RIT-D Draft Project Assessment Report

Providing supply to the Burra Park development area of the Northern Gateway precinct

21 November 2023

Endeavour Energy

POWER together

Contents

1.0 Executive Summary

This draft project assessment report (DPAR) was prepared by Endeavour Energy in accordance with the requirements of clause 5.17.4 of the National Electricity Rules (NER). It represents the second stage in the Regulatory Investment Test – Distribution (RIT-D).

The purpose of this report is to demonstrate the basis for selection of the preferred option to provide supply to the Burra Park development area.

The Western Sydney 'Aerotropolis' is a greenfield development of a new city covering 11,000 hectares of land, which will spearhead Western Sydney's future urbanisation. The proposed development features a precinct-based land use and zoning approach that will require significant development of electricity infrastructure to meet the needs of the area over the long term.

This includes the Burra Park development area of the Northern Gateway precinct of the Aerotropolis which is located in close proximity to the Western Sydney Airport and will be a hub for transport, logistics, warehousing and light industry. It will also include part of the Agribusiness precinct which is land planned for technology enabled agriculture, fresh food and value added food production with access to local and global markets via the airport.

The Burra Park development area is forecast to require approximately 78MVA of electricity supply capacity by 2031.

The identified need for this investment is 'reliability corrective action' because the investment is required to comply with our NER obligations to connect customers. The timing of the identified need for this RIT-D is determined by when the expected customer demand requiring connection will exceed the existing network capacity. This is currently expected to be in 2025/26, based on the customer connection enquiries received to date.

This report follows publication of an options screening notice that found that a non-network solution is unlikely to form a potential credible option on a standalone basis, or form a significant part of a potential credible option for the Burra Park development area RIT-D. This is due to the level of the forecast demand for the Burra Park development area, the expected cost of non-network options and the capacity of the existing network to facilitate non-network technologies. It also found that a SAPS solution could not contribute to meeting the identified need because the customer demand requirements of the greenfield development area are significant and therefore could not be supported by a network that is not part of the interconnected national electricity system with the ability to draw on grid-connected generation sources.

Three options were determined to be credible in addressing the network need and have been assessed in comparison to a 'do nothing' (no proactive intervention) base case. These are:

- Option 1 - Establish Burra Park Zone Substation with tail ended transformers;
- Option 2 - Establish Burra Park Zone Substation with a 132kV busbar;
- Option 3 - Establish a 22kV Zone Substation at the Western Sydney Airport Transmission Substation.

The 'do nothing' option is not considered credible because it will result in significant expected unserved energy in the development area and would not support the connection of new customers and result in the curtailment of growth at sites that would be supplied by the limited existing supply capacity in the area.

Two of the credible options involve establishing a Burra Park Zone Substation in a suitable business park approximately 1.0km from the Western Sydney Airport Transmission Substation which is currently under construction and due to be commissioned in FY24. The third option involves establishing a Zone Substation co-located within the Western Sydney Airport Transmission Substation (WSA TS).

The three network options will provide the required supply and connection capacity for the development area. All three options would provide 22kV supply from a high capacity 132/22kV Zone Substation. All three options are also staged to ensure that the major capital expenditure stages are aligned with the growth in customer demand.

The economic assessment of the credible options is shown in table 1. Under the NER, the preferred option is the credible option that maximises the present value of the net economic benefit to all those who produce, consume or transport electricity in the National Electricity Market (NEM). Applying this criteria, Option 3 is the preferred option at this draft stage because it has the highest net market benefit.

Scenario analysis has been undertaken based on three demand forecast scenarios. Sensitivity analysis has been undertaken across a range of assumptions including the discount rate, value of customer reliability (VCR) and capital expenditure. The scenario and sensitivity analysis has confirm Option 3 as the preferred option at this stage.

There are a number of important practical advantages of Option 3 they are:

- It would avoid the need to acquire additional land for the Zone Substation and the possible delays in sub-division of land. The local area is a high growth area and suitable final land parcels are not yet available for purchase. The estimated cost of land acquisition has been included in Options 1 and 2.
- Substantial ground and civil works have already been completed at the site for Option 3 and this avoids delays in the construction of the proposed Zone Substation.
- Avoids the need to install approximately 1.0km of 132kV cable and the related possible delays on locating a cable route and civil works for installation of this cable.

Table 1 – Economic assessment of credible options (using the central demand forecast scenario)

Option	Description	Project capex nominal ($M)	PV of market benefits ($M)	PV of costs ($M)	NPV ($M)	Rank
1	Establish Burra Park Zone Substation with tail ended transformers.	52.8	197,818.0	38.4	197,779.6	2
2	Establish Burra Park Zone Substation with a 132kV busbar.	51.4	197,778.3	39.7	197,778.3	3
3	Establish a 22kV Zone Substation at the Western Sydney Airport Transmission Substation.	43.7	197,785.9	32.1	197,785.9	1

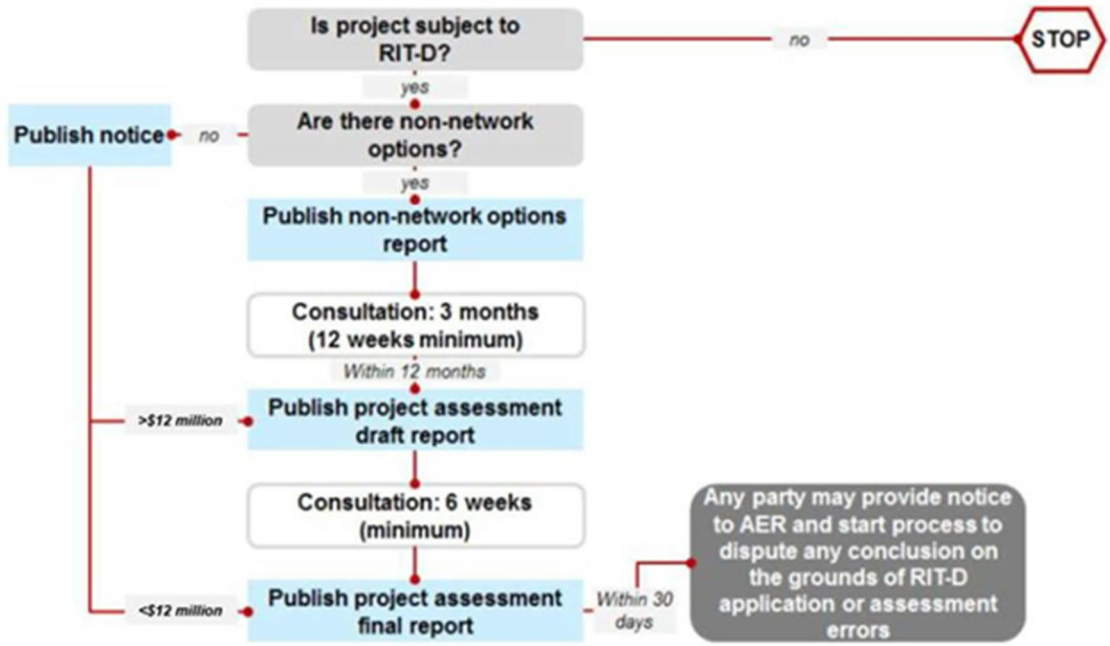
Endeavour Energy seeks written submissions from interested parties in relation to the preferred option outlined in this document. Submissions are due on or before **15 January 2024**. All submissions and enquiries should be directed to Endeavour Energy's Portfolio Management office at consultation@endeavourenergy.com.au.

2.0 RIT-D Process

This DPAR has been prepared by Endeavour Energy in accordance with the requirements of clause 5.17.4 of the NER. We have already applied the RIT-D process to other identified needs in the Aerotropolis precinct including providing 132kV supply and addressing 33kV network constraints.[1] This DPAR represents the second step in the RIT-D process to determine the most efficient means of providing supply and customer connection capability to the Burra Park development area. The RIT-D process is summarised in figure 1 below.

Endeavour Energy adopts a process of exploring feasible options in assessing the ability to supply new development areas in Western Sydney. However, for greenfield sites, Endeavour Energy needs to determine the length of time that the existing network will be able to sustain the prevailing precinct development rate. Endeavour Energy balances timely investment with the increase in demand as development progresses and our customers require connection to network.

Figure 1 – Overview of the RIT-D process



2.1 Submissions requested to the DPAR

Endeavour Energy seeks written submissions from market participants and interested parties in relation to the preferred option outlined in this document. The consultation period is 6 weeks and submissions are due on or before **15 January 2024**. Submissions and any subsequent response by Endeavour Energy may be published.

[1] See: https://www.endeavourenergy.com.au/modern-grid/creating-the-modern-grid/network-planning/rit-d-projects.

2.2 Contact details

All submissions and enquiries regarding this DPAR should be directed to Endeavour Energy's Portfolio Management office at consultation@endeavourenergy.com.au.

3.0 Key assumptions underpinning the 'identified need' for this RIT-D

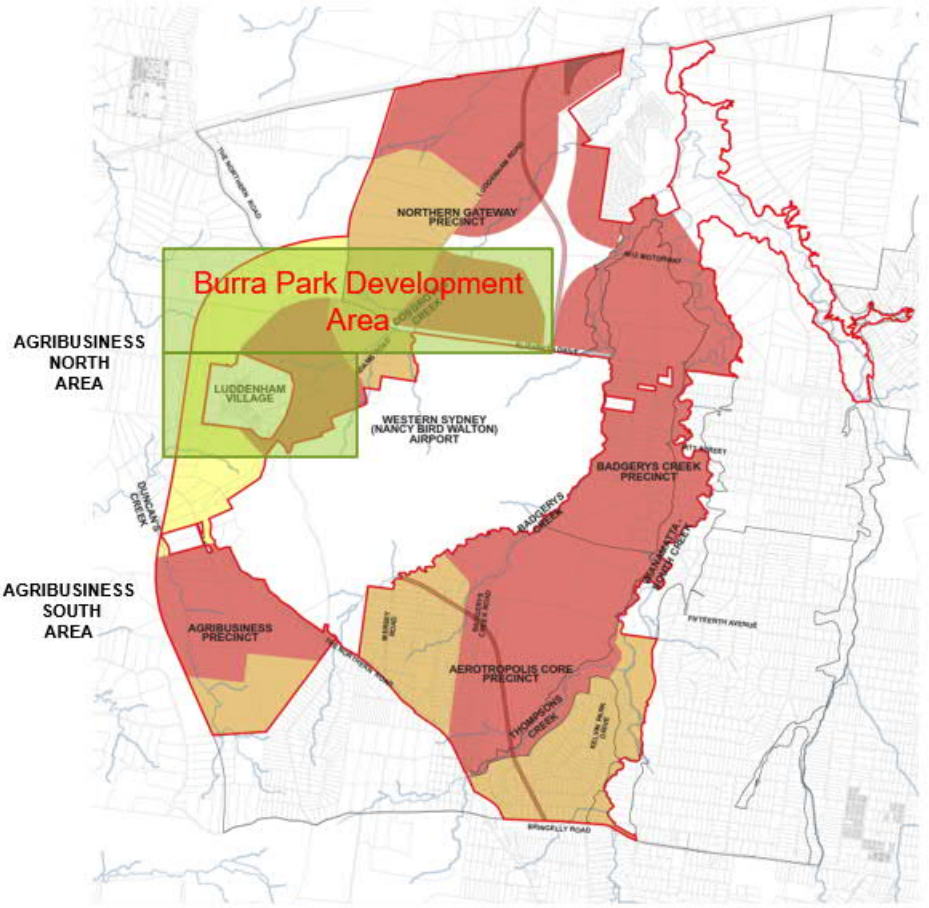
This section sets out the key assumptions and methodologies that underpin the identified need for this RIT-D.

3.1 Relevant area of our network

The Burra Park Development Area is located within the Northern Gateway Precinct of the Western Sydney Aerotropolis in close proximity to the Western Sydney Airport.

Figure 2 below shows the geographic area that we have called the Burra Park Development Area to define the identified need for this electricity supply requirement. The area is adjacent to the north and west boundary of the airport including the area immediately north of Elizabeth Drive and to the west towards the Luddenham Village. It includes land zoned for enterprise and agribusiness use. The close proximity to the new airport and the nearby major road connections are an attraction for businesses to locate within this high growth area.

Figure 2 – Location of the Burra Park Development Area



3.2 Load characteristics and demand forecast

The Burra Park Development Area will comprise land zoned for enterprise and agribusiness use. This will result in the area having a customer demand profile similar to other areas in Western Sydney with a transport and logistics major customer base.

The agribusiness area will be based on high technology agriculture and intensive value added food production using the close access to the airport for local and global markets for exports. The load characteristics for the agribusiness customers are expected to be similar to transport and logistics but with a flatter load profile based on a continuous operating profile through the day and week. Major customer connection requests have been received for the Burra Park Development Area and have been used to determine demand forecasts.

Key committed developments in the area include:

- The Burra Park warehousing and advanced logistics area to the east of Luddenham Road. The area will include the proposed M12 motorway interchange providing motorway road access to the airport. The development covers 250Ha of land and a proposed subdivision to enterprise lots. Based on the land area and the land use indicated by the developer, this has an assessable maximum demand of 37MVA. Initial network connection of 6MVA in 2023/24 and forecast to be 20MVA in 2025;

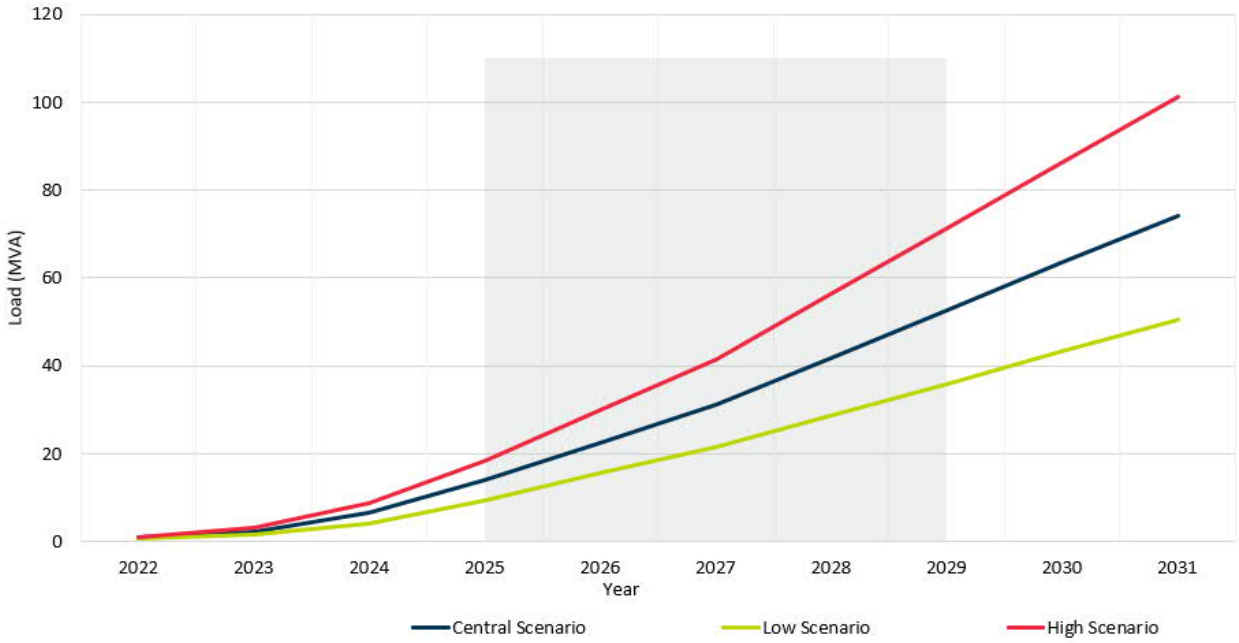
- Agribusiness North development for 55Ha of land dedicated to high technology agriculture and intensive food production with an ultimate demand of 20MVA by 2041. This area is located to the east of Luddenham Village and aligns to the historical agricultural land use in the area. The entire Agribusiness Precinct is expected to be fully developed by 2050 and based on the total land area and the end-use for intensive high technology agriculture will require at least one or maybe two additional zone substations by 2050. The area to the south of Luddenham Village is forecast to develop at a slower rate and is not included in the scope of this study and the demand forecast. Initial network connections are required by 2024; and

- West Luddenham Road including the area along Luddenham Road to the north of Burra Park has a similar expected land use to Burra Park east of Luddenham Road, however is likely to lag several years (possibly 4 to 5 years) behind the development of Burra Park due to it being further from the major access point to the airport via Elizabeth Drive and the M12 interchange. This area is also likely to be delayed due to roadworks and development of Luddenham Road. Our demand forecast takes into account the likely delay in this development by incorporating it into the forecast scenarios used in the study. Based on the land area available for development this has an ultimate maximum demand of 20MVA by 2041.

The total customer demand from these developments in this area are expected to require approximately 78 MVA of capacity by 2031.

Figure 3 below shows our forecast annual maximum demand to 2031 with central, low and high demand scenarios for the Burra Park Development Area.

Figure 3 – Burra Park Development Area maximum demand forecasts from 2023 to 2031



The demand forecast scenarios have been identified and developed on the following assumptions:

- The Central Scenario demand forecast is based on the expected demand from the committed major customers and the expected timing of their connections based on information provided by the customers and the overall rate of development of the area.
- The Low Scenario demand forecast is based on a delay to the Central Scenario and represents an approximate 2 year delay in the connection timing of major customers.
- The High Scenario demand forecast is based on an accelerated rate of development from the Central Scenario, however given the fixed development timeframes of the airport, major road works (including Elizabeth Drive and Luddenham Road) and the Metro this represents a possible acceleration of approximately one year ahead of the Central Scenario.

3.3 Expected pattern of use

Due to the fact that major customers have not yet connected to the network in this greenfield area, we have assessed the identified need using a representative demand profile, which assumes a representative load profile from an existing substation that we expect (at least initially), will have similar demand characteristics as the forecast demand (i.e. capturing the time of day, day of week and seasonal demand variations).

Specifically, the demand profile is based on the Marayong Zone Substation load profile which is an existing commercial and industrial area with a large transport, logistics and warehousing customer base. The Burra Park Development Area will have a similar customer base, however with the addition of the agribusiness customer base which we expect will have a flatter load profile reflecting a more continuous mode of operation.

Although the area is zoned for exclusive enterprise and agribusiness land use, the area will eventually provide back-up supply to the adjacent Sydney Science Park which is planned to have a partly residential customer base. The normalised load duration curve and pattern of use that has been used in this analysis reflects the expected customer base planned for the area.

Figure 4 below presents the normalised load duration curve (LDC) assumed based on the representative demand profile and Figure 5 presents the peak load profile for a summer day assumed for the customer connections expected within the Burra Park Development Area based on the representative demand profile.

Figure 4 – Normalised LDC assumed for customer connections expected in the Burra Park Development Area

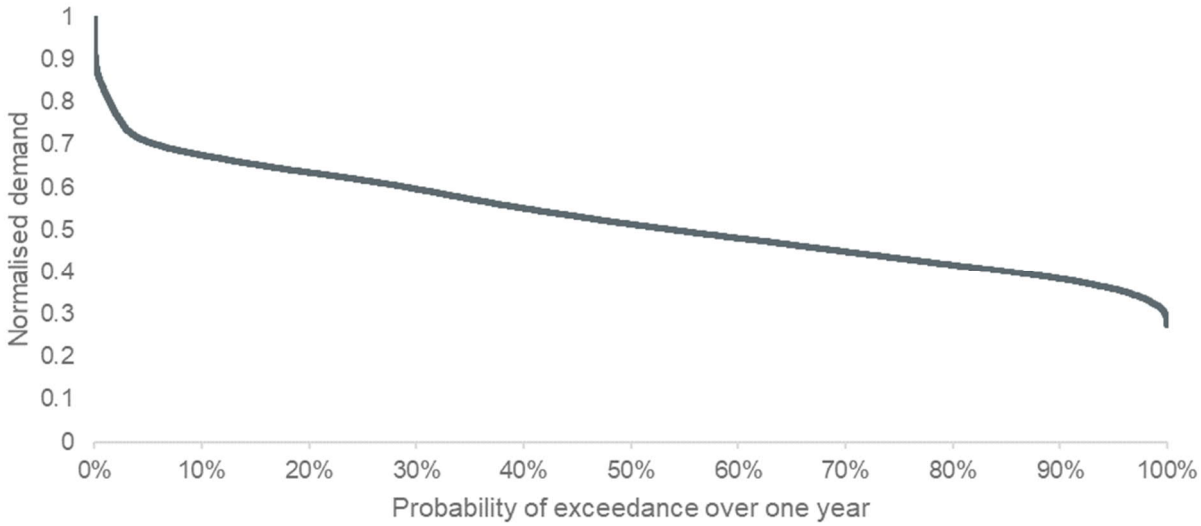
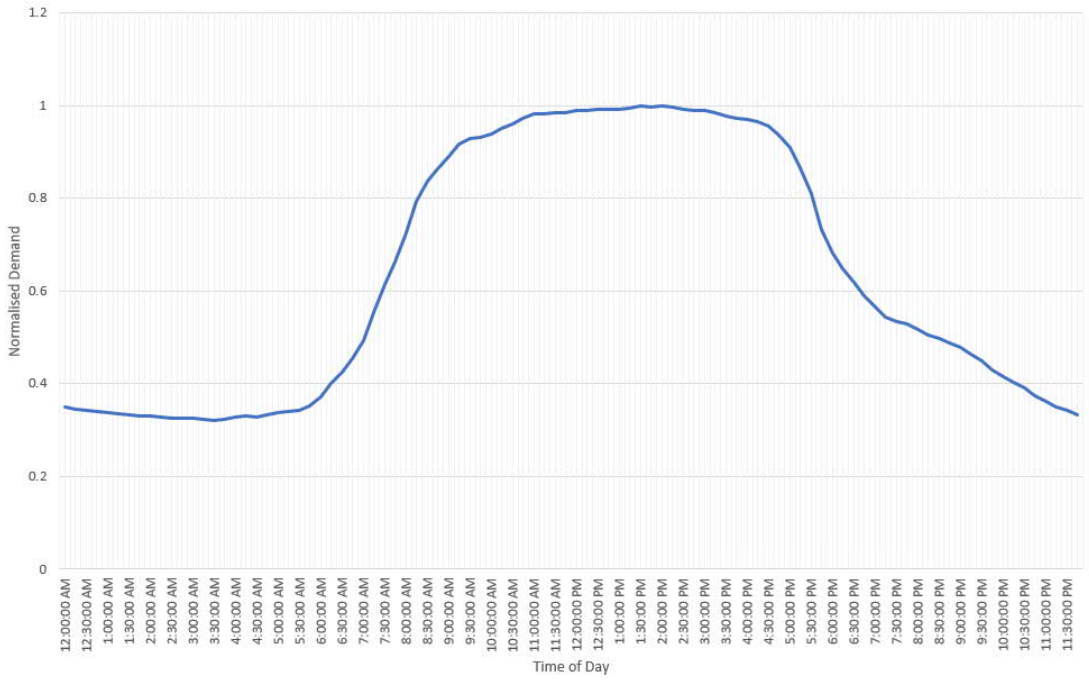


Figure 5 – Peak summer day profile for customer connections expected in the Burra Park Development Area



3.4 Existing network

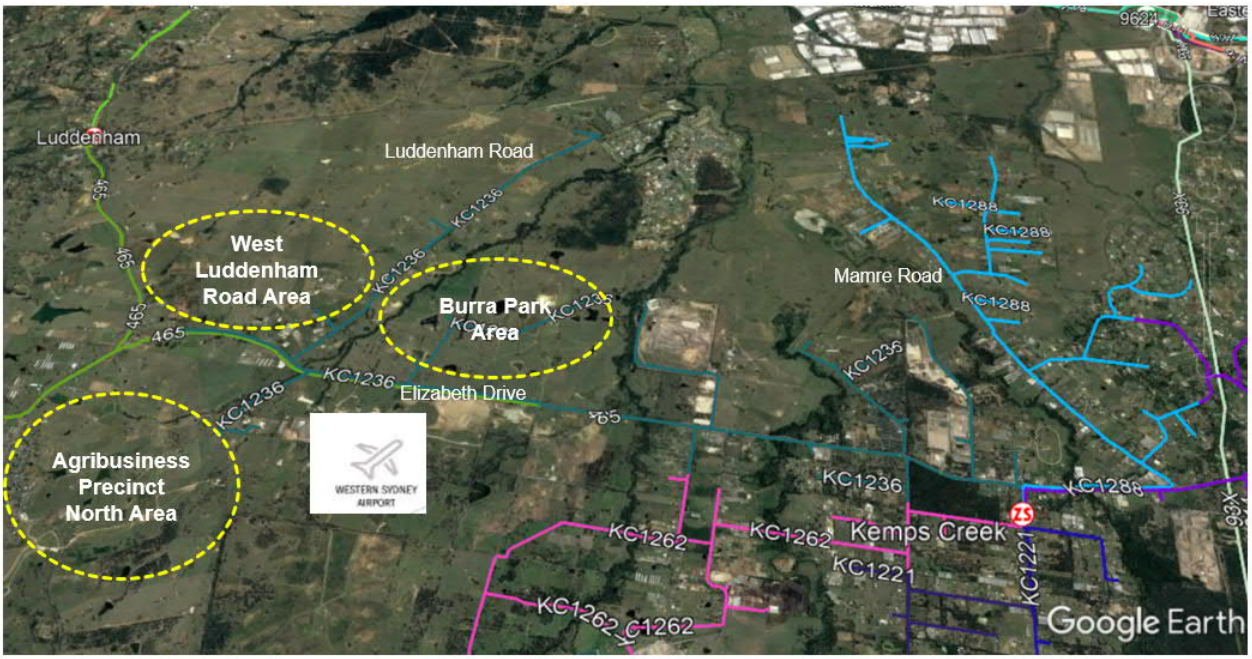
The location of the Burra Park Development Area is currently served by the Kemps Creek Zone Substation by a single 11kV distribution feeder (KC1236).

Figure 6 below shows the existing 11kV network in the Burra Park Development Area. This includes the three contained areas of: Burra Park, West Luddenham Road and Agribusiness Precinct North.

These three areas combined form the Burra Park Development Area that is the identified need and currently served by the single feeder supply.

The existing network is an overhead network and was constructed to meet the historical requirements of the area which was sparsely populated with a rural residential customer base engaged in agriculture and related light industry.

Figure 6 – Existing Network in the vicinity of the Burra Park Development Area



Importantly, the existing network in the area is not capable of servicing the growth in electricity demand. In particular, there are a number of network constraints that inhibit the ability to supply the forecast demand and customer connection requirements in the area. These network constraints are summarised in table 2 below.

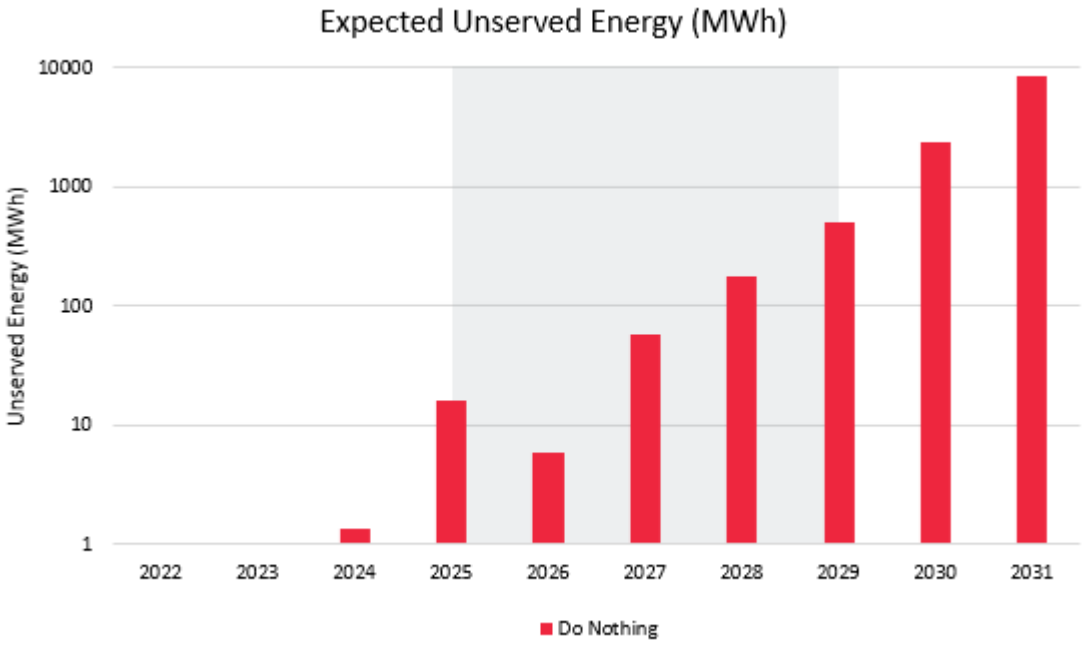
Table 2 – Network constraints in the Burra Park development area

Network Constraint	Description
Lack of distribution feeders	The area is a greenfields development and is currently served by one single distribution feeder with limited coverage to enable customer connections. The geographic area covered by the single feeder is limited and will not support the major customer connection requests received.
Distribution network capacity from Kemps Creek ZS to the Burra Park development area.	The Burra Park Development Area is currently supplied from Kemps Creek ZS via a single 11kV feeder (KC1236). The feeder has a total route length of approximately 7.0km and is further allocated to supply other developments on Elizabeth Drive that are closer to Kemps Creek ZS. No additional 11kV feeders are possible from Kemps Creek ZS into the Burra Park development area due to the distance of the development from Kemps Creek ZS and the lack of egress for feeders along Elizabeth Drive due to the current development in the area and the potential for road works which would widen the road and result in overhead asset relocation requirements.
Kemps Creek ZS transformer firm capacity.	The Kemps Creek ZS firm transformer capacity will be exceeded by 2025. This is due to the demand growth in the Kemps Creek area, Elizabeth Enterprise Precinct, the Sydney Water Facility, the Badgerys Creek area (south of Elizabeth Drive), the Austral areas, the provision of construction supplies for the WSA and Sydney Metro. Kemps Creek ZS has 2 x 25MVA transformers. Demand is forecast to exceed 25MVA in 2025 which would exceed firm capacity of supply.
Supply from Luddenham ZS.	Luddenham ZS is approximately 5.0km from the Burra Park Development Area. However, Luddenham ZS has limited firm capacity available. For the purpose of this requirement, we have allocated 15MVA of transformer firm capacity at Luddenham ZS for Burra Park, however there are currently no 11kV feeders from Luddenham ZS extending into the Burra Park area and there are no available distribution feeder connections possible at Luddenham ZS. Endeavour Energy has already maximised distribution feeder connection capacity at Luddenham ZS to provide connection capacity for two new feeders supplying adjacent development areas to the north of the Burra Park Development Area.

3.5 Expected unserved energy if action is not taken

If network augmentation is not undertaken, there will be significant unserved energy in our network over the next decade with available capacity being exceeded from 2025/26. Figure 7 presents the forecast of expected unserved energy if no action is taken. The graph is based on a logarithmic y-axis scale and shows the rapid increase in expected unserved energy for the years following 2026.

Figure 7 – Expected unserved energy for the Burra Park development area based on the central demand forecast scenario



Although we expect there to be significant market benefits associated with providing supply to the Burra Park development area, we consider the need for this investment a 'reliability corrective action' due to our regulatory obligations to connect new customers. These regulatory obligations are set out in the box below.

'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 provide supply to major new customer connections in the Burra Park development area.

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 customer demand requiring connection will exceed the existing network capacity. This is currently anticipated to be 2025/26, based on the firm connection enquiries received to date.

4.0 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 several options that were considered but that we do not propose to progress further.

Two of the credible options involve establishing a Burra Park Zone Substation in a suitable business park approximately 1.0km from the Western Sydney Airport Transmission Substation which is currently under construction and due to be commissioned in FY24. The third option involves establishing a Zone Substation co-located within the Western Sydney Airport Transmission Substation (WSA TS).

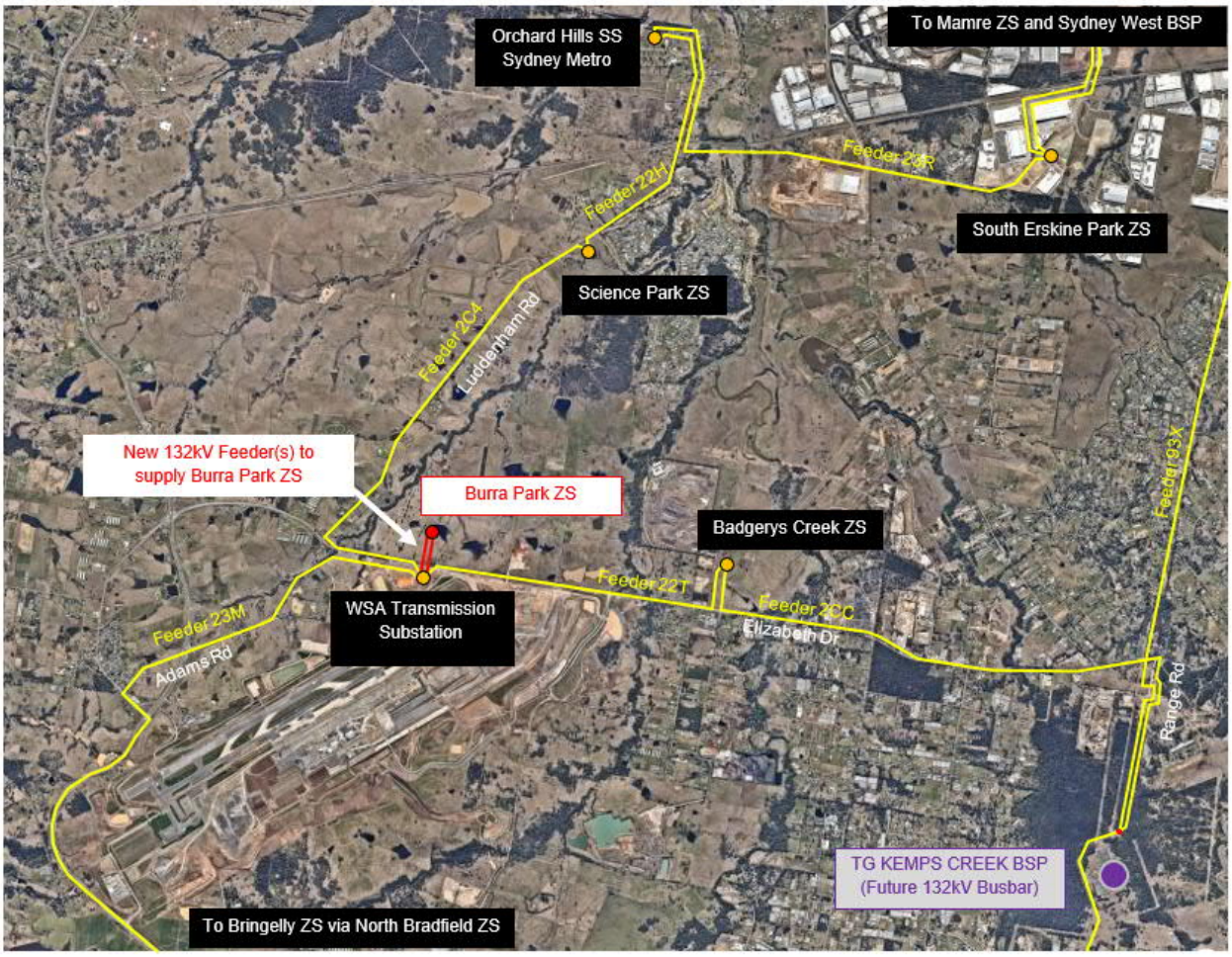
The three network options will provide the required supply and connection capacity for the development area. All three options would provide 22kV supply from a high capacity 132/22kV Zone Substation.

Figure 8 provides an overview of our Aerotropolis plan and shows the location of the credible network options considered at Burra Park and the Western Sydney Airport. It also shows the adjacent areas of Science Park, Badgerys Creek and North Bradfield which have proposed zone substations subject to separate independent RIT-D processes.

Figure 9 provides an aerial view of the development area and proposed network infrastructure showing the credible network options at Burra Park and Western Sydney Airport.

Figure 8 – Overview of our Aerotropolis plan with proposed and existing network infrastructure

Figure 9 – Aerial photography of the Aerotropolis area with an overlay of existing and planned major network assets including the network options for the Burra Park development area



4.1 Option 1 – Establish Burra Park ZS with tail ended transformers

Option 1 involves the establishment of the Burra Park Zone Substation at a location within a suitable business park in an area north of the Western Sydney Airport to supply the Burra Park Development Area.

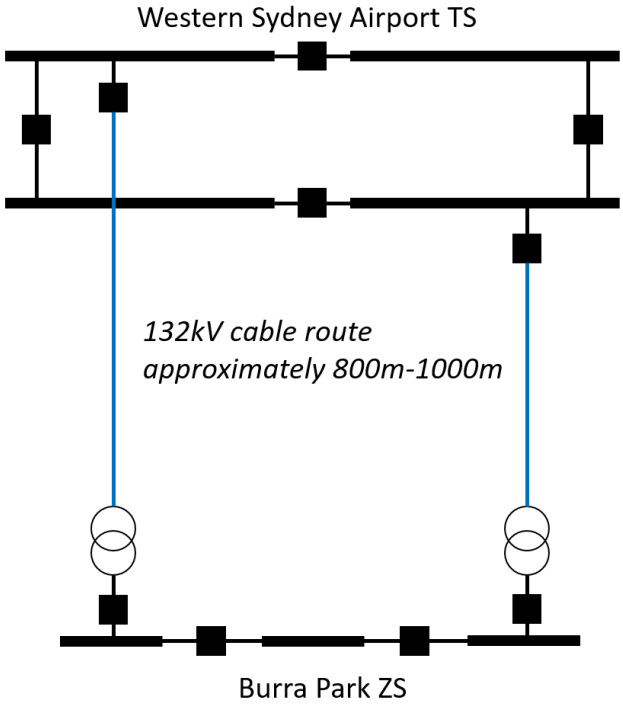
The location would be approximately 1.0km north of the airport and to the north of Elizabeth Drive.

In particular, the first stage would commence construction in 2023/24 with commissioning in 2025/26 and involves installing two 45MVA power transformers. These transformers would be connected to the WSA TS via two 132kV cables without installing a 132kV busbar at the proposed Burra Park ZS. This would take advantage of the relative proximity of the location to the WSA TS. This configuration is identified as "tail ended" transformers. This configuration provides an economic advantage of avoiding the cost of a primary busbar, however also foregoing the benefit by marginally reduced supply security and operational flexibility.

A final stage would add an additional power transformer and a 132kV busbar(s) in 2035. This would provide a final configuration of the Burra Park Zone Substation with three power transformers and a 132kV busbar to provide enhanced supply security and operational flexibility.

Figure 10 below provides an overview of Option 1. This shows the initial stage of the proposed implementation.

Figure 10 – Simplified line diagram of Option 1



The total cost of this option is estimated to be **$52.8 million** and the construction of the proposed Burra Park Zone Substation would commence in 2023/24 with commissioning in 2025/26. Table 3 provides an overview of the scope of works and capital cost of works for Option 1, with operating costs estimated to be 0.4 per cent per annum of the option's capital expenditure.

Table 3 – Scope of works and costs for Option 1

Stage	Commissioning	High Level Description of Scope and Deliverable	Cost Estimate ($M)
1	2025/26	Establishment of the Burra Park Zone Substation, including: • Suitable Land (10,000m^2). • 2 x 132kV feeders from WSA TS. • 2 x 132/22kV 45MVA transformer. • Buildings for housing staff worker amenities, switchgear, protection and control. • 3 x 22kV bus sections. Providing connection for up to 15 distribution feeders. • 22kV distribution works including: o Multiple distribution feeders to provide connection and supply capacity to the development area. o Auto-transformers for 11/22kV interconnection to adjacent areas. o Targeted 11kV to 22kV network conversion in existing adjacent 11kV supply area.	38.7
2	2034/35	Augment the proposed Burra Park Zone Substation with additional network assets as follows: • 1 x 132/22kV 45MVA transformer. • 3 x 132kV bus sections. • Terminate 2 x 132kV feeders to new 132kV circuit breakers.	14.1
		Total Cost over the two stage development of the proposed Burra Park Zone Substation.	**52.8**

4.2 Option 2 – Establish Burra Park ZS with a 132kV busbar

Option 2 involves the establishment of the Burra Park Zone Substation with the inclusion of a 132kV primary busbar in the initial stage.

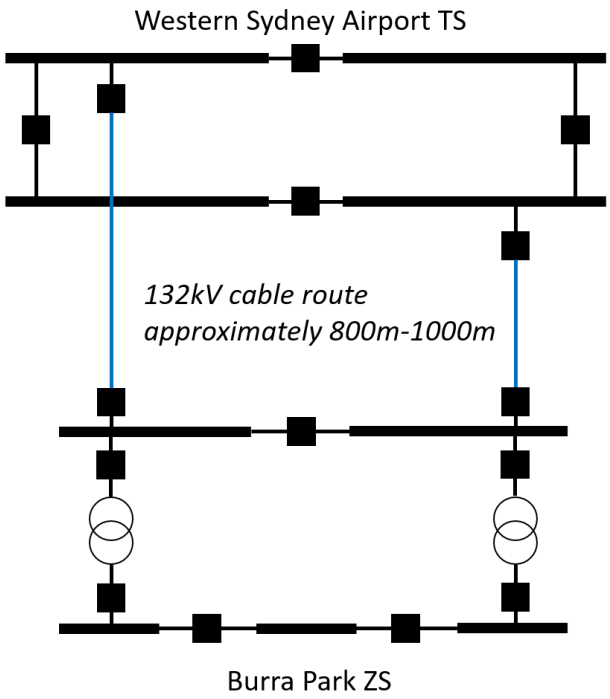
It differs from Option 1 by incorporating the installation of the 132kV busbar in the initial stage of works. This would provide an increase level of supply security and operational flexibility by providing configurable 132kV supply to the ZS.

Similarly to Option 1, this option would use a suitable land parcel in a business park located not more than 1.0km from the WSA TS location.

The first stage would commence construction in 2023/24 with commissioning in 2025/26.

Figure 11 below provides an overview of Option 2. This shows the initial stage of the proposed implementation.

Figure 11 – Simplified line diagram of Option 2



The total cost of this option is estimated to be **$51.4 million** and the construction of the proposed Burra Park Zone Substation would commence in 2023/24 with commissioning in 2025/26.

Table 4 provides an overview of the scope of works and capital cost of works for Option 2 with operating costs estimated to be 0.4 per cent per annum of the option's capital expenditure.

Table 4 – Scope of works and costs for Option 2

Stage	Commissioning	High Level Description of Scope and Deliverable	Cost Estimate ($M)
1	2025/26	Establishment of the Burra Park Zone Substation, including: • Suitable Land (10,000m^2). • 2 x 132kV feeder from Western Sydney Airport TS. • 2 x 132/22kV 45MVA transformer. • Buildings for housing staff worker amenities, switchgear, protection and control. • 3 x 132kV bus sections. • 3 x 22kV bus sections. Providing connection for up to 15 distribution feeders. • 22kV distribution works including: o Multiple distribution feeders to provide connection and supply capacity to the development area. o Auto-transformers for 11/22kV interconnection to adjacent areas. o Targeted 11kV to 22kV network conversion in existing adjacent 11kV supply area.	44.1
2	2034/35	Augment the proposed Burra Park Zone Substation with additional network assets as follows: • 1 x 132/22kV 45MVA transformer.	7.3
		Total Cost over the two stage development of the proposed Burra Park Zone Substation.	**51.4**

4.3 Option 3 – Establish a 22kV Zone Substation at the WSA TS

Option 3 involves the establishment of the Western Sydney Airport Zone Substation (132/22kV) to be co-located with the Western Sydney Airport Transmission Substation (WSA TS).

The WSA TS is currently under construction and is planned to be commissioned in late 2024. The WSA TS was the preferred option to address 33kV network constraints in the Luddenham, Kemps Creek and Badgerys Creek areas and completed its RIT-D process in 2022.

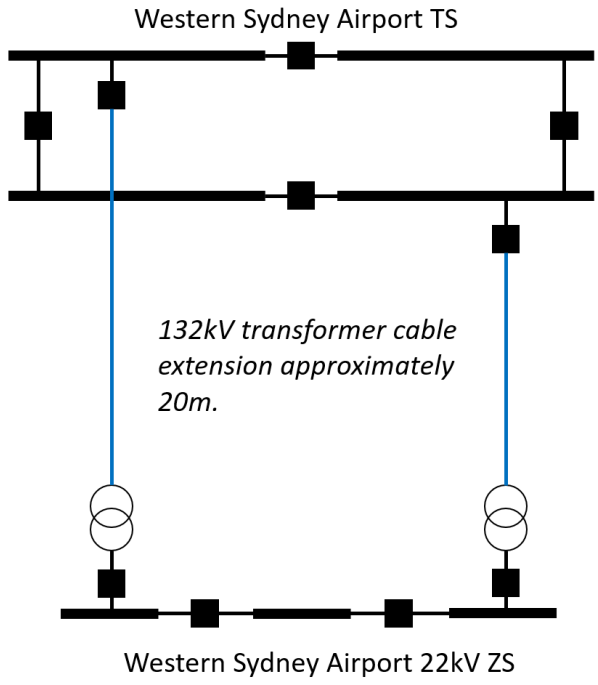
The WSA TS is a 132/33kV substation which will provide a strong 33kV source of supply to major customers in the area and supporting the 33kV network. There is sufficient available space on the site to accommodate both the WSA TS and WSA 22kV ZS. Major civil works and geo-technical ground works have been completed on the site as part of the construction of the WSA TS.

Option 3 will utilise the 132kV busbar to be constructed for the WSA TS to provide supply to the WSA 22kV ZS. This will enable the 22kV supply capacity and customer connection capability for the Burra Park development area. Option 3 also includes substantial 22kV feeder development works allowing low cost connection for major customers, installation of auto-transformers to interconnect to the historical 11kV network and will include targeted 11kV to 22kV conversion to upgrade the supply capacity in the local distribution network.

The WSA 22kV ZS would be commissioned in 2025/26 and a final stage would be commissioned in 2034/35 with the addition of a third power transformer and a 132kV busbar extension from WSA TS.

Figure 12 provides an overview of Option 3. This shows the initial stage of the proposed implementation.

Figure 12 – Simplified line diagram of Option 3



The total cost of this option is estimated to be **$45.3 million** and the construction of the proposed WSA 22kV Zone Substation would commence in 2023/24 with commissioning in 2025/26.

Table 5 provides an overview of the scope of works and capital cost of works for Option 3 with operating costs estimated to be 0.4 per cent per annum of the option's capital cost.

Table 5 – Scope of works and costs for Option 3

Stage	Commissioning	High Level Description of Scope and Deliverable	Cost Estimate ($M)
1	2025/26	Establishment of the WSA 22kV Zone Substation including the following components: • 2 x 132/22kV 45MVA transformers. • 3 x 22kV switchboards. • Construct a 22kV switchroom and control room. • 2 x 132kV cables from the WSA TS to the WSA 132/22kV transformers. • 22kV distribution works including: o Multiple distribution feeders to provide connection and supply capacity to the development area. o Auto-transformers for 11/22kV interconnection to adjacent areas. o Targeted 11kV to 22kV network conversion in existing adjacent 11kV supply area.	30.3
2	2034/35	Augment the WSA 22kV Zone Substation as follows: • 1 x 132/22kV 45MVA transformer. • 2 x 132kV bus sections. • Reconfigure 132kV transformer cables to terminate on to the new bus sections.	15.0
		Total Cost over the two stage development of the WSA 22kV Zone Substation.	**45.3**

4.4 Options considered but not progressed

Endeavour Energy has considered three options that we propose not to progress to the DPAR. These options, and our reasoning for not progressing them further, are summarised in Table 6.

Table 6 – Options considered but not proposed to be progressed in the DPAR

Option	Reason not progressed
Augmentation of existing Kemps Creek Zone Substation	A network option considered was to supply the area by augmenting the existing Kemps Creek Zone Substation by adding a third transformer, augmenting the existing transformers to 35MVA (from 25MVA) and conversion of the Kemps Creek Zone Substation to 132kV. However, this option would require taking the Kemps Creek ZS out of service for a long period of time during the construction period and is not feasible due to the impact on the existing Kemps Creek customers and the prolonged loss of supply. This option would also require construction of long feeders with a route length of 5 to 7km from Kemps Creek ZS to the development area which would be difficult due to existing egress and congestion issues with distribution feeders from Kemps Creek to the development area using Elizabeth Drive as a possible distribution corridor.
Augmentation of existing Luddenham Zone Substation	The augmentation of the existing Luddenham ZS to supply the Burra Park Development Area was considered, however there are a number of reasons that this option was not progressed, they are: • There are no available 11kV circuit breakers to support a supply to Burra Park. Luddenham ZS is located on a small land parcel and bordered to a major water pipe easement and is not capable of being augmented to increase supply and connection capacity. • The location of the Luddenham ZS is approximately 5.0km from the Burra Park Development Area and there would likely be voltage regulation issues using the existing 11kV supply available at Luddenham ZS. Our supply strategy for the Aerotropolis area utilises 22kV in preference to 11kV to provide a more economic supply for the area. • Any distribution feeders from Luddenham ZS to supply the Burra Park area are likely to be impacted by road works in the area over the next few years and result in costly asset relocation.
Utilise a 33kV supply option	While there is existing 33kV supply in the local area, this is used to supply the existing 33/11kV zone substations at Luddenham, Kemps Creek and Bringelly and provide a direct 33kV supply to major customers. The overall supply strategy for the Aerotropolis area will use 22kV and this is incompatible with a 33kV supply option. Our 22kV supply strategy will be more economic due to it resulting in a lower number of zone substations required to supply to overall area and the longer route length provided by 22kV feeders compared to 11kV feeders. Auto-transformers will be used to interconnect our 11kV and 22kV networks.

5.0 Assessment framework

This section outlines the methodology that we have applied in assessing the market benefits and costs associated with each of the credible options considered in this RIT-D.

5.1 Overview of the assessment framework

All costs and benefits for each credible option have been assessed in comparison to a 'do nothing', business-as-usual base case. Under this base case, Endeavour Energy would utilise the existing Kemps Creek and Luddenham Zone Substations to service the growing demand in the Burra Park development area. The consequence of not proceeding with any investment is significant unserved energy due to the existing supply network being constrained and incapable of supplying the forecast demand from new customers in the area.

The RIT-D analysis has been undertaken over a 30-year period, from 2022/23 to 2051/52. We consider that this assessment period takes into account the size, complexity and expected life of the relevant credible options to provide a reasonable indication of the market benefits and costs of the option.

Further, the Burra Park development area is expected to mature over a 30-year period and so the assessment period incorporates the expected demand growth development period. While the capital components of the credible options have asset lives greater than 30 years, we have taken a terminal value approach to incorporated capital costs in the assessment, which ensures that the capital costs of long-lived options are appropriately captured in the 30-year assessment period.

We have adopted a central real, pre-tax discount rate of 3.26 per cent as the central assumption for the NPV analysis presented in this DPAR.

We have also tested the sensitivity of the results to changes in this discount rate assumption with a lower bound real, pre-tax discount rate of 2.22 per cent and an upper bound discount rate of 4.30 per cent (i.e., a symmetrical upwards adjustment).

5.2 Market benefits are expected from reduced involuntary load shedding

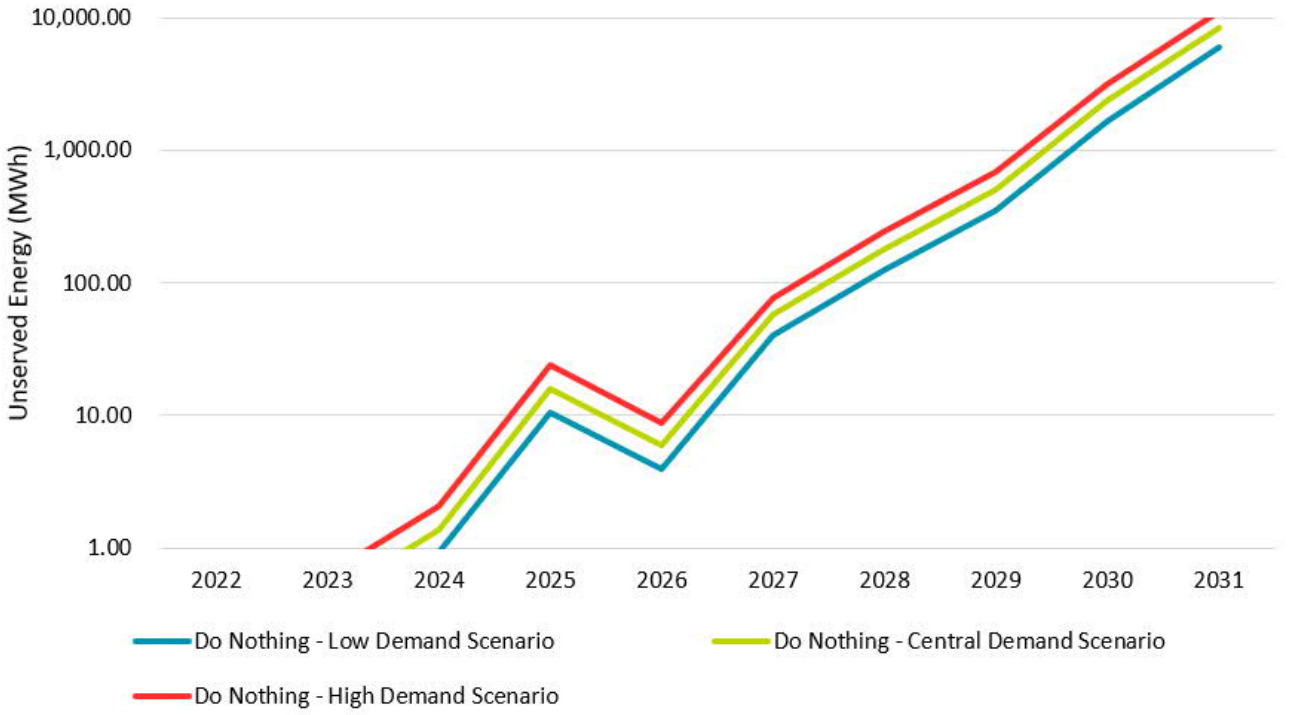
We expect that the only relevant categories of market benefits prescribed under the NER for this RIT-D relate to changes in involuntary load shedding and differences in the timing of expenditure. Our approach to valuing these market benefits are outlined below.

5.2.1 Reduced involuntary load shedding

Endeavour Energy has valued reduced involuntary load shedding by reference to our estimate of energy at risk, which is derived from the annual peak demand forecasts and load duration curves set out in the key assumptions.

Figure 13 illustrates the expected unserved energy scenario profiles used in the economic analysis of the credible.

Figure 13 – Expected Unserved Energy profile scenarios used in the economic analysis



The value of unserved energy is calculated using the VCR. This represents an estimate of the value electricity consumers place on reliable electricity supply. The VCR has been used in relation to customers who have not yet connected to the network to determine the avoided unserved energy to provide the benefits for the economic analysis.

The VCR value (in dollars per MWh) is applied to the difference in the MWh of unserved energy calculated in comparison to the base case and each credible option.

We used a composite VCR value of $45,746 per MWh in the evaluation. This is based on the 2021 VCR values provided by the AER,[2] weighted in accordance with the forecast composition of the agricultural, commercial, industrial and residential within the Burra Park development area. The Burra Park area will provide a back up supply to adjacent residential areas and this has been included in the composite VCR. We believe that the value of VCR used in this analysis is conservative. Based on the major customer connection requests we have received, many of the major enterprises planning to connect in this area have a high expectation on supply reliability and have proposed high value added business processes reliant on secure and reliable supply of electricity.

A breakdown of this calculation is provided in the table below.

[2] AER, *2023 VCR annual adjustment,* December 2022.

Table 7 – Composite VCR used in evaluation

Parameter	Agriculture	Commercial	Industrial	Residential
Demand composition of the Burra Park development area	6%	50%	17%	27%
AER VCR	$42,140	$49,540	$70,970	$23,640
Demand weighted VCR				**$45,746**

5.2.2 Differences in timing of expenditure

Differences in the timing of expenditure relates to the potential for a credible option to change the timing (or configuration) of other future investments to be made by or for the RIT-D proponent. Importantly, this relates to distribution investments that address identified needs other than those addressed by the credible option.

All three of the credible options include multi-staged developments and the differences in timing of the expenditure has been included in the economic analysis. For example, the preferred option includes a later stage in the 2030s for a third transformer and an extension of the 132kV busbar. The timing of this is included in the discounted cashflow analysis in the economic evaluation.

5.3 No other categories of market benefit are expected to be material

This section provides a brief overview of the categories of market benefit (other than reduced involuntary load shedding) that are not material for this RIT-D. These are:

- changes in voluntary load curtailment;
- option value;
- changes in load transfer capability;
- changes in costs to other parties; and
- changes in electrical losses.

5.3.1 Changes in voluntary load curtailment

Voluntary load curtailment is when customers agree to reduce their demand (load) to address a network limitation in return for a payment. A credible demand side option to enlist such customers to voluntarily reduce their demand could lead to a reduction in involuntary load shedding.

Endeavour Energy has not estimated any market benefits associated with changes in voluntary load curtailment. Although, generally, customers are now more capable of providing greater levels of voluntary load curtailment, the greenfield nature of this investment is such that the area does not have the capability to deliver sufficient voluntary demand reduction.

5.3.2 Option value

Endeavour Energy notes that the AER's view is that option value is likely to arise where there is uncertainty regarding future outcomes, the information that is available in the future is likely to change and the credible options considered by the RIT-D proponent are sufficiently flexible to respond to that change.

Although we have not explicitly quantified option value for this assessment, it is implicitly captured in the structure of our credible options (each of which have flexibility for future investment and include staging which could be accelerated or deferred to respond to customer demand over time).

5.3.3 Changes in load transfer capability

Distribution investments can improve load transfer capacity where a credible option allows customers to gain access to an alternate back-up power supply via the meshed network. This is a market benefit because the alternate supply can service customers in the event of loss of primary supply. The main objective of this project is to support connection of new customers in the Burra Park development area. The areas in and around the Burra Park development area are mostly serviced by long route distribution feeders and load transfers to other parts of the network cannot be meaningfully considered until adjacent areas are further developed in the future. Immediate changes to load transfer capacity are therefore not considered material for this RIT-D.

5.3.4 Changes in costs to other parties

Endeavour Energy has not identified any changes in costs to other parties from developing the credible options identified in this document.

5.3.5 Changes in electrical losses

Endeavour Energy recognises that there would be small changes in the loss profiles for customers across the network due to network augmentation. These changes are captured as part of the annual review of distribution loss factors when more information about customer usage patterns is available. Changes in electrical losses have therefore not been modelled for this RIT-D.

5.4 Three different 'scenarios' have been modelled to address uncertainty

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

We have assessed 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.

A summary of the key variables for each scenario is provided in table 8 below.

Table 8 – Scenarios used to test the robustness of the Preferred Option

Variable	Central scenario	High benefits	Low benefits
Capex	Central estimates	-25%	+25%
Demand	Central demand forecast (see Section 3)	High demand forecast (see Section 3)	Low demand forecast (see Section 3)
VCR	Load-weighted AER VCR	+30%	-30%
Discount rate	3.26%	2.22%	4.30%
Maintenance costs	Central estimates	-25%	+25%

Endeavour Energy considers that the central scenario is most likely because it is based primarily on a set of expected and central assumptions. We have therefore assigned this scenario a weighting of 50 per cent, with the other two scenarios being equally weighted with 25 per cent each.

Aligning to recent developments in the application of RIT-T and RIT-D, we have used the central scenario as the basis for the selection of the preliminary preferred option and use the scenario analysis to illustrate the robustness of the preferred option.

6.0 Assessment of credible options

This section summarises the results of the NPV analysis, including the sensitivity analysis undertaken. All credible options have been assessed in comparison to a business-as-usual base case.

6.1 Gross market benefits estimated for each credible option

The table below summarises the gross market benefit of each credible option relative to the base case in present value terms. The gross market benefit has been calculated for each of the scenarios outlined in the previous section.

Table 9 – Present value of gross economic benefits of each credible option relative to the base case ($M)

Option	Central scenario	High benefits	Low benefits	Weighted
Scenario weighting	50%	25%	25%	
Option 1	197,815.4	561,201.2	64,572.1	255,351.0
Option 2	197,815.3	561,201.1	64,572.1	255,350.9
Option 3	197,815.6	561,201.4	64572.1	255,351.2

6.2 Estimated costs for each credible option

The table below summarises the costs of each credible option relative to the base case in present value terms. The cost is the sum of the project capital costs and the estimated operating and maintenance costs for each option.

The cost of each option has been calculated for each of the three reasonable scenarios described above.

Table 10 – Present value of costs of each credible option under each scenario ($M)

Option	Central scenario	High benefits	Low benefits
Scenario weighting	50%	25%	25%
Option 1	-35.8	-25.5	-48.8
Option 2	-37.0	-26.2	-50.7
Option 3	-29.7	-21.5	-40.3

6.3 Net present value assessment outcomes

The table below summarises the net market benefit in NPV terms for each credible option under each scenario. The net market benefit is the gross market benefit (as set out in table 9) with the cost of each option (as set out in table 10) subtracted to obtain a net present value.

Table 11 – Present value of net market benefit of each credible option relative to the base case ($M)

Option	Central scenario	High benefits	Low benefits	Weighted	Rank
Scenario weighting	50%	25%	25%		
Option 1	197,779.6	561,175.7	64,523.3	255,314.6	2
Option 2	197,778.3	561,174.9	64,521.5	255,313.2	3
Option 3	197,785.9	561,179.9	64,531.8	255,320.9	1

Under the NER, the preferred option is the credible option that maximises the present value of the net economic benefit to all those who produce, consume or transport electricity in the National Electricity Market (NEM). Applying this criteria, Option 3 is the preferred option at this draft stage because it has the highest net market benefits.

We have used the central scenario to determine the preferred option and we have used the high and low scenarios to test the robustness of the preferred option. The weighting applied to the scenarios has also been selected to test the robustness of the preferred option. We have reviewed the recent RIT-D and RIT-T regulatory developments with regards to the use of scenarios. We have used them to test the robustness of the preferred option that has been identified by applying the central values of key variables in the economic evaluation.

The following section demonstrates that the sensitivity analysis we have undertaken confirms our view that Option 3 is preferred at this draft stage.

6.4 Sensitivity analysis results

We have undertaken a thorough sensitivity testing exercise to understand the robustness of the RIT-D assessment to underlying assumptions about key variables. Our sensitivity analysis has focused on testing the sensitivity of the total NPV benefit associated with the investment proceeding consistent with the timeframes for customer connection.

We have assessed the sensitivity of the net benefits of each option to:

- changes in the discount rate;
- changes in the capital costs; and
- changes in the VCR.

The figures below demonstrate that these sensitivities confirm the selection of the preliminary preferred option.

Figure 14 – Impact of varying the discount rate on the net market benefits of each credible option

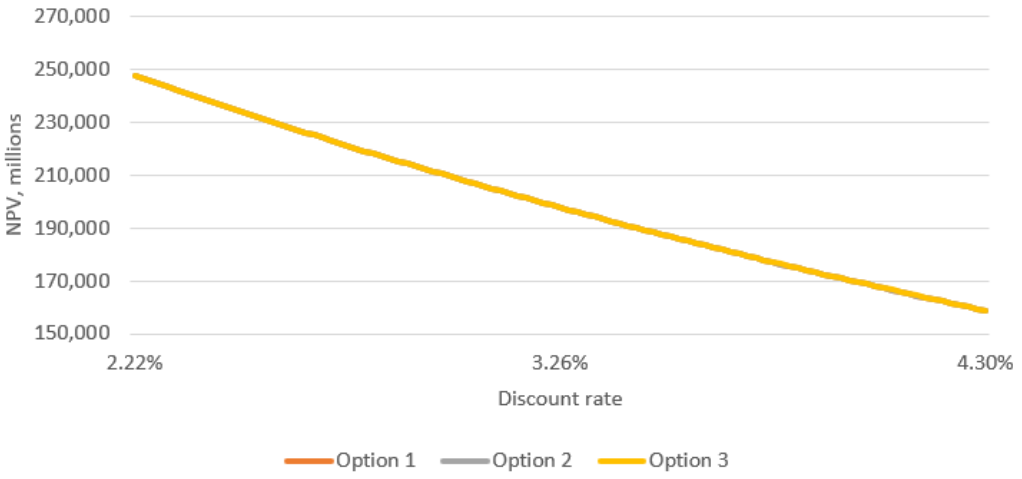


Figure 15 – Impact of varying capital costs on the net market benefits of each credible option

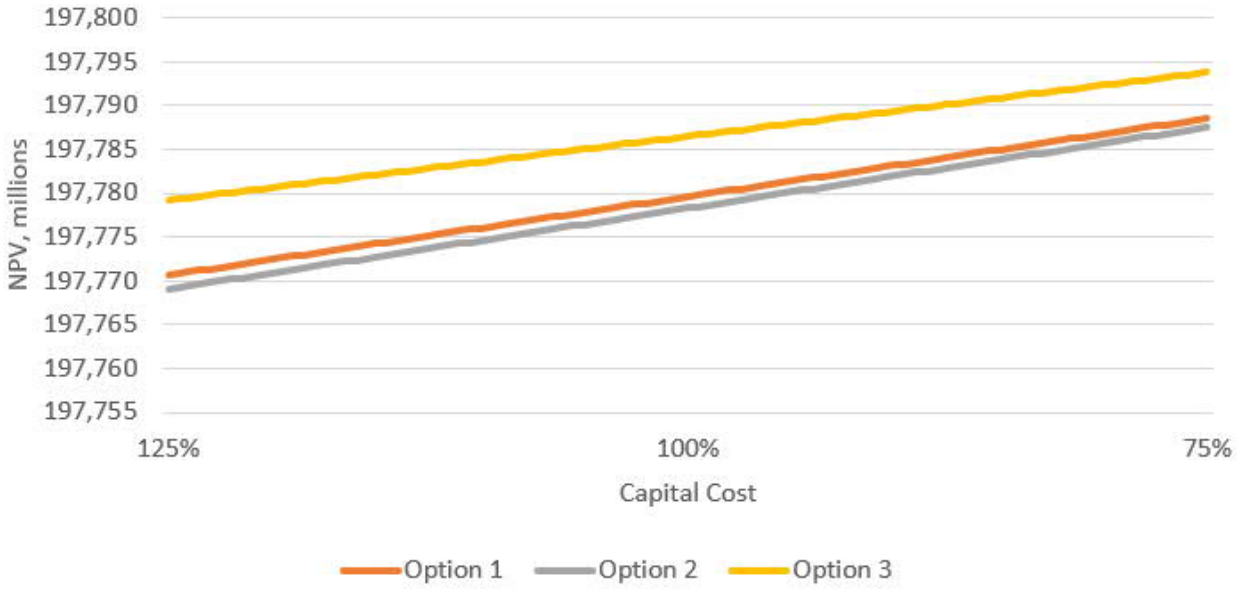
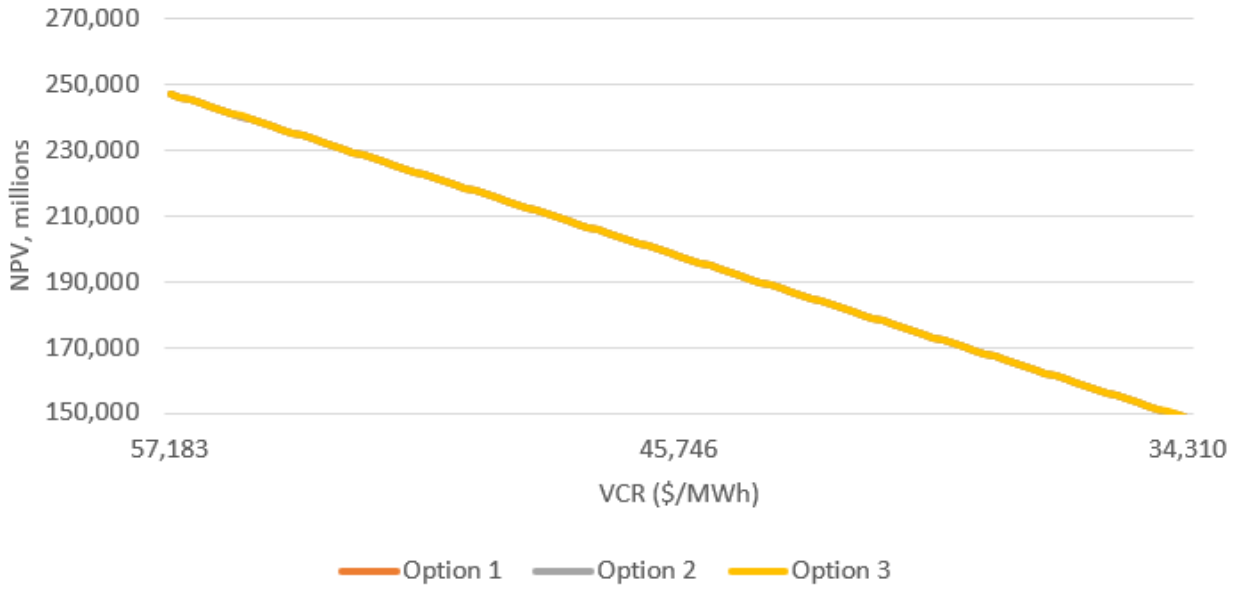


Figure 16 – Impact of varying the VCR on the net market benefits of each credible option



7.0 Conclusion

The Burra Park development area of the Northern Gateway precinct of the Aerotropolis will be a hub for transport, logistics, warehousing and light industry. It will also include part of the Agribusiness precinct which is land planned for technology enabled agriculture, fresh food and value added food production with access to local and global markets via the airport.

The Burra Park development area is forecast to require approximately 78MVA of electricity supply capacity by 2031.

As outlined in the options screening notice, it is not considered feasible that a non-network solution, or SAPS solution, will form a potential credible option on a standalone basis, or form a significant part of a potential credible option for the Burra Park development area RIT-D.

This DPAR identified three credible network-based options that can meet the required customer demand.

Two of the credible options involve establishing a Burra Park Zone Substation in a suitable business park approximately 1.0km from the Western Sydney Airport Transmission Substation which is currently under construction and due to be commissioned in FY24. The third option involves establishing a Zone Substation co-located within the Western Sydney Airport Transmission Substation (WSA TS).

The three network options will provide the required supply and connection capacity for the development area. All three options would provide 22kV supply from a high capacity 132/22kV Zone Substation. All three options are also staged to ensure that the major capital expenditure stages are aligned with the growth in customer demand.

- Option 1 - Establish Burra Park Zone Substation with tail ended transformers;
- Option 2 - Establish Burra Park Zone Substation with a 132kV busbar;
- Option 3 - Establish a 22kV Zone Substation at the Western Sydney Airport Transmission Substation.

Each of these options were considered in an economic evaluation and Option 3 was selected as the preferred option.

The estimated cost of this option is $45.3 with the initial stage having a cost estimate of $30.3 million.

Construction of the WSA 22kV Zone Substation would commence in 2023/24 with commissioning in 2025/26.

Endeavour Energy will apply a suitable contingency to the cost estimate.

Cost Estimate (Option 3 initial stage)	Value ($M)
Central estimate based on cost outcomes for similar recent project work including major equipment.	**30.3**
Guidance estimate including likely contingency for project delivery.	**34.0**

CONTACT

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Endeavour Energy

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