Luddenham, Kemps Creek and Badgerys Creek 33kV Network Constraints

Notice on screening for non-network options
May 2022

Endeavour Energy

CONTACT

If you have any comments or enquiries regarding this report or wish to submit your ideas regarding possible demand reducing initiatives, please send to the following email and addressed to Head of Portfolio Management Office:

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Contents

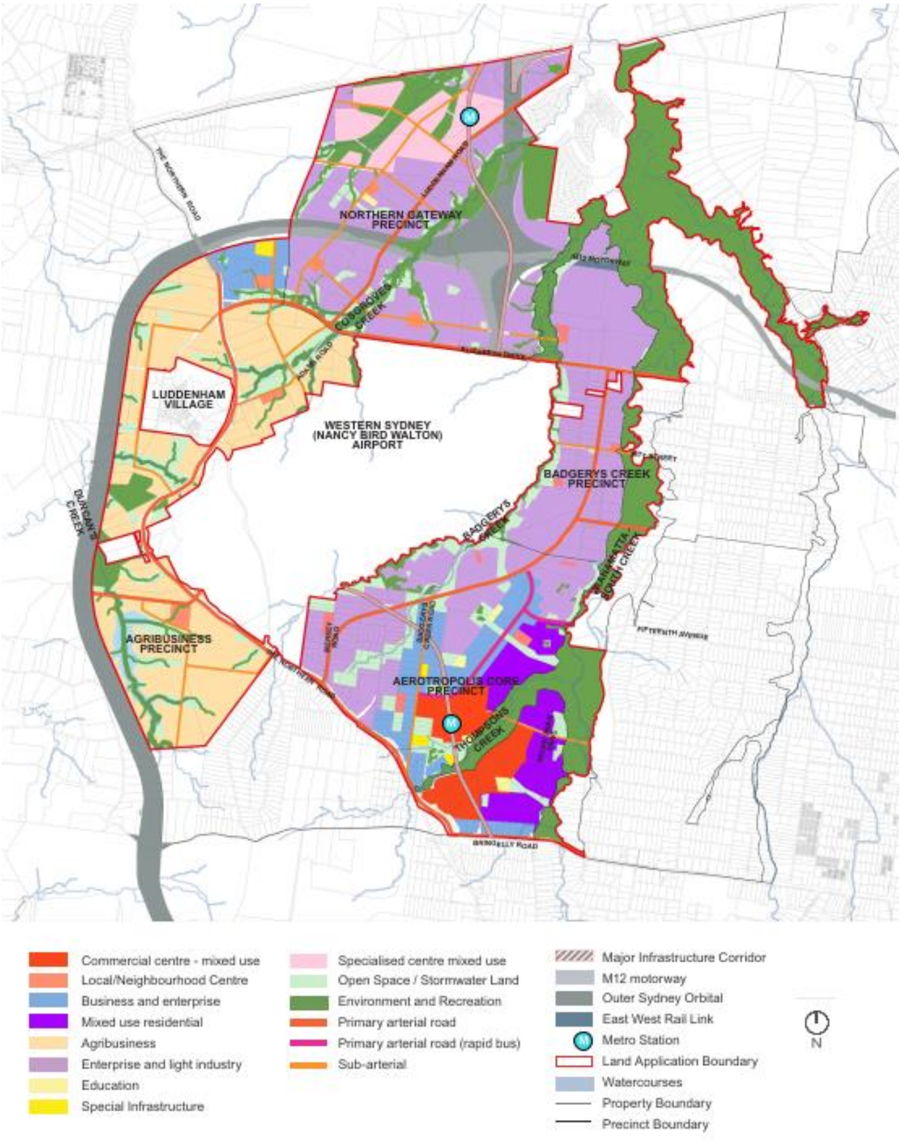
1. Introduction

The Western Sydney Aerotropolis area is a greenfield development and is a Priority Growth Area for the NSW State Government. The region covers around 11,000 hectares around the planned Western Sydney International 'Nancy-Bird Walton' Airport (herein WSIA).

The region will contribute towards 200,000 new jobs in the Western Parkland City in industries such as technology, logistics, science, creative industries and agribusiness. The NSW Department of Planning and Environment (DPE) estimates this region will be home for 1.1 million people by 2036.

To enable the region and facilitate efficient cross-utility planning, large areas of land were re-zoned, and Aerotropolis Precinct Plans prepared to support the priority release of land for development. Figure 1 shows the Western Sydney Aerotropolis area and the region under study.

Figure 1 – Aerotropolis growth area and region under study



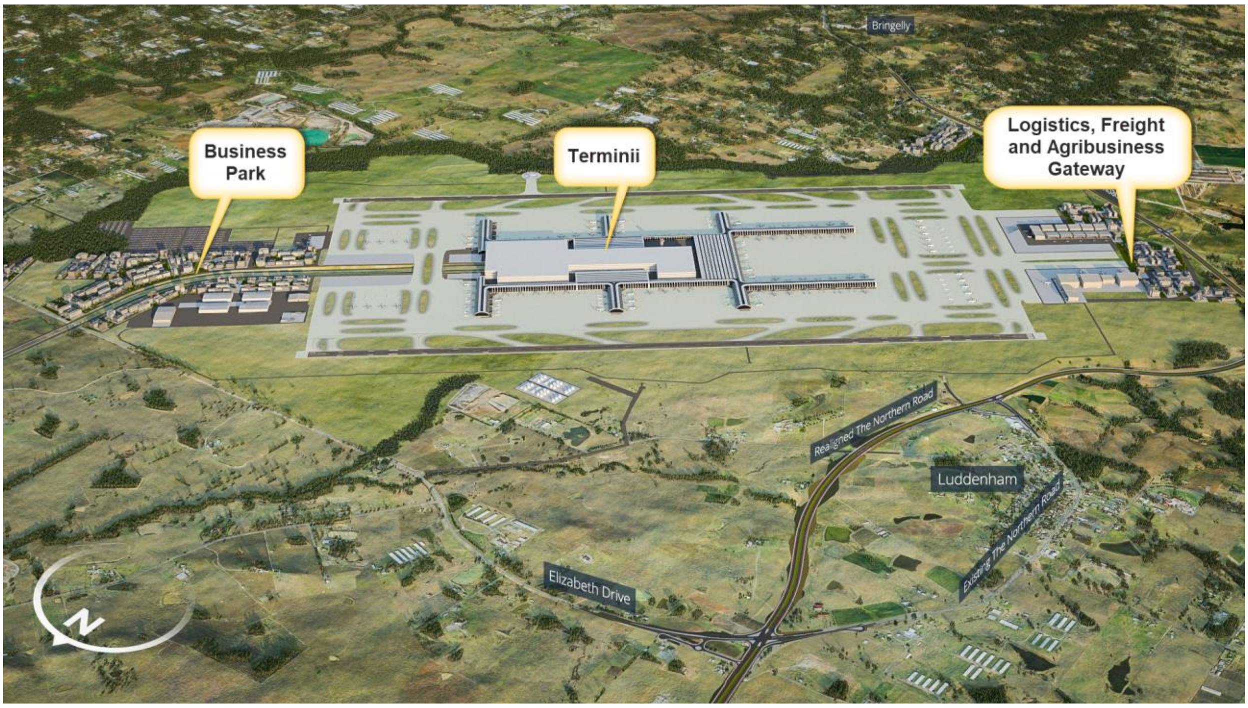
While the total ultimate demand of the Western Sydney Aerotropolis area and the Western Parkland City will develop over the next 50 years, there are requirements for connection of major loads in the short to medium-term that require network augmentation. We are therefore initiating a Regulatory Investment Test for Distribution (RIT-D) for this project.

The region immediately surrounding the WSIA is zoned for industrial and commercial uses. Table 1 below lists some of the applications and enquiries Endeavour Energy has received to date in the region of study, including high voltage connections for the WSIA to support 24-hour operations. The growth in the area is further supported by the extensive cross utility coordination, developer activity, and release of DPE precinct plans and Development Control Plans.

Table 1 – Sample of connections impacting the 33kV network capacity under study

Customer supplies through WSIA	Airport Terminal buildings (tendered connection required 2024) Airport North Business Park (tendered connection required 2024) Logistics, Freight and Agribusiness gateway (tendered connection required 2024) Sydney Metro Western Sydney Airport station and Business Park station Public transport electrification Western Sydney International Airport initial supply (DBL2631)
Luddenham region	Sydney Science Park (ENL3316) Chain of Ponds Residential Developments (ARP3834) Chain of Ponds Council Developments (ENL4226) DPIE Luddenham Village Discussion Paper and strategy
Kemps Creek region	Sydney Water Aerotropolis facility (ENL3685) Elizabeth Drive Industrial Park (NCL1653, UCL9988) Mamre Road Industrial development (DPIE rezoning and DCP 2021) Austral Residential expansion (DPIE rezoning and DCP 2021)

Figure 2 – Aerial view of precincts of the Nancy-Bird Walton Western Sydney International Airport



‘Identified need’ for this Regulatory Investment Test for Distribution (RIT-D)

We have initiated a Regulatory Investment Test for Distribution (RIT-D) to investigate, and consult on, how to most efficiently facilitate the connection of the new major loads in the regions of Luddenham, Kemps Creek and Badgerys Creek.

Endeavour Energy 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 expected load requiring connection will exceed the existing network capacity. This is currently anticipated to be 2023/24, based on the connection enquiries received to date.

Importantly, no construction on new distribution investments will commence until there is a high degree of certainty that the anticipated loads will be seeking connection to our network at the timing indicated.

The transmission network augmentation to support the growth in the regions of Luddenham, Kemps Creek and Badgerys Creek was included as part of our regulatory proposal to the Australian Energy Regulator (AER) for the current regulatory control period and also discussed in our most recent Distribution Annual Planning Report (DAPR).

Endeavour notes that the proposed transmission substation will be a shared network asset which will become part of Endeavour’s Regulatory Asset Base. As initially these prospective customers are expected to utilise a high majority of the asset, specific tariff arrangements will be established to recover the majority of the cost of the augmentation from the beneficiaries (i.e. the new customers). These customers will be charged a cost reflective network price, determined specifically from this network augmentation investment. This will ensure no cross subsidy from existing customers, but can be adjusted such that as a larger number of customers benefit from the asset, the costs can be shared accordingly.

This non-network screening notice sets out the reasons why we consider that there will not be a non-network option that forms a potential credible option on a standalone basis, or that forms a significant part of a potential credible option for this RIT-D project, ie, in accordance with NER clause 5.17.4(c). It represents the first formal stage of the RIT-D assessing how to most efficiently facilitate the connection of the major new loads in the regions of Luddenham, Kemps Creek and Badgerys Creek.

The second formal stage of this RIT-D is Draft Project Assessment Report (DPAR), which will include a full net present value (NPV) options assessment.

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2. Key assumptions underpinning the ‘identified need’ for this RIT-D

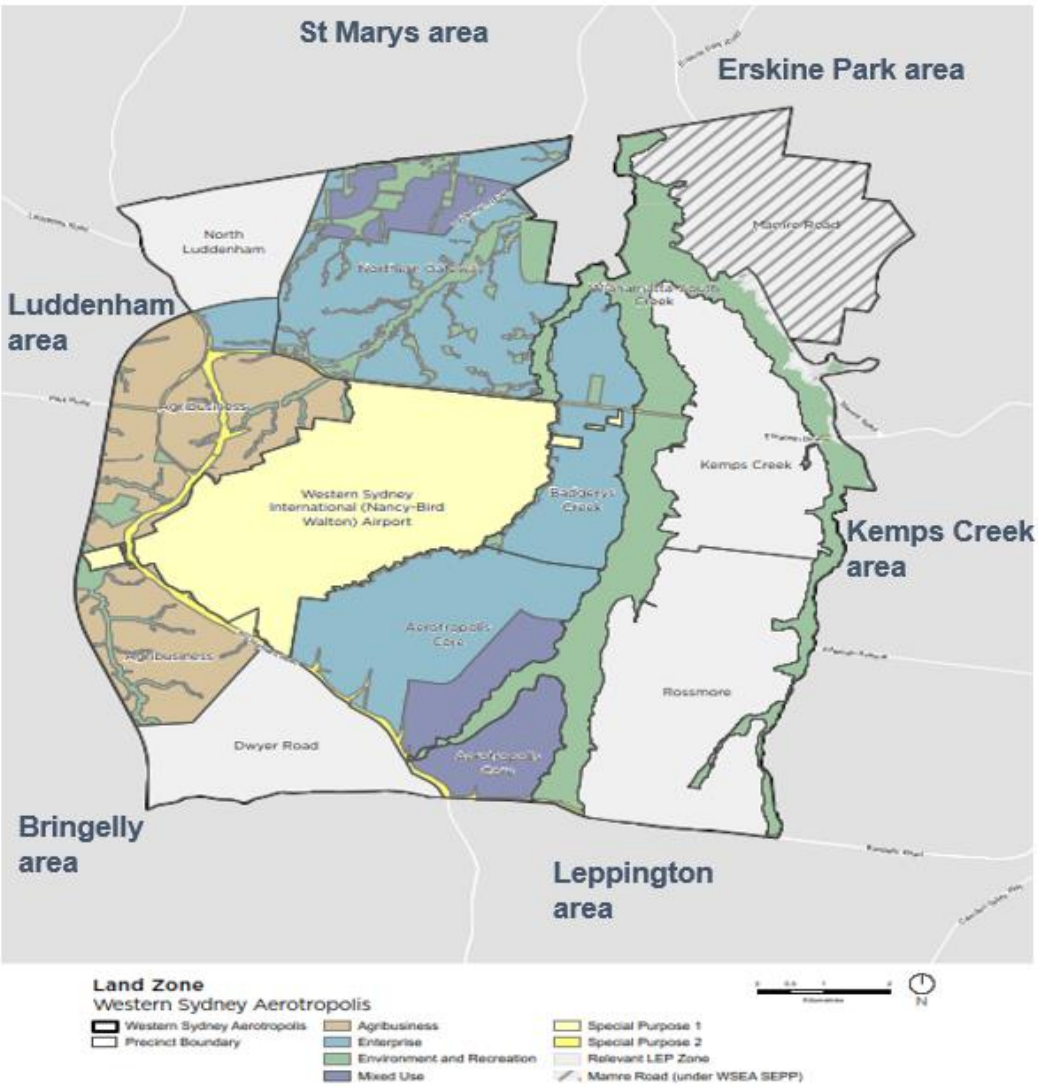
This section sets out the key assumptions and methodologies that underpin the identified need for this RIT-D. These assumptions have been used in making our determination that there will not be a non-network option that is a potential credible option on a standalone basis, or that forms a significant part of a potential credible option, ie, in accordance with NER clause 5.17.4(c).

2.1 Relevant area of our network

The region under study covers the currently mainly rural/agricultural area that is bound by the existing established locations of Erskine Park, St Marys, Luddenham, Bringelly, Leppington and Kemps Creek. The land area is approximately 11,000 hectares.

Figure 3 shows the Land Use Zoning for the area and the boundary of the precincts within the Western Sydney Aerotropolis.

Figure 3 – Western Sydney Aerotropolis Precinct Land Zones



The establishment of WSIA as Sydney's second international airport at Badgerys Creek, is the catalyst for development in the Western Sydney Aerotropolis area and is a commitment of the Australian Commonwealth Government and the NSW Government. However, the strategic planning for the area also includes the establishment of Sydney's third city – the Western Parkland City.

2.2 Load forecasts

Initial connections within the central WSIA precinct have been made using direct tee connections to the existing network. However, there are no further options for high voltage connections in this region on the existing lines. Further, as outlined in Table 1 the increase in connections volume will also result in an increase in the demand forecast. The demand forecasts for Luddenham ZS, Kemps Creek ZS, and the high voltage connections are shown below in Table 2 and Figure 4 below. These forecasts are underpinned by the number of applications already received and agreed to provide firm supply from both zone substations and key priority growth areas.

The existing 33kV feeder network has a total capacity of between 21MVA and 50MVA (section dependent) and is insufficient to meet the needs of the zone substations and customers in the area from 2023/24.

It should be noted that the load at risk presented in Table 2 is not simply a numerical summation of the load forecasts against the rating of an individual asset. Since the loads are geographically dispersed, interconnected by feeders of different ratings, and is supported by a network that changes-over between two bulk-supply-points, the load at risk is a function of the different load centres and the combination of elements that can be tripped. The load at risk presented is the maximum of the scenarios.

Table 2 – Central scenario demand forecast and load at risk (MVA)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Kemps Creek ZS	22.7	22.5	32.2	39.7	32.5	34.6	37.5	41.0	44.9	48.6
Luddenham ZS	10.4	17.9	25.2	31.5	39.3	33.9	40.4	46.8	52.9	58.6
High voltage connections associated with WSIA	0.8	1.6	3.7	5.9	18.1	40.7	36.7	37.4	37.9	54.9
Load at Risk	-	-	10.4	25.9	36.3	51.1	57.4	67.7	78.1	101.1

Figure 4 – Demand Forecast (Central load forecasting scenario)

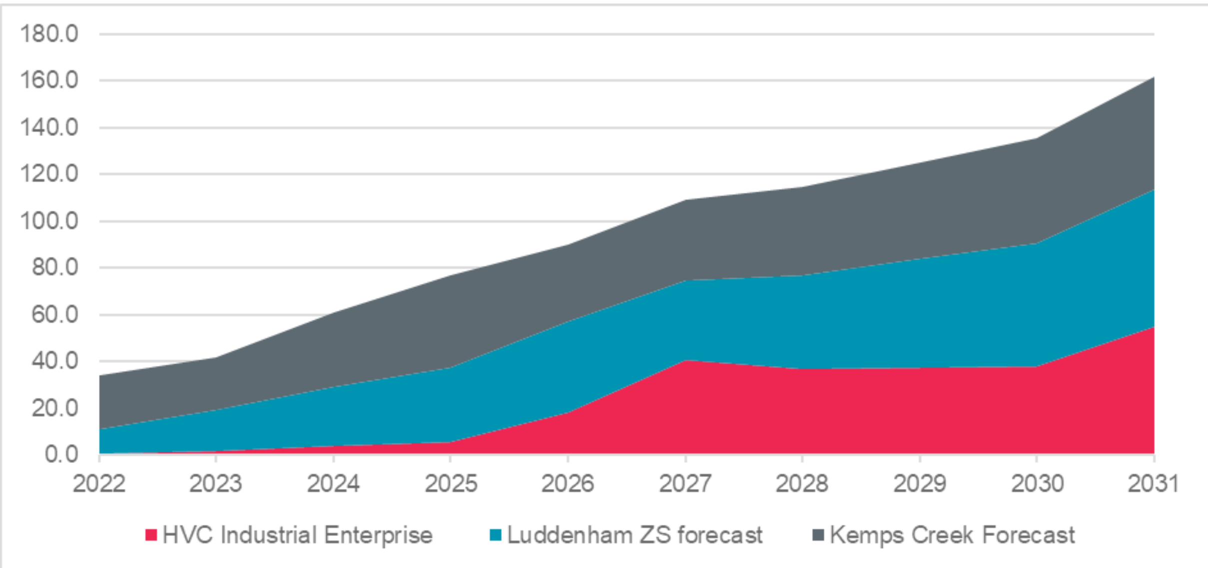
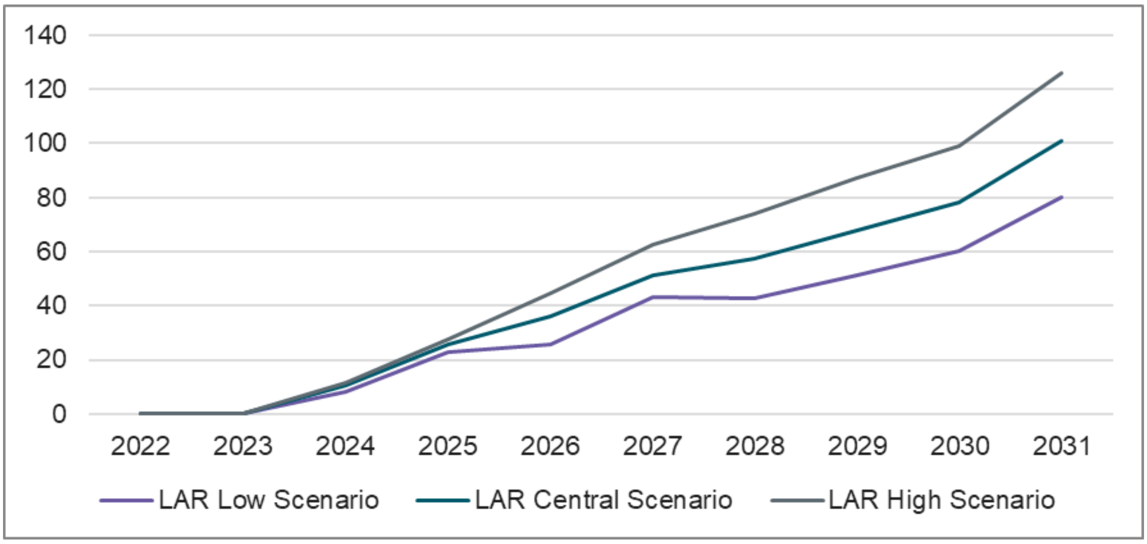


Figure 5 – Load at Risk (LAR) in MVA for Low, Central and High forecasting scenarios



Each scenario reflects different assumptions regarding the timing and quantity assumed for future load connections. In particular, we have considered different growth rates and different eventual load requirements for the seven key loads:

- Western Sydney International Airport
- BHL & Sydney University Employment Lands (residual)
- Initial BHL (Northern Gateway)
- BHL Northern Gateway Estate Stage 1
- Agribusiness North (excluding Adams Rd)
- UIL5931 - Adams Rd (Luddenham)
- UIL5931 - Adams Rd (Kemps Creek)

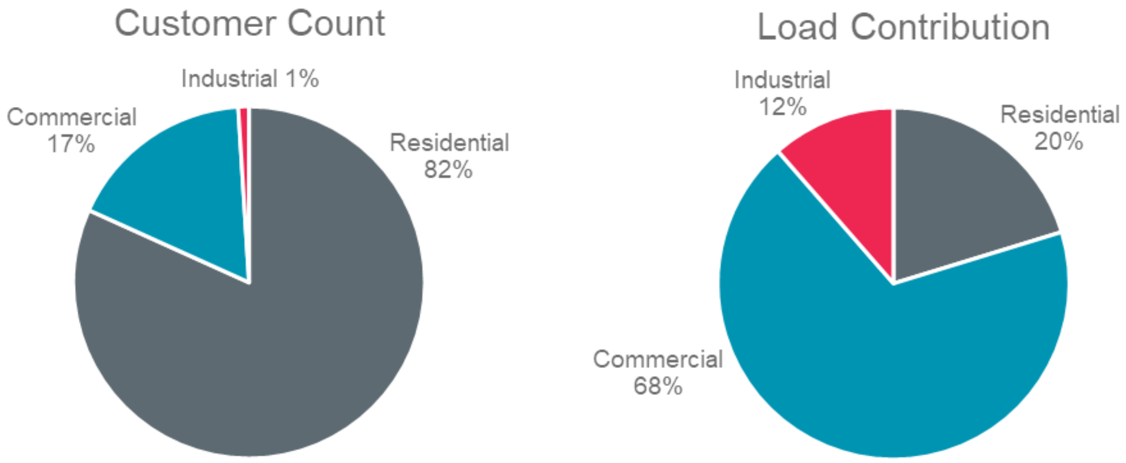
The demand forecast across the three scenarios can be summarised as follows:

- the central scenario assumes that these key customer connections eventually total 102.5 MVA in 2030/31 with a modest generation capacity estimate from WSIA;
- the low scenario assumes the same key customer connections as under the central scenario, albeit at lower growth rates and high generation capacity estimate from WSIA (ie, under the low scenario, demand reaches 81.3 MVA in 2030/31); and
- the high scenario assumes the same key customer connections as under the central scenario, albeit at higher growth rates and low generation capacity estimate from WSIA (ie, under the high scenario, demand reaches 127.6 MVA in 2030/31).

Due to the confidentiality of these forecast loads, we are not able to present a further breakdown of the composition of demand under each scenario. The combined demand forecasts shown above are based on currently available information derived from the plans of NSW government planning groups, infrastructure providers and private developers. There is a degree of uncertainty with regards to the demand requirements, as they are dependent upon individual commercial decisions of the development proponents, which has been reflected in the different load scenarios shown above.

Figure 6 below demonstrates the forecast connection count and load contribution in 2024/25 and illustrates the change underway within the region. What was historically residential (and agricultural) is shifting toward industrial and commercial use cases. By 2024/25, residential connections make up some 80% of connections but only contribute around 20% of the load.

Figure 6 – Forecast CY25 Customer Count and Load Contribution distributions



2.3 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 load profiles from other areas, that we expect will have similar demand characteristics as the forecast load (i.e. capturing time and seasonal demand variations).

Specifically, the composite demand profile is based on the Aerotropolis load profile, which incorporates Wetherill Park zone substation load profile (an existing commercial/industrial site). The existing supply capacity to the area has been included in our assessment of the identified need.

Figure 8 presents the normalised Load Duration Curve (LDC) assumed based on the composite demand profile.

Similarly, Figure 9 presents the peak load profile for summer assumed for the load from the high voltage connections associated with WSIA based on the composite demand profile.

Figure 8 – Normalised LDC assumed for high voltage connections associated with WSIA

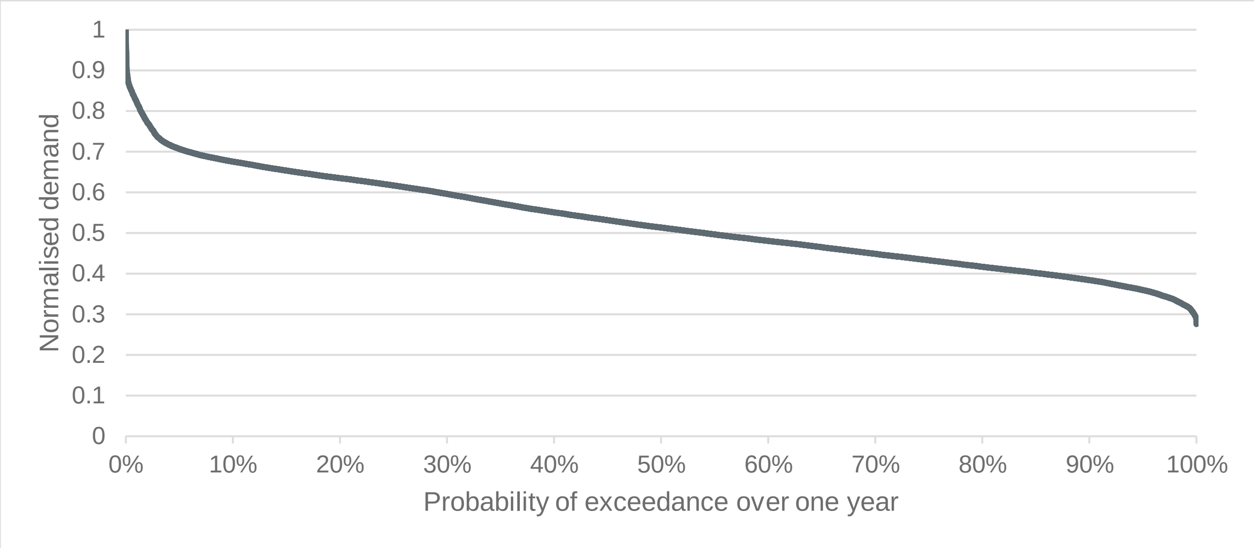
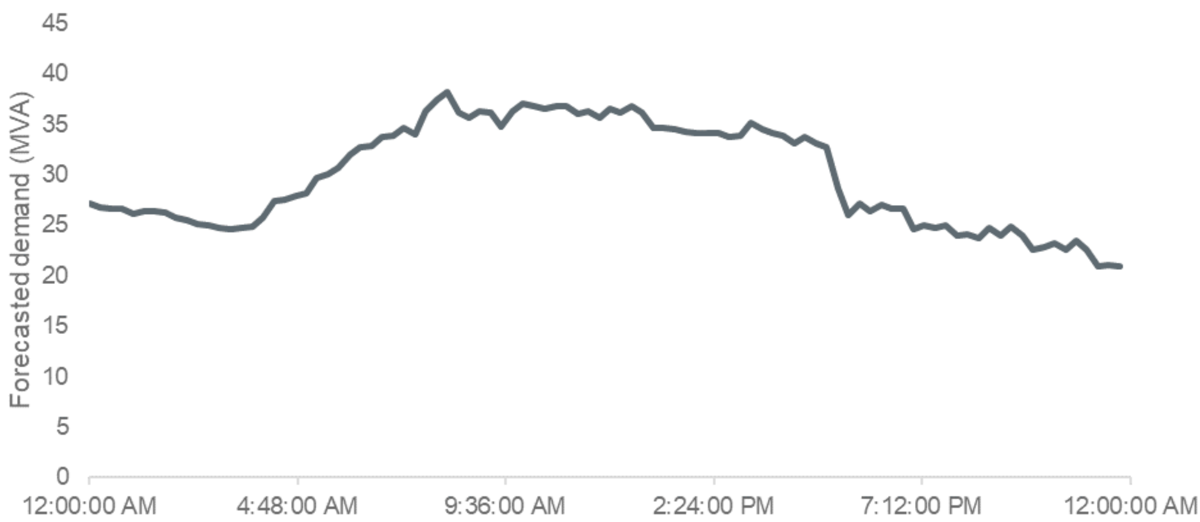


Figure 9 – Peak summer day profile for high voltage connections associated with WSIA



2.4 Existing network

The existing network in the region of interest is insufficient to meet the supply needs of the Luddenham, Kemps Creek and Badgerys Creek area from 2023/24.

The electricity supply network in the region was originally provided to meet the historical setting of rural and low-density residential loads. Existing loads in the area are supplied at 11kV from zone substations at Luddenham and Kemps Creek, that are supplied from a 33kV sub-transmission network between two bulk supply points, namely Liverpool BSP and Regentville BSP. Geographic overlay and simplified single line diagrams of the existing transmission network infrastructure are shown in Figure 10, Figure 11 and Figure 12.

Figure 10 – Geographic location with 33kV feeders, major substations, and indicative high voltage customer locations

Both Luddenham Zone Substation and the High Voltage connections are supplied on 33kV Feeders 464 and 465. These feeders are a radial supply originating from Regentville BSP through a single 132/33kV step down transformer at Glenmore Park ZS.

Kemps Creek ZS is normally supplied by Feeder 512 from Liverpool BSP (via West Liverpool TS). Feeder 464 and 465 service as backup supplies to Kingswood ZS (on Penrith TS system) and North Warragamba ZS (Regentville TG 132kV system). A necessary normally-open point between the Bulk Supply Points exists at the Kemps Creek ZS end of Feeder 465. Feeder 464 and Feeder 512 are rated at 50MVA. Feeder 465 is rated at 21 MVA (near term augment to 29MVA).

Due to a cross-bulk supply point arrangement, both Luddenham ZS and Kemps Creek ZS operate under a change-over configuration where an outage on any main supply feeder section (464, 465, 512) results in a disconnection of customers until restored from the single alternate healthy 33kV feeder.

Figure 11 – Simplified single line diagram of existing transmission network

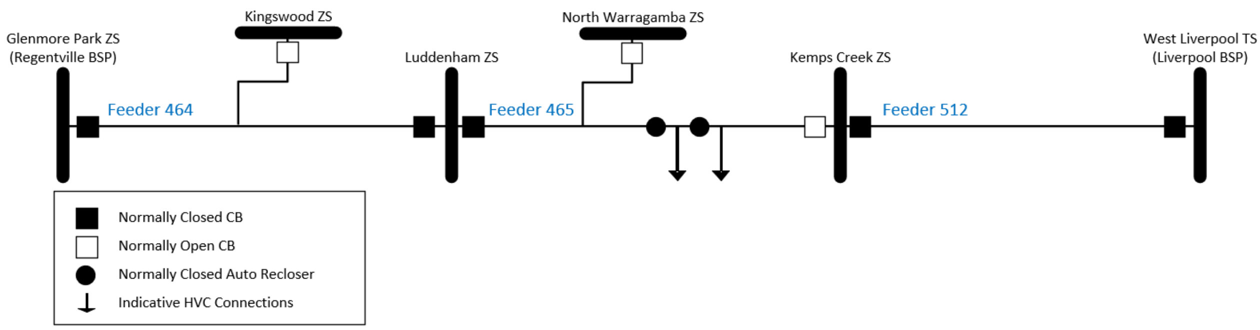
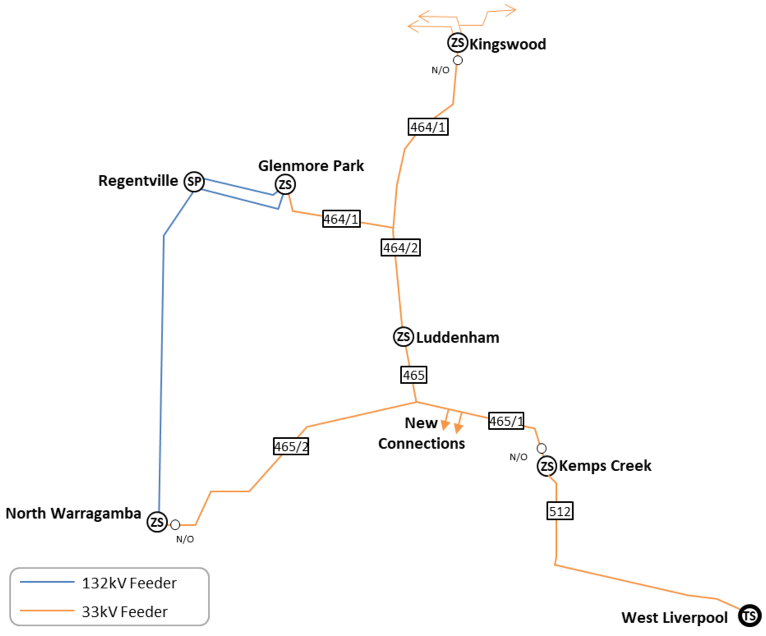


Figure 12 – Geographic single line diagram of transmission network



2.5 Expected unserved energy if action is not taken

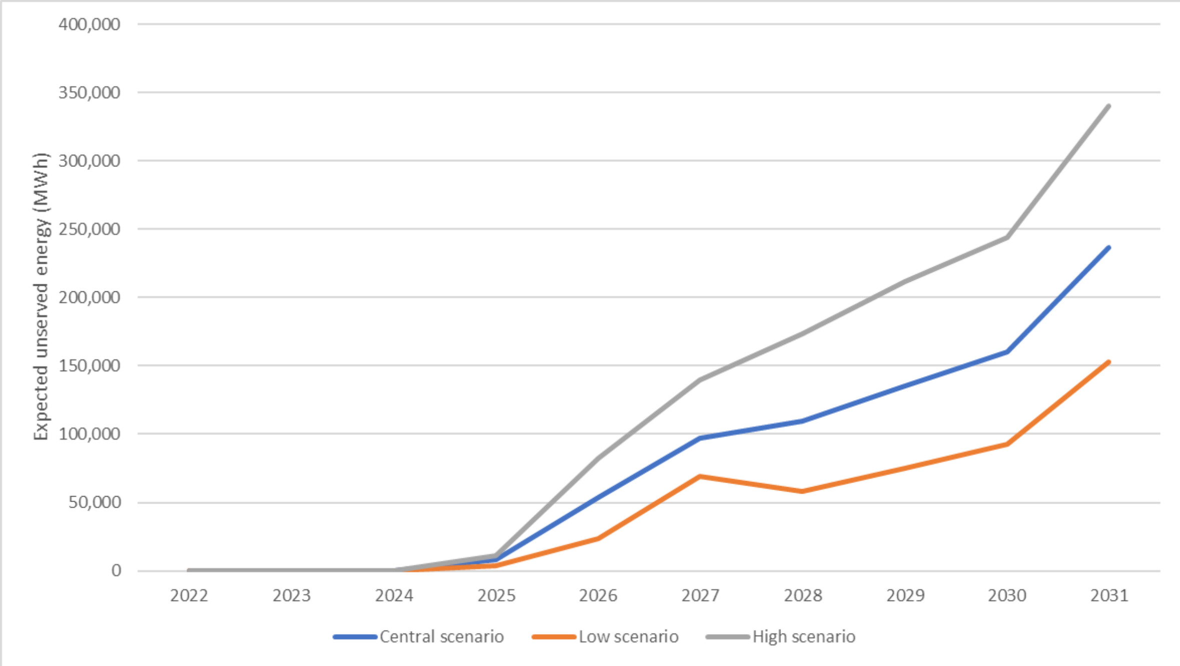
If network augmentation is not undertaken, there will be significant unserved energy in the development precincts from 2024 onwards. Table 3 shows the annualised risk cost of no proactive intervention.

Table 3 – Annualised risk cost of 'no proactive intervention'

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Risk Cost ($M)	0	0	0.18	15.0	1,074	3,003	3,612	4,960	6,312	10,372

Figure 13 below presents the estimated unserved energy if no action is taken under each of the three demand scenarios. We have only presented the next ten years to enable the differences to be clearly seen in the initial years (but we note that the unserved energy forecasts are expected to increase significantly after 2031).

Figure 13 – Expected unserved energy under the base case scenario (ie, with no investment)



2.6 Proposed scenarios for the forthcoming RIT-D NPV assessment

We propose to assess three alternative future scenarios as part of the DPAR NPV assessment, namely:

- a central scenario – consisting of assumptions that reflect a central set of variable estimates, which, in our opinion, provides the most likely scenario;
- a high benefit scenario – reflecting an optimistic set of assumptions, which have been selected to investigate an upper bound on reasonably expected market benefits; and
- a low benefit scenario – reflecting a number of assumptions that give rise to a lower bound NPV estimate for each credible option, in order to represent a conservative future state of the world with respect to the potential market benefits that could be realised under each credible option.

A summary of the key variables/framework expected to be used for each scenario is provided in Table 4 below.

Table 4 – Proposed scenarios for the forthcoming RIT-D NPV assessment

Parameter/ scenario	Central scenario	High benefits	Low benefits
Capex	Central estimates	-25%	+25%
Demand	Central demand forecast	High demand forecast	Low demand forecast
VCR	Load-weighted AER VCR	+30%	-30%
Discount rate	3.26%	2.22%	4.30%

We propose to assess all credible options across a 30-year assessment period.

3. Proposed network options to meet the identified need

We have identified three credible network options to meet the identified need. This section provides more information on the scope and cost of these options. It also outlines options considered but that we do not propose to progress further.

3.1 Option 1 – Establish 132/33kV transmission substation in two stages

This option is to establish a 132/33kV transmission substation near the WSIA industrial load precinct along Elizabeth Drive. The site is to be energised by cutting in and out of future 132kV Feeder 23R (Aerotropolis backbone feeder) to establish two transmission feeder connections. The proposed underground feeder route traverses 1km to the west of the WSIA.

Under this option, only a single 132/33kV transformer of 120MVA capacity would be established for commissioning in FY24 with supply secured from the existing 33kV network ties. A second transformer will need to be established in FY27 for commissioning in FY28 to address the annual and cumulative risk costs related to unserved energy due to increasing demand.

The scope of work and costs for this option are shown in Table 5.

Figure 14 – Option 1 simplified transmission single line diagram (first stage)

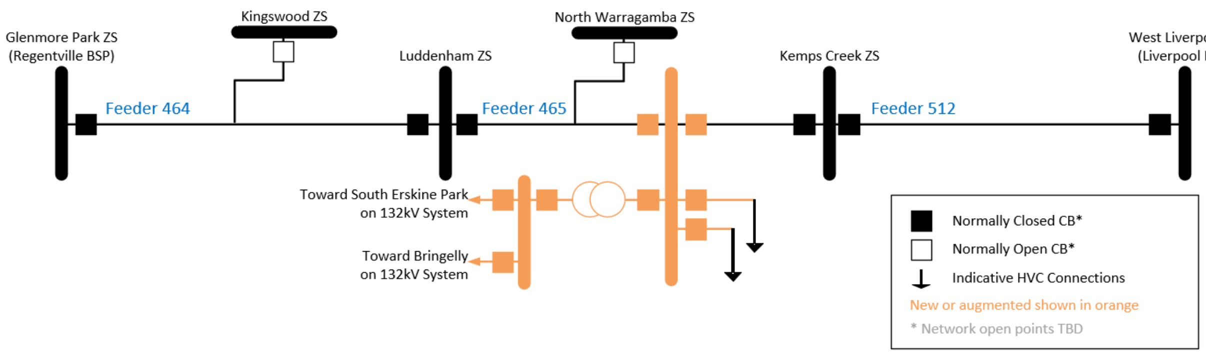


Figure 15 – Option 1 simplified substation single line diagram (first stage)

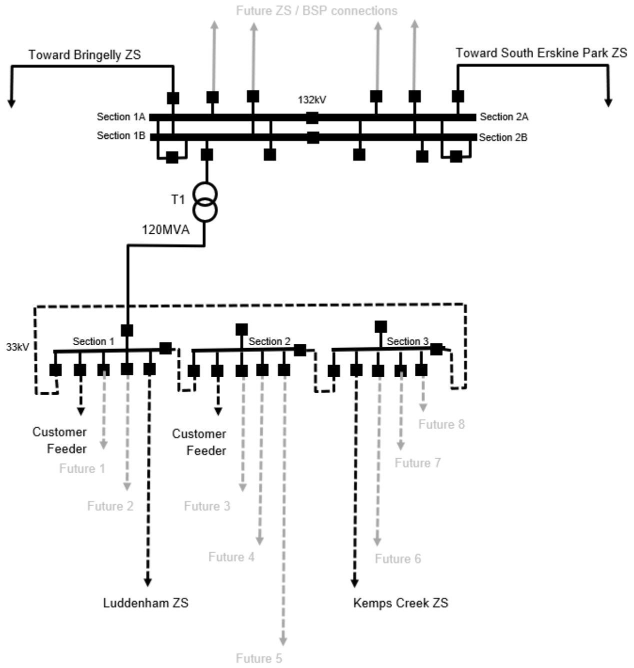


Table 5 – Scope of works and costs for Option 1

Scope	Description	Cost Estimate ($M)

Mains	Establish 132kV and 33kV mains connections
	• 2x 132kV sub-transmission connections
	    ○ Cut in and out from the Aerotropolis backbone feeder;
	    ○ Approximately 1,100m of 132kV feeder route from Adams Road and Elizbeth Drive intersection
	    ○ Utilise existing cable ducts along Elizabeth Drive West line route
	    ○ Associated protection and communication fibre
	    ○ Reimbursement of Sydney Water for increased depth of burial of water mains along Elizabeth Drive.
	• 4x 33kV sub-transmission connections
	    ○ Cut in and out from Feeder 465: Luddenham tee to Kemps Creek ZS by UG cable connection
	    ○ Relocate 2x existing high voltage customer tee connections from Feeder 465 to 33kV switchboard by UG cable and associated protection and communication fibre.
		12.5

Substations	Establish 132/33kV Transmission Substation • Acquire suitable land holding • 132kV busbar with modular construction of 6x feeder bays, 4x transformer bays; and 4x 132kV bus couplers. • One 120MVA 132/33kV transformer and associated bunds and firewalls in FY24 (Stage 1) • Second 120MVA transformer and associated bunds and firewalls in FY27 (Stage 2) • 33kV busbar with modular construction of three bus sections with 12x feeder CB's, 3x transformer CBs, and 3x bus couplers • 2x Auxiliary transformers • Modular type amenities building • Land acquisitions, related due diligence and legal costs	30.1
Total	Establish 132/33kV substation in two stages	**42.6**

3.2 Option 2 – Establish 132/33kV transmission substation with two 120MVA transformers upfront

This option is to establish a 132/33kV transmission substation with two 120MVA transformers upfront, near the WSIA industrial load precinct along Elizabeth Drive. Similar to Option 1, the site is to be energised by cutting in and out of future 132kV Feeder 23R (Aerotropolis backbone feeder) to establish two transmission feeder connections. The proposed underground feeder route traverses 1km to the west of the industrial load precinct.

The scope of work and costs for this option are shown in Table 6.

Figure 16 – Option 2 simplified transmission single line diagram

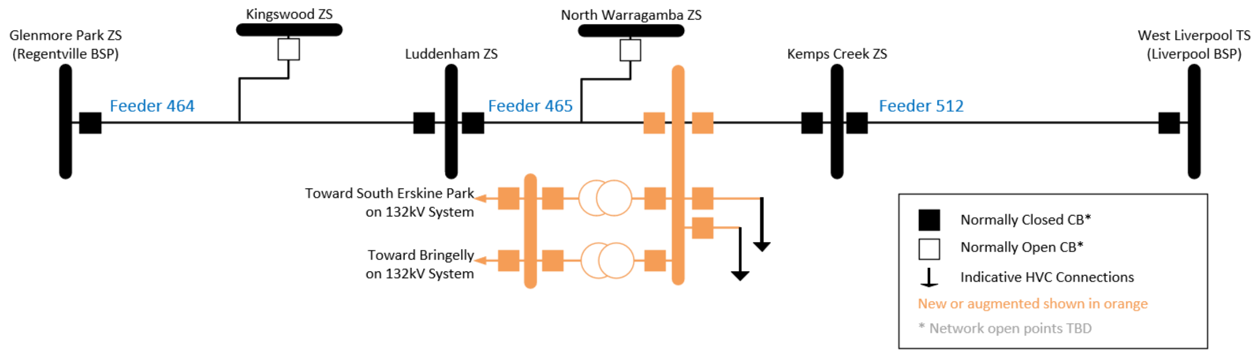


Figure 17 – Option 2 simplified substation single line diagram

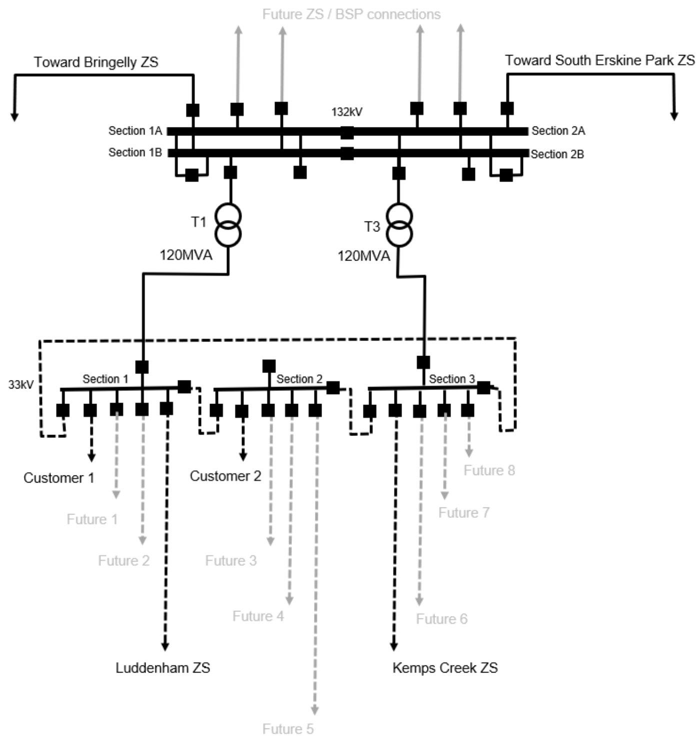


Table 6 – Scope of works and costs for Option 2

Scope	Description	Cost Estimate ($M)

Mains	Establish 132kV and 33kV mains connections
	• 2x 132kV sub-transmission connections
	  ○ Cut in and out from the Aerotropolis backbone feeder;
	  ○ Approximately 1,100m of 132kV feeder route from Adams Road and Elizbeth Drive intersection
	  ○ Utilise existing cable ducts along Elizabeth Drive West line route
	  ○ Associated protection and communication fibre
	  ○ Reimbursement of Sydney Water for increased depth of burial of water mains along Elizabeth Drive.
	• 4x 33kV sub-transmission connections
	  ○ Cut in and out from Feeder 465: Luddenham tee to Kemps Creek ZS by UG cable connection
	  ○ Relocate 2x existing high voltage customer tee connections from Feeder 465 to 33kV switchboard by UG cable and associated protection and communication fibre.
		12.5

Substations	Establish 132/33kV Transmission Substation • Acquire suitable land holding • 132kV busbar with modular construction of 6x feeder bays, 4x transformer bays; and 4x 132kV bus couplers. • Two 120MVA 132/33kV transformers and associated bunds and firewalls. • 33kV busbar with modular construction of three bus sections with 12x feeder CB's, 3x transformer CBs, and 3x bus couplers • 2x Auxiliary transformers • Modular type amenities building • Land acquisitions, related due diligence and legal costs	29.4
Total	Establish 132/33kV Substation with two 120MVA transformers upfront	**41.9**

3.3 Option 3 – Augment existing 33kV network

This option increases network capacity through augmentation and expansion of the existing sub-transmission network ties from West Liverpool TS. Under this option, three new 33kV feeders from West Liverpool TS will be established towards the load centre to provide additional network capacity.

As the load at risk is separated across two bulk supply points and to maximise operational flexibility, a new 33kV switching station will be established with initial capacity for nine 33kV feeder circuits.

The scope of work and costs for this option are shown in Table 7.

Figure 18 – Option 3 simplified single line diagram

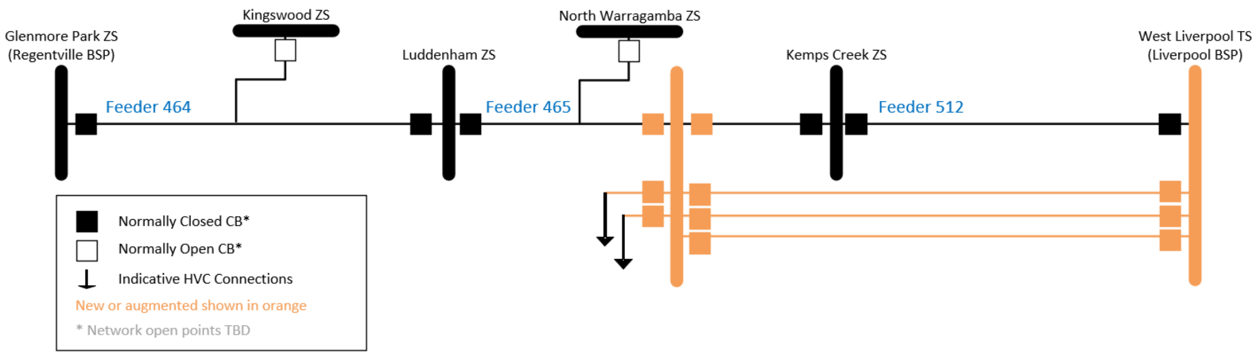


Table 7 – Scope of works and costs for Option 3

Scope	Description	Cost Estimate ($M)
Mains	Establish 3x 33kV Feeders from West Liverpool TS. • Each feeder of approximately 20.1 km route length via either Hoxton Park or Kurrajong Roads, Fifteenth Avenue and Elizabeth Drive. • Using existing cable ducts where available in road reserves or trenching as required. • Associated protection and communications fibre.	115.2
Substation	Establish 33kV Switching Station Facility with 9x 33kV feeder bays • Cut in and out existing Feeder 465 and relabel feeder section to Kemps Creek ZS. • Connect 3x new 33kV feeders to new switching station. • Cut over existing HV customer tee connections to dedicated CB's • 2x Auxiliary transformers • Circuit Breaker and Secondary systems (CTs/VTs, SCADA) • Land acquisitions and related due diligence and legal costs	7.0
	West Liverpool TS connection works: • Extend 33kV busbar. • Connect new feeders and relocate two existing feeders to achieve busbar diversity of the new feeders. • Installation of additional Secondary Systems equipment	5.5
Total	Augment existing 33kV network	**127.2**

3.4 Options considered but not proposed to be progressed in the DPAR

We have also considered whether there are other credible options that could also meet the identified need. Option 3 presented the augmentation of the existing 33kV network from West Liverpool TS. A similar option was also considered where the 33kV network was extended from the Regentville BSP system from Glenmore Park ZS. This option was not pursued in depth due to the inability to accommodate additional

132/33kV transformers at Glenmore Park ZS (required for capacity), and the increased distance from Regentville BSP and Glenmore Park ZS in comparison to the West Liverpool TS option.

4. Assessment of non-network solutions

Following a review of the expected future load demands in the regions of Luddenham, Kemps Creek and Badgerys Creek and the nature of the existing load and network capability, Endeavour Energy has determined that there is unlikely to be a non-network option that could form a potential credible option on a standalone basis, or that could form a significant part of a potential credible option, for this RIT-D.

This section sets out the assessment behind this determination, which draws on the assumptions outlined in the sections above, and considers the required technical characteristics that a non-network option would need to meet the identified need.

4.1 Requirements that a non-network option would need to satisfy

We have considered the requirement that a non-network option would need:

- to be able to form a credible stand-alone option, or
- to defer the network investment.

Table 8 below sets out the requirements that a non-network option would need to satisfy in order to form a stand-alone credible option (ie, without being combined with a network solution).

A viable non-network option must be capable of reducing the estimated shortfall on the network between Luddenham and Kemps Creek zone substations to retain supply to all customers. Under the central scenario, by the end of 2024/25, a shortfall is estimated to exist for 32 days in the year and is at a maximum of about 58 MWh per day in the summer period. By 2027/28, a shortfall is estimated to exist for 355 days in the year and at a maximum of about 640 MWh per day in the summer period under the central scenario. The requirement for non-network solutions is therefore substantive in both the number of days expected to be required and the magnitude of the support needed.

In addition, we note that for any non-network solution to be effective it would need to locate near, and essentially connect to, the new load connection points. We consider that any such co-location would be extremely difficult at the required capacity given the requirement for network itself, large land requirements, the planning approvals, issues with community acceptance and these being in addition and competition to those developments expected in these areas.

The table below summarises the expected network support requirements out to 2027/28 for any non-network solutions to form standalone options under the central scenario. We note that the requirements would increase further beyond 2027/28 as more load connects.

Table 8 – Network support required for a standalone option under the central scenario

Year	Peak load reduction required (MW)	Days required	Hours required	Total MWh required
FY25	8.1	32	166	321
FY26	25.7	287	4,152	23,252
FY27	38.4	346	6,849	65,179
FY28	41.7	355	7,421	78,437

Table 9 below sets out the requirements for non-network options in order to cost effectively defer network expenditure, ie, to be coupled with a network option in order to form a combined credible option.

Given that the comprehensive NPV assessment of the network options is yet to be undertaken (and will be part of the forthcoming DPAR), the deferral assessment has been undertaken in this screening report using the preliminarily preferred network option, Option 2 (which is the lowest cost out of the three options and meets the connection and load growth requirements of the area).

Table 9 – Network support required to defer a network option under the central scenario

Deferral period	Deferral year	Peak load reduction required (MW)	Days required	Hours required	Total MWh required	Deferral value
1 year	FY25	8.1	32	166	321	$1.3M
2 years	FY25	8.1	32	166	321	$2.7M
	FY26	25.7	287	4,152	23,252	
	Total	25.7	319	4,318	23,573	

The required characteristics for non-network solutions set out above demonstrates that the amount of demand reduction and/or local storage/generation that would be required to be provided in order to represent a credible option for this RIT-D is of an order of magnitude which does not appear realistic, given the existing load in the area. We therefore do not consider it technically feasible that non-network technologies can form standalone credible options that meet the entire identified need.

Similarly, the amount of load reduction that would be required in order to enable a deferral of network augmentation by one year is also reasonably high, particularly when considering the low deferral value. We therefore also do not consider it commercially feasible that non-network technologies can be coupled with a network option to form a credible option.

4.2 Assessment of specific non-network technologies

In addition to our general assessment of whether non-network options are likely able to form a potential credible option on a standalone basis, or form a significant part of a potential credible option, we have individually considered both demand management and new generation/storage below.

4.2.1 Demand management

The existing demand in the area of interest is based on the existing residential/agricultural areas served by the Luddenham and Kemps Creek zone substations.

We consider that traditional coordinated demand management programs targeting residential and commercial/industrial customers who currently consume energy in the area cannot produce sufficient reductions to meet the demand requirements of the area, even for a one year deferral of network investment under the central scenario (as shown above).

We note also that there is currently very limited industrial load, and typically the type of industry consists of the following (all of which are not considered likely to voluntarily curtail load at an efficient cost):

- a mix of transport, logistics and warehousing taking advantage of the access points to major motorways in the area for road transport (M4 and M7 motorways are nearby);
- industries supporting the growth and development of the Western Sydney Area, including building products and concrete batch processing centres; and
- manufacturing.

Recent experience in demand management programs and discussions with industrial customers in the area shows that many of the major demand management initiatives have already been implemented, e.g. LED lighting and improved motors and drives. While there is capability and interest by some major customers in our network to participate in demand response programs aligned to opportunities in the wholesale energy market, this relates to large scale industrial customers with building and process management systems that support a co-ordinated and controlled demand response. The existing brownfield areas in Luddenham, Kemps Creek and Badgerys Creek generally lack the existing capability to support a demand response program of this type.

The magnitude of demand reduction required to achieve a one-year deferral of network investment (as outlined in Table 9 above), given the limited capacity of existing load to reduce demand, makes the use of demand management impractical as part of a combined option.

By way of a recent example in our network, we implemented the Oakdale Energy Saver Program in late 2019 with the objective to achieve demand reduction to defer the construction of a new zone substation by one year. The program involved providing complimentary energy audits to customers in the Oakdale Industrial Park, comprised of mainly logistics and warehouse sites, and an incentive of $142/kVA for implementing permanent demand reduction initiatives was offered to participants. Around 2 MVA of potential demand reduction was identified from the twelve sites audited, which is insufficient to meet the 8.1 MVA target reduction and, while the program ends on 31 March 2022, so far only one site has implemented an initiative which is a 175 kWp upgrade to their existing solar capacity.

We therefore consider demand management programs to not be technically feasible under the RIT-D.

4.2.2 Generation and/or storage

Any potential non-network options such as grid-scale battery storage or large scale solar PV would require a large network capacity augmentation themselves to enable connection to the NEM and commercial operation. This augmentation would have a similar cost to the network options outlined in section 3 above.

We note that all existing solar PV is already captured in the analysis. For summer demand, we expect to see dedicated solar PV provide benefit in reducing the duration of peak demand events (i.e. before sunset) but we forecast that this will have a marginal impact on the remaining peak demand that will occur after sunset. Solar PV is not expected to be able to provide the firm dispatchable capacity required in high demand days.

Energy storage could contribute to peak demand after sunset, but this would involve a significant cost (and would also require comparable network augmentation to operate). For example, for a BESS to meet the worst day in 2024/25 under the central demand forecasts it would need to be at least 9MVA/65MWh (not including any additional margin for if that year ended up being a higher POE year), which we consider would cost at least $50 million, depending on the forecast assumptions.

Moreover, new generation/storage would also likely need to acquire land to situate on and a source of fuel to be able to provide network support as frequently as is required, which would further add to the cost and practical difficulties associated with these solutions.

We therefore consider that these technologies are not commercially feasible under the RIT-D for this particular network need.

4.2.3 Other non-network technologies

We consider it highly unlikely that power factor corrections can assist since most lighting in the area has already changed to LED. We typically find that it is electric motors in brownfields area that provide this saving.

Control schemes and automation in a smart-grid require new buildings and building management systems and we do not consider there to be the magnitude of these to meet, or help meet, the identified need for this RIT-D.

5. Conclusion

The ‘Nancy-Bird Walton’ Western Sydney International Airport (WSIA) is a significant infrastructure project currently underway and is driving significant cross sector investment across Sydney’s Western Parklands City. Significant load growth around the existing Luddenham zone substation and Kemps Creek zone substation, as well as central to the WSIA requires the establishment of additional connection and capacity capability to the network in the region.

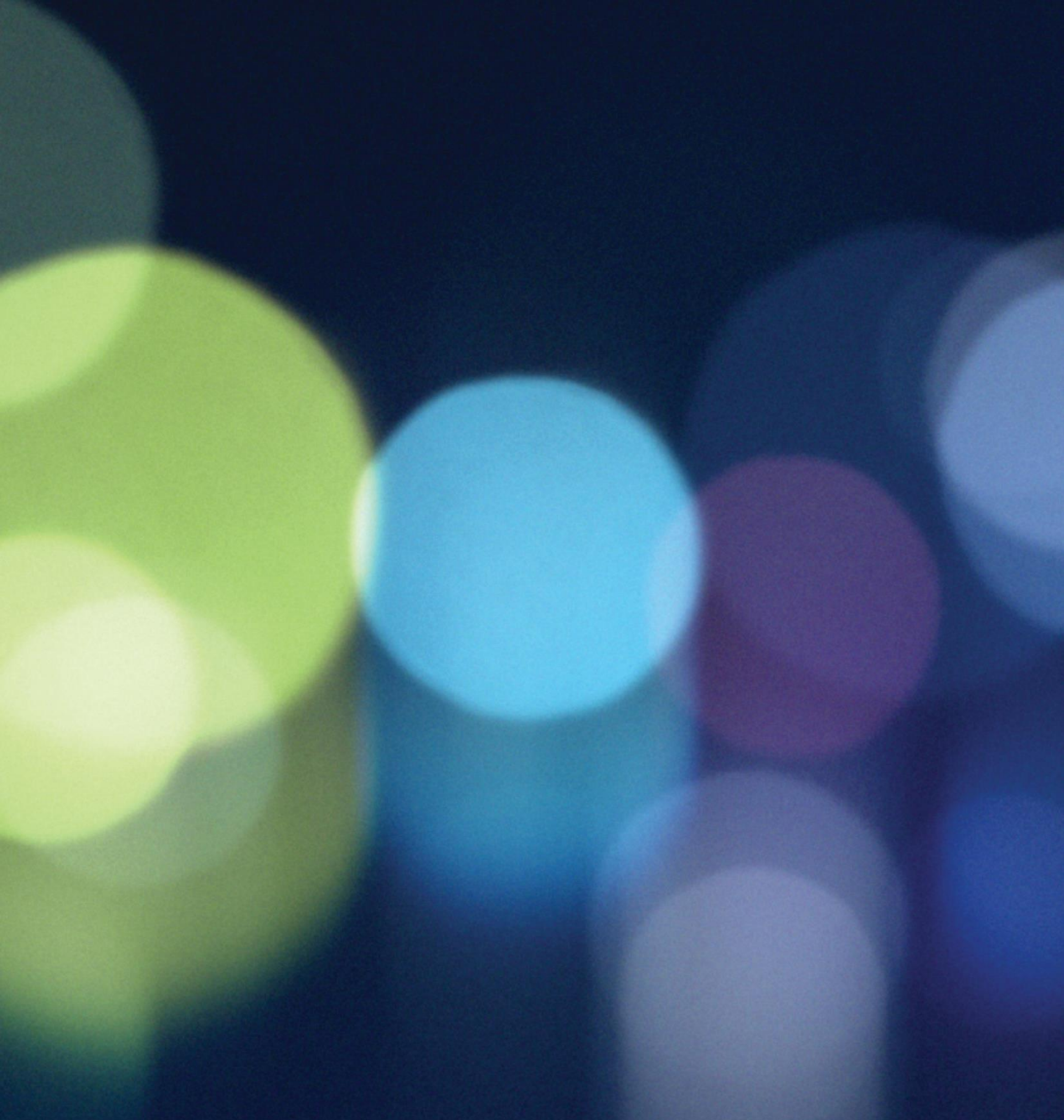
The initial loads have been serviced using tee connections to the existing network, and through the implementation of forced load shedding schemes at Kemps Creek zone substation to maintain supply to a majority of customers. Despite these actions there is a large amount of load at risk, and unserved energy resultant from exceeding capacity in the area.

The demand for Luddenham zone substation, Kemps Creek zone substation and new high voltage connections (including the Airport Terminal buildings, Airport North Business Park and Logistics, Freight and Agribusiness gateway) is expected to grow from 61 MVA in 2023/24 to over 160 MVA by 2030/31.

Based on the extent of forecast load for the Luddenham, Kemps Creek and Badgerys Creek area, the expected cost of network options and the capacity of the existing network to facilitate non-network technologies, it is not considered feasible that a non-network solution will form a potential credible option on a standalone basis, or form a significant part of a potential credible option for this RIT-D. Consequently, a Non-Network Options Report is not intended to be prepared for this RIT-D in accordance with clause 5.17.4(c) of the NER.

We consider that non-network solutions maybe more likely to be feasible for future developments in the area as the cost of large scale battery storage continues to decrease, the widespread inclusion of solar/PV in new commercial and industrial developments continues to increase, and the uptake of electric vehicles, including electric buses, begins to offer opportunities in the vehicle-to-grid capability for network support. These developments will be closely monitored as the Luddenham, Kemps Creek and Badgerys Creek area develop over the next decade and considered as part of future network augmentations.

Endeavour notes that the proposed transmission substation will be a shared network asset which will become part of Endeavour’s Regulatory Asset Base. As initially these prospective customers are expected to utilise a high majority of the asset, specific tariff arrangements will be established to recover the majority of the cost of the augmentation from the beneficiaries (i.e. the new customers). These customers will be charged a cost reflective network price, determined specifically from this network augmentation investment. This will ensure no cross subsidy from existing customers, but can be adjusted such that as a larger number of customers benefit from the asset, the costs can be shared accordingly.



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