RIT-D Final Project Assessment Report

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

19 April 2024

Endeavour Energy

POWER together

Contents

1.0 Executive summary

This Final Project Assessment Report (FPAR) was prepared by Endeavour Energy in accordance with the requirements of clause 5.17.4 of the National Electricity Rules (NER).

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' area 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 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 forecast customer demand requiring connection will exceed the existing network supply capacity. This is currently forecast to be in 2025/2026, based on the connection requests received to date.

This FPAR follows publication of a Draft Project Assessment Report (DPAR) on 21 November 2023 which invited written submissions on the materials contained in the DPAR. On publication of the DPAR, Endeavour Energy opened a six-week consultation period, during which time no submissions were received.

Three options were determined to be credible in addressing the network need and have been assessed in comparison to a "do nothing" (or 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 locations 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 (WSA TS) which is currently under construction and due to be commissioned in FY24. The third option involves establishing a Zone Substation co-located within the WSA TS.

The three network options will provide the required supply and connection capacity for the Burra Park 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 and investments 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 final stage because it has the highest net market benefits.

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 confirmed Option 3 as the preferred option at this stage. There are a number of important economic and 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 based on prevailing market prices have 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 and costs 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.

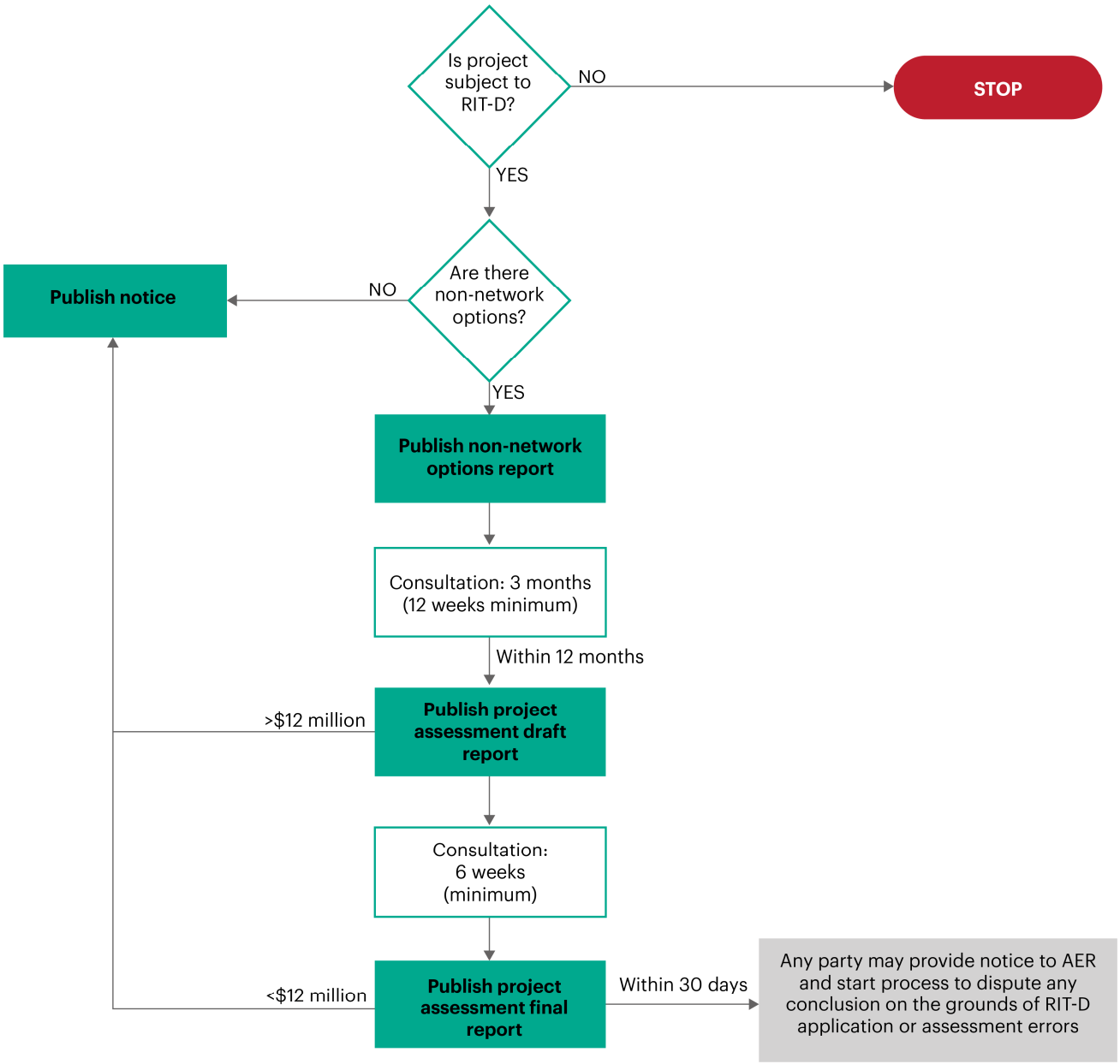
Table 1 – Economic assessment of credible options (using the central demand forecast scenario)

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.	60.4	197,771.9	44.7	197,727.2	2
2	Establish Burra Park Zone Substation with a 132kV busbar.	59.0	197,773.2	46.1	197,727.1	3
3	Establish a 22kV Zone Substation at the Western Sydney Airport Transmission Substation.	52.9	197,778.7	39.2	197,739.5	1

2.0 RIT-D process

This FPAR has been prepared by Endeavour Energy in accordance with the requirements of clause 5.17.4 of the National Electricity Rules. This report describes the application of the Regulatory Application Test – Distribution (RIT-D) for providing supply to the Burra Park development area. The RIT-D process is summarised in Figure 1 below. Endeavour Energy's RIT-D documentation for all relevant projects is available on our web site.[1]

Figure 1 – Overview of the RIT-D process



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

2.1 Completion of RIT-D Process

This FPAR represents the final stage of the consultation process in relation to the application of the RIT-D process undertaken by Endeavour Energy regarding providing supply to the Burra Park development area of the Northern Gateway precinct. It follows publication of the options screening notice and DPAR, both of which were published on 21 November 2023.

Endeavour Energy invited written submissions on the materials contained in the DPAR (over a six-week consultation period) and no submissions were received.

2.2 Contact details

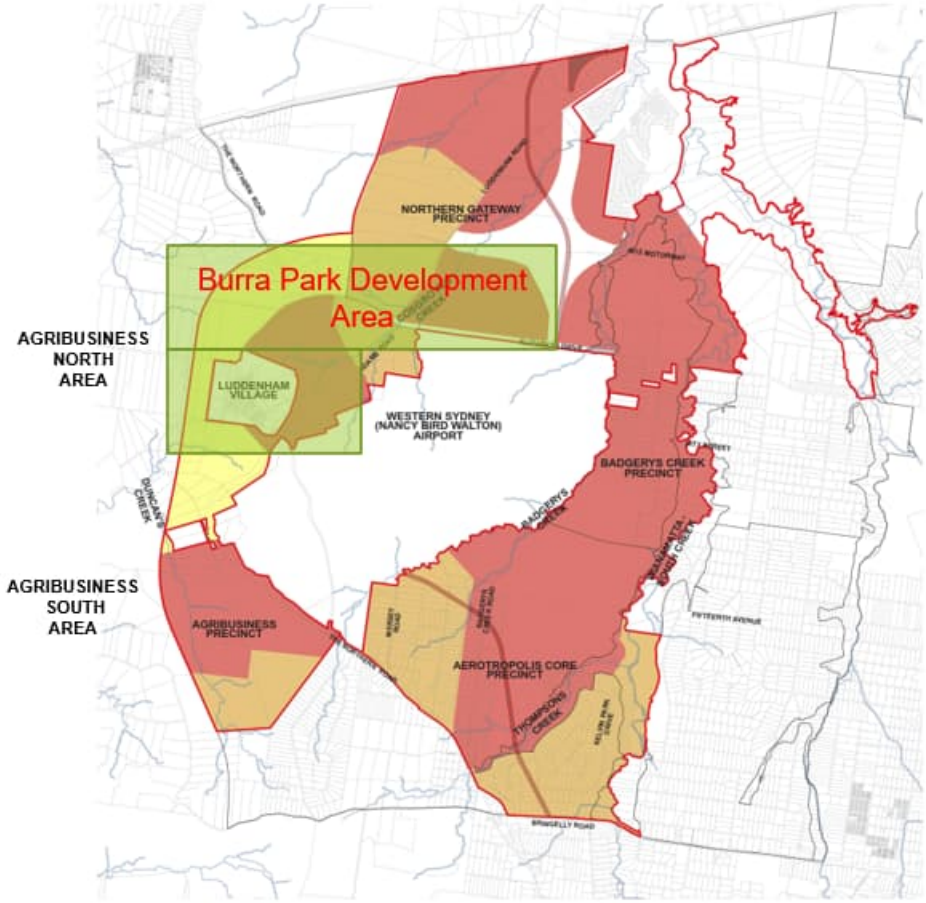
All enquiries regarding this FPAR should be directed to Endeavour Energy's Portfolio Management Office at consultation@endeavourenergy.com.au.

3.0 Context of the project

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



4.0 Network need

The network need for the Burra Park development area is to connect customers to the network by providing a suitable connection point and to provide the supply capacity to meet the demand of the customers.

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;

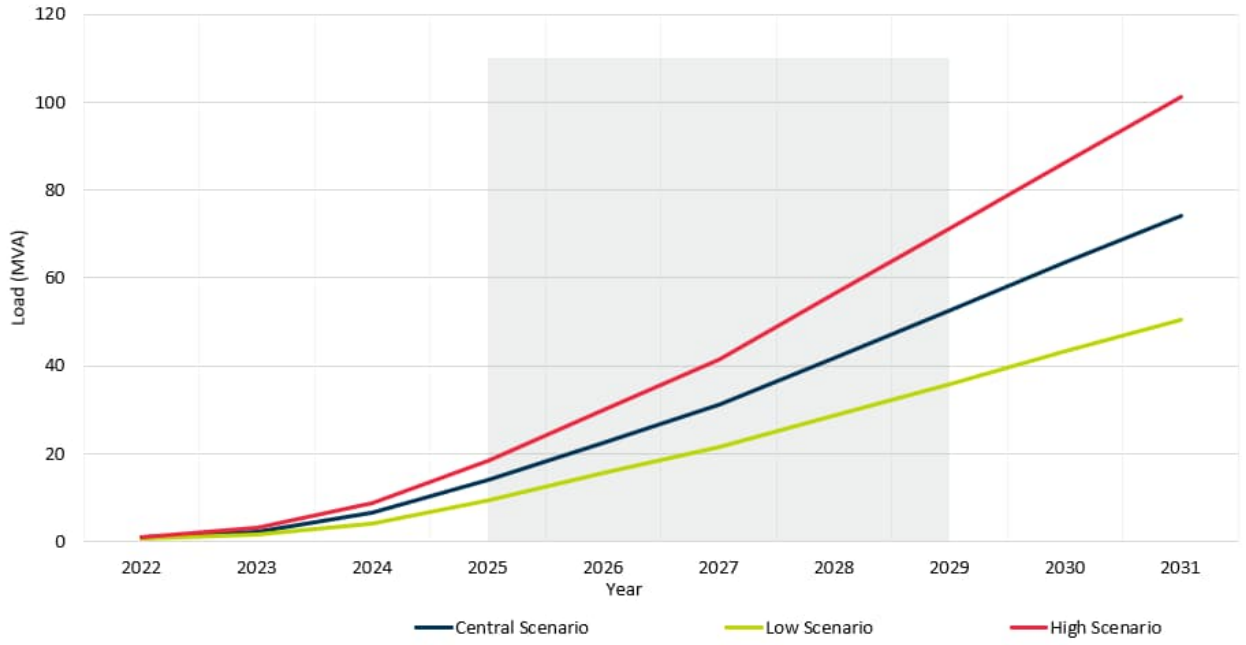
- Agribusiness North development for 55Ha of land dedicated to high technology agriculture and intensive food production with an ultimate demand of 20MVA by 2041. This area is located to the east of Luddenham Village and aligns to the historical agricultural land use in the area. The entire Agribusiness 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 2024 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. This includes consideration of the rate of development of other infrastructure including roads and water.
- 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. We believe that a potential 2 year delay is a reasonable basis for the low demand scenario.
- 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.

Existing Network is Constrained

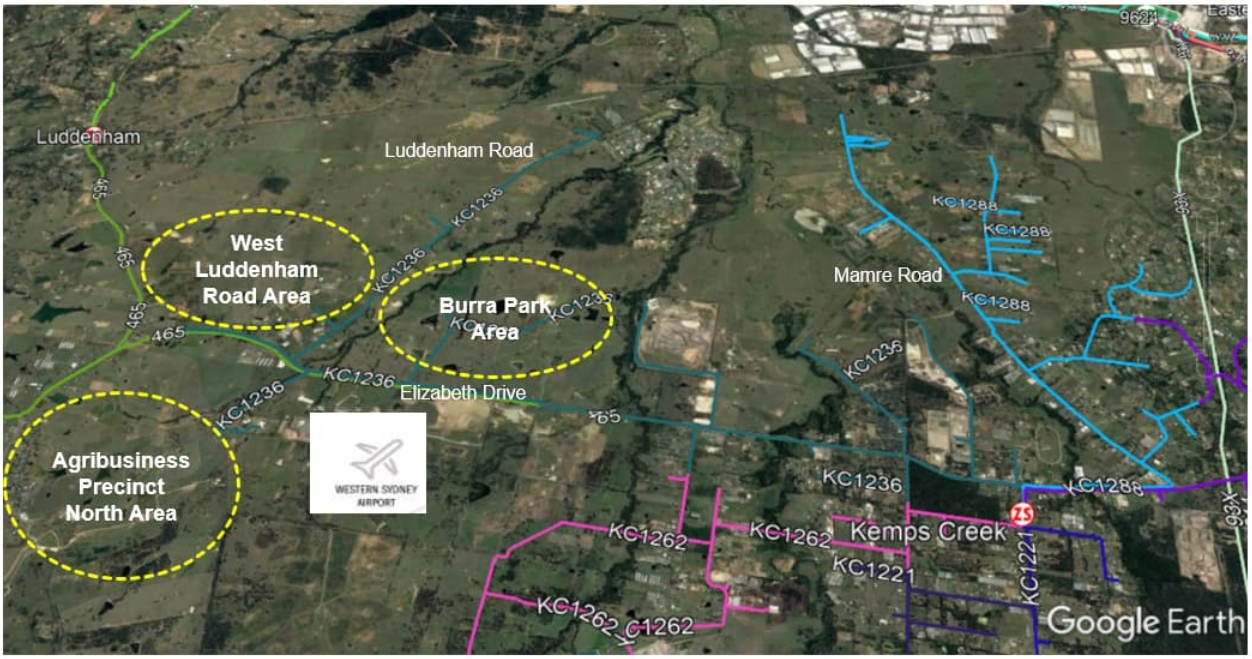
The location of the Burra Park development area is currently served by the Kemps Creek Zone Substation by a single 11kV distribution feeder (KC1236).

Figure 4 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 4 – Existing Network in the vicinity of the Burra Park development area



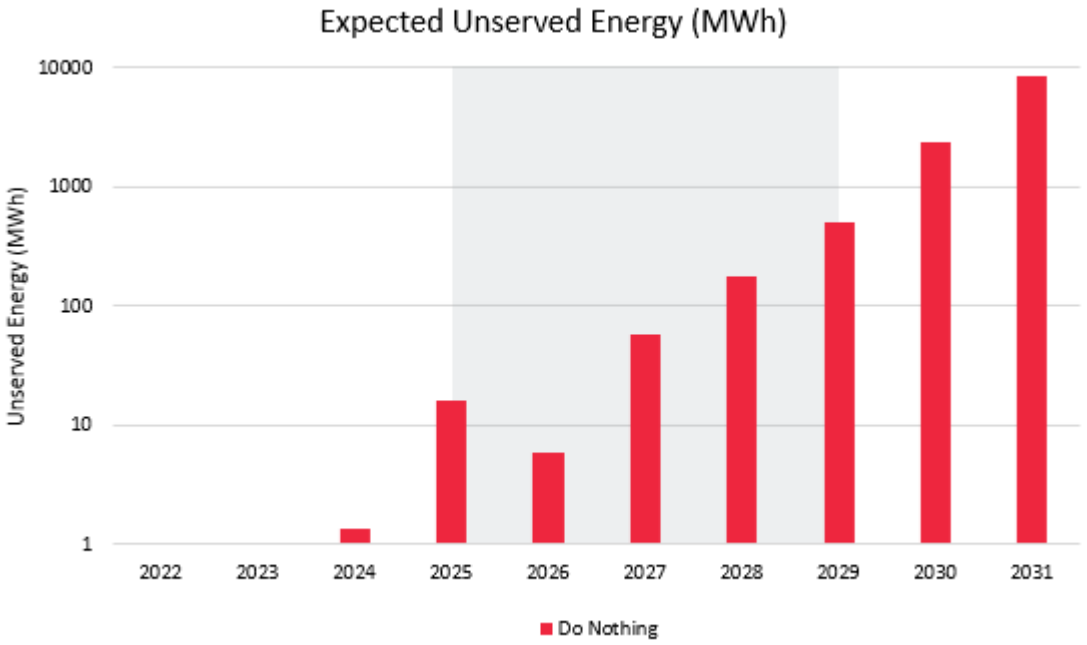
The existing network in the area is not capable of servicing the growth in electricity demand. In particular, there are a number of network constraints that inhibit the ability to supply the forecast demand and customer connection requirements in the area. These network constraints are summarised in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

Table 2 – Network constraints in the Burra Park development area

Network Constraint	Description
Lack of distribution feeders	The area is essentially a greenfield 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. The single distribution feeder servicing the area was originally constructed to supply the sparsely populated rural residential and light industry customer base.
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

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 5 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 5 – 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 this Regulatory Investment Test for Distribution (RIT-D) to investigate, and consult upon, how to most efficiently provide supply to new customers 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 connection requirement will exceed the existing network capacity. This is currently anticipated to be 2025/2026, based on our demand forecasts which are further based on the requirement to connect new customers.

5.0 Preferred Option

The option that presents the highest net market benefit and is therefore considered as the preferred option is Option 3. This option involves the establishment of a 132/22 kV zone substation co-located at the Western Sydney Airport Transmission Substation (WSA TS). The zone substation will be supplied from the 132kV busbar constructed for the WSA TS and include two 132kV/22kV transformers and distribution works to provide 22kV connection and supply capacity to the development area. The scope of the distribution works will provide major customers an economical connection point for their developments. It will include providing multiple 22kV feeders into the development area to ensure connection and supply capacity is available.

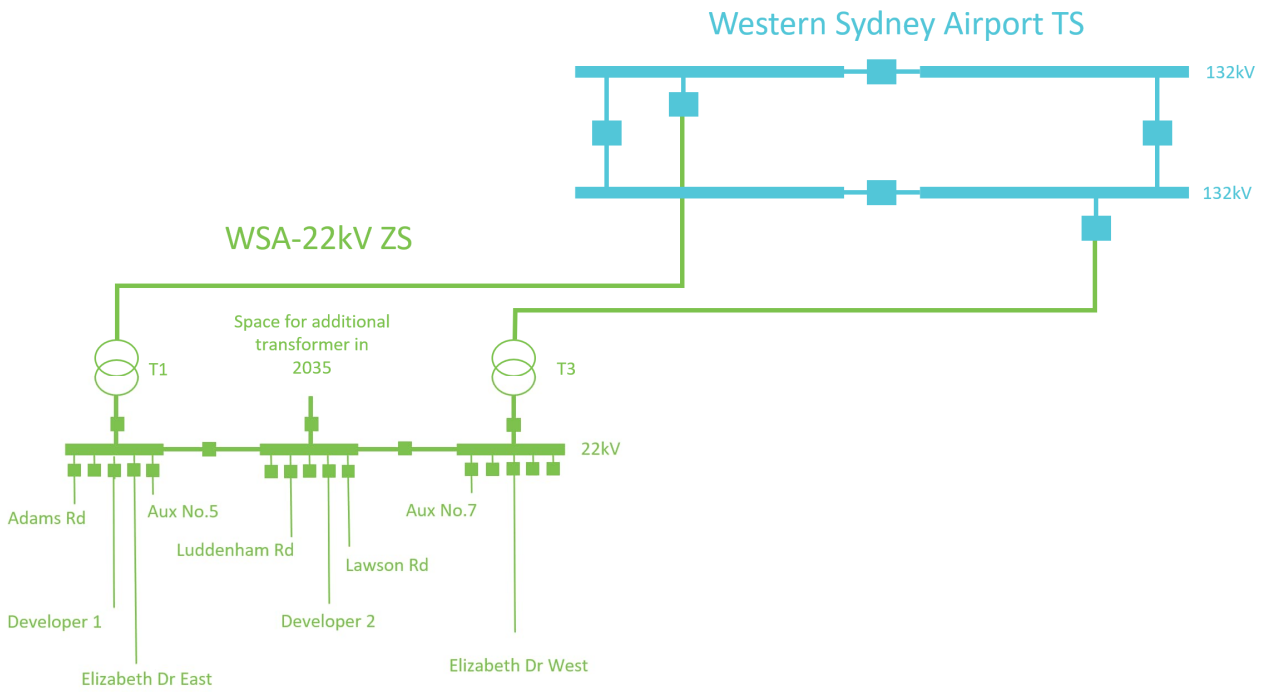
The total cost of this option is estimated to be **$52.9 million** in 2023/24 dollars and the zone substation construction is expected to commence in 2024 with commissioning in 2025/26. A final stage with a third power transformer and an extension to the 132kV busbar would be commissioned in 2034/35.

A detailed breakdown of the scope of this option is provided in Section 6.0.

Figure 6 below shows a simplified single line diagram of the preferred option to provide supply to the Burra Park development area. The WSA 22kV ZS will be co-located at the WSA TS location and take its 132kV supply directly from the 132kV busbars. The later stage of the project will extend the 132kV busbar and provide the third transformer.

The proposed 22kV distribution feeders that are within the scope of the preferred option are shown and they will provide supply and connection capability to the key developments within the area including a nearby business park, the northern agribusiness area and the future west Luddenham Road area. Additional customer funded 22kV feeders will be developed over time. Based on our forecast and the customer connection enquiries and applications currently received, we expect several more 22kV feeders to be developed either prior to commissioning or shortly after.

Figure 6 – Simplified single line diagram of the preferred option for the Burra Park development area: the WSA 22kV ZS



6.0 Credible options considered

Three options were determined to be credible in addressing the network need and have been assessed in comparison to a “do nothing” (or 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 22kV Burra Park zone substation at the Western Sydney Airport Transmission Substation

This section provides detailed information on the scope and cost of these options. It also discusses options that were considered but were not progressed 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 (WSA TS) which is currently under construction and due to be commissioned in FY24. The third option involves establishing a Zone Substation co-located within the WSA TS.

The three network options will provide the required supply and connection capacity for the Burra Park 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 and investments are aligned with the growth in customer demand.

6.1 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. Suitable land would be acquired.

The zone substation would comprise of 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 a third power transformer and a 132kV busbar 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.

The total cost of this option is estimated to be $60.4 million, and the construction of the Burra Park zone substation would commence in 2023/24 with commissioning in 2025/26. The final stage of work would be complete in 2034/35.

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 of total capital expenditure.

Table 3 – Scope of works and costs for Option 1

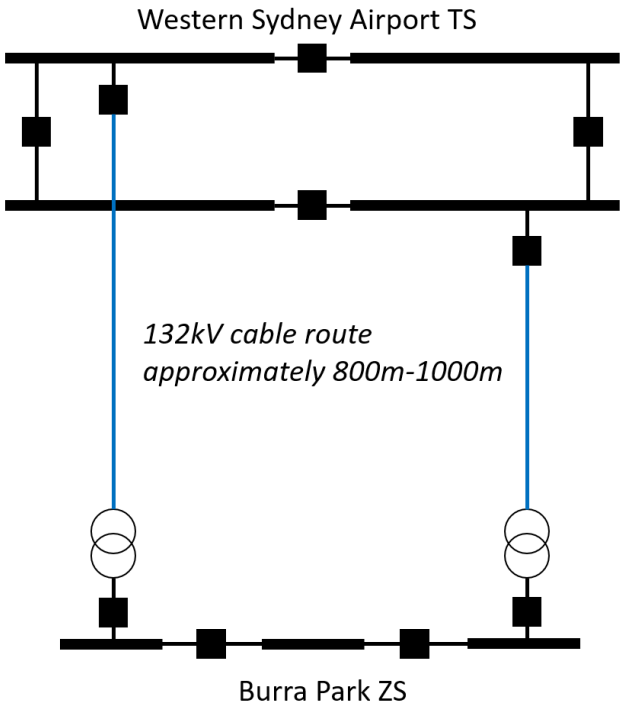
Stage	Commissioning	High Level Description of Scope and Deliverable	Cost Estimate ($M)

1	2025/26	Establishment of the Burra Park Zone Substation, including:
		• Suitable Land (10,000m2).
		• 2 x 132kV feeders from WSA TS.
		• 2 x 132/22kV 45MVA transformer.
		• Buildings for switchgear, protection & control equipment and amenities.
		• 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.
			46.3

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	**60.4**

Figure 7 below provides an overview of Option 1. This shows the initial stage of the proposed implementation. The proposed Burra Park ZS in this option would be located not more than 1.0km from the WSA TS. There would be no 132kV busbar in the initial stage of this option.

Figure 7 – Simplified line diagram of Option 1



6.2 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 is an addition to Option 1 in terms of scope of work and the network assets to be installed.

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. The final stage of work would be complete in 2034/35.

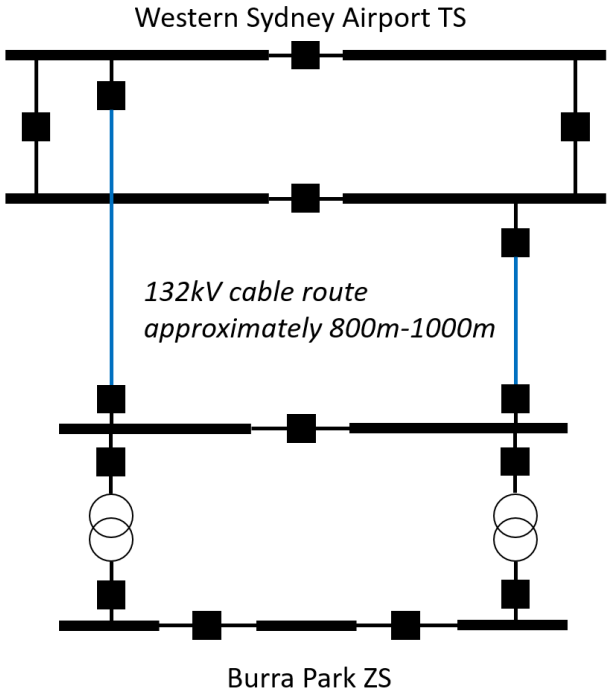
The total cost of this option is estimated to be $59.0 million, and the construction of the initial stage of the Burra Park zone substation would commence in 2023/24 with commissioning in 2025/26. The final stage would be commissioned in 2034/35.

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 switchgear, protection & control equipment and amenities. • 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	51.7
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	**59.0**

Figure 8 below provides an overview of Option 2. This shows the initial stage of the proposed implementation. The proposed option would include a 132kV busbar in the initial stage of the proposed Burra Park ZS.

Figure 8 – Simplified line diagram of Option 2



6.3 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 an economically efficient and comparatively lower 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 total cost of this option is estimated to be $52.9 million and the construction of the proposed WSA 22kV zone substation would commence in 2023/24 with commissioning 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.

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 of total capital expenditure.

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 switch room 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.	37.9
2	2034/35	Augment the proposed Burra Park Zone Substation with additional network assets 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 proposed WSA 22kV Zone Substation	**52.9**

6.4 Options considered but not progressed

Endeavour Energy considered a number of options that were not progressed to the DPAR and FPAR stage. These options, and our reasoning for not progressing them, are summarised in Table 6.

Table 6 – Options considered but not progressed

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.

7.0 Modelling & Assumptions

7.1 Assumptions

The RIT-D requires that the preferred option is the credible option that maximises the present value of the net economic benefit to all those who produce, consume and transport electricity in the NEM.

The market benefit of a credible option is calculated by comparing the credible option in place with the state of the system in the base case. The emphasis in this situation is differences in the risks of involuntary load shedding.

The market benefits that can be considered under the National Electricity Rules are:

- Changes in voluntary load curtailment (considered a negative benefit);
- Changes in involuntary load shedding and customer interruptions caused by network outages;
- Changes in costs to other parties (timing of new plant, capital costs, operating and maintenance costs);
- Differences in timing of expenditure;
- Changes in load transfer capacity and the capacity of embedded generators to take up load;
- Option value;
- Changes in electrical energy losses; and
- Any other class of market benefit determined to be relevant by the AER.

The time period chosen for the NPV analysis was 30 years.

7.1.1 Energy at risk and expected unserved energy

A core justification for this project is based on the load at risk and energy not able to be supplied to customers waiting to connect to the network. This is different to the situation where existing connected customers risk losing supply by a fault on the network. The same VCR value has been applied as a default position to the energy at risk values established from the connection requests received. For a greenfield development such as this, where the forecast demand rapidly exceeds the available capacity in the network, the VCR benefits to be captured from implementing a project to address network constraints can rapidly rise to extremely large amounts. The Energy at Risk (EAR) has been estimated from the annual peak demand forecasts and load duration curves.

7.1.2 Load profile characteristics

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).

The Burra Park development area will comprise of land zoned for enterprise and agribusiness use. 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 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 9 below presents the normalised load duration curve (LDC) and Figure 10 presents the peak load profile for a summer day assumed for the customer connections associated with the Burra Park development area.

Figure 9 – Normalised LDC assumed for customer connections expected within the Burra Park development area

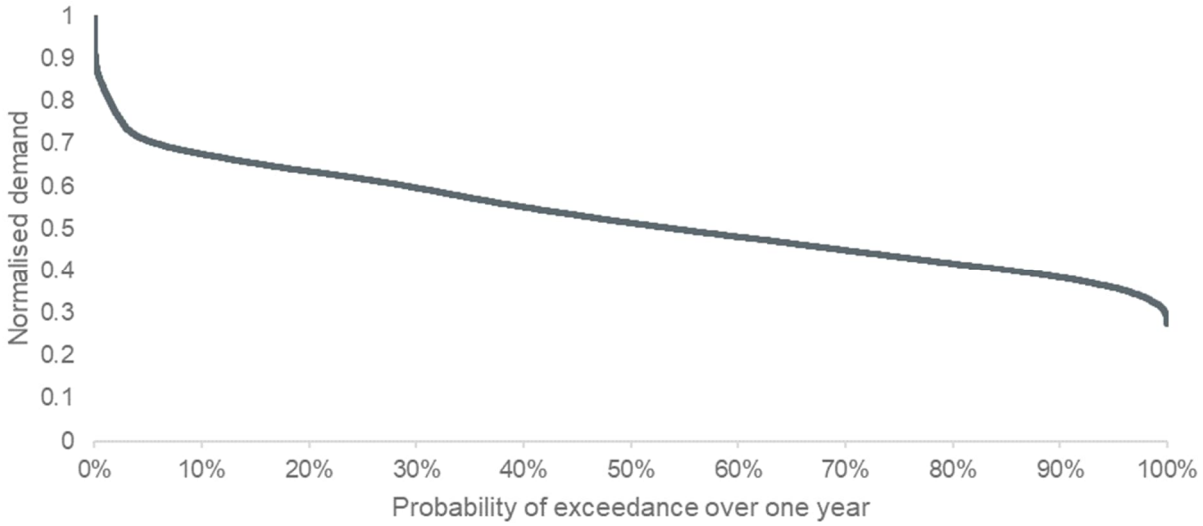
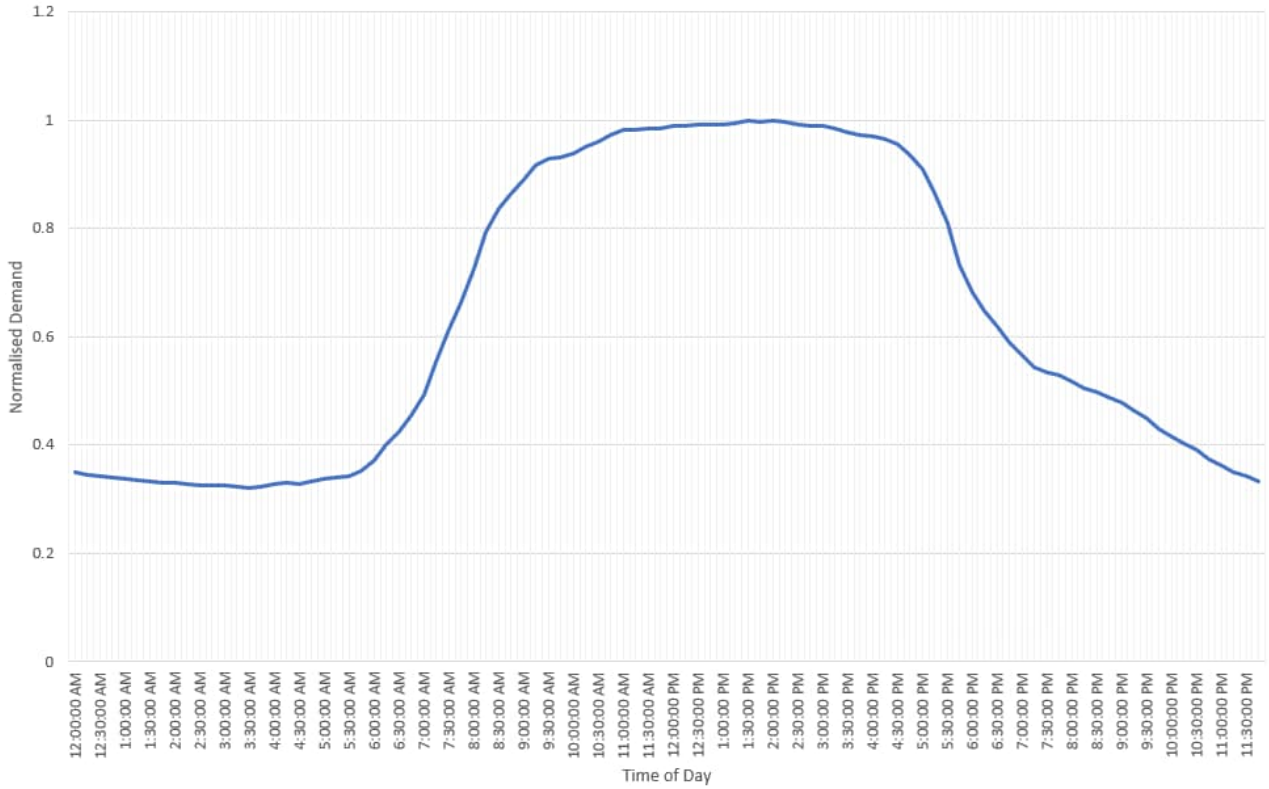


Figure 10 – Peak summer day profile for customer connections expected within the Burra Park development area



7.1.3 Value of customer reliability

The value of unserved energy is calculated using the Value of Customer Reliability (VCR). This represents an estimate of the value electricity consumers place on a reliable electricity supply. Endeavour Energy used a VCR of $45,746 per MWh in the evaluation which is based on the 2023 VCR annual adjustment provided by the AER, weighted in accordance with the composition of the commercial, industrial and residential demand within the Burra Park development Area. The Burra Park area will provide a backup supply to adjacent residential areas, and this has been included in the composite VCR. This approach is conservative and leads to a lower VCR value. A breakdown of this calculation is provided in Table 7 below.

Table 7 – Composite VCR used in the 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	$23,640
Demand weighted VCR ($/MWh)				**$45,746**

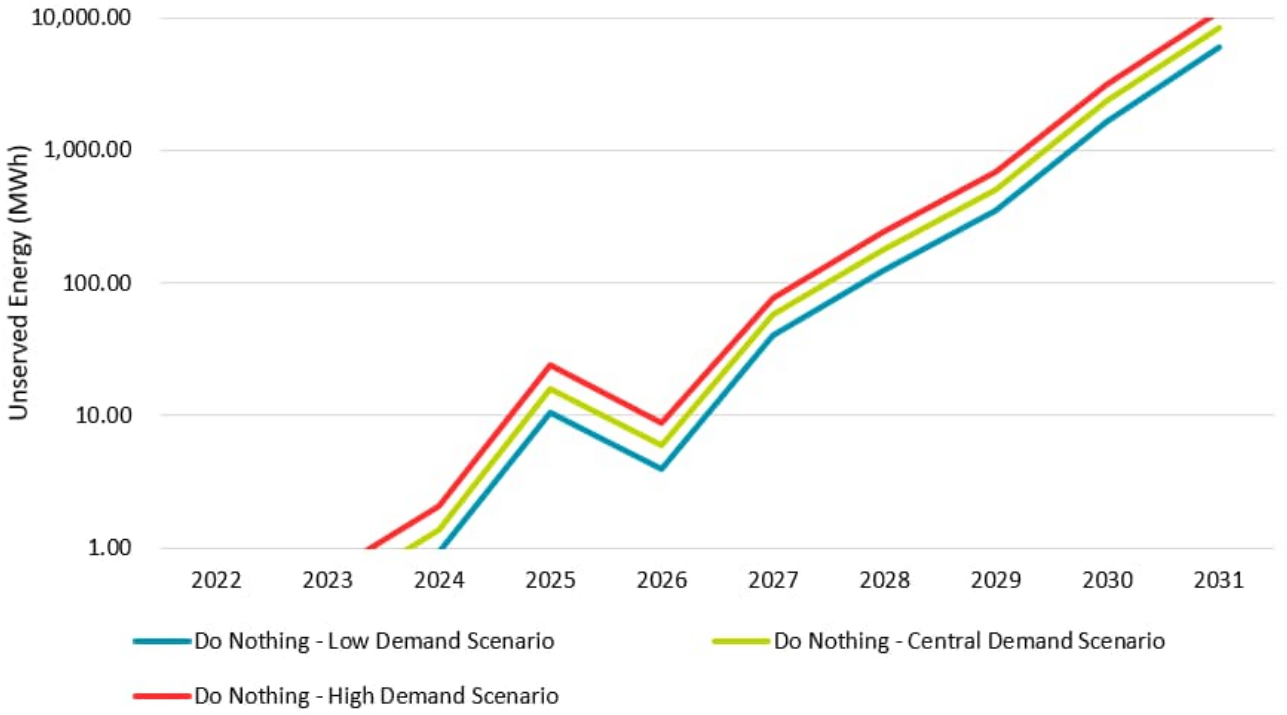
7.2 Classes of market benefit considered

7.2.1 Changes in 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 11 illustrates the expected unserved energy scenario profiles used in the economic analysis of the credible.

Figure 11 – 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.

7.3 Classes of market benefit not considered to be material

The classes of market benefits that are not considered material include:

- Changes in voluntary load curtailment;
- Option value;
- Changes in load transfer capacity;
- Changes in costs to other parties; and
- Changes in electrical losses.

These are further detailed below.

7.3.1 Changes in voluntary load curtailment

Voluntary load curtailment is when customers agree to reduce their demand to address a network limitation in return for a payment. A credible demand side option to enlist such customers to voluntarily reduce 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 as there is insufficient capacity in the existing customer base to deliver sufficient voluntary demand reduction.

7.3.2 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.

Due to the certainty of the Burra Park development area being developed, there is little doubt about the need and use of the infrastructure investment and each option is considered equivalent in that respect. Option value has therefore not been considered in the economic analysis. The Burra Park development area is in close proximity to the airport and there is a high level of commitment towards the airport and its commissioning from all levels of government.

7.3.3 Changes in load transfer capability

Distribution investments can improve load transfer capacity where a credible option allows end users to gain access to a back-up power supply. This is a market benefit because backed-up power supplies can service end-users in the event of power failure. The primary objective of this project is to facilitate connection of new customers in the Burra Park development area. Because 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.

7.3.4 Changes in costs to other parties

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

7.3.5 Changes in electrical losses

Endeavour Energy recognises that there would be small changes in the loss profiles for customers across the network due to changes in the network proposed by this project requirement. The impact of the small change in loss profile for these customers is unlikely to have significant impact on the network wide distribution loss factors that will be applicable to these and other customers. These changes are captured as part of the complex 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.

7.4 Scenarios and sensitivities

The central scenario parameters and relevant references in the FPAR are summarised in Table 8.

Table 8 – Central Scenario Parameters and references in the FPAR

Parameter	Central scenario
Maximum demand forecasts	The Central demand forecast provided in Section 4.0.
Capital costs	Cost Estimates provided in Section 6.
Operating & Maintenance costs	0.4 per cent of capital expenditure per annum.
Value of customer reliability	Section 7.1.3

7.4.1 Demand forecasts

The maximum demand forecasts have been derived from a projection of the customer connection applications and enquiries and the time series forecast is presented in Section 4.0.

The central scenario has been developed from analysis of the customer connection request information. It is based on:

- An ultimate load forecast for the precinct based on surface area analysis;
- A timeframe to reach that ultimate load (the estimated time for this precinct to reach maturity is 30 years); and
- A load ramp up rate assumption (which is linear in this instance).

Probabilistic 'load realisation' factors have been applied to the development derived forecast, which in turn is calibrated by the actual connections applications that we receive over time.

7.4.2 Capital costs

Capital cost estimates have been based on the scope of work presented for each option and are based on current market pricing for materials, labour and third party contracting. The cost estimates in the FPAR have been updated from the DPAR to reflect an uplift in costs observed in certain aspects of conversion of the area from 11kV to 22kV and also includes a risk based allowance for the extensive distribution scope and costs of providing 22kV feeders.

For sensitivity analysis, these estimates have been varied by ± 25%.

7.4.3 Value of customer reliability

Our analysis adopts the value of customer reliability values published by the AER to calculate the expected unserved energy. The ratio of load types has been estimated and used to calculate the weighted aggregate VCR value and then applied to the energy at risk. Based on the estimated load composition of the subject area, a demand composition weighted VCR value of $45.75 per kWh has been derived and used in the RIT-D analysis. A variation of ±25% has been used for sensitivity testing in accordance with AER guidelines.

7.4.4 Discount rates

The discount rate used in the financial analysis will impact the estimated present value of net market benefits and may affect the ranking of credible options. Endeavour Energy has employed a real, pre-tax discount rate based on the latest AER determination as the low case. For sensitivity analysis, a symmetrical application was used to determine the high case.

7.4.5 Summary of sensitivities and scenarios

We have assessed three alternative future scenarios as part of the 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 and framework used for each scenario is provided in Table 9 below.

Table 9 – Scenarios used in the Burra Park development area NPV assessment

Parameter	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%
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 central assumptions with regards to the key variables. 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. Importantly, we select our preferred option based on the Central scenario and use the weighted scenario as a basis for comparison and to test the robustness of the central scenario in comparison to the other options.

8.0 Results of analysis

This section describes the results of the economic assessment for each of the credible options considered in this RIT-D.

8.1 Central case results

Table 10 – Central case results presents the economic analysis of the options under the central case scenario including the present value of the benefits and costs.

Option 1 has the highest project nominal capex as it includes the land acquisition costs and the cost of 132kV cables to its proposed location which would require approximately 1.0km of cable route length. Option 1 has a lower present value of costs because Option 1 has a lower initial capex value compared to Option 2.

Option 2 also requires land acquisition and 132kV cable costs and the related civil works to the proposed location, it has a higher initial capex value than Option 1 because it includes a 132kV busbar. However, it has a lower final stage capex value compared to Option 1. Option 2 provides marginally higher benefits than Option 1 due to it having the addition of a 132kV busbar which would provide a marginally higher level of supply security and reliability. For example, an outage of one of the 132kV feeders in the initial stage of Option 1 would result in the supply capacity of the proposed Burra Park ZS being limited to the capacity of one transformer only. Option 2 under this outage scenario would alleviate this limitation by allowing both transformers to operate in the event of the loss of one of the 132kV supply feeders. While this scenario is relatively remote, it does provide Option 2 with marginally higher market benefits compared to Option 1. This situation would persist until the proposed final stage of Option 1 in 2035 when the 132kV busbar would be installed. Option 1 has a lower PV of costs as a result of this deferral of capital expenditure to the later stage.

This is the key reason for Option 1 being preferred when compared to Option 2.

Option 3 is the preferred option with the highest NPV. It has an NPV which is $12.3M higher than the second highest NPV value for Option 1. The main reason for this higher NPV is the lower PV of costs and primarily based on this option avoiding the requirement to acquire new land for locating a new zone substation.

The market benefits of all three options are very high, based on the avoided unserved energy benefits of all three options.

In addition to the economic assessment, Option 3 is a lower risk option for supplying our customers. It will be located on a site that is currently well progressed with civil and ground works and is subject to no delays related to land acquisition or 132kV supply because it will be co-located at the WSA TS.

Table 10 – Central case results

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.	60.4	197,771.9	44.7	197,727.2	2
2	Establish Burra Park Zone Substation with a 132kV busbar.	59.0	197,773.2	46.1	197,727.1	3
3	Establish a 22kV Zone Substation at the Western Sydney Airport Transmission Substation.	52.9	197,778.7	39.2	197,739.5	1

8.2 Sensitivity and scenario assessment

Endeavour Energy has carried out sensitivity analysis in the RIT-D assessment based on variations of key parameters. Specifically, Endeavour Energy has investigated as part of the scenarios change in relation to the:

- Forecast demand, and hence quantity of involuntary load shedding;
- Value of customer reliability;
- Investment costs; and
- Discount rate.

Option 3 is the preferred option under the central and our weighted scenario. Based on the sensitivity and scenario assessment, we have a high level of confidence in our selected preferred option.

8.3 Economic timing

The economic timing of the preferred option is the point in time when the existing network capacity is insufficient to supply new customers.

The supply to the Burra Park development area requires connection capacity to be made available as soon as the existing available capacity in the network is exhausted. Based on the current demand forecast, this is expected to occur in 2025/2026. Consequently, this date/time is taken to be the economic timing for this project.

Endeavour Energy is constantly monitoring customer demand in this precinct via customer network connection requests and direct discussions with major customers and other utilities. Any material delays in the development of the Burra Park development area would require a reassessment of the economic timing. We have a high level confidence in the commissioning date for the initial stage of the preferred option, the second stage has an economic timing of 2034/35 and this will be monitored over the period and may alter depending on the level of customer demand.

9.0 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.

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.

- Agribusiness North development for 55Ha of land dedicated to high technology agriculture and intensive food production with an ultimate demand of 20MVA by 2041; 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.

Although the existing network capacity is able to service the initial customer connections, as demand continues to grow it will exhaust the existing supply capacity of the network.

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 RIT-D has identified three credible network-based options that can technically meet the required network demand. The three network options will provide the required 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. In particular, the options 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.

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

The total cost of this option is estimated to be **$52.9 million** and the construction of the WSA 22kV zone substation would commence in 2023/24 with commissioning in 2025/26. The second stage of the option will be commissioned in 2034/35, based on our central demand forecast.

Endeavour Energy will proceed with capital expenditure on the initial stage of the WSA ZS in 2023/24.

The table below shows the increase in the cost estimate from the DPAR to the FPAR.

Cost Estimate (Option 3 – Preferred Option – Initial Stage)	Value ($M)
Central estimate presented in the DPAR	**30.3**
Central estimate presented in the FPAR	**37.9**

CONTACT

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Endeavour Energy

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