NPR-000080 Supply to the Badgerys Creek Development Area

Case for Investment

August 2022

Endeavour Energy

The image on the front page is of the proposed Elizabeth Enterprise Precinct and was taken from Mirvac's public document supporting their State Significant Development application.

Investment Title	Supply to Badgerys Creek Development Area
Project Reference	NPR-000080 (Previously known as PR728 Western Sydney Employment Lands).
Portfolio	AUGEX
CFI Date	1 August 2022
Pre RIT-D	☒
Final CFI	☐

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Contents

1. Executive summary

The Badgerys Creek development area is within the Western Sydney Aerotropolis and will include key electricity supply connections for Mirvac's Elizabeth Enterprise Precinct business park, the Sydney Water Advanced Water Recycling Centre and the Badgerys Creek enterprise area south of Elizabeth Drive. These developments are expected to require approximately 20MVA of supply capacity by 2031 and 60MVA by 2050.

The identified need for this greenfield development has been determined to be a 'reliability corrective action' as defined in the National Electricity Rules (NER), due to the obligation to connect customers to the electricity supply network. The timing of the identified need is determined by when the expected customer connections will exceed the supply capacity of the existing network and this is expected to be 2025/26.

This Case for Investment (CFI) recommends the establishment of a new 132/22kV zone substation with two 45MVA transformers by 1 July 2025 (FY2026). The option will include two 132kV feeders with one feeder from the Western Sydney Airport Transmission Substation (TS) and one feeder from the major feeder 93X which lies to the east of the Aerotropolis area. This option will enhance the supply security and reliability of the entire Aerotropolis area by providing a diversified 132kV supply. This option produced the highest value of economic benefit compared to the alternatives including:

- A 'no proactive action' option of utilising the existing network in the Badgerys Creek and Kemps Creek areas.
- An alternative 132kV feeder supply option to the proposed zone substation of two 132kV feeders from the Western Sydney Airport TS.
- Staged installation options of the proposed zone substation including single transformer and single 132kV feeder supply variations. These staged options would result in the full establishment of the zone substation by FY2028.

Table 1 below shows the four credible network options evaluated for supply to the Badgerys Creek development area. The numbering of the options aligns to the Network Investment Options workshop and aligns to the cost estimates provided to Network Planning for the option evaluation.

Network Options	Description
1B	Staged Establishment of Badgerys Creek ZS to a firm 45MVA 132/22kV ZS in FY28. - 2 x 45 MVA transformers (FY26 & FY28) - 1 x 132kV feeder from WSA TS - 1 x feeder from 93X
2A	Establish Badgerys Creek ZS to a firm 45MVA 132/22kV ZS in FY26. - 2 x 45 MVA transformers - 2 x 132kV feeders from WSA TS
2B	Establish Badgerys Creek ZS to a firm 45MVA 132/22kV ZS in FY26. - 2 x 45 MVA Transformers - 1 x 132kV feeder from WSA TS - 1 x 132kV feeder from 93X
4B	Staged Establishment of Badgerys Creek ZS to a firm 45MVA 132/22kV ZS in FY28. - 2 x 45 MVA transformers - 1 x 132kV feeder from WSA TS - 1 x feeder from 93X (FY28)

Table 1: Credible Network Options evaluated for the Badgerys Creek development area

The option of 'no proactive action' will result in significant expected unserved energy due to the substantial demand forecast from the customer connections expected in the Badgerys Creek development area. There are also substantial reputational risks of negative media coverage and major customer and Government dissatisfaction if Endeavour Energy is unable to meet the supply requirements for this high profile area.

The preferred option, Option 2B will provide a strong economic benefit with an NPV of $17B based on the value of the customer's reliability in electicity supply for the Badgerys Creek development area.

It is recommended that:

- **Option 2B** – the establishment of Badgerys Creek zone substation including two 45MVA transformers and two 132kV feeders, one from Western Sydney Airport TS and one from 93X – proceed to preliminary release. This will enable the development of a project definition, detailed design, environmental assessment and preliminary market engagement activities.
- A Non-Network Options Screening Report be issued to notify stakeholders of our determination that there are no feasible non-network options to defer or avoid the establishment of the Badgerys Creek Zone Substation. Figure 1 below shows the RIT-D Process that is proposed to be followed for this project including seeking final financial approval.

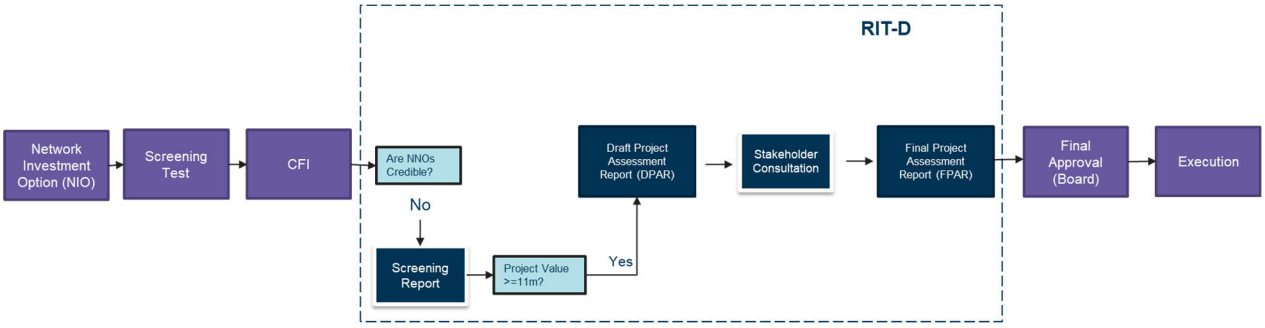

Figure 1: Endeavour Energy's RIT-D Process for this Project

2. Project Proposal

2.1 Identified Need or Opportunity

The Western Sydney Aerotropolis

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.

The Structure Plan for the Western Sydney Aerotropolis is shown in Figure 2. The location of the proposed Badgerys Creek and existing Kemps Creek zone substations are shown as an overlay to the Structure Plan and are both located in land zoned for Enterprise use.

The catalyst for the development of the Western Sydney Aerotropolis is the establishment of Sydney's second international airport and the strategic planning for the area includes the establishment of Sydney's third city – the Western Parkland City.

In addition to the Western Sydney Airport, the Aerotropolis will also include a Metro rail line from St Marys to the Airport, major road developments including the M12 motorway and establishment of industries including agribusiness, transport and logistics, defence, aerospace, education and advanced manufacturing. The airport will also attract tourism and entertainment within the surrounding areas and greater Sydney.

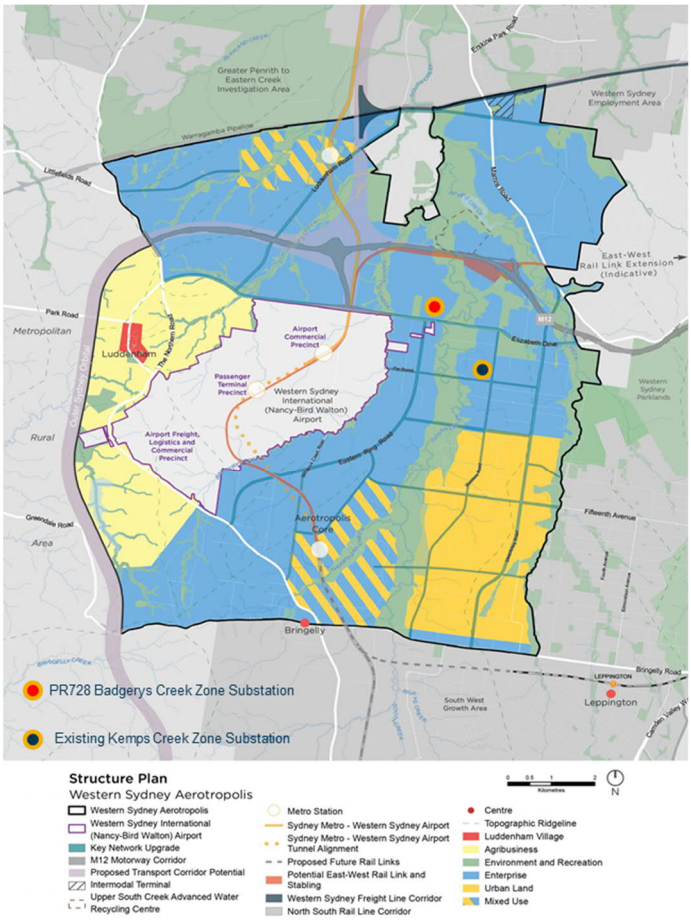

Figure 2 – Aerotropolis Structure Plan showing the proposed Badgerys Creek ZS location

Mirvac's Elizabeth Enterprise Precinct

In April 2021, Mirvac (a property developer) released the State Significant Development Application for the proposed masterplan development for general industry, warehouse and distribution centres at 1669-1723 Elizabeth Drive, Badgerys Creek as part of the Elizabeth Enterprise Precinct (EEP).

The site location is within the Penrith Local Government Area (LGA), the site is on the northern side of Elizabeth Drive and is approximately 800m east of the Western Sydney Airport boundary as shown in Figure 3. This site provides close access to the transport, cargo and logistics services that will be available at the Western Sydney Airport.

Initial interim supply for the EEP will be made available from Kemps Creek ZS. This interim supply will not be sufficient after July 2025.

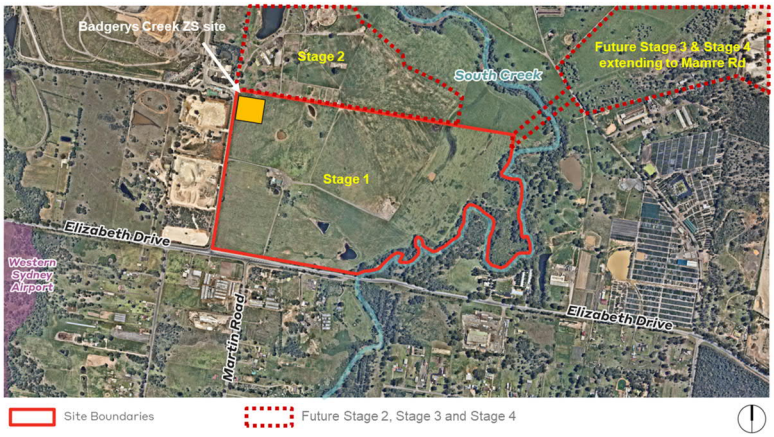

Figure 3 –State Significant Development (SSD) at 1669-1723 Elizabeth Drive, Badgerys Creek

Sydney Water's Water Recycling Facility

Sydney Water has commenced public consultation for a large water recycling facility to be located in the Badgerys Creek development area, to the north of Elizabeth Drive. In September 2021, Sydney Water released the Environmental Impact Statement (EIS) for this facility under the project name Upper South Creek Advanced Water Recycling Centre (AWRC).

According to the EIS, construction of the Sydney Water Facility is expected to begin in 2022 and will include the following four aspects:

- Commissioning of the new AWRC with the function to collect wastewater from businesses and homes and to treat the water to produce high-quality recycled water, renewable energy and biosolids for beneficial reuse.
- New treated water pipeline running 17 km west from the AWRC to the Nepean River at Wallacia. This will use Elizabeth Drive for the commissioning of open trench underground pipes.
- New environmental flows pipeline running 4.5 km from the treated water pipeline to the Warragamba river.
- New brine (a by-product of the reverse osmosis process) pipeline running 24 km east and connecting to the existing Malabar waste water system at Lansdowne.

Initial interim supply for the Water Recycling Facility is being made available from Kemps Creek ZS. This interim supply will not be sufficient after July 2025.

2.2 Existing Infrastructure not capable to service the growth

2.2.1 Existing Infrastructure

The location of the Badgerys Creek development area is currently served by the Kemps Creek ZS which is not capable of servicing the growth of the area. The existing network is predominantly an overhead network and was constructed to meet the historical requirements of the area which was sparsely populated with rural residential demand including agriculture.

Kemps Creek ZS has two 25MVA transformers and supplies the surrounding area by 11kV feeders. Kemps Creek ZS is supplied at 33kV by two 33kV feeders (465 from Regentville and 512 from West Liverpool). The normal operational supply is via Feeder 512 with Feeder 465 being normally open at Kemps Creek ZS and used for back up in the event of an outage on Feeder 512.

Endeavour Energy will be commissioning the new Western Sydney Airport Transmission Substation in mid 2024. This establishment of this substation will serve the airport and also enhance the 33kV network in this area, in particular provide a strong 33kV source connected to Feeder 465.

Figure 4 below shows the existing 33kV supply network in the area of Badgerys Creek and Kemps Creek.

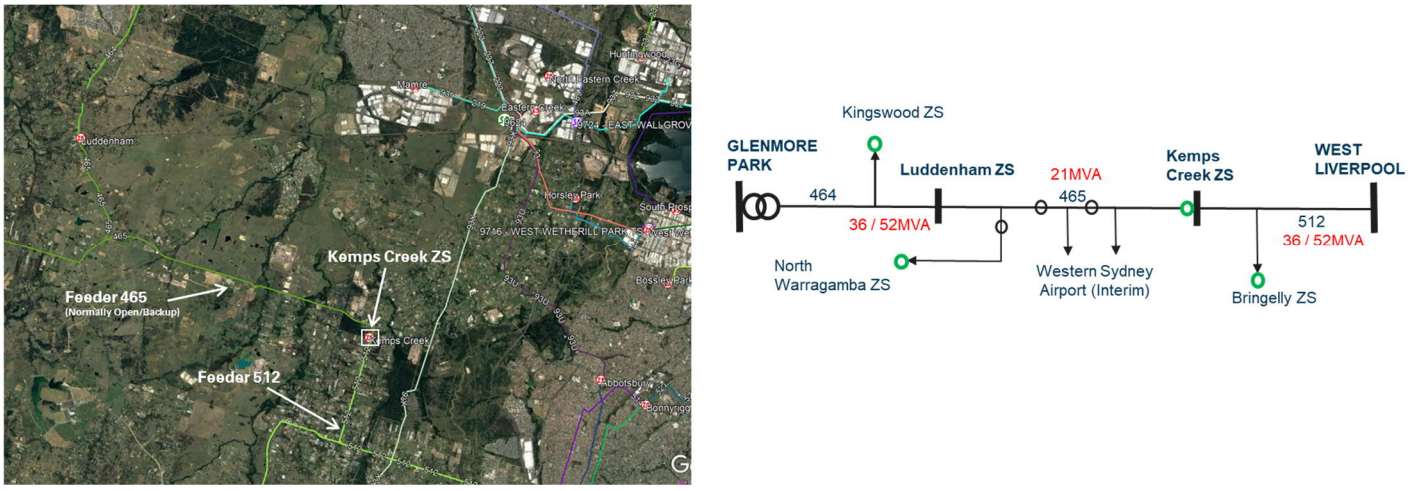

Figure 4 – Existing 33kV supply network to the Kemps Creek area.

2.2.2 Load Growth

The load growth in the Badgerys Creek development area is due to the major developments requiring connection to the network. The demand forecast for the analysis and evaluation of the network options has been based on these major developments, they are :

- Mirvac's Elizabeth Enterprise Precinct (EEP) which is expected to develop to a maximum demand of 13MVA by 2029 and 39MVA by 2051.
- Sydney Water Facility which is expected to develop to a maximum demand of 5MVA by 2029 and 17MVA by 2051.
- The Badgerys Creek Enterprise Area (the area south of Elizabeth Drive) which is expected to develop to a maximum demand of 2MVA by 2029 and 27MVA by 2051.

2.2.3 Constrained Network

The existing network in the Badgerys Creek development area is constrained in its ability to supply the forecast demand based on the load growth from the major developments in the area.

Table 2 below provides a description of the existing network constraints for the Badgerys Creek development area.

Network Constraints	Severity	Description
Distribution network capacity from Kemps Creek ZS to the Badgerys Creek development area.	**High**. By mid 2025 there will be unserved demand.	The Badgerys Creek development area is currently supplied from Kemps Creek ZS and the interim supplies for the Elizabeth Enterprise Precinct and the Sydney Water facility will be supplied by 11kV feeders from Kemps Creek ZS. The interim supplies will be insufficient by mid 2025 due to the lack of available 11kV feeder connections at Kemps Creek ZS and limitations on feeder egress from Kemps Creek ZS.
Kemps Creek ZS transformer firm capacity.	**Moderate to High**. The constraint is in firm capacity (N-1).	The Kemps Creek ZS firm transformer capacity will be exceeded by 2025. This is due to the load 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.
33kV Feeder 512 firm capacity.	**Transient**. The constraint is in firm capacity (N-1), however will be alleviated by mid 2024.	The 33kV supply to Kemps Creek ZS will decrease its firm capacity as the load on Feeder 464 from Glenmore Park will increase due to load growth on Luddenham ZS and the interim supply to Western Sydney Airport the in between Feeder 465 to Kemps Creek ZS. The establishment of the WSA TS in 2024 will provide a strong 33kV source of supply to the Feeder 465 and will alleviate this constraint in the period after 2024.

Table 2: Existing network constraints in the Badgerys Creek development area

2.2.4 Demand Forecast

The demand forecast for the Badgerys Creek development area is shown in **Table 3** below.

The demand forecast is based on the major developments in the area and provides three forecast scenarios: Central, High and Low.

Three demand forecast scenarios have been developed to take into account the possible differences in timing of the major developments and allow for a range of possible outcomes to support the sensitivity analysis in the evaluation of options.

The central forecast scenario represents the most likely level of demand expected in the Badgerys Creek development area based on the information provided by the proponents of the developments and their expected timeframes for development. This forecast is moderated and diversified to take into account our knowledge of similar developments in areas such as Erskine Park and Moorebank where there are similar developments of enterprise zoned areas in recent years.

The high and low forecast scenarios represent respectively accelerated and delayed rates of development for the area. Based on the available land area in the EEP and the Badgerys Creek enterprise residual area there is a relatively high fully developed demand possible and the developers of those areas have the potential for multi-stage business park developments over many years. The demand forecast extends to 2051 and in the high forecast scenario continues to show strong demand growth in the period 2046 to 2051. The low forecast scenario shows much lower levels of demand by the period 2051.

Table 3 also shows the network constraint and estimated unserved demand and load at risk that form the basis of the identified need and the economic evaluation of the network options.

Demand Forecast (MVA)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2036**	**2041**	**2046**	**2051**
Elizabeth Enterprise Precinct (Mirvac)	0.0	2.3	4.6	6.9	9.2	11.5	12.7	13.9	15.0	16.2	21.9	27.7	33.5	39.2
Sydney Water Facility	0.0	0.0	0.0	0.0	2.4	4.8	5.2	5.7	6.1	6.5	8.6	17.6	17.6	17.6
Badgerys Creek – Enterprise (residual)	0.0	0.0	0.0	0.0	0.0	0.0	1.2	2.3	3.5	4.6	10.4	16.2	21.9	27.7
Total Undiversified	**0.0**	**2.3**	**4.6**	**6.9**	**11.6**	**16.3**	**19.1**	**21.9**	**24.6**	**27.3**	**40.9**	**61.5**	**73.0**	**84.5**
Total Diversified at 80% diversity	**0.0**	**1.8**	**3.7**	**5.5**	**9.3**	**13.1**	**15.2**	**17.5**	**19.7**	**21.8**	**32.7**	**49.2**	**58.4**	**67.6**
Scenarios	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2036**	**2041**	**2046**	**2051**
Central Forecast	0.0	2.3	4.6	6.9	9.2	11.5	13.9	16.2	18.5	20.8	32.3	43.9	55.4	66.9
Low Forecast	0.0	1.4	2.8	4.2	5.5	6.9	8.3	9.7	11.1	12.5	19.4	26.3	33.2	40.2
High Forecast	0.0	3.5	6.9	10.4	13.9	17.3	20.8	24.2	27.7	31.2	48.5	65.8	83.1	100.4
Constraint (MVA)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**				
Distribution Network installed capacity	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0				
Distribution Network firm capacity	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Unserved Demand	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**	**2.5**	**4.9**	**7.2**	**9.5**	**11.8**				
Load At Risk	**0.0**	**0.0**	**0.0**	**0.9**	**3.2**	**5.5**	**7.9**	**10.2**	**12.5**	**14.8**				

Table 3: Demand Forecast for Badgerys Creek development area

Figure 5 below shows the three demand forecast scenarios and the constrained supply capacity on both an installed and firm capacity basis.

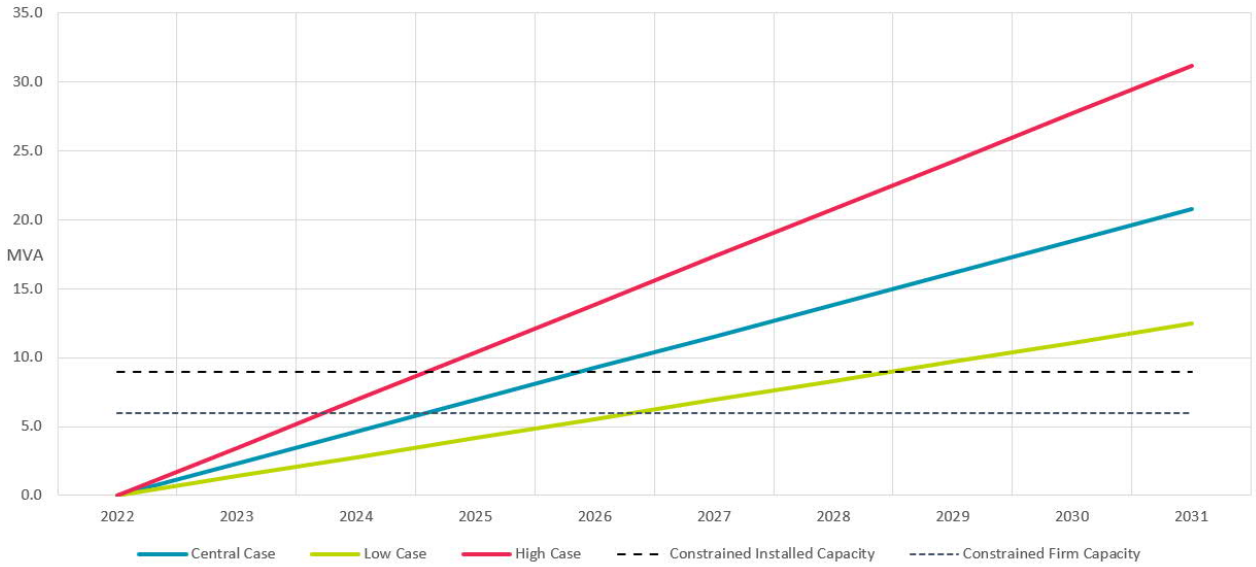

Figure 5 – Badgerys Creek development area – Demand forecast – Central, High and Low scenarios.

2.2.5 Existing Network Limitation

The network limitation that causes the constraint to supplying the Badgerys Creek development area from the existing Kemps Creek ZS is in the distribution network (11kV).

Table 4 below provides details on the network limitation that has been used in determining the expected unserved energy and economic evaluation of the network options.

Distribution Feeder	Feeder Name	Nominal Rating Installed Capacity (MVA)	Firm Capacity (MVA)
KC1247	Sydney Water AWRC No 1 (future)	4.5	6.0
KC1258	Sydney Water AWRC No 2 (future)	4.5	
KC1288	Mirvac Estate No 1 (future)	4.5	6.0
KC1236	Clifton Avenue (to be redirected to Mirvac Estate)	4.5	

Table 4: Existing network constraints in the Badgerys Creek development area distribution network supply

In determining the network limitation level the nominal rating of the distribution feeders were considered and the back-up provided by alternate feeders for each of the major developments in the area.

The Elizabeth Enterprise Precinct (Mirvac development) has two feeders with nominal rating of 4.5MVA giving a total installed capacity of 9.0MVA. The development will have a backup feeder with an emergency rating of 6.0MVA. Although there are constraints at the 33kV transmission level and the Kemps Creek ZS level, it is the distribution network that provides the highest level of expected unserved energy and forms the basis of the economic analysis and the evaluation of options.

Figure 6 below shows the existing 11kV distribution feeders from the Kemps Creek ZS that serve the area in the vicinity of the Elizabeth Enterprise Precinct and the Sydney Water Facility. The feeder KC1236 serves the area where the EEP will be developed. Feeder KC1288 serves the area east of the EEP and feeder KC1262 serves the area south of Elizabeth Drive. The figure shows the existing lack of feeder development in the area of the EEP and Sydney Water. The feeders KC1247, KC1258 and KC1288 will form the interim supplies to the development area and are not shown in Figure 6 at this stage because they are yet to be constructed. All three proposed feeders are contestable works and will be established by the customer(s) and are expected to be commissioned during in 2023.

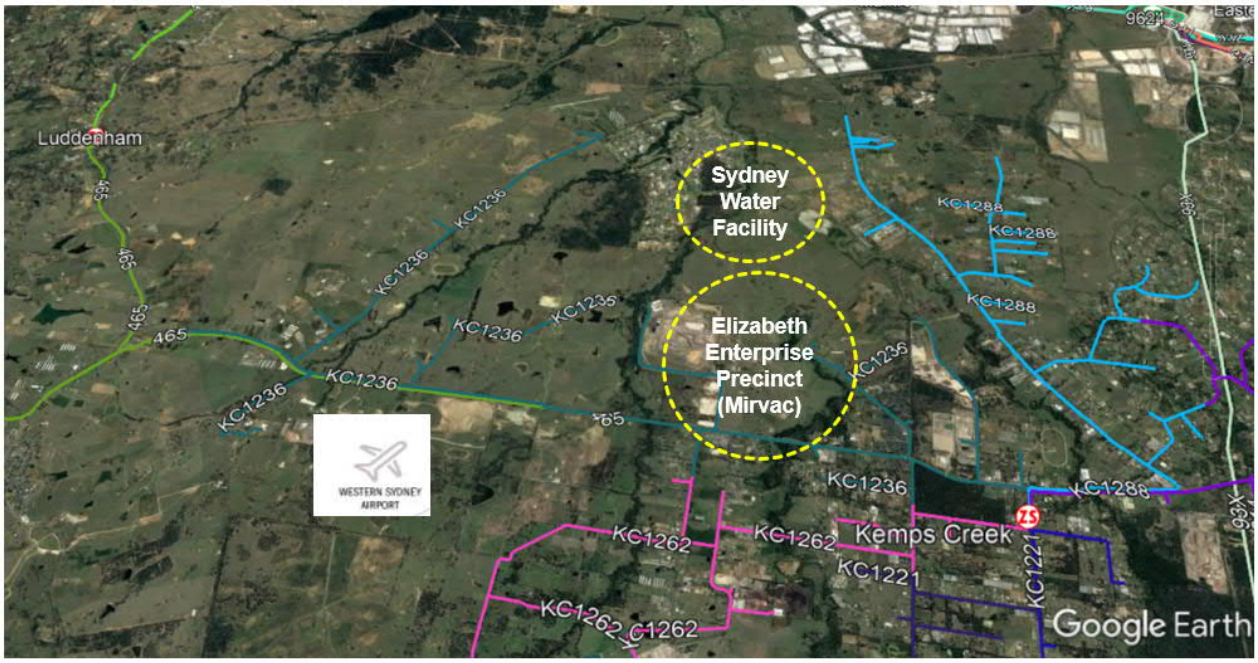

Figure 6 – Existing 11kV distribution feeders from Kemps Creek ZS.

2.2.6 Investment timing

To demonstrate the appropriate and optimal timing of the investment an analysis was conducted on key criteria. The criteria examined were:

- Zoning of the area by Government.
- Development status observed in the area from planning, design and construction activity.
- Progress in development of supporting infrastructure in the area.

Table 5 below shows results of the investment timing analysis for the Badgerys Creek development area and the network option investments evaluated. The analysis shows that high growth is expected in the short term.

Criteria	Low or later growth time frame	Moderate growth in medium term expected	High growth likely in shorter term
Zoning	Not part of any official release area and not rezoned.	Part of official release area but not rezoned.	The Badgerys Creek development area has been rezoned for Enterprise land use.
Development status	No current activity.	First stages already planned /committed.	Construction has commenced for initial stages. Endeavour has imposed hard limits on the interim supplies to the area. Major developments in the area are well advanced in their public consultation and approval processes.
Supporting infrastructure (water/sewer, roads, transport)	Lack of other infrastructure commitment.	Planned/committed initial stages of other infrastructure.	Significant progress on roads and transport and water/sewer infrastructure. Sydney Water has commenced construction on major pipelines that will connect to the water recycling plant located in the Badgerys Creek development area.

Table 5: Investment Timing Analysis

2.3 Related Projects

The proposed Badgerys Creek ZS will be located at the site that will be acquired under project NLP-000040. The land for the proposed substation will be acquired within the Elizabeth Enterprise Precinct.

3. Options Considered

The network options considered for the Badgerys Creek development area were selected according to their alignment to the Aerotropolis growth servicing plan to ensure that they support the long term plan for servicing the area.

Appendices 6.1 and 6.2 shows the decision making framework and rules followed in determining our approach for identifying and considering options for the Badgerys Creek development area.

Non-network options and a 'no proactive intervention' (Do Nothing) option were considered. The network option of augmenting the existing Kemps Creek ZS to supply the Badgerys Creek development area was also considered.

A Network Investment Options workshop was conducted in February 2022 with representatives from across the Endeavour Energy business including planning, design, delivery, environmental assessment and property to discuss the network options.

Table 6 below shows the options considered for supply to the Badgerys Creek development area. The option identifications are consistent with the Network Investment Options workshop and the preliminary cost estimates provided to support the evaluation.

Option	Type	Details
No Proactive Intervention	Do Nothing (BAU)	Used as the Base Case for comparing options.
Non network options	Non Network	Assessed using the New Technology Master Plan tool.
Augmentation of Kemps Creek ZS	Network Option	Not credible and not taken further due to incompatible operating voltages (11/22kV) and inability to take ZS out of service to support a large scale augmentation including conversion to 132kV and replacement and uprating of transformers.
1A	Network Option	Credible option, however not taken further due to non-alignment to the growth servicing strategy for the Aerotropolis area.
1B	**Network Option**	**Credible option taken to option evaluation stage.**
2A	**Network Option**	**Credible option taken to option evaluation stage.**
2B	**Network Option**	**Credible option taken to option evaluation stage.**
3A	Network Option	Not credible option and not taken further due to lack of N-1 network security in both transformers and 132kV supply.
3B	Network Option	Not credible option and not taken further due to lack of N-1 network security in both transformers and 132kV supply.
4A	Network Option	Credible option, however not taken further due to non-alignment to the growth servicing strategy for the Aerotropolis area.
4B	**Network Option**	**Credible option taken to option evaluation stage.**

Table 6: Options considered for supply to the Badgerys Creek development area.

3.1 Base Case - 'No proactive intervention'

The 'No proactive intervention' option involves doing nothing and calculating the economic cost of this inaction and then use this as a base case for comparison and evaluation of the other options.

This option will result in significant expected unserved energy from 2025/26 due to the existing network being constrained and unable to serve the demand forecast expected at this time.

It also carries with it significant development implications and reputational risks of negative media and Government dissatisfaction if Endeavour Energy is unable to meet supply requirements for this area.

This case for investment examines the risks and benefits of undertaking a no proactive approach. This assesses the option of increasing load at risk and associated expected unserved energy.

The expected unserved energy of the option is based on the three scenarios of the demand forecast (Central, High and Low). The Value of Customer Reliability (VCR) has been applied to determine the economic value of the expected unserved energy. This represents the economic cost of not augmenting supplying to the Badgerys Creek development area. This high economic value of the expected unserved energy forms the basis for the 'reliability corrective action' identified need determination that Endeavour is making for the Badgerys Creek development area.

Table 7 below shows the value of the expected unserved energy from 2025-2031. The three scenarios of the demand forecast have been used to provide Central, Low and High value streams for the expected unserved energy. A weighted case has been calculated using a 50:25:25% weighting of the Central, Low and High demand forecast scenarios. This is a reasonable approach to incorporate the uncertainty in the timing of development across the three scenarios that form the basis of the demand forecasts. This table confirms the timing of the network investment at FY2026 based on the weighted case ($33.7M economic value of expected unserved energy being more than sufficient to justify the investment). If the Central case were used as the basis for determining the timing then it would result in an FY2027 timing for network investment. Alternatively, under the Low demand forecast scenario, the optimal timing based on the value of the expected unserved energy would be FY2030.

Value of Unserved Energy ($M)	Weighting	2025	2026	2027	2028	2029	2030	2031
Central Case	50%	0.1	0.1	10.1	134.5	421.7	808.1	1,260.3
Low Case	25%	0.0	0.0	0.0	0.1	0.2	4.6	36.8
High Case	25%	1.4	134.5	604.2	1,261.8	2,004.7	2,763.7	3,543.5
Weighted Case		**0.4**	**33.7**	**156.1**	**382.7**	**712.1**	**1,096.1**	**1,525.2**

Table 7: Economic Value of Expected Unserved Energy as a result of a 'no proactive intervention'

3.2 Credible Network Options

The network options to address the supply requirements to the Badgerys Creek development area have been developed in accordance with the Growth Servicing Strategy for the Western Sydney Aerotropolis. This strategy provides a long term plan for supply of the airport and Aerotropolis area and additionally provides a plan for servicing the growth of the south west area of Sydney using the major Bulk Supply Points in the area and also includes provision for the future Bulk Supply Point at Kemps Creek which will be developed to provide 132kV bulk supply by Transgrid by 2030.

Figure 7 below shows the Aerotropolis Area Plan for 132kV supply the Western Sydney Aerotropolis and South West Sydney area. It shows the 132kV transmission network planned to support the development of the area with high level security of supply using a diversified meshed network utilising multiple sources of bulk supply. The network configuration shown is expected to be in place by the period 2035-2040 and subject to multiple separate individual network investments with their own investment evaluations prior to implementation.

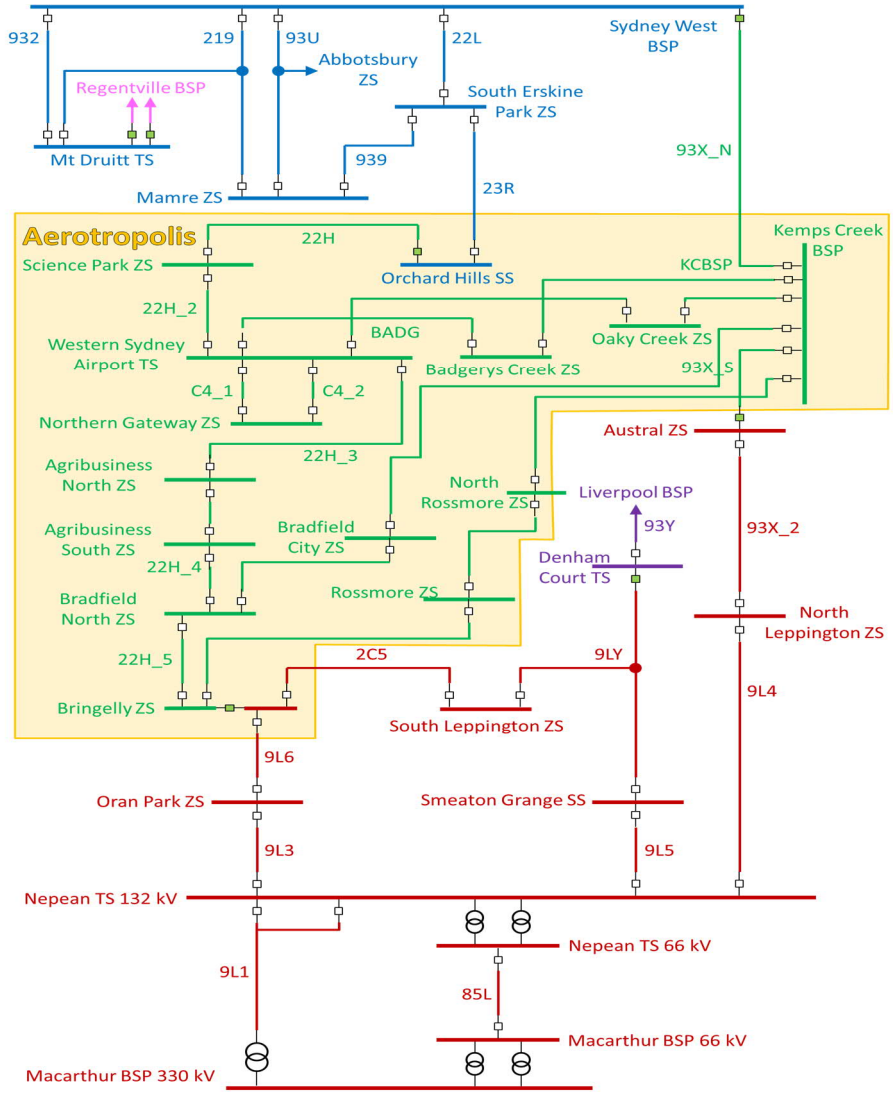

Figure 7: Aerotropolis Area Plan for 132kV supply showing network configuration expected by 2035-2040.

Figure 8 below shows the area within the Aerotropolis area that is planned to be supplied with 22kV. Major customers and Accredited Service Providers (ASPs) have been informed of Endeavour's decision to supply this area with 22kV distribution network. This decision provides for economically efficient distribution network for this area by providing longer distance distribution feeders compared to 11kV and reduces the number of major substations required to service the area.

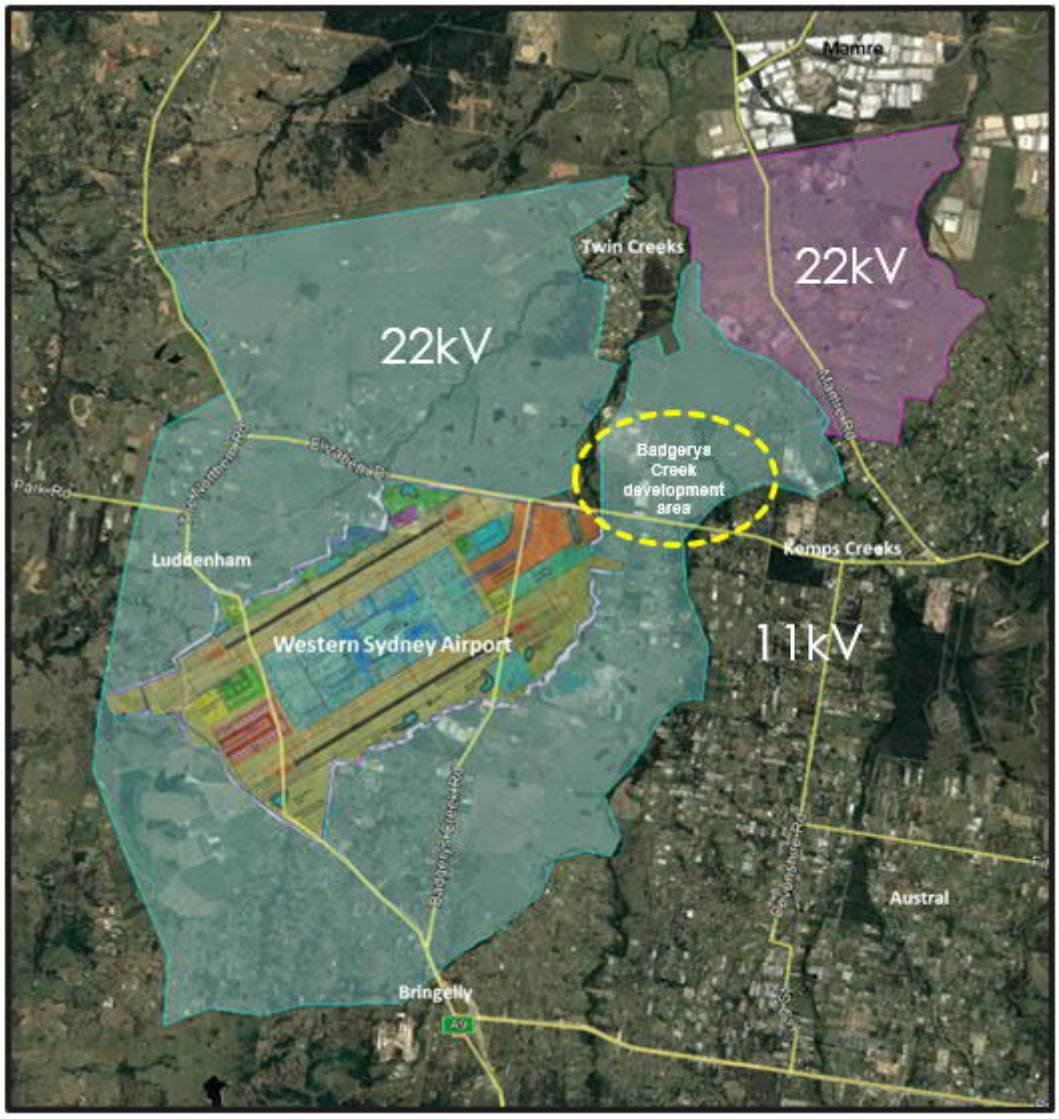

Figure 8: Aerotropolis Area Plan for 22kV supply in relation to the Badgerys Creek development area.

The network options identified for the Badgerys Creek development area have been assessed in their degree of alignment to and capability to support the Aerotropolis Area Plan. This includes the future development of the 132kV supply network and the proposed 22kV distribution network.

In 2020, Endeavour issued the Technical Bulletin 0294 22kV Distribution Supply Strategy for the Western Sydney Aerotropolis Area to inform ASPs and therefore major customers of the 22kV strategy for the area.

3.2.1 Option 2A - Establishment of a 132/22kV Zone Substation with two 45MVA transformers and transmission supply from WSA TS

This option proposes to establish a new zone substation with two 45MVA transformers and the 132kV transmission supply to the new substation to be provided from the Western Sydney Airport (WSA) Transmission Substation (TS).

The new zone substation would be commissioned in FY26 with a target date of 1 July 2025.

The zone substation would be designed to have space provision for a future third transformer which based on the current demand forecast for the area would be required by the period 2035-2045.

The 132kV supply to the new zone substation would be from 2 x 132kV transmission feeders from the WSA TS which is scheduled to be commissioned in 2024.

A diagram for Option 2A is shown in Figure 9 below.

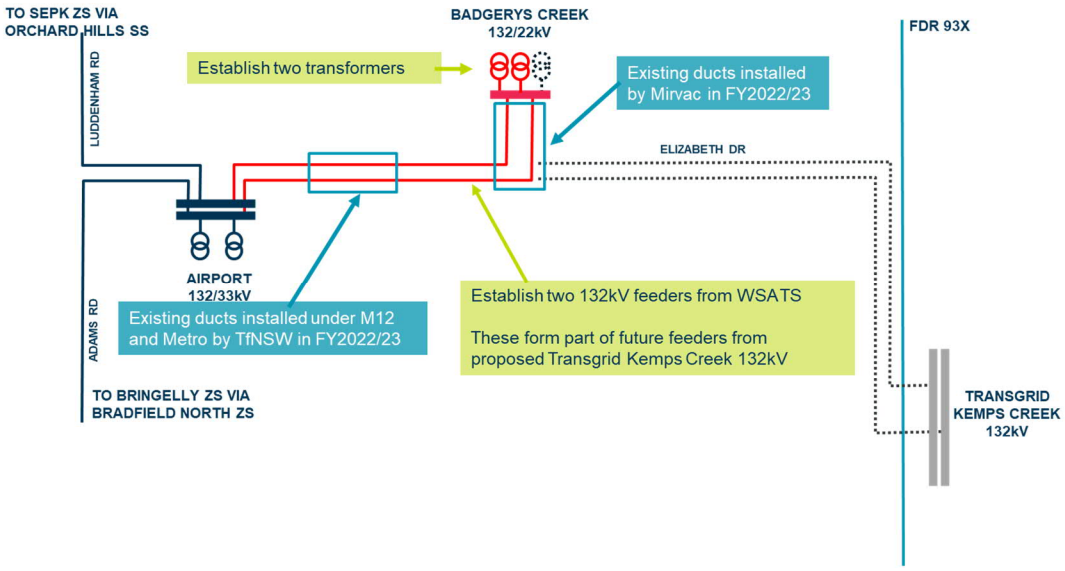

Figure 9: High level diagram for Option 2A

3.2.2 Option 2B - Establishment of a 132/22kV Zone Substation with two 45MVA transformers and transmission supply from WSA TS and 93X

This option proposes to establish a new zone substation with two 45MVA transformers and the 132kV transmission supply to the new substation to be provided with one feeder from the Western Sydney Airport (WSA) Transmission Substation (TS) and one feeder from a connection to the existing 132kV feeder 93X.

The new zone substation would be commissioned in FY26 with a target date of 1 July 2025.

The zone substation would be designed to have space provision for a future third transformer which based on the current demand forecast for the area would be required by 2035-2045.

The 132kV supply to the new zone substation would be from two different sources with one supply from the WSA TS to the west of the proposed location of the new substation and one supply from the east.

The 132kV feeder from 93X has significant benefits in terms of diversifying the supply security and reliability of the Aerotropolis area by providing an alternative supply to the area in addition to the Aerotropolis backbone feeder, which will be the primary supply to the Western Sydney Airport. The connection to 93X provides a highly secure and reliable meshed ring for supply to the area and also provides a future high capacity connection to the future augmentation of Transgrid's Kemps Creek BSP to provide 132kV supply to the Aerotropolis area. Transgrid's augmentation to provide 132kV supply from Kemps Creek BSP is expected by 2030. This option would provide for a connection to Transgrid's Kemps Creek BSP as soon as it is available and provide ready access to the new BSP. It would also avoid any delays that may occur in the future due to construction of the feeder in public roads and environmental and easement considerations for routes from underground to overhead in connecting to the Transgrid site.

This option was favoured in internal discussions in analysing the network options, prior to conducting the economic evaluation of the options.

A diagram for Option 2B is shown in Figure 10 below.

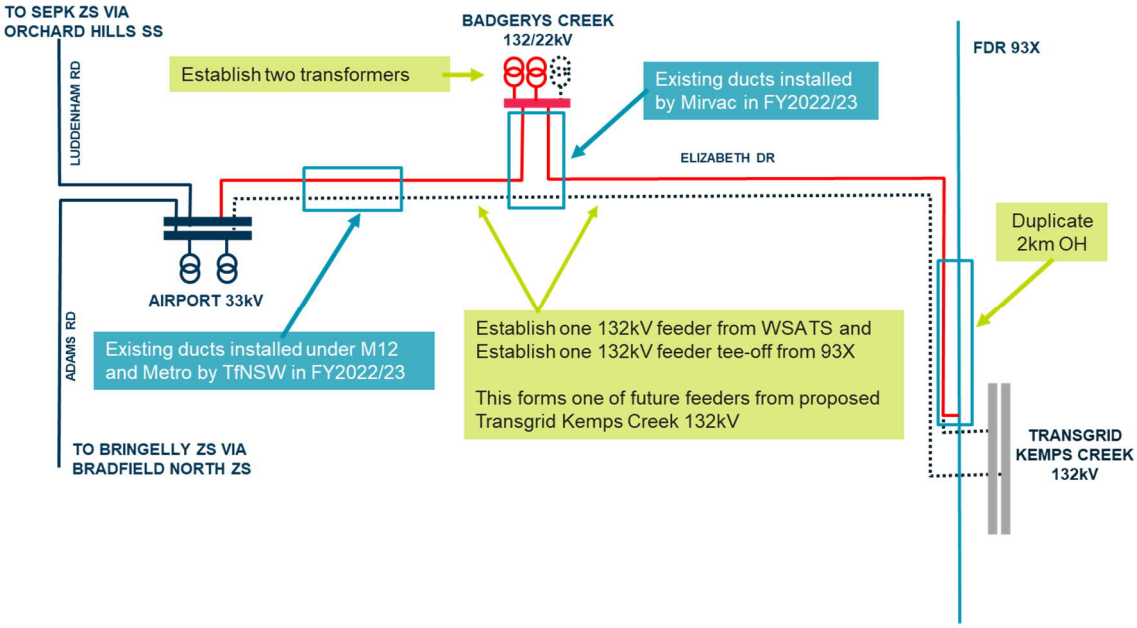

Figure 10: High level diagram for Option 2B

3.2.3 Other Network Options Considered

As indicated in **Table 6** there were other network options considered in the planning and options identification process but not taken further in the evaluation.

They were:

- **Augmentation of the existing Kemps Creek ZS** – possible network options considered were addition of a third transformer and augmentation of the existing transformers to 35MVA from their existing 25MVA. However, this would require long duration planned outages to Kemps Creek ZS during the construction works period and this would not be technically feasible considering the impact on customers supplied by the zone substation. The conversion of Kemps Creek ZS to a 132kV zone substation was also considered, however this would also require long duration interruptions to supply and significant 132kV feeder works.

- **Option 3A** – proposed the establishment of a single transformer Zone Substation with a 132kV supply from WSA TS. This was identified as the minimum network option, however this was deemed not feasible due to the lack of firm capacity supply from a single transformer and single transmission supply. There would also be insufficient back up capacity from the distribution network to support this network option. The Badgerys Creek development area will be a 22kV distribution network and initially there will be no backup at 22kV and will rely upon autotransformers to the adjacent 11kV networks. This results in a lower level of backup available from the distribution network. It is estimated that it will not be until 2030 that a widespread 22kV network will be available in the adjacent areas. However, the adoption of the 22kV network provides lower cost supply to the overall area based on the longer feeder routes available and the consequential saving on large substations.

- **Option 3B –** similar to Option 3A, however with the single transmission feeder from 93X was evaluated as not feasible in terms of supply reliability and security and also not practical given that the connection to WSA TS provided under Option 3A is the preferred supply option under a single transmission feeder supply consideration.

- **Options 1A and 4A** – both of these options are staged variants of Option 2A and although they are technically feasible and credible options, they would not provide full alignment to the Aerotropolis growth servicing strategy that utilises the new Transgrid BSP for the area.

3.3 Staged Network Options Considered

The case for investment considered the staging of the options by staging both the installation of transformers and the 132kV transmission mains.

3.3.1 Option 1B - Establishment of a 132/22kV zone substation with staged installation of transformers

Option 1B proposes a two stage implementation of Badgerys Creek ZS.

The first stage of this implementation would be completed by FY26 including:

- 1 x 45MVA transformer.
- 1 x 132kV feeder from WSA TS.
- 1 x 132kV feeder from 93X.

The second stage of the implementation to be commissioned by FY28:

- 1 x 45MVA transformer.

A two year deferral of the second transformer would be the minimum feasible deferral due to the demobilisation and remobilisation of works on the site.

This option would provide the staged implementation of Option 2B with the staged installation of the transformers. It would provide identical benefits of Option 2B, however this option will incur a higher expected unserved energy during the period of the zone substation being supplied by the single transformer, however it would defer capital expenditure required for the second transformer.

A diagram for Option 1B is shown in Figure 11 below.

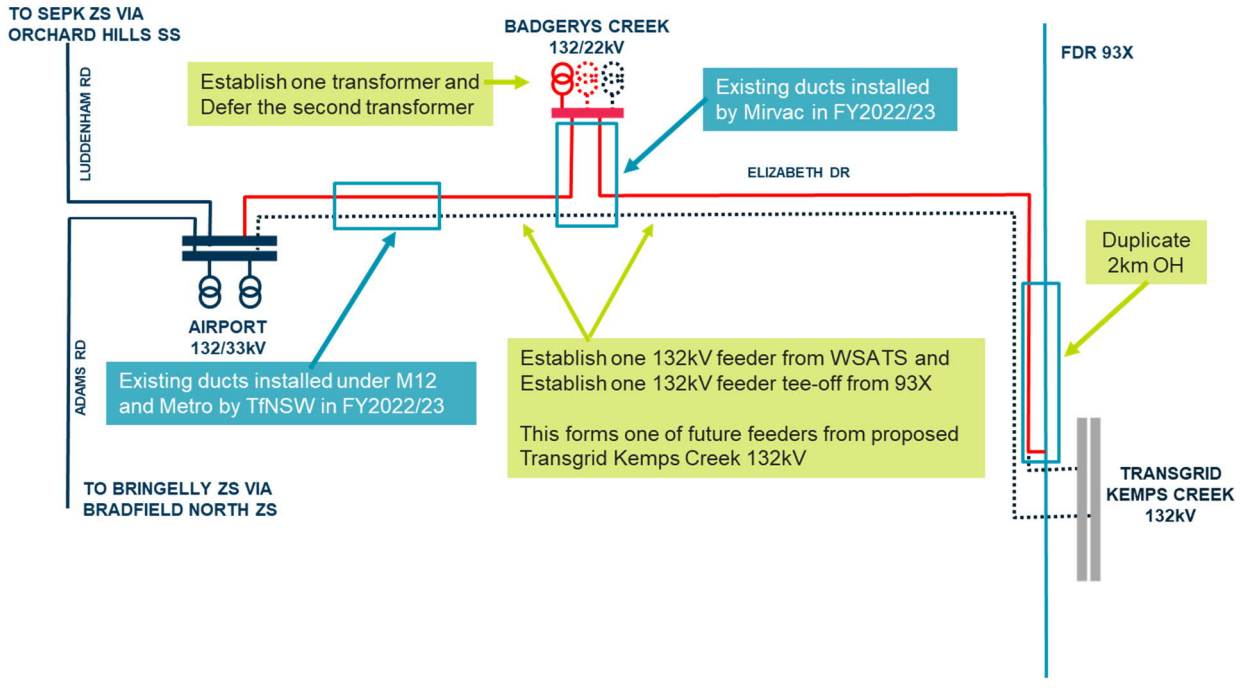

Figure 11: High level diagram for Option 1B

3.3.2 Option 4B - Establishment of a 132/22kV zone substation with two 45MVA transformers and a staged 132kV transmission supply

Option 4B proposes the following two stage implementation of Badgerys Creek ZS.

The first stage of this implementation would be completed by FY26 including:

- 2 x 45MVA transformers.
- 1 x 132kV feeder from WSA TS.

The second stage of the implementation to be commissioned by FY28:

- 1 x 132kV feeder from 93X.

This option would provide the staged implementation of Option 2B, however by staging the installation of the 132kV transmission supply. This option will incur a higher expected unserved energy during the period of the zone substation being supplied by the single 132kV, however it would defer capital expenditure required for the second feeder. The single feeder from WSA TS would have sufficient capacity to supply the Badgerys Creek ZS, however it would result in a higher level of reliability and security of supply risk due to the dependence on the single transmission feeder. If there were a fault on the single incoming 132kV cable to Badgerys Creek ZS then it would result in a long duration outage to the customers. This higher level of reliability risk is quantified in the economic evaluation of the option in comparison to the other options.

A diagram for Option 4B is shown in Figure 12 below.

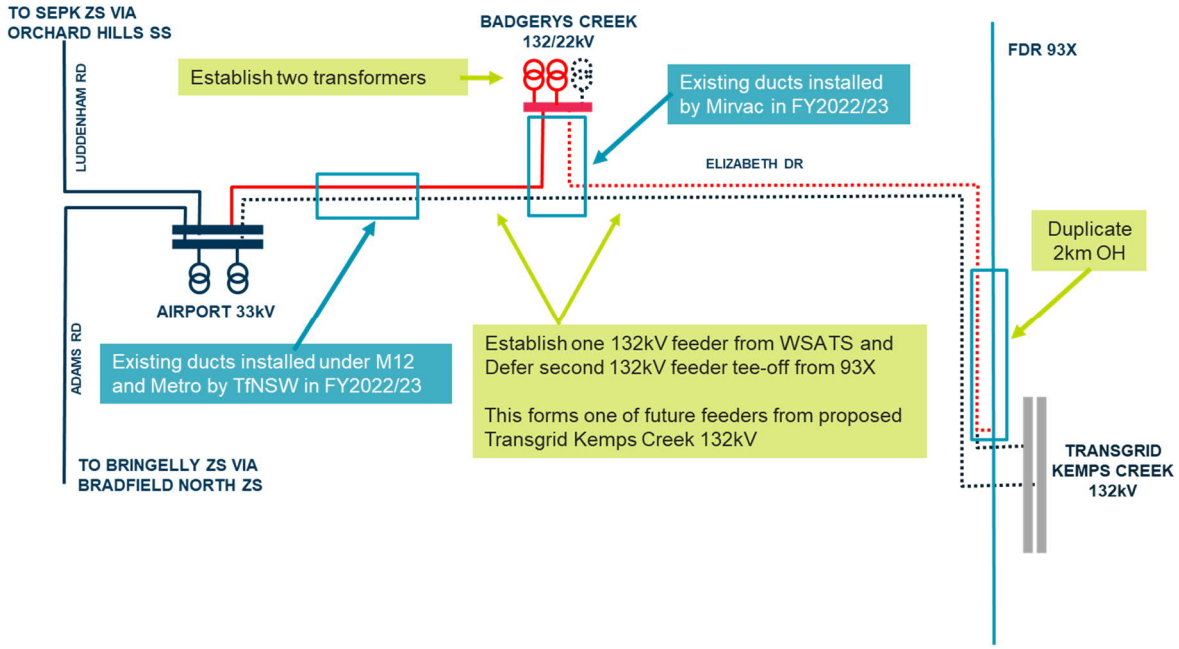

Figure 12: High Level diagram for Option 4B.

3.4 Evaluation of Network Options

The Houston Kemp (HK) model was utilised in the evaluation of the options. Endeavour Energy's unserved energy model was used to calculate the expected unserved energy that was used as an input to the HK model. The expected unserved energy is based on the demand forecast and the three scenarios for the Badgerys Creek development area.

Table 8 below shows the results of the economic evaluation of the options.

The economic evaluation used three scenarios to incorporate the uncertainty in the key variables are in the evaluation. The scenarios include the possible variations in the demand forecast for the Badgerys Creek development area.

The base case has been included to show the relative NPV of the network options compared to the base case. The base case involves the economic cost of not supplying the Badgerys Creek development area beyond the limited interim supplies that are currently in place.

Option	Description	Nominal Cost $M	PV Market Benefits $M	PV Costs $M	Scenario Weighted NPV $M	Rank
Base Case	Do Nothing 'No proactive intervention'	0	0	0	0	5
1B	Staged Establishment of Badgerys Creek ZS to a firm 45MVA 132/22kV ZS in FY28. - 2 x 45 MVA transformers (FY26 & FY28) - 1 x 132kV feeder from WSA TS - 1 x feeder from 93X	48.7	17,802.5	45.1	17,757.4	2
2A	Establish Badgerys Creek ZS to a firm 45MVA 132/22kV ZS in FY26. - 2 x 45 MVA transformers - 2 x 132kV feeders from WSA TS	41.8	17,801.2	44.1	17,757.1	3
2B	Establish Badgerys Creek ZS to a firm 45MVA 132/22kV ZS in FY26. - 2 x 45 MVA Transformers - 1 x 132kV feeder from WSA TS - 1 x 132kV feeder from 93X	47.7	17,804.5	44.8	17,759.7	**1**
4B	Staged Establishment of Badgerys Creek ZS to a firm 45MVA 132/22kV ZS in FY28. - 2 x 45 MVA transformers - 1 x 132kV feeder from WSA TS - 1 x feeder from 93X (FY28)	47.9	17,800.1	44.2	17,755.9	4

Table 8: Summary of the economic evaluation of the network options.

Further detailed assessment of the deferral options in comparison to the preferred option

The economic evaluation identified Option 2B as the preferred option with the highest NPV.

To ensure the robustness of the preferred option in comparison to the staged variants: 1B (deferring a transformer) and 4B (deferring a transmission feeder), a more granular analysis based on the marginal costs and benefits was conducted over the period 2022 to 2028.

This period of time from 2022 to 2028 covers the time that the staging would occur and ensures that the marginal benefits of avoided unserved energy were compared to the marginal cost of staging the transformers and the 132kV transmission supply.

This analysis used Option 2B (the preferred option) as the base case and evaluated Option 1B and 4B in comparison to the base base.

Table 9 below shows the results of the dedicated assessment of the deferral options.

Option	Description	Relative PV Cost $M	Relative PV Benefits $M	Relative NPV $M	Comments
1B	Staged Establishment of Badgerys Creek ZS to a firm 45MVA 132/22kV ZS in FY28. - 2 x 45 MVA transformers (FY26 & FY28) - 1 x 132kV feeder from WSA TS - 1 x feeder from 93X	1.688	-0.536	-2.224	Lower relative benefits compared to Option 2B.
2B	Establish Badgerys Creek ZS to a firm 45MVA 132/22kV ZS in FY26. - 2 x 45 MVA Transformers - 1 x 132kV feeder from WSA TS - 1 x 132kV feeder from 93X	0	0	0	Base case Option.
4B	Staged Establishment of Badgerys Creek ZS to a firm 45MVA 132/22kV ZS in FY28. - 2 x 45 MVA transformers - 1 x 132kV feeder from WSA TS - 1 x feeder from 93X (FY28)	4.580	-0.221	-4.801	Lower relative benefits compared to Option 2B.

Table 9: Further assessment of deferral options.

This assessment confirmed the preferred Option 2B as the preferred option.

Option 2B provides the highest weighted NPV in the economic evaluation and is the preferred option to supply to the Badgerys Creek development area.

The option provides an NPV of $17B. The preferred option also provides a higher NPV compared to the staged options 1B and 4B when examined over the shorter time period 2022 to 2028 (covering the period of the proposed staging of Option 1B and 4B).

Consideration of costs related to the proposed future Aerotropolis BSP project (NPR-000043)

Transgrid plan to commission a new 132kV Bulk Supply Point (BSP) in the Aerotropolis area with a planned commissioning date of 2030. Based on joint planning discussions between Endeavour and Transgrid, the preferred option for Transgrid is to provide 132kV supply from their existing Kemps Creek substation (500/330kV). Currently, Endeavour is not supplied from this substation, it is a substation for Transgrid's network connecting the generation centre at the central coast to southern NSW.

The new 132kV BSP would require enabling works by Endeavour to provide high capacity connection of the new BSP to the customers in the Aerotropolis and to the south west area of Sydney. The costs of these works are included in the capital project NPR-000043. The Aerotropolis Area Plan shows the 132kV connectivity of the new 132kV supply to the Aerotropolis area.

The network options in this evaluation vary in their scope in relation to the Aerotropolis BSP enabling works and providing high capacity connection. The network options 1B, 2B and 4B include the connection of the proposed Badgerys Creek ZS to Feeder 93X and therefore provide a higher degree of the future

costs than Option 2A which does not include the connection to 93X. The advantage of the connection to feeder 93X provides a future low cost and timely connection option to the proposed Kemps Creek BSP. The comparative difference in these future costs have been included in the evaluation because they represent future avoided costs or savings in project NPR-000043 depending on the Badgerys Creek network options.

Table 10 below shows the Aerotropolis BSP costs included in this economic evaluation.

Network Option Cost Plus the Aerotropolis BSP component ($M)	FY23	FY24	FY25		FY28	FY29	Total
	Network Option Cost				Aerotropolis BSP Cost		
2A	6.27	18.81	16.72		8.00	6.50	**56.3**
2B	7.15	21.46	19.08		4.50	3.60	**55.8**

Table 10 – Option Cost comparison including the future Aerotropolis BSP.

The inclusion of the Aerotropolis BSP costs in this evaluation ensures value for money, economic efficiency and the principles of maximising benefits under the NER are included in the evaluation.

The $0.5M cost difference between the total costs of 2A and 2B (including the Aerotropolis BSP Cost) is due to the additional cost of cable works for Option 2A. Under this option, the Aerotropolis BSP cost component would include a cut-in to one of the WSA TS to Badgerys Creek 132kV feeders and potentially additional joint bay and cable length because the final network configuration would have a direct connection between WSA TS and the planned Aerotropolis BSP at Kemps Creek.

Optimal Timing for the investment

The optimal timing for the investment using the AER's 'crossover' method is 2027. This is the first year when net operating benefits are larger than the annualised cost of an option. However, due to the need date for the project being driven by the need to connect customers and it being a 'reliability corrective action' to meet the connection of customers in accordance with the 5.2.3(d) of the NER, the expected commissioning date is in FY2026.

Figure 13 below shows a visualisation of the optimal timing for the preferred network option. It shows the annualised benefits exceeding the annualised cost of the investment in **FY2027**, however based on the connection requirements of the major customers in the Badgerys Creek development area, the expected indicative commissioning of the network option is 1 July 2025 (early in FY2026).

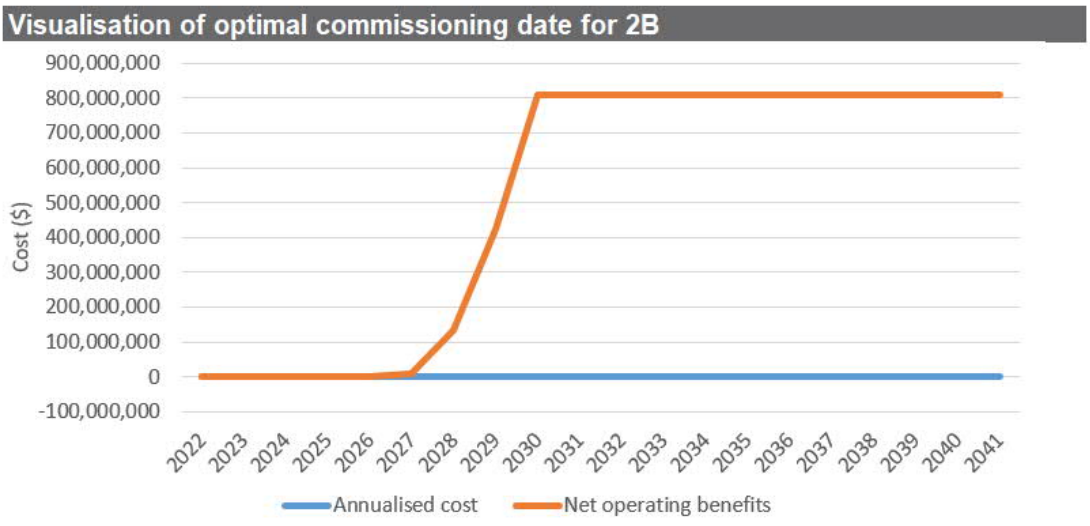

Figure 13: Optimal Timing of the preferred network option.

Table 11 below shows the key assumptions used in the economic evaluation of the network options.

Economic Evaluation Assumption	Detail
Analysis Period Duration.	30 years.
Discount Rate.	3.26%.
Operating & Maintenance (O&M) costs of the options.	0.4% of capital cost.
Load Duration Curve used for the expected unserved energy calculation.	Moorebank ZS. Based on similar load profile expected in the Badgerys Creek development area.
Methodology for Capping Unserved Energy.	5 years after proposed commissioning date, 2026. Unserved Energy is set to the capped level for the remaining period of the analysis period. This is consistent with the capping methodology approach adopted for other RIT-D projects in the Aerotropolis area, based on advice from Houston Kemp.
Base year for dollar costs	2022.
Value of Customer Reliability (VCR)	$44,500 per MWhr, based on assumption of the load composition in the area and consistent with previous values adopted for the Aerotropolis area.
Weighting of Scenarios in the NPV	The NPV has been calculated by weighting the scenarios by the following factors: Central : 50% High : 25% Low : 25% These weightings reflect the assumed likelihood of each scenario.

Table 11: Assumptions used in the evaluation of the network options.

3.5 Sensitivity & Scenario Analysis

3.5.1 Sensitivity Analysis

Sensitivity tests and analysis have been applied to the economic evaluation in the Houston Kemp model and results are shown below.

To confirm the robustness of the economic evaluation and to demonstrate the results over a range of variation in some of the key variables, the sensitivity analysis was conducted on all of the credible network options.

The key variables included in the sensitivity analysis and shown below in Figure 14 were:

- Discount rate used for the discounted cashflow in the evaluation.
- Capital cost estimates.
- Value of customer reliability
- Risk costs, for this project, essentially the value of the expected unserved energy.

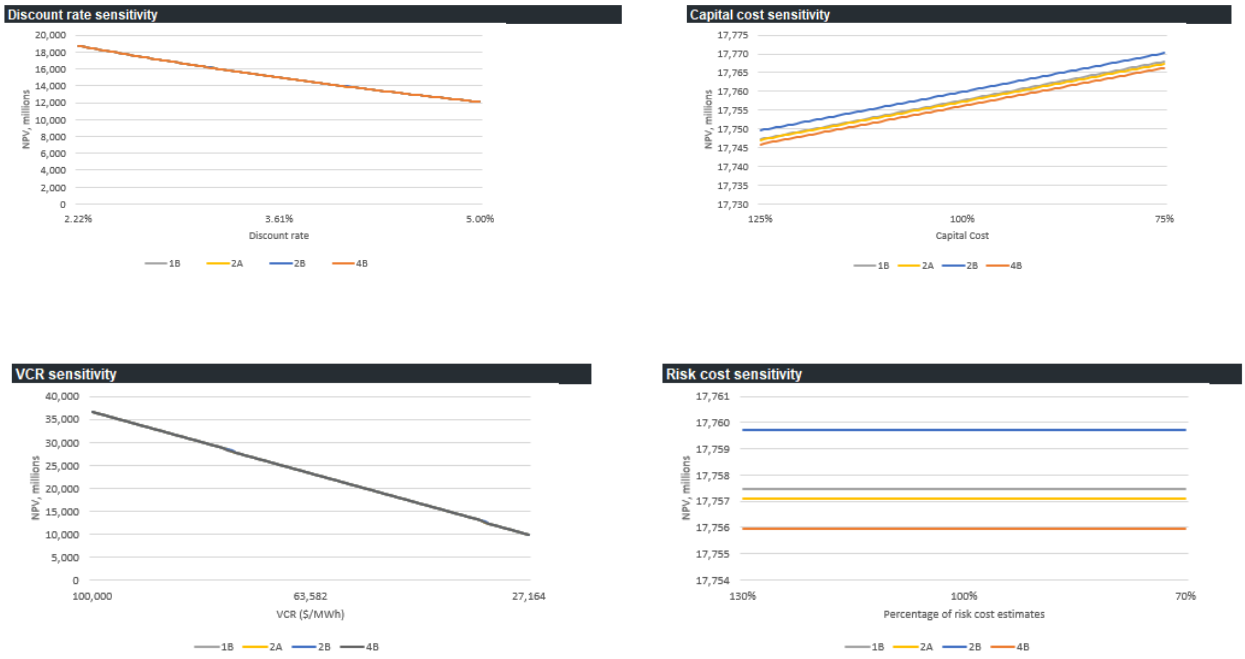

Figure 14: Sensitivity analysis results for selected variables.

3.5.2 Scenario Analysis: Weighted NPV Scenarios

Table 12 below shows the three scenarios used in the economic evaluation of the network options. In particular these scenarios were used in the weighted NPV.

Variable	Scenario 1 – baseline	Scenario 2 – high benefits	Scenario 3 – low benefits
Capital cost	Estimated network capital costs	25% decrease in the estimated network capital costs	25% increase in the estimated network capital costs
Demand Forecast (Expected Unserved Energy MWhrs)	Central	High	Low
Value of customer reliability (VCR)	$44.5/kWh	$50.5/kWh 30% higher than baseline	$27.2/kWh 30% lower than baseline
Discount rate	3.26% (WACC)	2.22%	4.3%
Maintenance costs	Estimated network maintenance costs	25% increase in the estimated network maintenance costs	25% decrease in the estimated network maintenance costs
Scenario weighting	50%	25%	25%

Table 12 – Definition of the scenarios used in the economic evaluation and the sensitivity analysis.

Table 13 below shows the breakdown of the NPV results for the three scenarios.

The ranking has been performed on the basis of the weighted NPV. The highest NPV for each scenario has been highlighted in green.

Option	Scenario 1 NPV ($M)	Scenario 2 NPV ($M)	Scenario 3 NPV ($M)	Weighted NPV ($M)	Option ranking
Option 1B	10,434.7	50,188.1	-27.6	17,757.4	2
Option 2A	10,436.9	50,181.0	-26.4	17,757.1	3
Option 2B	10,436.7	50,192.8	-27.3	17,759.7	1
Option 4B	10,432.7	50,185.0	-26.7	17,755.9	4

Table 13: Weighted NPV of Options.

3.6 Non-network Options Consideration

The National Electricity Rules (NER) require Distribution Network Service Providers (DNSP) to investigate non-network (demand management) options as part of planning for major network augmentations. This includes determining whether non-network options will be technically and economically feasible in deferring or avoiding network augmentations and also to utilise market and public consultation in sourcing possible non-network options.

This project has an estimated cost of greater than $6M and requires a screening of non-network options and consultation at Draft Project Assessment and Final Project Assessment stages.

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

We have initiated a Regulatory Investment Test for Distribution (RIT-D) to investigate, and consult on, how to most efficiently facilitate the connection of the new major loads in the Badgerys Creek 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 load requiring connection will exceed the existing network capacity. This is currently anticipated to be 2025/26, based on the customer connection interim supply arrangements in place.

Importantly, no construction on new distribution investments will commence until there is a high degree of certainty that the anticipated loads will be seeking connection to our network at the timing indicated. Further, we note that new customers will contribute to the costs of the investment (as well as the cost of the wider network), via their 'Distribution Use of System' tariffs.

The distribution network augmentation to support the development of the Badgerys Creek development area was included as part of our regulatory proposal to the Australian Energy Regulator (AER) for the current regulatory control period and also discussed in our most recent Distribution Annual Planning Report (DAPR). This area was previously known as the Western Sydney Employment Lands in both our regulatory proposals and the DAPR.

A non-network screening notice will be published in accordance with NER clause 5.17.4(c), and will state that there is unlikely to be a non-network option that could form a potential credible option on a standalone basis, or that could form a significant part of a potential credible option.

The screening notice will explain the greenfields nature of the development and the existing lack of supply capacity to meet the demand of the development area and that non-network options would not be feasible from both the technical and commercial considerations.

To illustrate the situation further, if there were a commercially feasible non-network option located in the Badgerys Creek development area it would require this proposed network augmentation to provide its connection to the national electricity market and would therefore not be able to defer or avoid the augmentation. Following the completion of the augmentation with the commissioning of the proposed Badgerys Creek ZS it would technically feasible to connect a non-network option to defer or avoid further augmentation in the local network.

The determination of the 'reliability correction action' basis for the project provides the foundation for the non-network screening notice that we intend to publish.

In addition to this determination we have conducted feasibility testing of non-network options using the New Technology Master Plan (NTMP) tool. These results also demonstrate the non-network options are not currently feasible for this network need. The results are shown in Appendice 6.4.

4. Detailed description and costs of preferred option

The preferred option proposes the establishment of the Badgerys Creek ZS with 2 x 45MVA 132/22kV transformers and 2 x 275MVA 132kV feeders. One of the 132kV feeders will be an underground cable from the WSA TS with a route length of 3.6km. The other 132kV feeder will be connected to the existing feeder 93X and will be approximately 6.0km of underground cable and 2.0km of overhead line.

The preferred option would also include distribution works to provide 22kV feeders and autotransformers for the connection to the adjacent 11kV area supplied by Kemps Creek ZS.

Project Scope of Works

Table 14 below shows the scope of work, description of key scope items and cost estimates.

Scope	Description	Cost Estimate ($M)
Mains	Establishment of 2 x 132kV feeders providing supply to Badgerys Creek ZS. • 1 x Feeder from Western Sydney Airport TS to Badgerys Creek ZS. (3.6km route length with UG cable with 275MVA capacity.) • 1 x Feeder from 93X to Badgerys Creek ZS. (6.0km route length with UG cable with 275MVA capacity and 2.0km overhead route length in the 93X easement to the location of Transgrid's Kemps Creek BSP.) • Associated protection works and communications fibre.	22.1
Zone Substation	Establishment of the Badgerys Creek ZS. • Outdoor 132/22kV zone substation with two 45MVA transformers. • Building(s) to house 3 x 22kV switchboards. • Building(s) to house protection,control equipment and amenities. • Spatial provision in civil arrangement for future (no material cost included): o 3rd 45MVA transformer o 3rd incoming 132kV feeder bay o 3rd 22kV switchboard o Grid BESS.	20.6
Distribution	Construction of : 7 x 22kV Distribution Feeders as follows: • 2 x 22kV feeders for Mirvac (EEP). • 2 x 22kV feeders for Sydney Water Facility. • 1 x 22kV feeder heading westward towards the Northern Gateway area. • 2 x 22kV feeders and autotransformers for Kemps Creek ZS feeder ties with the location of the ties south of Elizabeth Drive (closer to the Kemps Creek ZS location to allow for beneficial load transfer). • 22kV conversion of network to be transferred to Badgerys Creek ZS. • Implement AFIC, time clock and/or smart meter conversions as required (residential areas south of Elizabeth Drive.)	5.0
Total	Establishment of Badgerys Creek ZS including 132kV supply and distribution works.	**47.7**

Table 14 – Scope of works and cost estimate

Single Line Diagram of the Proposed Badgerys Creek Zone Substation

Figure 15 below shows the proposed single line diagram for the proposed Badgerys Creek ZS. The diagram shows the future provisions for a third transformer and a third 132kV supply. Based on the current demand forecast for the Badgerys Creek development area these are likely to be required in the period 2035 to 2045.

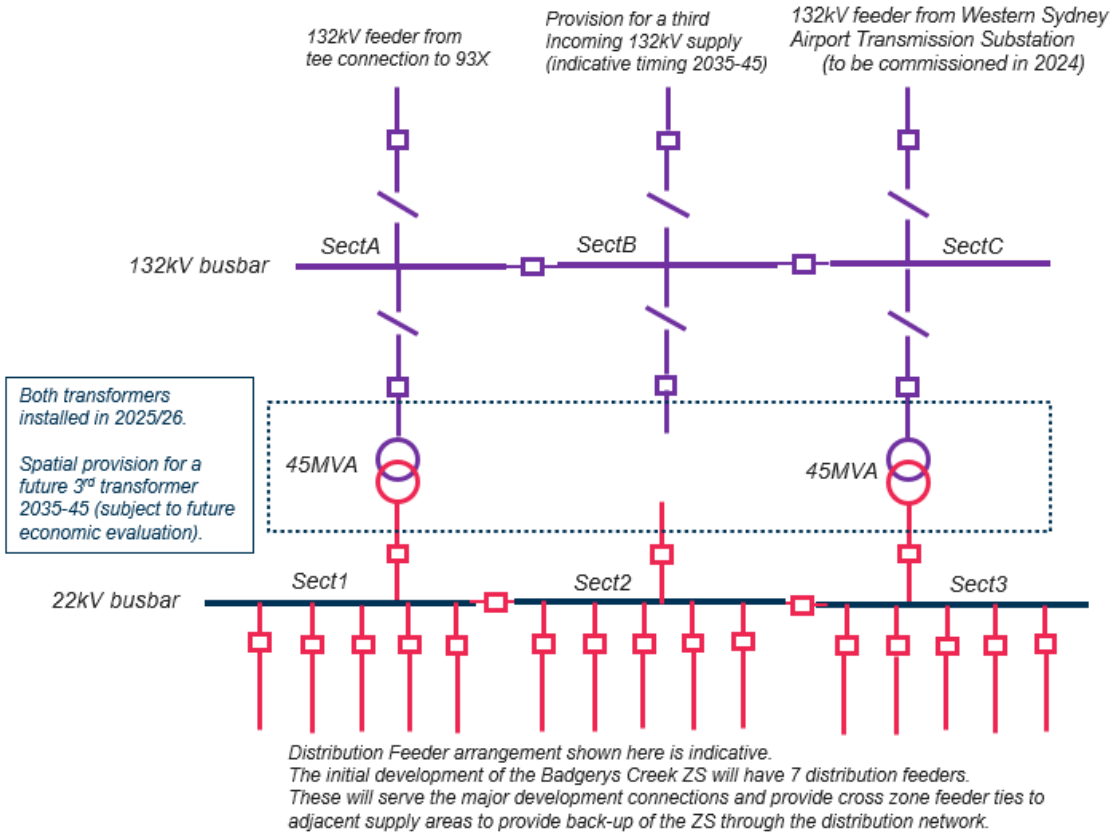

Figure 15: Single Line Diagram for the proposed Badgerys Creek Zone Substation.

Project Costs and Timing

The estimated cost to establish Badgerys Creek ZS is **$47.7M**.

The expected timing of the zone substation construction is over the period FY23 to FY25 with a planned commissioning date of 1 July 2025. Table 15 below shows the estimated project expenditure cashflow.

A contingency amount of 12% has been added to the cost estimate (as a lump sum) to cover unforeseen factors including, but not limited to:

- procurement of major equipment (including cable).
- the substantial 132kV feeder works and cost of related civil works required.

The contingency level of 12% is higher than recent major projects to cover emerging cost increases in civil works associated with transmission mains cable trenching and recent CPI increases that are above the level included in the Design estimates for this project.

Estimated Cost ($)	FY23	FY24	FY25	Total
Badgerys Creek ZS Establishment	7,155,000	21,465,000	19,080,000	**47,700,000**
Contingency (12%)				**5,700,000**
Total				**53,400,000**

Table 15 – Estimated project expenditure cashflow

5. Recommendations and Next Steps

It is recommended that:

- **Option 2B** – the establishment of Badgerys Creek zone substation including two 45MVA transformers and two 132kV feeders, one from Western Sydney Airport TS and one from 93X – proceed to preliminary release. This will enable the development of a project definition, detailed design, environmental assessment and preliminary market engagement activities.
- A Non-Network Options Screening Report be issued to notify stakeholders of our determination that there are no feasible non-network options to defer or avoid the establishment of the Badgerys Creek Zone Substation.

6. Appendices

6.1 Decision Framework from Endeavour's Growth Service Strategy

Figure 16 shows the decision rule from Endeavour Energy's growth servicing strategy to determine the approach required to address the identified need presented by the Badgerys Creek development area.

- Based on characteristics of growth, this investment is classified as **greenfield.**
- Identified need based on consequence of no action for the greenfield development is **reliability corrective action**.

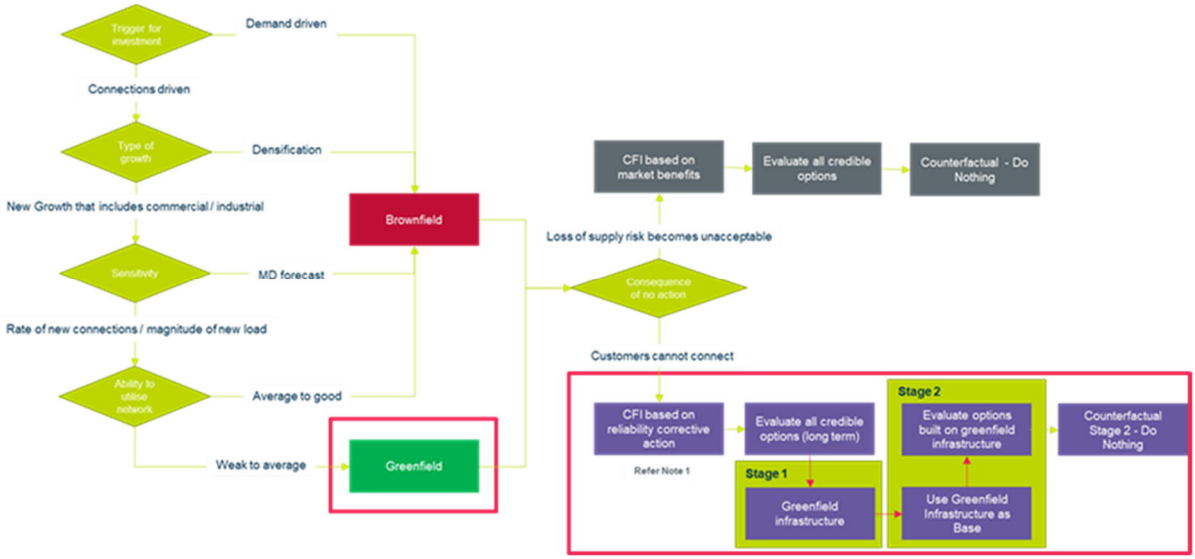

Figure 16: Decision Framework from Endeavour's Growth Service Strategy.

6.2 Decision Rule from Endeavour's Growth Service Strategy

Based on the decision framework the characteristics of the area are:

- Investment is classified as **greenfield.**
- Identified need based on consequence of no action for the greenfield development is **reliability corrective action**.

Figure 17 below has been utilised to outline the options.

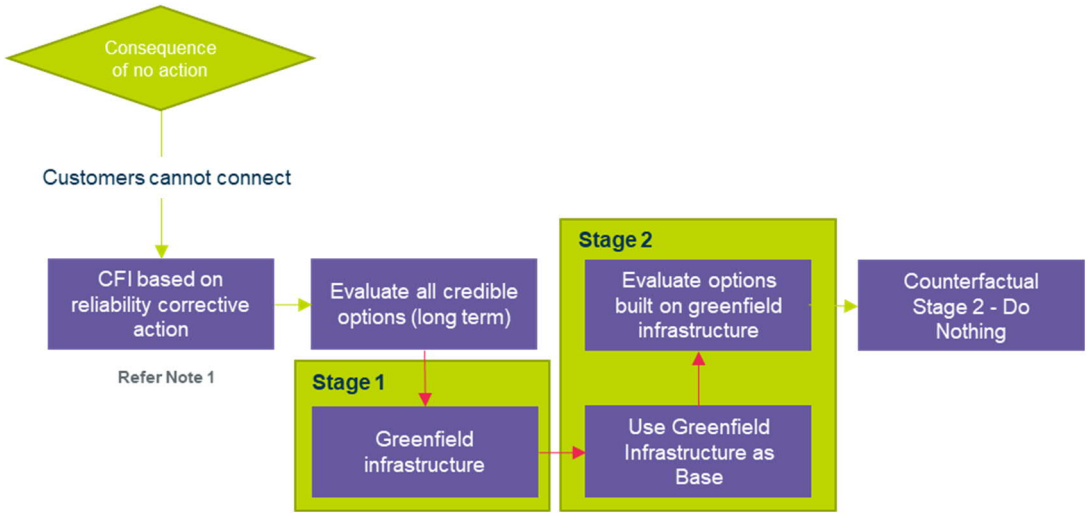

Figure 17: Decision Rule from Endeavour Energy's Growth Servicing Strategy

6.3 Scenario Settings for Weighted NPV and Sensitivity Analysis

Figure 18 below shows the scenario settings used for the weighted NPV and sensitivity analysis. These are the values used in the Houston Kemp model.

Scenario settings

Parameters		S1	S2	S3
General parameters	**Unit**	**Central**	**High**	**Low**
Commercial discount rate	Percent	3.26%	2.22%	4.30%
VCR for involuntary load shedding	$/MWh	44,582	50,447	27,164
VCR for voluntary load curtailment	$/MWh	44,582	50,447	27,164
Cost parameters	**Unit**	**Central**	**High**	**Low**
Capital cost	Factor	1.00	0.75	1.25
Planned routine maintenance and refurbishment	Factor	1.00	0.75	1.25
Unplanned corrective maintenance	Factor	1.00	1.25	0.75
Decommissioning costs	Factor	1.00	1.25	0.75
NNO proponent charges	Factor	1.00	0.75	1.25
Cost X	Factor	1.00	1.00	1.00
Risk cost parameters	**Unit**	**Central**	**High**	**Low**
Reliability and security risk costs	Factor	1.00	1.30	0.70
Safety and health risk costs	Factor	1.00	1.30	0.70
Environmental risk costs	Factor	1.00	1.30	0.70
Legal/regulatory compliance risk costs	Factor	1.00	1.30	0.70
Financial risk costs	Factor	1.00	1.30	0.70
Benefit parameters	**Unit**	**Central**	**High**	**Low**
Avoided involuntary load shedding	Factor	1.00	1.00	1.00
Avoided voluntary load curtailment	Factor	1.00	1.00	1.00
Avoided costs for non-RIT-D proponent parties	Factor	1.00	1.00	1.00
Differences in the timing of unrelated network expenditure	Factor	1.00	1.00	1.00
Changes in load transfer capacity	Factor	1.00	1.00	1.00
Additional option value	Factor	1.00	1.00	1.00
Changes in electrical energy losses	Factor	1.00	1.00	1.00
Scenario weightings	**Unit**	**Central**	**High**	**Low**
Weightings	%	0.50	0.25	0.25

Figure 18 Economic evaluation analysis model scenario settings.

6.4 New Technology Master Plan tool

The New Technology Master Plan (NTMP) tool was used to evaluate credible non-network options with the network constraints for the Badgerys Creek development area.

Under the ‘Reliability Corrective Action’ determination of the identified need for the Badgerys Creek development area, Endeavour Energy has determined that non-network options are not feasible and the NTMP tool and assessment has been used for the purpose of the CFI, however will not be included in the RIT-D documents.

Figure 19 shows the comparison of non-network solutions and network solutions against the base case (“no proactive intervention”) and Figure 20 compares non-network options in comparison to the network solution.

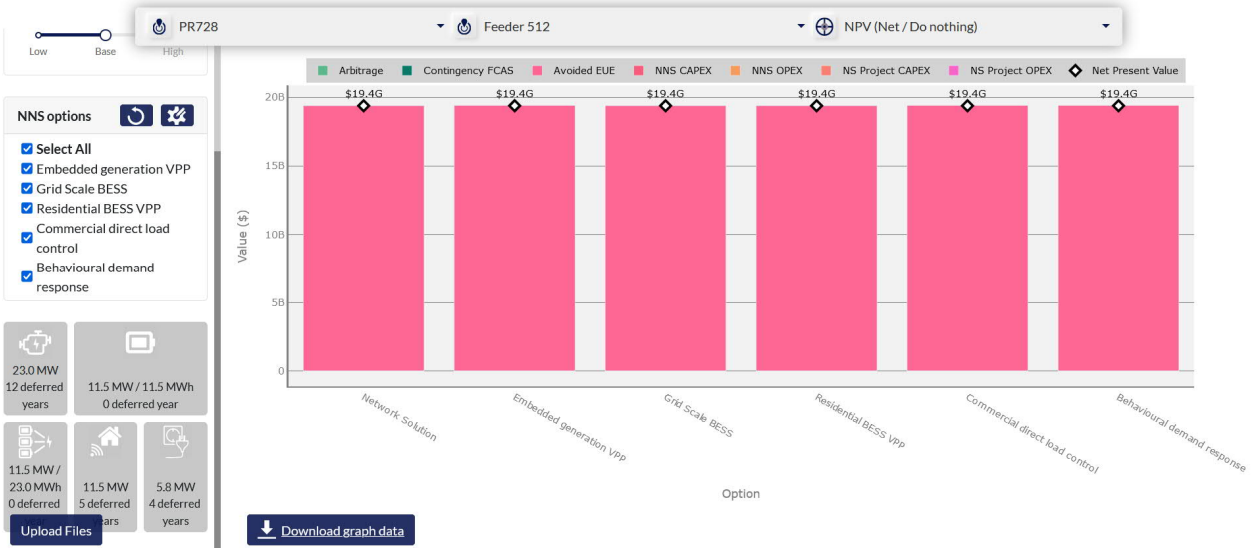

Figure 19: NTMP Output for Non-Network Options when compared to the Base Case.

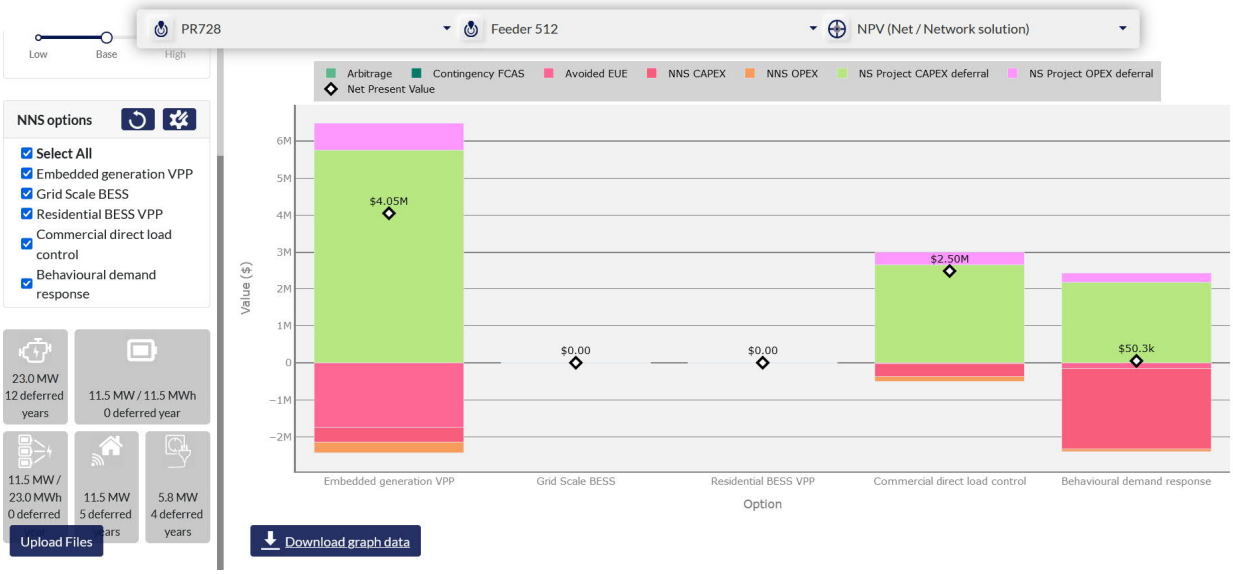

Figure 20 :NTMP Output for Non-Network Options when compared to the Network Solution

Table 16 below shows an overview of the outputs from the NTMP tool and includes comments on the qualitative assessment of the non-network options considered.

Non-Network Options	Outcomes	Qualitative Assessment	Comments
Grid-Scale Storage (11.5 MW /11.5 MWh)	Does not defer network investment	✕	Not feasible as it does not defer network investment
VPP (23 MW)	Potentially defer the network investment by 12 years	✕	Not a feasible option as this is a new development. Additionally, the proposed capacity is approximately 70% of the forecasted new load in FY29
Residential BESS VPP (11.5 MW /23 MWh)	Does not defer network investment	✕	Not feasible as it does not defer network investment
Commercial Direct Load Control (11.5 MW)	Potentially defer the network investment by 5 years	✕	Not feasible due to lack of greenfield infrastructure. Additionally, the proposed capacity is approximately 35% of the forecasted new load in FY29
Behavioural Demand Response (5.8 MW)	Potentially defer the network investment by 4 years	✕	Not feasible due to lack of greenfield infrastructure.

Table 16: Non-Network - New Technology Options.

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