transgrid	**$14.2m**	**$28.5m**	**$69.0m**		**$111.7m**
Endeavour Energy[23]					
New 132 kV feeder from Kemps Creek BSP to Badgerys Creek ZS	$0.5m	$1.3m	$0.4m	$0.1m	$2.3m
Re-energising existing 132 kV built	$1.9m	$4.3m	$1.0m	$0.4m	$7.7m
Augment Bringelly ZS	$1.9m	$4.2m	$1.1m	$0.4m	$7.7m
Ring 93X into Kemps Creek BSP	$0.3m	$0.8m	$0.2m	$0.1m	$1.4m
Macarthur BSP Connection works	$1.5m	$3.2m	$0.8m	$0.3m	$5.8m
Total capital cost – Endeavour Energy	**$6.2m**	**$13.8m**	**$3.6m**	**$1.3m**	**$25.0m**

Table 3-2 shows the expected expenditure profile of this option (which is not expected to change under the different demand forecasts).

[21] Note some numbers may not add to due to rounding.
[22] Transgrid recently finalised the purchase of the land, the capital costs associated with land acquisition are not expected to change.
[23] The Endeavour Energy cost breakdown is indicative only and is based on standard breakdowns for similar projects across Endeavour' Energy's network (i.e., it is not specific to this project).

Table 3-2 Annual breakdown of Option 1's expected capital cost, $m

Year	Capital expenditure
Transgrid	
FY25	$21.9m
FY26	$3.7m
FY27	$11.8m
FY28	$59.8m
FY29	$14.5m
Total capital cost – Transgrid	**$111.7m**
Endeavour Energy	
FY25	$2.9m
FY26	$4.6m
FY27	$1.3m
FY28	$7.7m
FY29	$5.4m
FY30	$3.1m
Total capital cost – Endeavour Energy	**$25.0m**

Additional operating expenditure for Transgrid and Endeavour Energy has been estimated at $904,600/year (approximately 1 per cent of total capital expenditure) and $100,000/year (approximately 0.4 per cent of total capital expenditure), respectively, for this option.

While Option 1 and Option 2 (below) have been designed to avoid forecast EUE over the medium-term, we note that some EUE is forecast to occur under the central and high demand forecasts with each option in-place over the longer-term (particularly under the high demand forecast). However, we do not consider this forecast EUE to be material to the outcome of assessment as it is lower under Option 1 than Option 2 and the investment to resolve it (adding transformers to the new BSP) is the same cost irrespective of the option identified as preferred in this RIT-T. We have not included the investment to resolve this future EUE within the scope of this RIT-T and note that it would be subject to a separate RIT-T in the future (subject to outturn load growth).

All works are estimated to take six years to complete and the new BSP has an expected commissioning date of 2029/30.

Figure 3-1 below presents the layout of the new Kemps Creek BSP under Option 1.

Figure 3-1 Layout of the new Kemps Creek BSP under Option 1

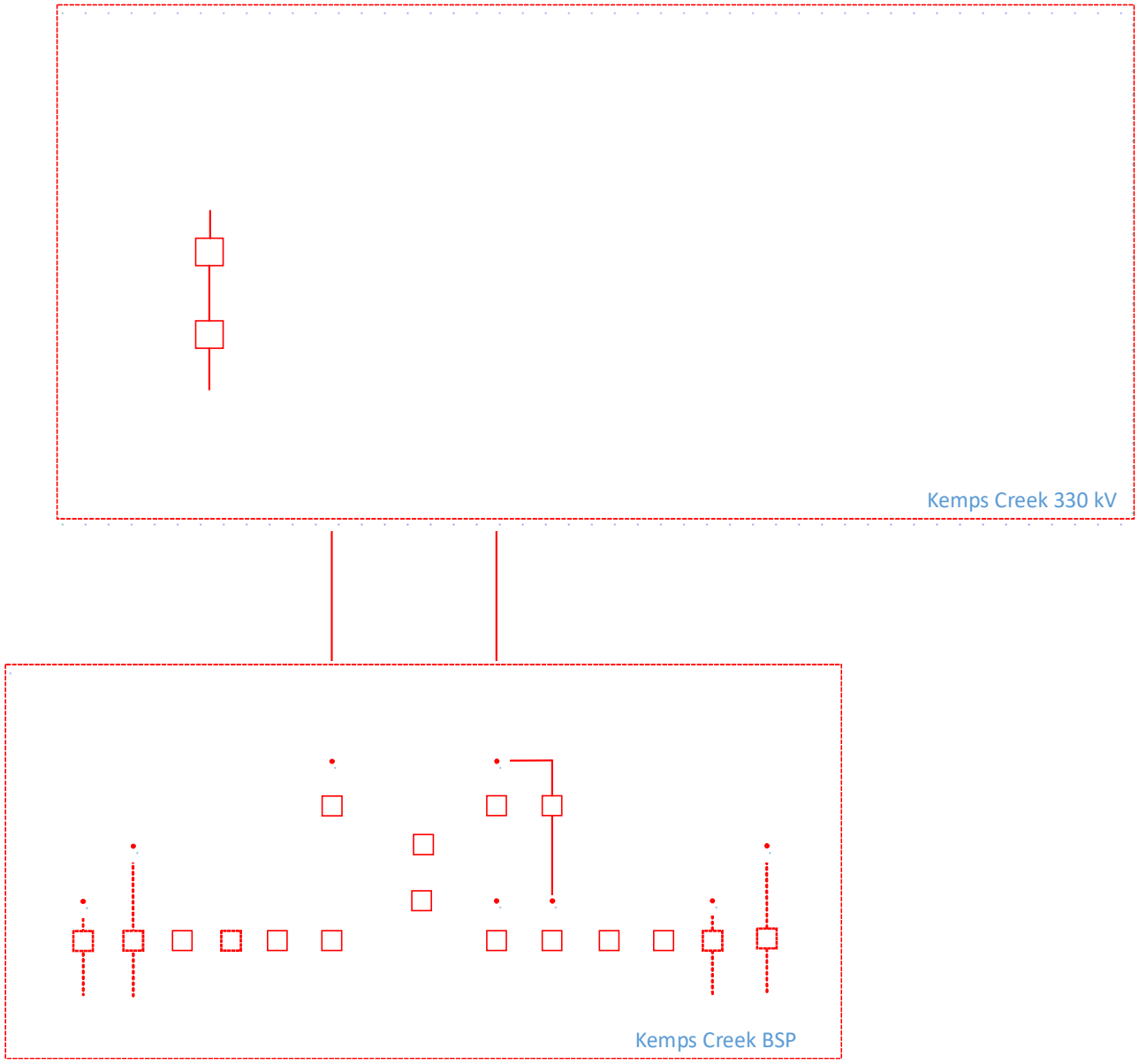


Figure 3-2 below shows the Macarthur BSP layout for connecting one new 330/132 kV transformer (which also applies to Option 2 below).

Figure 3-2 Macarthur BSP layout for connecting one new 330/132 kV transformer (for both options 1 and 2)

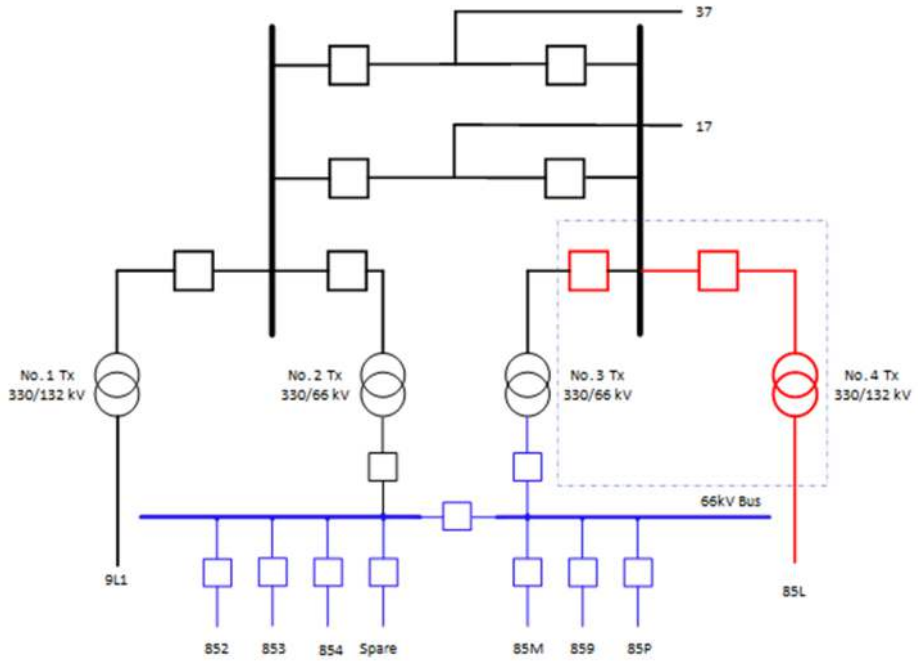
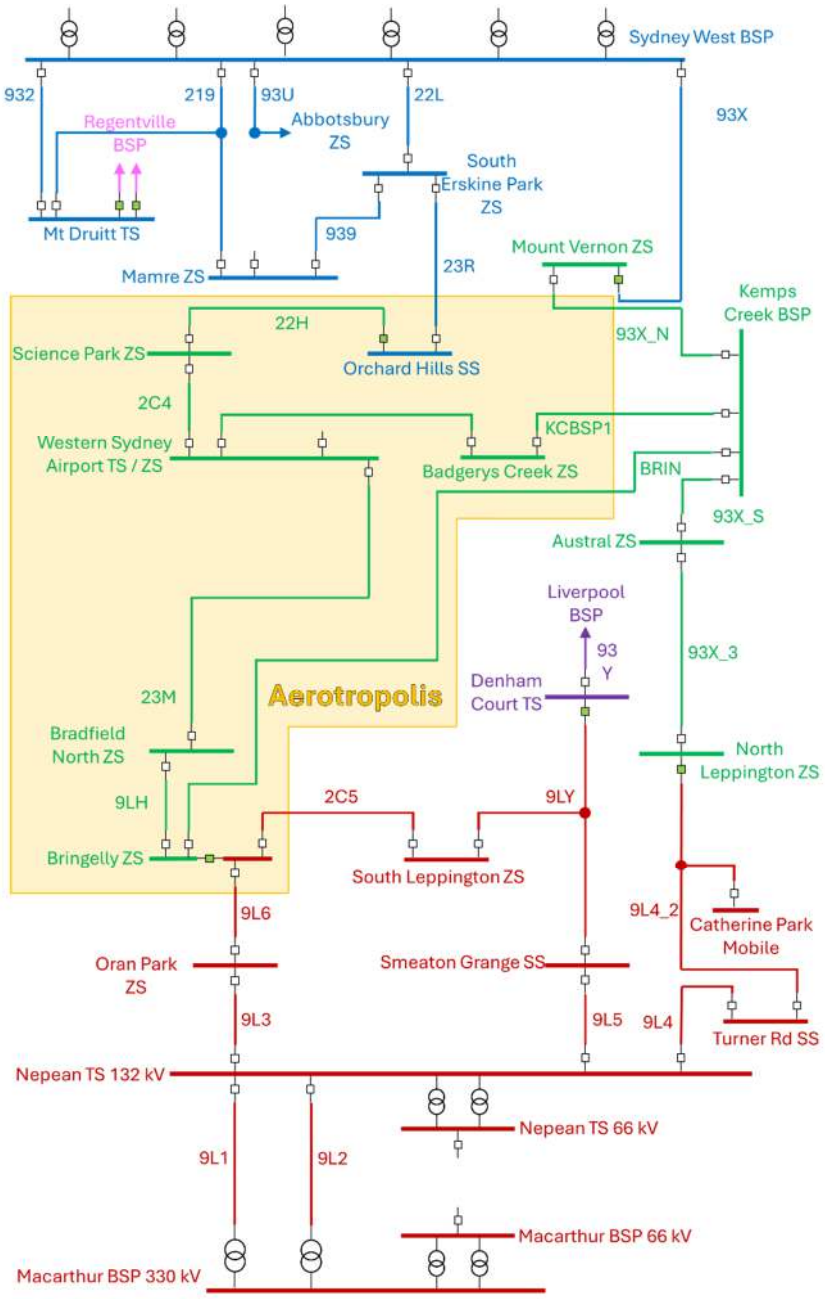


Figure 3-3 shows the Endeavour Energy Aerotropolis Area Plan for its 132 kV network configuration expected by 2035-2040, including the new Kemps Creek BSP under Option 1.

Figure 3-3 Endeavour Energy Aerotropolis Area Plan for 132 kV supply showing network configuration expected by 2035-2040



3.3. Option 2 – New Airport South BSP supplied from cut-in to Line 39

Option 2 involves the commissioning of a new BSP near the southern transition station of the Western Sydney Airport underground cable, which is cut-in to Line 39.

Specifically, Option 2 involves Transgrid:

- establishing a new Transgrid Airport South BSP with two x 375 MVA 330/132 kV transformers, and looping-in the 330 kV Line 39; and
- installing an additional 375 MVA 330/132 kV transformer at Macarthur BSP.

Option 2 also involves Endeavour Energy:

- establishing a new 132 kV feeder from Airport South BSP to Bringelly ZS;
- establishing a new 132 kV feeder from Airport South BSP to Badgerys Creek ZS via Northern Road;
- establish two new 132 kV cables from Airport South BSP to feed 93X north and south; and
- undertaking Macarthur BSP connection works comprising:
  - upgrading the existing 66 kV line 85L to a 132 kV line, including any associated 132 kV and 66 kV works to address resultant network constraint;
  - upgrading line 9L1 and 9L2[24] to match the new Transgrid transformer rating of 375 MVA; and
  - increasing the rating for cables/lines between the new Kemps Creek BSP and South Erskine Park.

The estimated capital cost of this option is $263.1 million, which is comprised of $161.0 million in Transgrid costs and $102.1 million in Endeavour Energy costs.

Neither Transgrid nor Endeavour Energy has refined its costs for this option since the PADR.

Option 2 will add extra loading to the already heavily loaded Line 39, which may lead to network constraints causing a reduction in renewable generation available from the southern Sydney area compared to Option 1. While this is noted, it has not been estimated as part of the assessment (as outlined in section 4.2 below).

The new BSP under Option 2 will be located on new property Transgrid will need to purchase. The cost of this land has been included in the cost estimate for this option in accordance with the AER RIT-T Guidelines.[25]

Table 3-3 shows the breakdown of the estimated capital costs for this option.

[24] New proposed line number when 85L is upgraded to 132 kV.
[25] AER, *Regulatory investment test for transmission application guidelines – November 2024,* p 27-28.

Table 3-3 Breakdown of Option 2's expected capital cost, $m[26]

Component	Labour	Materials	Expenses	Land	Total
Transgrid					
New Transgrid Airport South BSP (including two x 375 MVA 330132 kV transformers)	$5.2m	$34.7m	$96.6m[27]		$136.5m
Transmission Line Works	$1.2m	$6.6m	$5.7m		$13.6m
New 375 MVA 330/132 kV transformer at Macarthur BSP	$1.9m	$3.6m	$5.5m	-	$11.0m
Total capital cost – Transgrid	**$7.4m**	**$47.4m**	**$106.3m**		**$161.0m**
Endeavour Energy[28]					
New 132 kV feeder Airport South BSP to Bringelly ZS	$4.3m	$9.5m	$2.6m	$0.8m	$17.4m
New 132 kV feeder from Airport South BSP to Badgerys Creek ZS	$5.5m	$12.3m	$3.4m	$1.1m	$22.3m
Two new 132 kV cables from Airport South BSP to 93X	$14.2m	$31.2m	$8.5m	$2.9m	$56.8m
Macarthur BSP connection works	$1.4m	$3.2m	$0.8m	$0.3m	$5.8m
Total capital cost – Endeavour Energy	**$25.5m**	**$56.2m**	**$15.3m**	**$5.1m**	**$102.2m**

Table 3-4 shows the expected expenditure profile of this option (which is not expected to change by demand forecast assumed).

[26] Note some numbers may not add to due to rounding.
[27] Some of the Transgrid cost breakdowns for Expenses and Land have been combined due to commercial processes Transgrid would need to engage in to strategically acquire the land.
[28] The Endeavour Energy cost breakdown is indicative only and is based on standard breakdowns for similar projects across Endeavour' Energy's network (i.e., it is not specific to this project).

Table 3-4 Annual breakdown of Option 2's expected capital cost, $m

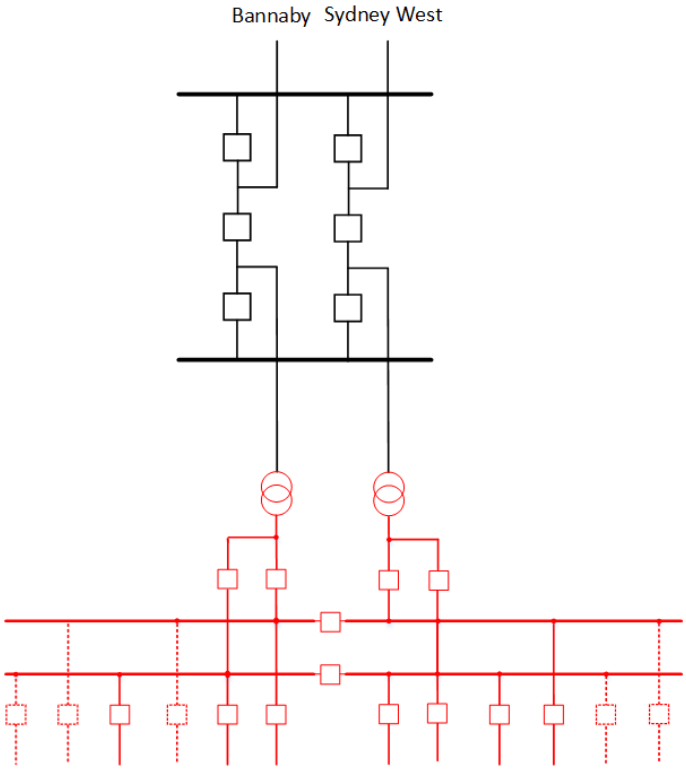
Year	Capital expenditure
Transgrid	
FY25	$0.9m
FY26	$3.5m
FY27	$9.5m
FY28	$47.6m
FY29	$99.4m
Total capital cost – Transgrid	**$161.0m**
Endeavour Energy	
FY25	$2.9m
FY26	$36.2m
FY27	$25.9m
FY28	$24.8m
FY29	$7.8m
FY30	$4.4m
Total capital cost – Endeavour Energy	**$102.1m**

Additional operating expenditure for Transgrid and Endeavour Energy has been estimated at $850,500/year (approximately 1 per cent of total capital expenditure) and $408,400/year (approximately 0.4 per cent of total capital expenditure), respectively, for this option.

All works are estimated to take six years to complete and the new BSP has an expected commissioning date of 2029/30.

Figure 3-4 below presents the layout of the new Airport South BSP under Option 2.

Figure 3-4 Layout of the new Airport South BSP under Option 2



The layout of the Macarthur BSP for connecting one new 330/132 kV transformer is the same as for Option 1 (i.e., that shown in Figure 3-2 above).

Endeavour Energy has not developed a single-line diagram for the Aerotropolis Area Plan 132 kV network configuration by 2035-2040 for Option 2 (as they have for Option 1 above) given it is not the preferred option at this draft stage (and there is considerable work involved in developing these diagrams).

3.4. Options considered but not progressed

We considered several additional options to meet the identified need in this RIT-T. Table 3-5 summarises the reasons the following options were not progressed further.

Table 3-5 Options considered but not progressed

Description	Reason(s) for not progressing
Upgrade the existing Sydney West and Macarthur BSP, and transfer load from Macarthur to Sydney West BSP	While this option is considered technically feasible, it is not considered commercially feasible under the RIT-T. Specifically, it is expected to cost significantly more than Option 1 and Option 2 (approximately $260 million for Transgrid and approximately $128 million for Endeavour Energy[29]) and not provide any additional expected market benefits.
Upgrade existing Sydney West and Macarthur BSP with open point within Endeavour Energy distribution network	While this option would reduce the loading on Macarthur BSP transformers, which would reduce the scope of works at the Macarthur BSP, it also reduces the reliability level of Metro and Western Sydney Airport load to N since there will be short supply disruptions when switching from one BSP to another. These periodic disruptions to supply are not acceptable to the Western Sydney airport and will breach the IPART transmission reliability standards for redundancy. This option is therefore not considered technically feasible under the RIT-T.
Non-network solutions	Non-network options are not expected to constitute potential credible options for this RIT-T, either on a standalone basis or as part of a potential credible option. As outlined in section 4 of the PSCR and noted in the Executive Summary of this PACR, this is due to the network augmentation being required to facilitate substantial new loads, i.e., the investment is being built solely for greenfield load developments (and the magnitude of these developments is such that realistic non-network solutions cannot alter the timing or scope of the expected network investment). Additionally, we did not receive any submissions regarding non-network options in response to the PSCR or PADR.

[29] The Endeavour Energy estimate excludes additional expected costs associated with fault level upgrades.

4. Materiality of market benefits

This section outlines the categories of market benefits prescribed in the National Electricity Rules (NER) and whether they are considered to be material for this RIT-T.[30]

We consider that the only category of market benefit that is likely to be material is changes in involuntary load shedding. Other categories of market benefits prescribed in the NER are not considered material for this RIT-T at this stage (as outlined in the sections below).

4.1. Changes in involuntary load shedding are expected to be material

The only category of market benefit that is likely to be material, is changes in involuntary load shedding.

We have estimated the value of avoided EUE at the Aerotropolis precinct under each of the credible options, compared to the base case. This includes both planned and unplanned outages and has been valued using the AER's estimate of the Value of Customer Reliability (VCR).

4.2. Wholesale electricity market benefits are not considered material

Option 2 is expected to add extra loading to the already heavily loaded Line 39, which may lead to network constraints causing a reduction in renewable generation available from the southern Sydney area compared to Option 1. However, we do not consider that the consequent impact on the wholesale market will be material to the outcome of this RIT-T and are therefore have not quantified this market benefit (cost).

Specifically, due to its significantly lower cost, Option 1 is already strongly preferred to Option 2 in the PACR assessment. Estimating the (negative) impact of Option 2 on the wholesale market is therefore not expected to change this conclusion and we do not consider the resources required to do so to be proportionate for this RIT-T.

We therefore consider that the following classes of market benefits are not material for this RIT-T assessment:

- changes in fuel consumption arising through different patterns of generation dispatch;
- changes in Australia's greenhouse gas emissions;[31]
- changes in voluntary load curtailment (since there is no impact on pool price);
- changes in costs for parties other than the RIT-T proponent;
- difference in the timing of unrelated expenditure (since this market benefit is driven through wholesale market changes);
- changes in ancillary services costs;

[30] The NER requires that all classes of market benefits identified in relation to the RIT-T are included in the RIT-T assessment, unless the TNSP can demonstrate that a specific class (or classes) is unlikely to be material in relation to the RIT-T assessment for a specific option – NER clause 5.15A.2(b)(6). See Appendix A for requirements applicable to this document.

[31] While the PSCR noted that any insights from the work Transgrid was doing at the time to understand how to assess the value of expected changes in greenhouse gas emission would be considered and presented within the PADR, we subsequently noted in the PADR that we do not consider this new category of market benefit to be material for this RIT-T and so we have not considered it further. Specifically, and as outlined in section 3.3 (and 5.3 of the PSCR), Option 2 is expected to lead to network constraints causing a reduction in renewable generation available from the southern Sydney area compared to Option 1, and thus will have greater levels of greenhouse gas emissions than Option 1 (which is already ranked ahead of Option 2 excluding the impact on greenhouse gas emissions).

- changes in network losses; and
- competition benefits.

4.3. No other classes of market benefits are considered material

In addition to the classes of market benefits discussed above, NER clause 5.15A.2(b)(4) requires that we consider the following classes of market benefits arising from each credible option. We consider that none of the classes of market benefits listed will be material for this RIT-T assessment for the reasons in Table 4-1.

Table 4-1 Reasons why other non-wholesale electricity market benefits are considered immaterial

Market benefits	Reason
Difference in the timing of unrelated expenditure (outside of any benefits of this nature driven by wholesale market changes)	While we note that potential future works are expected to be lower if Option 1 is pursued, compared to Option 2, we do not consider this to be material under the RIT-T. Specifically, if load growth from the Aerotropolis precinct were to continue for a sustained period, then this would be met by: • installing additional transformers in the new BSP if Option 1 is pursued; or • upgrading an existing line or constructing an additional line if Option 2 is pursued. We expect that the cost of installing additional transformers in the new BSP will be lower than the cost of upgrading an existing line or constructing an additional line. Since Option 1 is strongly preferred over Option 2 at this draft stage, as outlined above, quantifying this additional market benefit for Option 1 will only further increase its net benefits over Option 2, which will not change the ranking of the two options. We therefore do not consider this category of market benefit to be material for this RIT-T and therefore have not estimated it.
Option value	We note the AER's view that option value is likely to arise where there is uncertainty regarding future outcomes, the information that is available is likely to change in the future, and the credible options considered by the TNSP are sufficiently flexible to respond to that change.[32] We note that no credible option is sufficiently flexible to respond to change or uncertainty for this RIT-T. Specifically, each option is focused on proactively providing network capacity ahead of demand growth to avoid unserved energy.

[32] AER, *Regulatory Investment Test for Transmission – Application Guidelines*, November 2024, p. 56-57.

5. Overview of the assessment approach

This section outlines the approach that we have applied in assessing the net benefits associated with each of the credible options against the base case as part of the PACR.

5.1. Description of the base case

As described in section 3.1 above, the base case assumes that no proactive capital investment will be made to accommodate the forecast demand growth, which results in very high levels of unserved energy.

While we note that the EUE is not forecast to breach the IPART reliability standards by the proposed date for investment, they would be breached over the longer-term under the base case if action is not taken due to the exponential demand growth forecast. While we would never plan for this situation to eventuate, the RIT-T requires the credible options to be assessed against a common base case, representing a state of the world where action is not taken to address the long-term need. We are planning to have the most efficient long-term solution (as identified through this RIT-T process) in place to continue to provide reliable supply to the loads in the Western Sydney Priority Growth Area (PGA).

We have capped the future EUE in the assessment because the uncapped value will otherwise become unrealistically high (since, in reality, we would undertake investment to avoid widespread customer outages) and this will distort the comparison of the *differences* in net market benefits between credible options. We have capped the EUE by 99 per cent, i.e., we only include 1 per cent of expected future unserved energy in each year. Capping the expected unserved energy in the base case is in-line with other RIT-Ts and does not affect the overall ranking of the options.[33]

5.2. Assessment period and discount rate

A 20-year assessment period from 2024/25 to 2043/44 has been adopted for this RIT-T analysis. This period takes into account the size, complexity and expected asset life of the options.

Where the capital components of the credible options have asset lives extending beyond the end of the assessment period, the NPV modelling includes a terminal value to capture the remaining functional asset life. This ensures that the capital cost of long-lived options over the assessment period is appropriately captured, and that all options have their costs and benefits assessed over a consistent period, irrespective of option type, technology or serviceable asset life. The terminal values have been calculated as the undepreciated value of capital costs at the end of the analysis period.

A real, pre-tax discount rate of 7 per cent has been adopted as the central assumption for the NPV analysis presented in the PACR, consistent with AEMO's latest Input Assumptions and Scenarios Report (IASR).[34] The RIT-T requires that sensitivity testing be conducted on the discount rate and that the regulated weighted average cost of capital (WACC) has been used as the lower bound. We have therefore tested the

[33] This is also consistent with the approach proposed by Dr Biggar in his review of 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, p. 27). While Dr Biggar suggests capping the 'congestion cost' (calculated as the unserved energy valued at the VCR) in such assessments, we consider it more intuitive to cap the underlying unserved energy, in MWh, and continue to value it at the appropriate VCR. This is the approach that has been adopted by other NSPs and is effectively equivalent to the approach proposed by Dr Biggar.

[34] AEMO, *2023 Inputs, Assumptions and Scenarios Report*, Final report, July 2023, p 123.

sensitivity of the results to a lower bound discount rate of 3.63 per cent,[35] as well as an upper bound discount rate of 10.5 per cent (i.e., the upper bound in the latest IASR).[36]

5.3. Approach to estimating option costs

The two subsections below outline how the Transgrid and Endeavour Energy costs have been estimated.

5.3.1. Transgrid costs

Transgrid has estimated the capital costs of the options based on the scope of works necessary together with costing experience from previous projects of a similar nature.

All costs estimated by Transgrid's project development team use the estimating tool 'MTWO'. The MTWO cost estimating database reflects actual outturn costs built up over more than 10 years from:

- period order agreement rates and market pricing for plant and materials;
- labour quantities from recently completed project; and
- construction tender and contract rates from recent projects.

The MTWO estimating database is reviewed annually to reflect the latest outturn costs and confirm that estimates are within their stated accuracy range and represent the most likely expected cost of delivery (P50 costs[37]). As part of the annual review, Transgrid benchmarks the outcomes against independent estimates provided by various engineering consultancies.[38]

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

We estimate that actual costs will be within +/- 25 per cent of the central capital cost estimate. While we have not explicitly applied the AACE cost estimate classification system, we note that an accuracy of +/- 25 per cent for cost estimates is consistent with industry best practice and aligns with the accuracy range of a 'Class 4' estimate, as defined in the AACE classification system.

No specific contingency allowance has been included in the cost estimates.

All cost estimates are prepared in real, 2024/25 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.

Routine operating and maintenance costs are based on works of similar nature.

[35] This is equal to WACC (pre-tax, real) in the latest final decision for a transmission business in the NEM (TasNetworks) as of the date of this analysis, see: https://www.aer.gov.au/industry/registers/determinations/tasnetworks-determination-2024-29/final-decision#final-decision. We note that this value has changed from the 3.21 per cent discussed in the PSCR. This is because the final decision for TasNetworks was made following the drafting of the PSCR for this RIT-T.
[36] AEMO, *2023 Inputs, Assumptions and Scenarios Report*, July 2023, Final Report, p. 123.
[37] I.e., there is an equal likelihood of over- or under-spending the estimate total.
[38] For further detail on Transgrid's cost estimating approach refer to section 7 of Transgrid's Augmentation Expenditure Overview Paper submitted with Transgrid's 2023-28 Revenue Proposal.

5.3.2. Endeavour Energy costs

The Endeavour Energy costs presented in this document were prepared by Endeavour Energy's Network Planning team based on estimates provided for recent scopes of work, primarily establishing new 132 kV underground feeders and substation builds. Unit rates were then applied by proposed feeder length and by construction methodology.

Costs have been split across cost elements based on high level percentage splits as observed on recent projects. The costs have been phased across financial years based on the expected delivery date of the projects.

Endeavour Energy does not generally apply the AACE international cost estimate classification system to classify cost estimates. Endeavour Energy estimates that actual costs will be within +/-50 per cent of the central capital cost estimate.

No specific contingency allowance has been included in the cost estimates.

All cost estimates are prepared in real, 2024/25 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.

Routine operating and maintenance costs are based on a fleet level assessment of assets and works of similar nature.

5.4. Three different scenarios have been modelled to address uncertainty

The RIT-T is focused on identifying the top ranked credible option in terms of expected net benefits. However, uncertainty exists in terms of estimating future inputs and variables (termed future 'states of the world').

To deal with this uncertainty, the NER requires that costs and market benefits for each credible option are estimated under reasonable scenarios and then weighted based on the likelihood of each scenario to determine a weighted ('expected') net benefit. It is this 'expected' net benefit that is used to rank credible options and identify the preferred option.

The credible options are assessed under three scenarios as part of this PACR assessment. For this RIT-T, the only market benefit considered to be material is changes in involuntary load shedding. As a result, the three scenarios differ only through their assumed local demand forecasts, as this is the key parameter influencing the ranking of the credible options.

Given that wholesale market benefits are not relevant for this RIT-T, the three scenarios implicitly assume the expected most likely scenario for the 2024 ISP (i.e., the 'Step Change' scenario).

Table 5-1 below summarises the specific key variables that influence the net benefits of the options under each of the scenarios considered.

Table 5-1 Summary of scenarios

Variable/scenario	Central	Low demand scenario	High demand scenario
Scenario weighting	45%	45%	10%
Demand growth	Central forecast (from section 2.3.1)	Low forecast (from section 2.3.1)	High forecast (from section 2.3.1)
Discount rate	7%	7%	7%
VCR ($/MWh)	$36,892	$36,892	$36,892
Network capital costs	Base estimate	Base estimate	Base estimate

While we have assigned the high demand scenario a lower weight than the other two scenarios (on account of the extent of the load included in that scenario), we note that the scenarios weights are ultimately immaterial for this RIT-T assessment since Option 1 is the top-ranked option in each scenario.

The effect of changes to other variables (ie, the discount rate, VCR and capital costs) in the NPV results has been investigated in the sensitivity analysis as part of the PACR. We consider this to be consistent with the AER guidance for RIT-Ts of this type (i.e., where wholesale market benefits are not expected to be material).[39,40]

5.5. Sensitivity analysis

In addition to the scenario analysis, we have considered the robustness of the outcome of the cost benefit analysis through undertaking various sensitivity testing.

The range of factors tested as part of the sensitivity analysis in this PACR include:

- optimal timing of the project;
- alternate commercial discount rate assumptions;
- higher and lower VCRs; and
- higher and lower assumed capital costs.

The above list of sensitivities focuses on the key variables that could impact the identified preferred option.

In addition, we have identified the 'boundary value' for key variables beyond which the outcome of the analysis would change, including the amount by which capital costs would need to increase for the preferred option to no longer be preferred.

[39] AER, *Regulatory Investment Test for Transmission – Application Guidelines*, November 2024, pp. 42-44.
[40] See: AER, *Decision: North West Slopes and Bathurst, Orange and Parkes Determination on dispute - Application of the regulatory investment test for transmission*, November 2022, pp. 18-20 & 31-32, as well as with the AER's RIT-T Guidelines.

6. Assessment of credible options

This section outlines the assessment we have undertaken of the credible network options. The assessment compares the costs and benefits of each credible option to the base case.

6.1. Estimated gross benefits

Table 6-1 below summarises the present value of the gross market benefits for the credible options, relative to the base case, under the three scenarios and on a weighted basis. As outlined in section 4, the only market benefit included in the assessment is avoided involuntary load shedding.

Option 1 has the greatest estimated gross market benefit of the two options, both in each scenario and on a weighted basis. While both options avoid all involuntary load shedding under the base case once commissioned, the end of the period involves an uptick in estimated involuntary load shedding for both options (as outlined in section 3.2), which is lower for Option 1 than Option 2 (which is what drives its slightly greater benefits).

Table 6-1 PV of estimated gross benefits from credible options relative to the base case ($m, 2024/25)

Option/scenario	Central	Low demand scenario	High demand scenario	Weighted
Scenario weighting	45%	45%	10%	
Option 1	$310.1	$55.7	$3,027.8	$467.4
Option 2	$302.5	$55.6	$2,765.0	$437.7

While it appears that the gross market benefits under the low scenario are the same for Option 1 and Option 2, this is due to rounding.

6.2. Estimated costs

Table 6-2 below summarises the present value of the costs of the credible options, relative to the base case, under the three scenarios and on a weighted basis. The only costs included in this RIT-T assessment are direct capital costs and operating costs.

Table 6-2 PV of costs of credible options relative to the base case ($m, 2024/25)

Option/scenario	Low□central and high scenarios	Weighted
Option 1	$90.4	$90.4
Option 2	$159.0	$159.0

6.3. Estimated net economic benefits

Table 6-3 below summarises the present value of the net economic benefits of the credible options, relative to the base case, under the three scenarios and on a weighted basis. The net economic benefits are calculated as the estimated gross benefits less the estimated costs plus the terminal value.

Table 6-3 PV of net economic benefits for Option 1 relative to the base case ($m, 2024/25)

Option/scenario	Central	Low demand scenario	High demand scenario	Weighted
Scenario weighting	45%	45%	10%	
Option 1	$219.8	-$34.7	$2,937.5	$377.0
Option 2	$143.5	-$103.4	$2,606.0	$278.6

While the net economic benefits under the low demand scenario are shown as negative values, this is solely due to the capping of the EUE. Under the full EUE, the low demand scenario has strongly positive net benefits (as outlined at the end of section 5.1).

In addition, we note that the estimated net benefits for both options under all scenarios have fallen since the PADR due to a lower VCR value now being applied, consistent with the AER's 2024 VCR estimates (as discussed in section 2.3.4).

6.4. Sensitivity testing

We have undertaken sensitivity testing to understand the robustness of the RIT-T assessment to underlying assumptions about key variables. We have undertaken two sets of sensitivity tests:

- 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, if actual circumstances turn out to be different.

The application of the two steps to test the sensitivity of the key findings is outlined below.

6.4.1. Step 1 – Optimal timing of the project

This section outlines the sensitivity of the identification of the commissioning year to changes in the underlying assumptions.

The optimal timing of an investment is the year in which the annual benefits from implementing the option become greater than the annualised investment costs. The purpose of this analysis is to examine the sensitivity of the commissioning year to changes in the underlying assumptions. This analysis was undertaken under the central set of assumptions and using a range of alternative assumptions of key variables. Because this analysis involves calculation of the point where annual benefits become greater than annual costs, we use the full estimate of EUE (as opposed to the capped value).

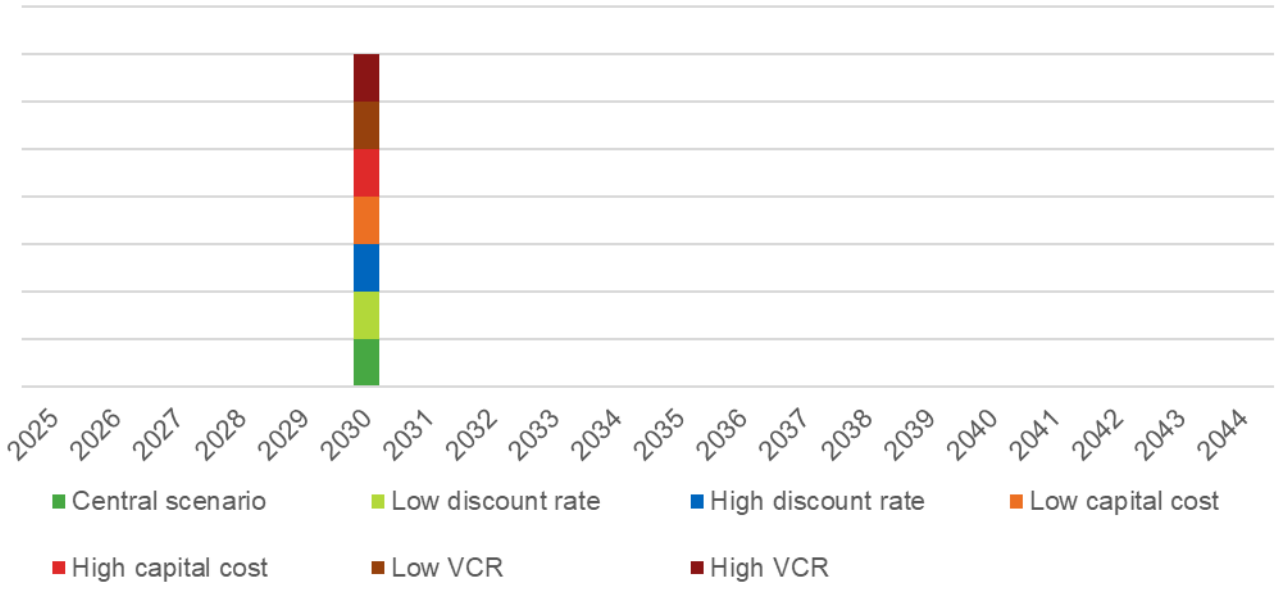
We find that the optimal timing of Option 1 is found to be invariant to the following assumptions:

- a lower discount rate of 3.63 per cent and a higher discount rate of 10.5 per cent;
- a 30 per cent increase / decrease in the VCR; and
- a 50 per cent increase / decrease in capital costs.[41]

[41] While Transgrid capital costs are expected to be within +/- 25 per cent of the central capital cost estimate, we test using +/- 50 per cent because Endeavour capital costs are expected to be within +/- 50 per cent of the central capital cost estimate.

Specifically, figure below outlines the impact on the optimal commissioning year, under a range of alternative assumptions. It illustrates that for Option 1, the optimal commissioning date is found to be 2029/30 for all sensitivities investigated.

Figure 6-1 Distribution of optimal timing of Option 1 under a range of different key assumptions



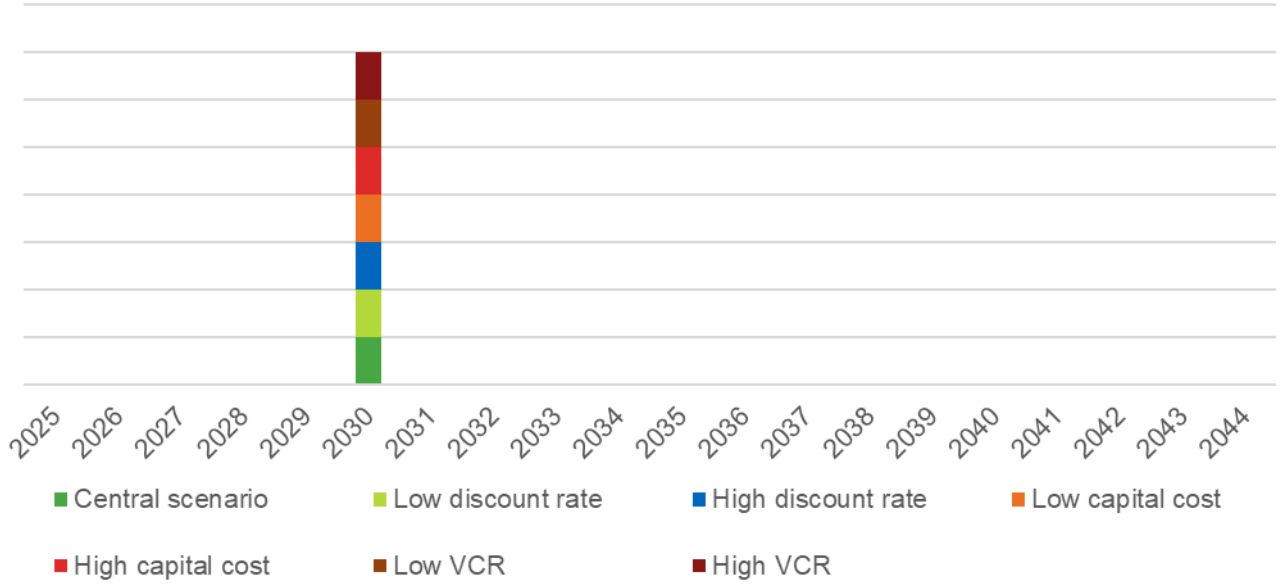
Similarly, the optimal timing of Option 2 is found to be invariant to the following assumptions:

- a lower discount rate of 3.63 per cent and a higher discount rate of 10.5 per cent;
- a 30 per cent increase / decrease in the VCR; and
- a 50 per cent increase / decrease in capital costs.[42]

Specifically, figure below outlines the impact on the optimal commissioning year, under a range of alternative assumptions. It illustrates that for Option 2, the optimal commissioning date is found to be in 2029/30 for all the sensitivities investigated.

[42] While Transgrid capital costs are expected to be within +/- 25 per cent of the central capital cost estimate, we test using +/- 50 per cent because Endeavour capital costs are expected to be within +/- 50 per cent of the central capital cost estimate.

Figure 6-2 Distribution of optimal timing of Option 2 under a range of different key assumptions



6.4.2. Step 2 – Sensitivity of overall benefit

We have conducted sensitivity analysis on the present value of the net economic benefit, based on undertaking the project by 2029/30 for both options and using the capped EUE values. Specifically, we have investigated the same sensitivities under this step as in the first step:

- a lower discount rate of 3.63 per cent and a higher discount rate of 10.5 per cent;
- a 30 per cent increase / decrease in the VCR; and
- a 50 per cent increase / decrease in capital costs.[43]

These sensitivities investigate the consequences of 'getting it wrong' having committed to a certain investment decision.

Option 1 is always found to deliver strongly positive net benefits and to be ranked ahead of Option 2.

[43] While Transgrid capital costs are expected to be within +/- 25 per cent of the central capital cost estimate, we test using +/- 50 per cent because Endeavour Energy's capital costs are expected to be within +/- 50 per cent of the central capital cost estimate.

Figure 6-3 Discount rate sensitivity

Figure 6-4 VCR sensitivity

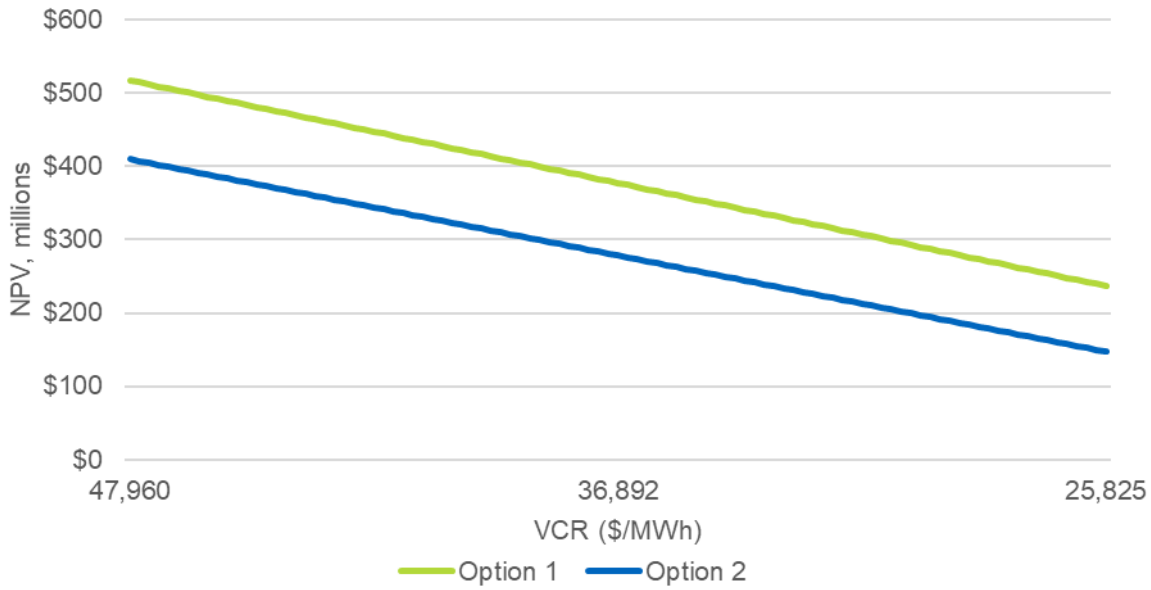
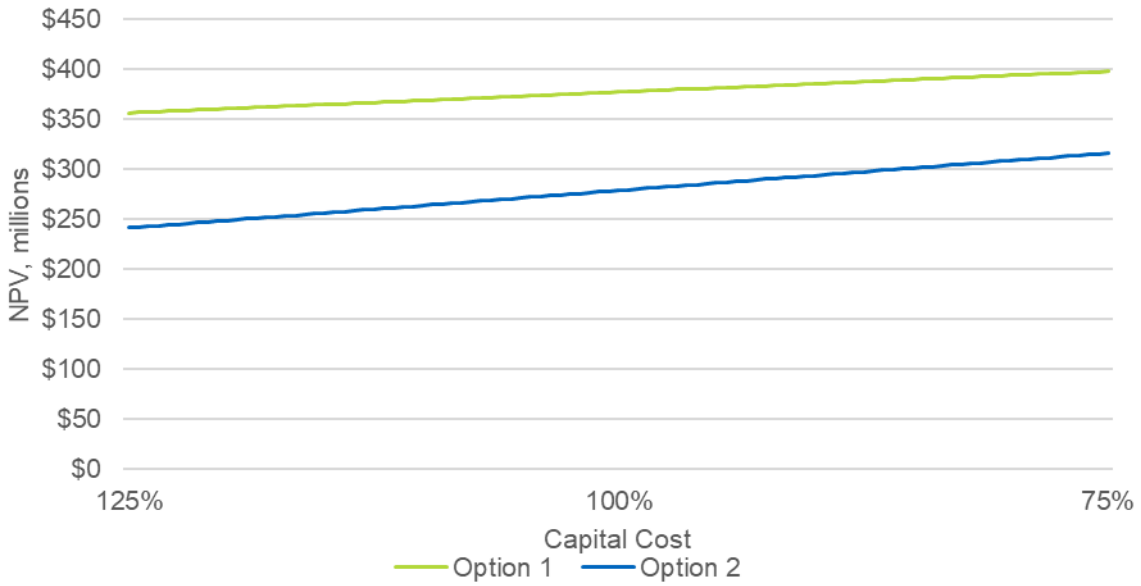


Figure 6-5 Capital cost sensitivity



In terms of boundary testing, we find that the following would need to occur for Option 1 to have zero net benefits:

- a discount rate would need to be greater than 22.49 per cent;
- the VCR value would need to be less than $7,132/MWh; or
- assumed network capital costs would need to increase by a factor of approximately 5.5.

However, these boundaries have been undertaken on the capped EUE and so we do not consider there are realistic alternate assumptions regarding the discount rate, VCR or capital costs that would ever result in Option 1 having negative estimated net benefits.

We also find that no alternate discount rate, assumed VCR or capital costs would result in Option 1 having the same or less net benefits relative to Option 2.

We further find that, if Endeavour Energy's estimated capital costs are reduced by 50 per cent (in-line with their lower bound estimate) for just Option 2 and Transgrid's remain unchanged, Option 1 still ranks ahead of Option 2. While this sensitivity has been investigated due to the different stated capital cost estimated accuracies between the organisations, we note that it is not considered a realistic situation as the same general cost drivers can be expected to affect both options and NSPs in effectively the same way.

6.5. Reopening triggers

Under the current NER, we were required to set out in the PADR, for consultation and confirmation in the PACR, 'reopening triggers' for this RIT-T since the estimated capital cost of the proposed preferred option is greater than $103 million.[44]

[44] NER clause 5.16.4(k)(10).

Our scenario and sensitivity analysis (above) has shown that the outcome of the RIT-T is robust to changes in all of the key underlying assumptions. Namely:

- alternate load forecasts;
- changes in the assumed commercial discount rate;
- variations in the VCR; and
- higher and lower capital costs.

The NPV assessment, including the sensitivity and boundary assessment, in this PACR confirms that the key findings are not sensitive to changes in these variables.

We have not identified any key assumptions that, if they were to change, could alter the preferred option under this RIT-T. We therefore do not propose any reopening triggers as part of this RIT-T.

7. Conclusion

This PACR finds that Option 1 is the preferred option to supply the expected increase in demand from developments in the Greater Western Sydney Aerotropolis 'Priority Growth Area'. Option 1 involves the commissioning of a new BSP next to the existing Kemps Creek substation.

The capital cost of this option is approximately $136.7 million, which is comprised of $111.7 million in Transgrid costs and $25.0 million in Endeavour Energy costs. Routine operating and maintenance costs are estimated at $904,600/year (approximately 1 per cent of total capital expenditure) for Transgrid and $100,000/year (approximately 0.4 per cent of total capital expenditure) for Endeavour Energy.

All works are estimated to take six years to complete and the new BSP has an expected commissioning date of 2029/30.

Option 1 is the preferred option in accordance with NER clause 5.15A.2(b)(12) because it is the credible option that maximises the net present value of the net economic benefit. The analysis undertaken and the identification of Option 1 as the preferred option satisfies the RIT-T.

This PACR has been prepared in conjunction with Endeavour Energy (as the relevant distribution network service provider).[45]

[45] Consistent with the joint-planning requirements in the National Electricity Rules.

Appendix A Compliance checklist

This appendix sets out a checklist which demonstrates the compliance of this PACR with the requirements of the National Electricity Rules version 232.

Rules clause	Summary of requirements	Relevant section(s)
5.16.4(v)	The PACR must set out:	
	(1) the matters detailed in the PADR as required under paragraph (k); and	See below
	(2) a summary of, and the RIT-T proponent's response to, submissions received, if any, from interested parties sought in response to the PADR.	N/A
5.16.4(k)	A RIT-T proponent must prepare a report (the assessment draft report), which must include:	-
	(1) a description of each credible option assessed;	3
	(2) a summary of, and commentary on, the submissions to the PSCR;	N/A
	(3) a quantification of the costs, including a breakdown of operating and capital expenditure, and classes of material market benefit for each credible option;	3, 4, 5 & 6
	(4) a detailed description of the methodologies used in quantifying each class of material market benefit and cost;	4 & 5
	(5) reasons why the RIT-T proponent has determined that a class or classes of market benefit are not material;	4
	(6) the identification of any class of market benefit estimated to arise outside the region of the Transmission Network Service Provider affected by the RIT-T project, and quantification of the value of such market benefits (in aggregate across all regions);	4 & 6
	(7) the results of a net present value analysis of each credible option and accompanying explanatory statements regarding the results;	6
	(8) the identification of the proposed preferred option;	7
	(9) for the proposed preferred option identified under subparagraph (8), the RIT-T proponent must provide: (i) details of the technical characteristics; (ii) the estimated construction timetable and commissioning date; (iii) if the proposed preferred option is likely to have a material inter-network impact and if the Transmission Network Service Provider affected by the RIT-T project has received an augmentation technical report, that report; and (iv) a statement and the accompanying detailed analysis that the preferred option satisfies the regulatory investment test for transmission.	3 & 7

In addition, the table below outlines a separate compliance checklist demonstrating compliance with the binding guidance in the latest AER RIT-T guidelines.

Guidelines section	Summary of the requirements	Relevant section(s)
3.2.5	A RIT-T proponent must consider social licence issues in the identification of credible options. A RIT proponent should include information in its RIT reports about when and how social licence considerations have affected the identification and selection of credible options.	N/A[46]
3.4.3	The value of emissions reduction (VER), reported in dollars per tonne of emissions (CO2 equivalent), is used to value emissions within a state of the world. A RIT-T proponent is required to use the then prevailing VER under relevant legislation or, otherwise, in any administrative guidance.	N/A[46]
3.5A.1	Where the estimated capital costs of the preferred option exceeds $103 million (as varied in accordance with a cost threshold determination), a RIT-T proponent must, in a RIT-T 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-T • 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.	5.3[47]
3.5A.2	For each credible option, a RIT-T proponent must specify, to the extent practicable and in a manner which is fit for purpose for that stage of the RIT-T: • 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	5.3

[46] These are new requirements stipulated in revised RIT-T Application Guidelines released by the AER, which came into effect on 21 November 2024. For compliance purposes, the AER only have regard to the guidance that was in effect when Transgrid initiated the RIT-T in question. In this context, initiated means from the publication of a PSCR. As the PSCR was published prior to 21 November 2024, these new requirements are not applicable to this RIT-T.

[47] The cost threshold of $103 million has been updated in the new guidelines from the previous value of $100 million. In accordance with footnote 46, the previous cost threshold applies.

Guidelines section	Summary of the requirements	Relevant section(s)
3.5	In the RIT-T, costs must include the following classes: • Costs incurred in constructing or providing the credible option • Operating and maintenance costs over the credible option's operating life • Costs of complying with relevant laws, regulations and administrative requirements For, asset replacement projects or programs, there are costs resulting from removing and disposing of existing assets, which a RIT-T assessment should recognise. RIT-T proponents should include these costs in the costs of all credible options that require removing and disposing of retired assets. For completeness, the RIT-T proponent would exclude these costs from the 'BAU' base case.	3
3.5.3	The RIT-T proponent is required to provide the basis for any social licence costs in its RIT-T reports and may choose to refer to best practice from a reputable, independent and verifiable source.	N/A[46]
3.6	RIT-T proponents are required to apply classes of market benefits consistently across all credible options.	N/A[46]
3.7.3	When calculating the benefit from changes in Australia's greenhouse gas emissions, a RIT-T 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: • direct emissions from generation • direct emissions other than from generation • estimate the change in annual emissions (once identified in accordance with this Guideline) 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	N/A[46]
3.8.2	Where the estimated capital cost of the preferred option exceeds $103 million (as varied in accordance with an applicable cost threshold determination), a RIT-T proponent must undertake sensitivity analysis on all credible options, by varying one or more inputs and/or assumptions.	6.4[47]
3.9.4	If a contingency allowance is included in a cost estimate for a credible option, the RIT-T 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.	N/A
3.11.2	Where a concessional finance agreement is included, the RIT-T proponent is required to provide sufficient detail about the concessional finance agreement to justify an agreement's inclusion and such that it can articulate how the value of the concession is to or would be shared with consumers. If a proponent seeks to include an unexecuted concessional finance agreement in the RIT-T, they must undertake sensitivity testing for the scenario the agreement doesn't eventuate.	N/A[46]

Guidelines section	Summary of the requirements	Relevant section(s)
4.1	RIT-T proponents are required to describe in each RIT-T report • how they have engaged with local landowners, local council, local community members, local environmental groups or traditional owners and sought to address any relevant concerns identified through this engagement • how they plan to engage with these stakeholder groups, or • why this project does not require community engagement.	N/A[46]