# RIT-D Options Screening Notice

Providing increased supply capacity for the Menangle Development Area

17 March 2025

Endeavour Energy

POWER together

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# 1. Introduction

The Menangle Development Area is located approximately 40km south-west of Parramatta and is within the Greater Macarthur Growth Area. The Greater Macarthur Growth Area is a key part of the New South Wales Government's plan to support Greater Sydney's growing population through the development of new communities in land release areas.

The Menangle Development Area consists of five precincts that are in advanced stages of planning, re-zoning and early stage sales and marketing by their respective property developers. The precincts are:

- Menangle Park Precinct.
- Rosalind Park.
- West Hume Highway residential precinct.
- Southern Gateway Business Park.
- Macarthur Business Park.

These precincts are expected to result in approximately 10,200 new residential dwellings including complementary developments such as town centres, schools, community facilities and future commercial and industrial spaces. The area includes two specific business parks that are expected to be major employment hubs for the area. The business parks will take advantage of the close proximity to the Hume Highway which traverses the Menangle Development Area.

These developments are forecast to require a supply capacity of 92MVA by 2042 under the central demand forecast that we have prepared for the area. This greatly exceeds the supply capacity of the existing network in the area.

We are commencing this RIT-D to determine the most efficient means of providing supply to the Menangle Development Area. Specifically, the RIT-D looks to address the planned precincts of Menangle Park precinct, Rosalind Park, a future West Hume Highway residential development area, Southern Gateway Business Park, and Macarthur Business Park. We refer to these five precincts collectively as the 'Menangle Development Area'.

Although we expect there to be significant market benefits associated with providing supply to the Menangle 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 RIT-D**

We have initiated a RIT-D to investigate, and consult on, how to most efficiently provide supply to future customer developments in the Menangle Development Area.

Endeavour Energy is required to connect customers under section 5.2.3(d) of the National Electricity Rules (NER), which state that "A Network Service Provider must:

> (1) Review and process applications to connect or modify a connection which are submitted to it and must enter into a connection agreement…
>
> (6) Permit and participate in commissioning of facilities and equipment which are to be connected to its network in accordance with rule 5.8;"

We therefore consider the identified need for this investment to be a 'reliability corrective action' under the RIT-D since investment is required to comply with the above NER obligations.

The timing of the identified need for this RIT-D, and so the required timing for credible options to address the need, is determined by when the expected customer demand and network load requiring connection will exceed the existing network capacity. This is likely to occur from late 2024/25, and based on the connection enquiries received to date, load requirements in this area are expected to continue to grow.

This options screening notice (OSN) sets out the reasons why we consider that a non-network solution is unlikely to form a potential credible option on a standalone basis, or form a significant part of a potential credible option, to meet the identified need for the Menangle Development Area, i.e., in accordance with NER clause 5.17.4(c). It represents the first formal stage of the RIT-D assessing how to most efficiently provide supply to major new loads in the Menangle Development Area.

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

If you have any comments or enquiries regarding this report, please send them to the Enterprise Portfolio Management office at consultation@endeavourenergy.com.au.

# 2. Key assumptions underpinning the identified need

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

## 2.1 Relevant area of our network

The Menangle Development Area is located approximately 40km south-west of Parramatta and 20km south-east of the Western Sydney Airport. The area is traversed by the Hume Highway which is the major motorway through the area. The development in the area is largely along side of the Hume Highway with major precincts planned for both the east and west side of the Hume Highway. There is currently major road works being undertaken with bridges and merge lanes being constructed which will enable the road and traffic connectivity from the area to the Hume Highway.

Figure 1 below shows the location of the Menangle Development Area in relation to Parramatta and the Western Sydney Airport site.

The Menangle Development Area is a part of the Greater Macarthur Growth Area, a key part of the New South Wales Government's plan to support Greater Sydney's growing population through the development of new communities in land release areas.[1]

[1] NSW Government and Greater Sydney Commission, *Greater Sydney Region Plan 2018*, pp 8, 61.

**Figure 1 – Location of the Menangle Development Area in relation to Parramatta and the Western Sydney Airport site**

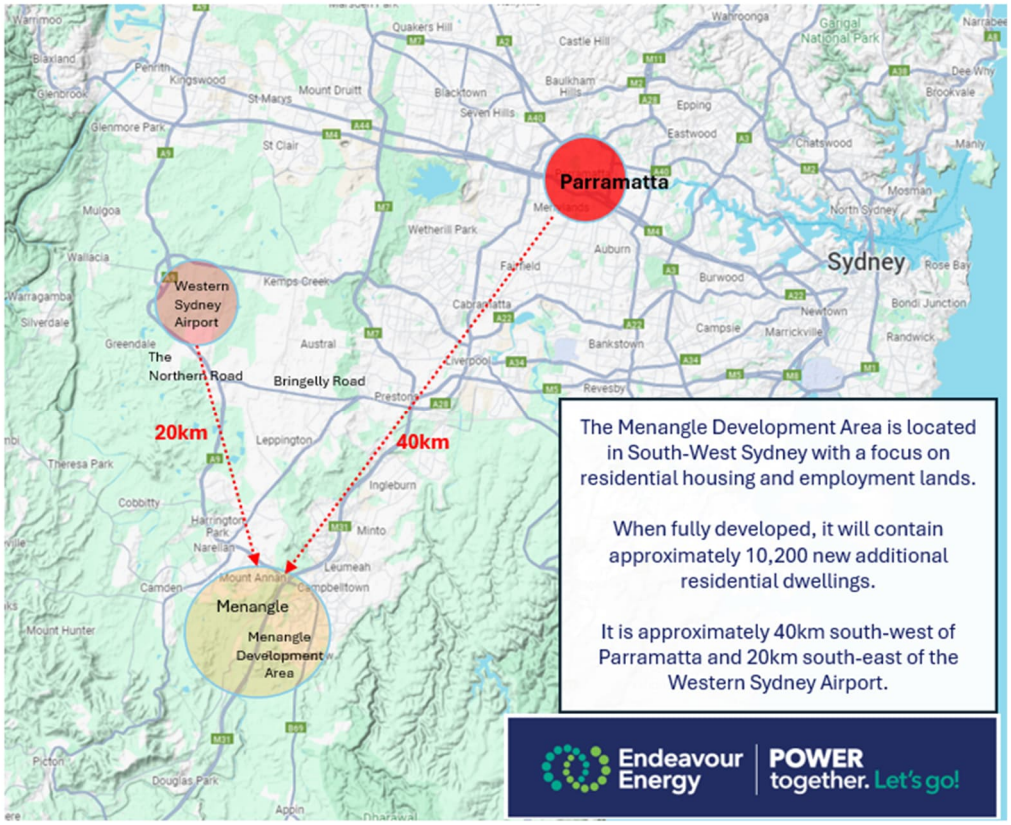
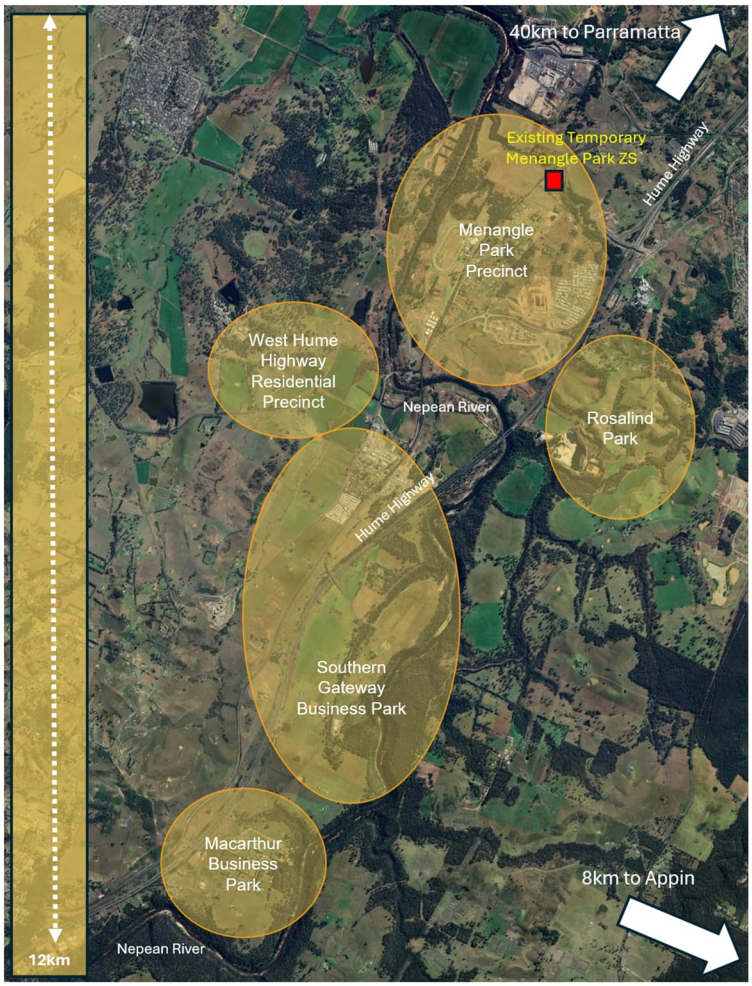


Figure 2 below shows the proposed five precincts for development of residential housing and enterprise business parks within the Menangle Development Area. The location of the existing temporary Menangle Park ZS is shown at the northern end of the area. The five precincts and their related development, customer demand and connection requirements form the identified need for this RIT-D. Our demand forecasts are based on our analysis of these precincts and their underlying customer demand requirements.

The area is approximately 8km from Appin, however there are strong and distinct geographical separations between the Menangle area and the Appin area due to the Nepean River and the steep terrain that is adjacent to the Nepean River in this area. The terrain is largely unsuitable for both underground cable and overhead lines and forms a border between the Menangle development area and the future Appin development area. The Appin are is not included in the identified need for this RIT-D and we expect to conduct a separate RIT-D for the Appin area in line with the customer demand.

**Figure 2 – Proposed development precincts in the Menangle Development Area**




In general, the Menangle Development Area is 'land locked' by the Nepean River and its steep terrain to the south-east. The southern most precinct will be adjacent to the Nepean River and will have a hard border

with the adjacent area to the east, particularly Appin. The Menangle area and the Hume Highway through the area are being developed according to the New South Wales strategic plans for the Macarthur area.[2]

## 2.2 Load characteristics and demand forecast

The Menangle Development Area will comprise five precincts which will include new residential dwellings and enterprise based business parks. Although the final name of the precincts may be changed, we have used the following precinct names in our analysis of the customer characteristics and the demand forecasts for the area:

- Menangle Park
- Rosalind Park
- West Hume Highway residential development area
- Southern Gateway Business Park
- Macarthur Business Park

Based on information from developers of these precincts and the local governments of Campbelltown City Council and Wollondilly Shire Council, we have developed three scenarios for the demand forecast for the area. The precincts are expected to contain 10,200 new residential dwellings and complementary developments of town centres, shopping villages, schools and community facilities.

Our demand forecasts are based on a level of growth in line with the delivery plans provided by developers and adjusted to align with the latest NSW Government Urban Development Program forecasts.[3]

Based on the proposed precincts, the development area will require 92MVA of electricity supply capacity by 2042. This is our central demand forecast for the Menangle Development Area as we have defined it in the identified need for this RIT-D.

[2] See NSW Department of Planning and Environment, *Greater Macarthur 2040: An interim plan for the Greater Macarthur Growth Area*, November 2018, pp 19, 84.

[3] See NSW Government website, available at: https://www.planning.nsw.gov.au/policy-and-legislation/housing/urban-development-programs#udp-dashboards.

Table 1 provides a summary of the estimated new residential dwellings in the Menangle Development Area. This information is the basis of the demand forecasts. The demand forecasts for the enterprise business parks are based on our network connection request information.

**Table 1 – Menangle Development Area precinct summary**

| Proposed Precinct | Estimate of total residential housing lots by 2042 | Details |
|---|---|---|
| Menangle Park Precinct | 3,800 homes and 2,000 apartments | A major residential centre with a mix of free standing residential homes and apartments. Includes a new school, town centre, community facilities and commercial functions and small scale employment lands. |
| Rosalind Park | 1,500 | A town or village centre with shopping and small commercial centre. |
| Future West Hume Highway Residential Precinct | 1,900 | A town or village centre, new school, tourism and tourist attraction development, environmental showcase demonstration, commercial and retail developments. |
| Southern Gateway Business Park | 1,000 | Residential, commercial and industrial developments. Development area to take advantage of proximity access to the Hume Highway allowing for transport and logistics operations. |
| Macarthur Business Park | Nil | Employment hub and business park. Likely to include transport and logistics functions using the proximity of access to the Hume Highway. Based on the zoning proposals and plans, no residential development is expected. |

Table 2 below shows the assumptions that have been used by Endeavour Energy to develop the demand forecast from the underlying growth plans for the area. These demand forecast assumptions are based on our extensive experience in supplying Western Sydney and monitoring the adoption of new technology such as rooftop solar panels, electric vehicles and distributed battery storage systems. We expect residential and enterprise areas in the Menangle Development Area to utilise these latest end-use energy technologies.

**Table 2 – Menangle Development area demand forecast assumptions**

| Assumption | Value and unit of measure |
|---|---|
| Residential Lot Freestanding Home | 5.4kVA per Lot |
| Residential Terrace Home (semi-detached) | 4.35kVA per Lot |
| Residential Apartment | 3.3kVA per Lot |
| Town Centre Shopping Village | 3.0MVA |
| School K-12 | 1.0MVA |
| School K-6 | 0.75MVA |
| Water Supply Services | 0.3MVA |
| Residential Diversity Factor | 0.8 |
| Commercial Diversity Factor | 0.6 |

The demand forecast for the enterprise based business parks are based on the connection applications in place with the proponents of those business parks.

Table 3 below shows the Menangle Development Area demand forecasts based on the precinct level demand forecast, our demand forecast assumptions of the residential development component and our analysis of the customer connection information for the enterprise based commercial and industrial customers expected primarily in the business park precincts.

**Table 3 – Menangle Development Area demand forecasts**

| Precinct forecast (MVA) | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | | 2037 | 2042 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Menangle Park Precinct | 3.9 | 5.5 | 8.2 | 10.6 | 13.0 | 15.8 | 18.1 | 19.9 | 21.7 | | 28.6 | 29.8 |
| Rosalind Park | 0.0 | 0.2 | 2.6 | 3.7 | 4.8 | 5.6 | 6.6 | 7.5 | 7.5 | | 7.5 | 7.5 |
| West Hume Highway Residential Precinct | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.9 | 3.7 | | 8.2 | 10.5 |
| Southern Gateway Business Park | 0.6 | 1.1 | 1.9 | 2.7 | 5.3 | 12.5 | 13.6 | 15.8 | 18.6 | | 26.8 | 35.5 |
| Macarthur Business Park | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 1.3 | 1.9 | | 5.0 | 8.2 |
| **Total Demand** | **4.5** | **6.8** | **12.7** | **17.0** | **23.0** | **33.9** | **39.3** | **46.3** | **53.4** | | **76.2** | **91.6** |
| **Menangle Development Area demand forecast (MVA)** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** | **2031** | **2032** | | **2037** | **2042** |
| High forecast | 5.0 | 7.5 | 13.9 | 18.7 | 25.3 | 37.3 | 43.2 | 51.1 | 58.9 | | 83.9 | 100.7 |
| Central forecast | **4.5** | **6.8** | **12.7** | **17.0** | **23.0** | **33.9** | **39.3** | **46.3** | **53.4** | | **76.2** | **91.6** |
| Low forecast | 4.1 | 6.2 | 11.4 | 15.3 | 20.7 | 30.5 | 35.4 | 41.8 | 48.2 | | 68.6 | 82.4 |

Based on the central demand forecast set out above we have developed additional demand forecasts by applying a 10% increase in MVA to derive a high demand forecast and a 10% decrease in MVA to derive a low demand forecast. Although this 10% variation on the higher and lower scenarios is somewhat arbitrary, we have used the approach of selecting a variation that we believe would have equal probability across the three scenarios. Using our weighted approach to the economic evaluation, we believe that all three scenarios have an equal (33%) likelihood of occurring.

This range is selected to cover a range of factors which may change customer demand such as variations in the timing of developments or economic conditions. We note that the NSW government has made the development of this area a priority based on statements and their commitment to the extensive road works that we have observed in the area, including relocation of some of our distribution assets to facilitate the road works that we believe gives a higher degree of certainty in the customer demand and the timing of the demand as a requirement on the network to increase supply capacity.

## 2.3 Expected pattern of use

Due to the similarities in the expected residential housing development proposed in the Menangle Development Area and the large residential development at Oran Park, we have used the pattern of use from the Oran Park Zone Substation. Although Oran Park is located approximately 15km to the north-west, it has a modern contemporary residential housing stock and similar complementary developments to those expected in the Menangle area. We have also used the Oran Park area for our South Creek West area study in 2024 as we believe that it is representative of contemporary residential developments in Western Sydney.

We expect that the demand profile will be similar, including the time of day and day of week demand profiles and the seasonal variation in demand.

The penetration of rooftop solar is expected to be similar and we have assumed the solar penetration to be similar to Oran Park which has 30% of residential homes with a rooftop solar installation. The average size of rooftop solar system in the Oran Park ZS service area is 6.8kW. We expect similar sizing and penetration in the residential precincts of the Menangle development area.

The enterprise based business parks are also expected to include rooftop solar installations but are expected to have a flatter load profile and pattern of use.

The existing supply capacity currently servicing the Menangle Development Area has been included in our assessment of the identified need. The existing temporary Menangle Park ZS based on the mobile substation has a largely residential customer load, however it is also providing temporary supply to support the extensive road works in the area. We believe that the Oran Park ZS pattern of use is more representative of the eventual customer demand profile than the existing temporary substation.

Figure 3 below shows the load duration curve (LDC) for Oran Park ZS which we have used as the representative pattern of use for the Menangle Development Area. The LDC is based on the actual Oran Park ZS demand profile, however this has been normalised for the Menangle Development Area in our analysis of the identified need.

**Figure 3 – LDC for Oran Park ZS assumed to be representative for the Menangle Development Area**

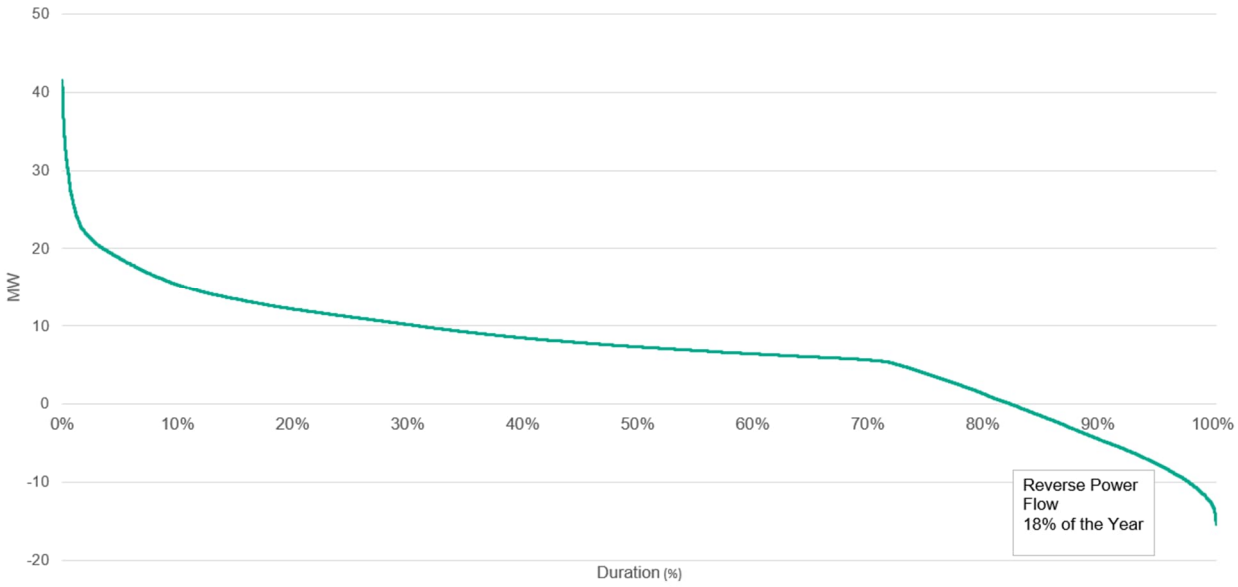
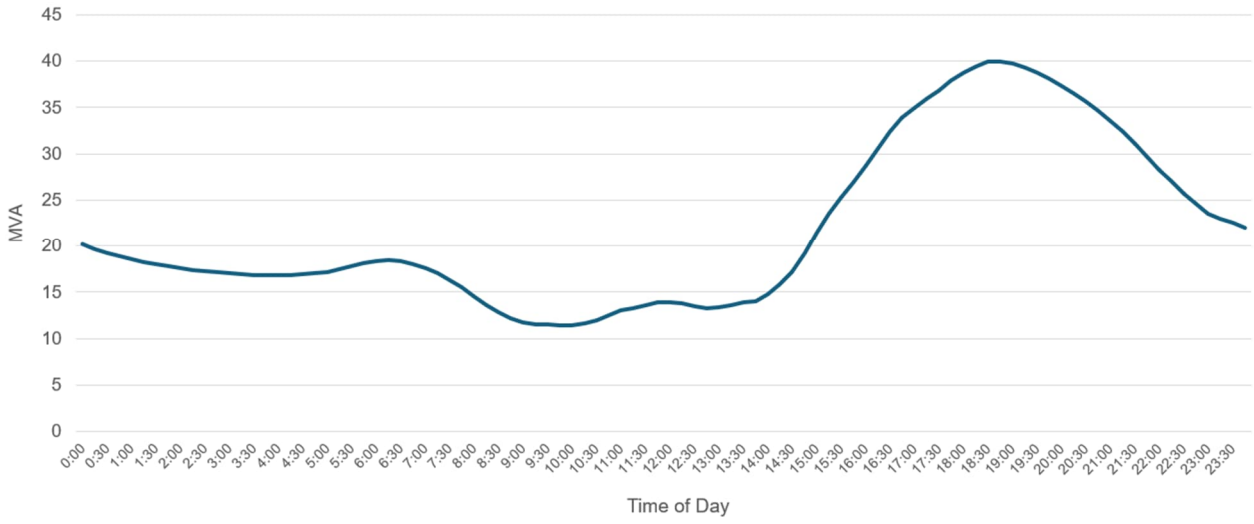



Figure 4 below shows the peak summer day profile for Oran Park ZS, that we expect to be similar to the Menangle Development Area and representative of the expected peak summer day load profile for the customers in the Menangle Development Area. The profile has been normalised in our analysis. We expect the peak demand to be on a hot summer day and at the time of day when the rooftop solar production decreases and the use of home air conditioning is high, typically between 6pm and 8pm.

**Figure 4 – Peak summer day profile for Oran Park ZS assumed to be representative of the Menangle Development Area**



## 2.4 Existing network

The Menangle Development Area is currently supplied by a 66/11 kV 15MVA mobile substation, the Menangle Park Mobile ZS. The mobile substation was commissioned in 2021 following the publication of the 'Menangle Park Greenfield Supply Area' FPAR in February 2019, which identified establishing the 15MVA mobile substation at the north end of the Menangle Development Area as the preferred option to service the initial development of the Menangle Park precinct. The mobile substation is connected to the Transgrid's Macarthur Bulk Supply Point via a single 66 kV feeder 85P.

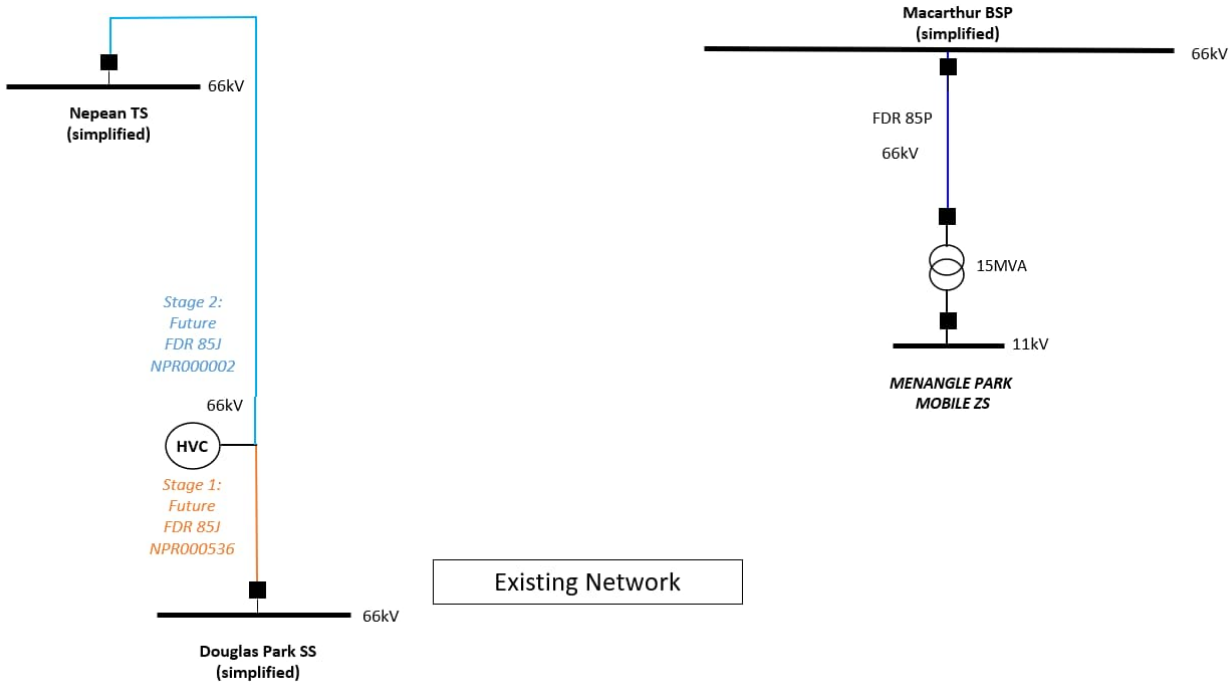
The previous RIT-D conducted in 2018 and 2019 was concluded in February 2019 with the FPAR publication. The identified need in that RIT-D was the supply to the initial development of the Menangle Park Precinct which is one of the five precincts contemplated in this RIT-D for the larger area that we have defined as the Menangle Development Area. The February 2019 FPAR indicated that a permanent Menangle Park ZS would be required at a later date.

The commissioning of the Menangle Park mobile ZS in 2021 included key network components with the 66kV feeder supply 85P and the two 11kV distribution feeders servicing the area.

**Figure 5 – Cover page of the FPAR - establishing the existing temporary Menangle Park ZS based on a mobile substation and the 66kV supply to the site and the two 11kV distribution feeders**

Figure 6 below shows a simplified single line diagram of the existing 66kV network in the Menangle Development Area. The existing 66kV network in the area includes 85P which is supplied from Transgrid's Macarthur BSP and there is 66kV feeder 85J which is supplied from Douglas Park Switching Station and will be extended to Nepean TS by a separate project.

**Figure 6 - High level simplified single line diagram of existing 66kV supply network**




The Menangle Park mobile substation has a single transformer with a total capacity of 15MVA. If there is a failure of the 15MVA transformer or a failure on the 66kV transmission feeder 85P then there is only a firm backup capacity of 5.67MVA from the adjacent zone substations via feeders NN1251 and T874.

Table 4 below shows the firm capacity available to the Menangle Development Area from the adjacent zone substations at Ambarvale ZS and Nepean ZS. For the purpose of our analysis of the available spare capacity or firm capacity for the Menangle Development Area, the value is rounded to 5.7MVA.

**Table 4 – Firm capacity available from the adjacent zone substations via the 11kV distribution network**

| Zone Substation | Backup Feeder | Design Rating (MVA) | Spare Capacity (MVA) |
|---|---|---|---|
| Ambarvale | T874 | 5.62 | 3.36 |
| Nepean | NN1251 | 6.10 | 2.31 |
| **Total** | | **11.72** | **5.67** |

Figure 7 below shows the existing 11kV distribution network in the Menangle Development Area including the existing 11kV feeders from the mobile Menangle Park ZS ( they are labelled A0724 and A0727) , it also shows the feeder ties to the adjacent zone substations and Nepean ZS (NN1251) and Ambarvale ZS (T874).

The existing 11kV network is sufficient for the existing customer base and it provides a wide geographical spread for supply to the development area to support the initial development of many of the precincts. However, the demand forecast will require additional supply capacity and also additional 11kV feeders to further cover the development area to enable customer connections.

**Figure 7 – Existing 11kV distribution network in the Menangle Development Area**

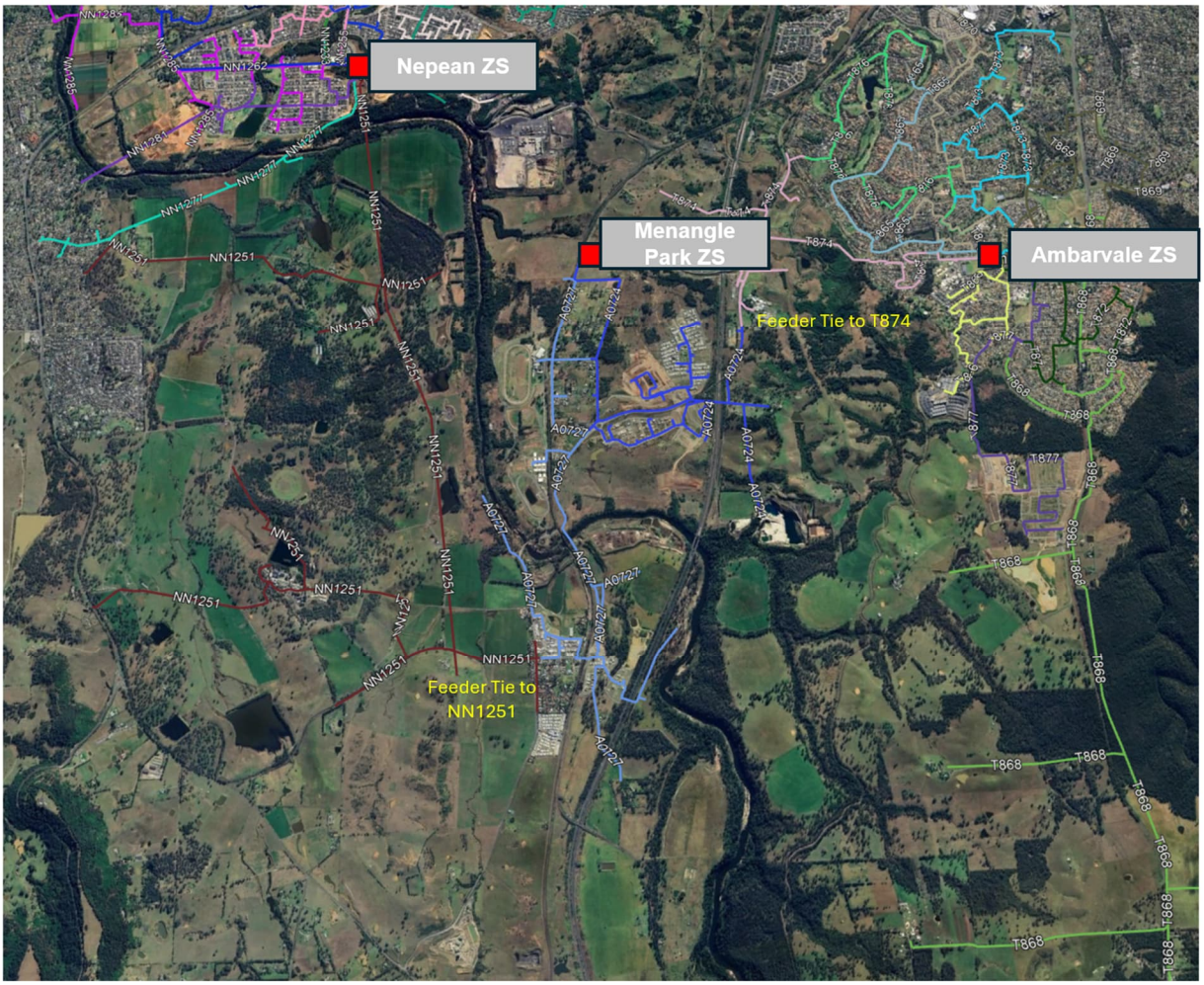


Table 5 sets out the network constraints in the Menangle Development Area.

**Table 5 – Network constraints in the Menangle Development Area**

| Network Constraint | Description |
|---|---|
| Lack of firm capacity in the existing Menangle Park mobile substation | The existing temporary Menangle Park mobile substation consists of one (1) transformer and although it is well maintained and has provided excellent service reliability since its establishment on the site in 2021, if it were to fail then there is no alternative back-up to provide 66/11 kV transformation for the Menangle Development Area. The only firm capacity is available via the 11kV distribution network from Ambarvale ZS and Nepean ZS. |
| Lack of 11kV distribution network capacity with cross zone feeder ties | The adjacent zone substations at Nepean ZS and Ambarvale ZS have limited available supply capacity. There are only two adjacent 11kV feeders from these zone substations to provide a limited back up in the event that there is an outage of the existing Menangle Park ZS. The main constraints in the 11kV distribution system are the voltage regulation due to the distance of both Nepean ZS and Ambarvale ZS from the load and the thermal capacity of the existing 11kV feeders. |

## 2.5 Expected unserved energy if action is not taken

If network augmentation is not undertaken, there will be a significant increase in expected unserved energy over the next two decades as demand in the Menangle Development Area increases.

The expected unserved energy is determined from the difference between the firm capacity available and the demand forecast for Menangle development area.

We have used the firm capacity available via the 11kV distribution network to determine the load at risk and the expected unserved energy.

Based on the demand forecast there will be load at risk from late 2024/25 due to the central demand forecast exceeding the firm capacity of the network. The total capacity of the existing Menangle Park mobile substation will be exceeded in 2026/27 when the demand forecast will exceed the 15MVA capacity.

In summary, the existing network provides:

- A limited firm capacity of 5.7MVA which is insufficient to supply the development area from 2024/25 onwards; and
- A total capacity of 15MVA which is insufficient to supply the development area from 2026/27.

Table 6 shows the demand forecasts and the existing capacity in the Menangle Development Area. It presents the three (3) demand forecast scenarios and the load at risk under the central demand forecast scenario.

Figure 8 shows the Load at risk and the three demand forecast scenarios. The existing network supply capacities from the mobile substation and the 11kV distribution network are also shown. Figure 9 clearly shows the expected unserved energy if no action is taken in the Menangle Development Area.

**Table 6 – Demand forecasts and existing capacity in Menangle Development Area**

| Demand Forecast (MVA) | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | | 2037 | 2042 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High Forecast | 5.0 | 7.5 | 13.9 | 18.7 | 25.3 | 37.3 | 43.2 | 51.1 | 58.9 | | 83.9 | 100.7 |
| Central Forecast | **4.5** | **6.8** | **12.7** | **17.0** | **23.0** | **33.9** | **39.3** | **46.3** | **53.4** | | **76.2** | **91.6** |
| Low Forecast | 4.1 | 6.2 | 11.4 | 15.3 | 20.7 | 30.5 | 35.4 | 41.8 | 48.2 | | 68.6 | 82.4 |
| **Capacity (MVA)** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** | **2031** | **2032** | | **2037** | **2042** |
| Menangle Park Mobile ZS (Total Capacity) | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | | 15.0 | 15.0 |
| Supporting 11kV Network (Firm Capacity) | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | | 5.7 | 5.7 |
| Load At Risk (MVA) (Central) | **0.0** | **1.1** | **7.0** | **11.3** | **17.3** | **28.2** | **33.6** | **40.6** | **47.7** | | **70.5** | **85.9** |

**Figure 8 – Load at risk due to insufficient capacity at Menangle Park Mobile ZS**

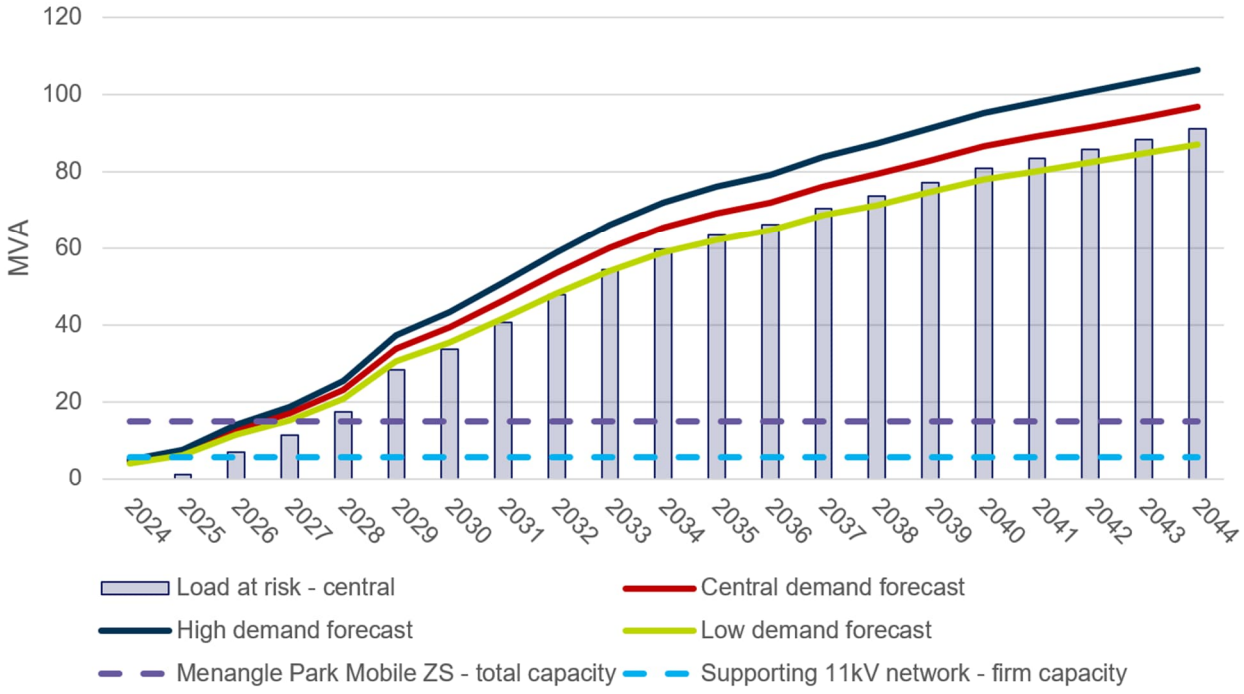
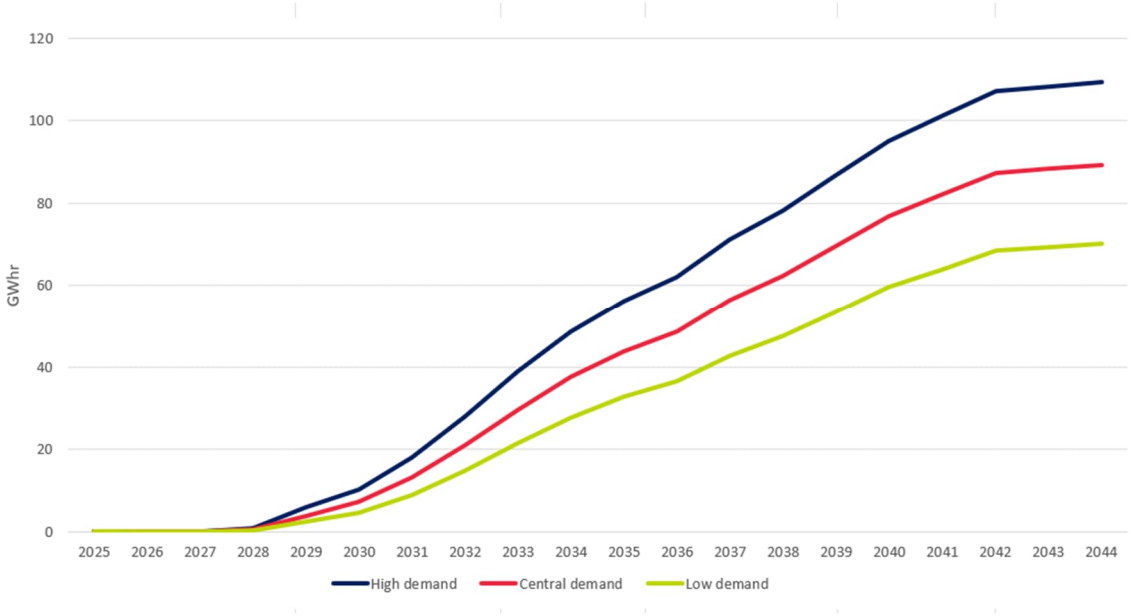



**Figure 9 – Expected unserved energy profiles in each demand scenario**



## 2.6 Proposed scenarios for the forthcoming RIT-D NPV assessment

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

We have assessed three alternative future scenarios as part of the DPAR NPV assessment, namely:

- a central demand scenario – consisting of assumptions that reflect the central demand forecast in MVA terms. This scenario represents the best estimate of demand based on estimates from network connection applications, developers, local councils and government;
- a high demand scenario – reflecting higher demand forecasts above the central demand scenario in MVA terms. This scenario has been included in the assessment to test the impact of a higher demand forecast on the ranking of the credible options; and
- a low demand scenario – reflecting lower demand forecasts below the central demand scenario in MVA terms. This scenario has been included in the assessment to test the impact of a lower demand forecast on the ranking of the credible options.

Other parameters, including capital expenditure, VCR and discount rate are held constant across the scenarios, with variations considered as part of the sensitivity analysis.

A summary of the key variables used for each scenario is provided in Table 7 below.

**Table 7 – Scenario used in the RIT-D NPV assessment**

| Parameter / Scenario | Central scenario | High demand | Low demand |
|---|---|---|---|
| Demand | Central demand forecast | High demand forecast (+10% MVA) | Low demand forecast (-10% MVA) |
| Capex | Central estimates | Central estimates | Central estimates |
| VCR | Load-weighted AER VCR of $51,318/MWh | Load-weighted AER VCR of $51,318/MWh | Load-weighted AER VCR of $51,318/MWh |
| Discount rate | 3.27% | 3.27% | 3.27% |
| Scenario weighting | 33% | 33% | 33% |

Endeavour Energy considers that all scenarios are equally likely on the basis that there is no information that would indicate each individual scenario being more likely than other scenarios, and as such they have all been given equal weighting of one third for the assessment of credible options.

# 3. Proposed options to meet the identified need

We have identified two credible network options for providing increased supply to the Menangle Development Area. Both credible options involve establishing the same two new zone substations but differ on the staging of these substations:

- Option 1 – Establish Moreton Park Road ZS in Stage 1 and then establish a permanent Menangle Park ZS under Stage 2; and
- Option 2 – Establish a permanent Menangle Park ZS under Stage 1 and then establish Moreton Park Road ZS in Stage 2.

We briefly describe each credible option and their costs below.

Endeavour Energy is only committing to the first stage of investment following this RIT-D. The second stage of the preferred option identified in the RIT-D process will be further assessed and confirmed via a separate RIT-D at a later point in time, assuming that demand forecasts continue to indicate that a second stage is required.

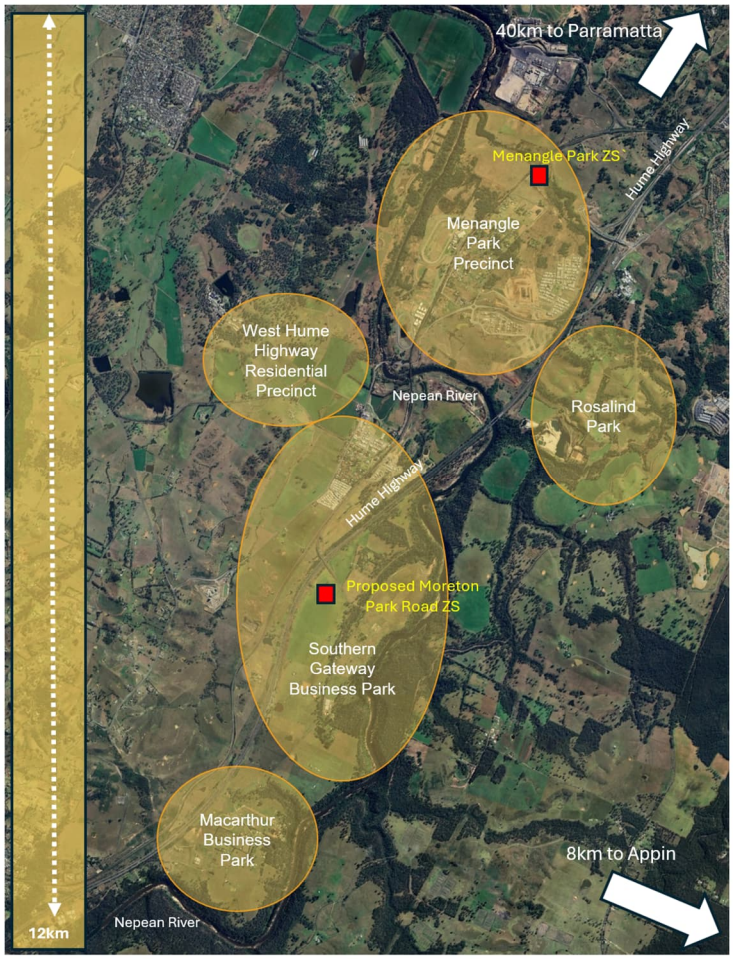
## 3.1 Option 1 – Establish Moreton Park Road ZS in 2027/28 and then establish a permanent Menangle Park ZS in 2030/31

Option 1 provides increased supply capacity to the Menangle Development Area in two stages:

- Stage 1 – establish a 66/11kV Moreton Park Road ZS with 35MVA firm capacity (70MVA installed capacity) to be commissioned in 2027/28; and
- Stage 2 – establish a permanent 66/11kV Menangle Park ZS with 35MVA firm capacity (70MVA installed capacity) to be commissioned in 2030/31. Including decommissioning of the existing 15MVA mobile substation which is currently on the site.

Figure 10 below shows the location of the stage 1 and stage 2 scope of works proposed under Option 1 in relation to the planned precincts in the Menangle Development Area. The proposed Moreton Park Road ZS would possibly be located within the Southern Gateway Business Park subject to a detailed site assessment. The permanent Menangle Park ZS would be located on the site of the existing temporary mobile substation. The two locations would be approximately 6km apart and provide geographic coverage of the entire Menangle Development Area. The total length of the development area is 12km and is centred on both sides of the Hume Highway and also the geographical features of the Nepean River. The steep terrain of the Nepean River limits the ability to provide 11kV distribution feeders at an economic cost and in some areas are not technically or environmentally feasible. Given the geographical constraints and the length of the development area, the cost of developing 11kV distribution feeders are key considerations in the assessment of the options and their ability to service the developments across the entire area.

**Figure 10 – Location of proposed stage 1 and 2 relative to the planned precincts in the Menangle Development Area**




### 3.1.1 Stage 1

Under Stage 1 of Option 1, the 66kV supply to the proposed new Moreton Park Road ZS would be from the feeder 85J which is being extended as part of a separate project to provide augmented supply to the Southern Macarthur area.

The connection to the Moreton Park Road ZS would be established during 2027/28. This is likely to require an underbore of the Hume Highway and include an overhead to underground deviation because the 66kV within the Menangle Development area will be via underground cable and use the existing or proposed public roads as a line route.

The costs of these 66kV transmission feeder works are shown in Table 9 below.

### 3.1.2 Stage 2

Under Stage 2 the 66kV supply would be established to the permanent Menangle Park ZS from the existing 66 kV feeder (85P) connected to the Macarthur Bulk Supply Point (BSP) with a new 66 kV feeder (85U) from Macarthur BSP. The existing 66 kV feeder 85P will be relocated from the existing 15MVA mobile substation and terminated onto the proposed new 66kV busbar. The mobile substation would be decommissioned and

removed from site to an appropriate storage location for future use. The decommissioning costs are included in the RIT-D analysis.[4]

### 3.1.3 Distribution Feeders

In addition to establishing two new zone substations across the two stages of the option, there is also the need under this option, Option 1 (and Option 2) to establish new 11 kV distribution feeders. The cost estimates for Option 1 include the scope of works required to establish feeders from Moreton Park Road ZS to the customer demand network load centred around the precincts of Rosalind Park and Menangle Park until 2030. These areas are located to the north of the Menangle Development Area.

A major part of the cost of these 11kV distribution feeders will be met by developers and customers to the degree that they are dedicated assets for their benefit on a user pays principle. For the purposes of this economic evaluation, we have included the costs of these feeders, consistent with RIT-D guidelines for the inclusion of costs, risks and benefits to all market participants.

Under Option 1, a customer demand of approximately 24.7MVA, based on the central demand forecast, will need to be serviced from Moreton Park Road ZS to the load centred around the precincts of Rosalind Park and Menangle Park until 2030. Because the existing Menangle Park Mobile ZS (in proximity to Rosalind Park and Menangle Park) is retained in this option, the interim demand of 24.7MVA is reduced to 9.7MVA and can be serviced by three 11 kV distribution feeders, the route length of which has been determined to be 4.5 km.

A summary of these 11kV distribution requirements and the key assumptions are set out in Table 8 below.

**Table 8 – Summary of the 11kV distribution feeder assumptions for Option 1**

| First Zone substation | Interim Demand | Number of Feeders | Distance to load centre (km) | Unit Cost ($M) | Total Cost ($M) |
|---|---|---|---|---|---|
| Moreton Park Road ZS | 9.7 | 3 | 4.5 | 3.7 | 11.1 |

### 3.1.4 Summary and costs

Table 9 sets out the scope of work and the capital cost estimates for Option 1.

The capital cost in real 2024/25 dollar terms is estimated to be $51.8 million for Stage 1 and $53.7 million for Stage 2.

The total capital cost for Option 1 is estimated to be **$105.5 million**.

Annual operating and maintenance costs are estimated to be 0.4 per cent of the capital cost for all capital components other than land.

Decommissioning costs of $0.5 million in 2030/31 for the existing Menangle Park mobile substation are included as a separate operating cost. The mobile substation would be removed from the site and transported to a storage location and be ready for future use.

[4] Decommissioning costs for the mobile substation are recognised as an operating cost in the RIT-D analysis.

**Table 9 – Scope of works and capital costs of Option 1**

| Network Component | Proposed Scope of Works | Commissioning year | Cost Estimate ($M, 2024/25) |
|---|---|---|---|
| **Stage 1** | | | |
| **Land** | Land acquisition. | 2024/25 | 5.0 |
| **Moreton Park Road ZS** | Establish an Outdoor ZS at Moreton Park Road:<br>• 66/11kV 2 x 35MVA transformers and space for a third.<br>• 2 x Transmission Feeder bays and space for a third.<br>• 3 x 66kV busbars.<br>• 2 x 11kV busbar with 6 x 11kV circuit breakers per busbar. | 2027/28 | 29.0 |
| **66kV transmission feeders** | Establish two 66kV transmission feeders connecting to the adjacent 66kV feeder 85J. Including approximately 6.0km of cable (2 x 3.0km) and 2 x UGOHs to provide the connection of the underground cables to the overhead feeder 85J. | 2027/28 | 12.8 |
| **Distribution works** | Establishment of distribution feeders to provide auxiliary supply to the new zone substation and feeder ties to the adjacent zone substations to provide load transfer and back-up capability. | 2027/28 | 5.0 |
| | **Total Capital Cost of Stage 1** | | **51.8** |
| **Stage 2** | | | |
| **11kV feeders** | Establish three 11kV feeders from Moreton Park Road ZS to serve developments in proximity to Menangle Park and Rosalind precincts prior to Stage 2 being commissioned. | 2027-2030 | 11.1 |
| **Menangle Park ZS** | Indoor Zone Substation at Menangle Park:<br>• 66/11kV 2 x 35MVA transformer and space for a third.<br>• 2 x Transmission Feeder bays and space for a third.<br>• 3 x 66kV busbars (new indoor 66kV GIS).<br>• 2 x 11kV busbar with 6 x 11kV circuit breakers per busbar. | 2030/31 | 29.6 |
| **66kV transmission feeders** | Establish new 66kV transmission feeder from Macarthur BSP to the Menangle Park ZS location to be named 85U. Disconnect existing 66kV transmission feeder 85P from mobile substation and terminate into new Menangle Park ZS 66kV busbar via GIS. | 2030/31 | 9.5 |
| **Distribution** | Provide additional feeder ties to the adjacent zone substation service areas to enhance load transfer and back-up capability. | 2030/31 | 3.5 |
| | **Total Capital Cost of Stage 2** | | **53.7** |
| **Total capital cost of Option 1** | | | **105.5** |

Figure 11 below presents a simplified single line diagram for Option 1. It represents the network configuration that would exist following the commissioning of Stage 1 and Stage 2.

**Figure 11 – Simplified single line diagram of Option 1 including Stage 1 and Stage 2**

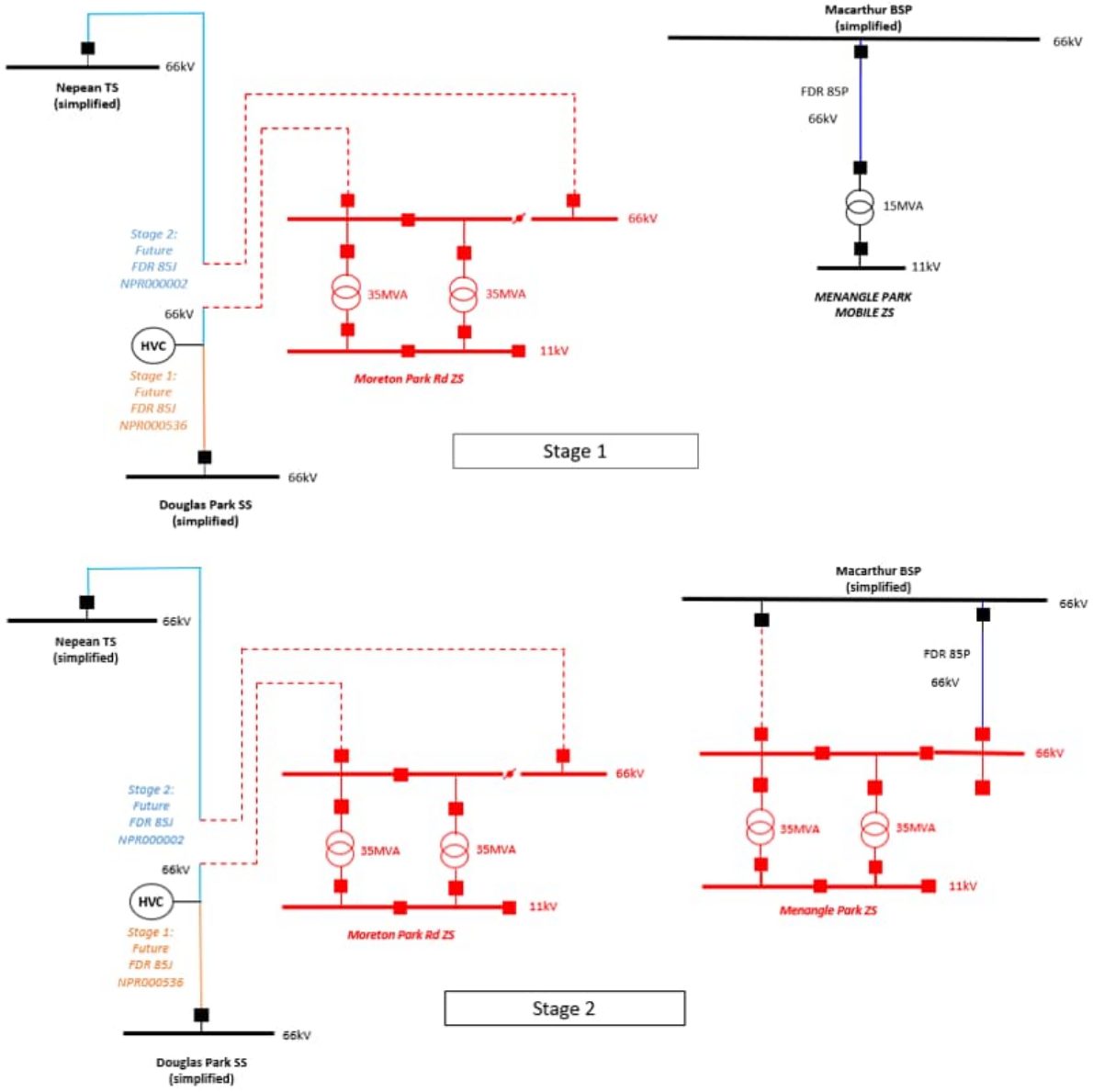
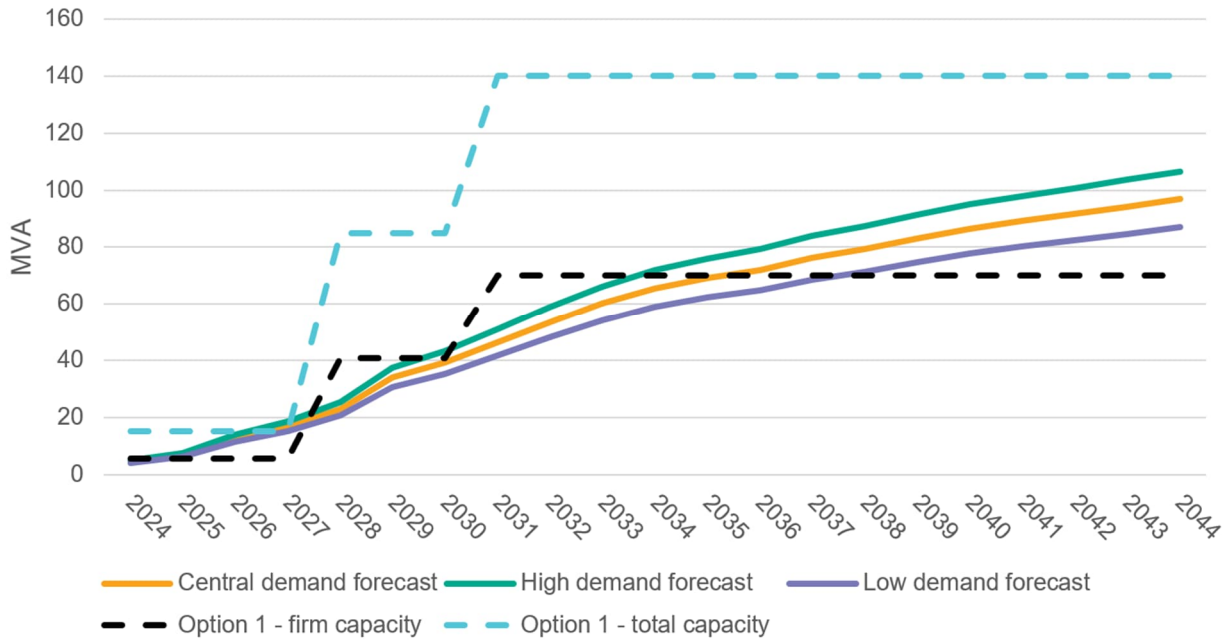


Figure 12 shows the firm and total capacity of Option 1 relative to the demand forecasts discussed in section 2.5. The second stage under this option would occur during the next regulatory period. Endeavour Energy intends to undertake a separate RIT-D before committing to this second stage. Therefore, the timing of the second stage can be reviewed in the future based on the progress of the proposed development precincts.

**Figure 12 – Demand forecasts and option 1 firm and total capacity**




We note that demand is expected to exceed the ultimate firm rating of the two proposed zone substations between approximately 2033 and 2037, such that there would be a need for further investment to augment supply in the area.

However, because the area is still developing and land is being released and rezoned, it is not clear where the final geographic centre of load will be located between the Moreton Park Road and Menangle Park sites. Consequently, adding an additional transformer to meet customer demand after say 2035 at one of the two proposed sites is currently considered by Endeavour Energy as a future project and will be further defined at the time when the location of future demand growth at Moreton Park Road ZS and Menangle Park ZS becomes known with more certainty.

## 3.2 Option 2 – Establish a Permanent Menangle Park ZS as Stage 1 and then establish Moreton Park Road ZS as Stage 2

Option 2 provides increased supply capacity to the Menangle Development Area in two stages:

- Stage 1 – establish a permanent 66/11kV Menangle Park ZS with 35MVA firm capacity (70MVA installed capacity) to be commissioned in 2027/28. Including decommissioning of the existing 15MVA mobile substation which is currently on the site; and
- Stage 2 – establish a 66/11kV Moreton Park Road ZS with 35MVA firm capacity (70MVA installed capacity) to be commissioned in 2030/31.

### 3.2.1 Stage 1

Under Stage 1 of Option 2, the 66kV supply to the proposed permanent Menangle Park ZS would be from the existing feeder 85P and a new feeder will be installed, also from Macarthur BSP, and is proposed to be named 85U

The permanent Menangle Park ZS would be located on the site of the existing mobile substation and also connect to the existing 11kV distribution network currently supplied by the mobile substation.

The existing Menangle Park ZS location is suitable for an indoor substation arrangement and we are proposing to use a GIS unit (Gas Insulated Switchgear) that Endeavour Energy currently has in our essential spares fleet. The cost of this GIS unit is estimated to be $2.7M lower than the cost of alternate options available for the proposed permanent Menangle Park ZS.

Accordingly, the cost of developing the permanent Menangle Park ZS is expected to be $2.7M lower in Option 2 compared to Option 1 ($26.9 million compared to $29.6 million). Primarily, the reason for this is that the GIS to be utilised in Option 2 for Menangle Park ZS will not available in 2030 because the unit is also suitable for 132kV primary and is likely to be allocated to another project by that time and not be available to this project.

### 3.2.2 Stage 2

The scope of work and technical details of Stage 2 of Option 2 are similar to Stage 1 of Option 1, however with commissioning to occur in 2030/31.

### 3.2.3 Distribution Feeders

In addition to establishing two new zone substations over the two stages of work in Option 2 there is also the need to establish 11 kV distribution feeders to provide customer connections and support reticulation of electricity to customers.

Under Option 2, in which Menangle Park ZS is established first, a demand of approximately 14.6 MVA (based on the central demand forecast) will need to be serviced from Menangle Park ZS to the load centred around the precincts of the Southern Gateway Business Park, West Hume Highway Residential Precinct, and Macarthur Business Park until 2031. To service the interim demand of 14.6 MVA, three 11 kV distribution feeders will be required, the route length of these feeders have been determined to be 6km.

The higher costs of 11kV feeders for this interim supply period between the stages under Option 2 compared to Option 1 is due to this additional route length (the distance to the load centre and the route itself). In summary, the Menangle Park ZS would require longer feeders to supply southern areas than Moreton Park Road ZS does to supply northern areas.

A summary of the 11kV distribution feeder requirements and key assumptions are shown in Table 10 below.

**Table 10 – Summary of 11kV distribution feeder assumptions for Option 2**

| First Zone Substation | Interim Demand | Number of Feeders | Approximate Distance to load centre (km) | Feeder Unit Cost Estimate ($M) | Total Cost Estimate ($M) |
|---|---|---|---|---|---|
| Menangle Park ZS | 14.6 | 3 | 6.0 | 4.5 | 13.5 |

### 3.2.4 Summary and costs

Table 11 shows the scope of work and capital cost estimate for Option 2.

The capital cost in real 2024/25 dollar terms is estimated to be $39.9 million for Stage 1 and $65.3 million for Stage 2. The total capital cost for Option 2 is estimated to be $105.2 million.

Routine operating and maintenance costs are estimated to be 0.4 per cent of the capital cost for all capital components other than land.

Decommissioning costs of $0.5 million in 2027/28 for the Menangle Park mobile substation are included in the assessment framework as a separate operating cost.

**Table 11 – Scope of works and costs for Option 2**

| Network Component | Proposed Scope of Works | Commissioning year | Cost Estimate ($M, 2024/25) |
|---|---|---|---|
| **Stage 1** | | | |
| **Menangle Park ZS** | Indoor Zone Substation at Menangle Park:<br>• 66/11kV 2 x 35MVA transformers and space for a third.<br>• 2 x Transmission Feeder bays and space for a third.<br>• 3 x 66kV busbars (utilising an essential spare 66kV capable GIS board).<br>• 2 x 11kV busbar with 6 x 11kV circuit breakers per busbar. | 2027/28 | 26.9 |
| **66kV transmission feeders** | Establish new 66kV feeder from Macarthur BSP (85U). Disconnect existing 66kV feeder 85P from mobile substation and terminate it into the permanent Menangle Park zone substation. | 2027/28 | 9.5 |
| **Distribution** | Provide additional feeder ties to the adjacent zone substation service areas to enhance load transfer and back-up capability.<br>The existing Menangle mobile substation has two 11kV distribution feeders and these would be disconnected from the mobile substation. | 2027/28 | 3.5 |
| | **Total Capital Cost of Stage 1** | | **39.9** |
| **Stage 2** | | | |
| **11kV feeders** | Establish three 11kV feeders to serve the southern developments from Menangle Park ZS prior to Stage 2 (Moreton Park Road ZS) being commissioned. | 2025-2030 | 13.5 |
| **Land** | Land acquisition. | 2027/28 | 5.0 |
| **Moreton Park Rd ZS** | Outdoor Zone Substation at Moreton Park Road:<br>• 66/11kV 2 x 35MVA transformer, space for a third.<br>• 2 x Transmission Feeder bays, space for a third.<br>• 3 x 66kV busbars<br>• 2 x 11kV busbar with 6 x 11kV circuit breakers per busbar. | 2030/31 | 29.0 |
| **66kV transmission feeders** | Establish two 66kV transmission feeders connecting to the adjacent 66kV feeder 85J. Including approximately 6.0km of cable (2 x 3.0km) and 2 x UGOHs to provide the connection of the underground cables to the overhead feeder 85J. | 2030/31 | 12.8 |
| **Distribution** | Establishment of distribution feeders to provide auxiliary supply to the new zone substation and feeder ties to the adjacent zone substations to provide load transfer and back-up capability. | 2030/31 | 5.0 |
| | **Total Capital Cost of Stage 2** | | **65.3** |
| **Total capital costs of Option 2** | | | **105.2** |

Figure 13 below shows a high-level single line diagram for Option 2. It represents the network configuration provided following the commissioning of Stage 1 and Stage 2.

**Figure 13 – High level single line diagram for Option 2**

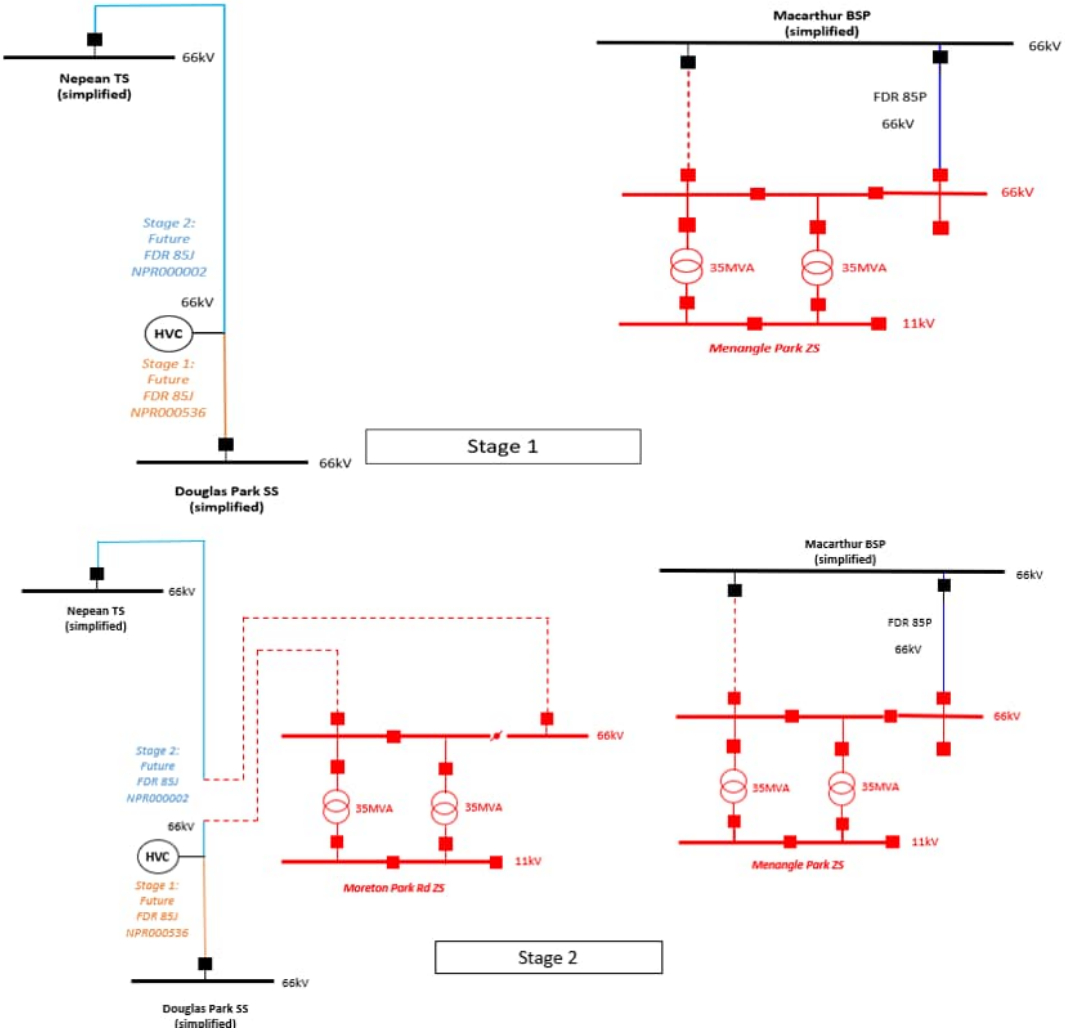
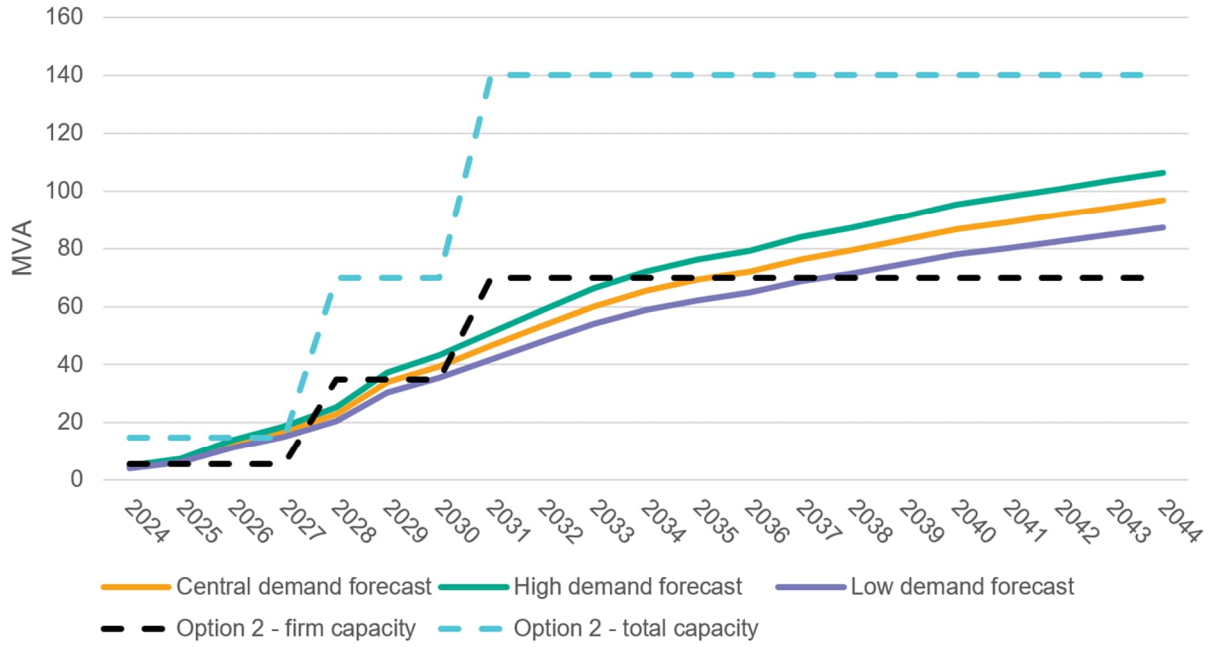


Figure 14 shows the firm and total capacity provided by Option 2 relative to the demand forecasts. The proposed staged implementation of Option 2 provides for a staged augmentation to the supply capacity to cater for the customer demand, over the three scenarios.

**Figure 14 – Demand forecasts and option 2 firm and total capacity**



# 4. Assessment of non-network solutions and SAPS

Following a review of the expected future customer demand in the Menangle Development Area and the nature of the existing customer demand and network capability, Endeavour Energy has determined that there is unlikely to be a non-network option, or SAPS option, that could form a potential credible option on a standalone basis, or that could form a significant part of a potential credible option for this RIT-D.

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

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

We have considered the requirements that a non-network option would need to meet:

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

A viable non-network option that maintains supply to all customers must be capable of reducing the estimated shortfall on the network from the firm capacity available from the 11kV network in the Menangle Development Area using the existing feeders from Nepean ZS and Ambarvale ZS.

The estimated shortfall by the end of 2024/25 is estimated to exist for 5 days in the year and is at a maximum of about 2 MWh per day in the summer period.

By 2028/29, a shortfall is estimated to exist for 365 days in the year (every day of the year) and at a maximum of about 277 MWh per day in the summer period under the central scenario. The requirement for support from non-network options is therefore substantive in both the number of days expected to be required and the magnitude of the support needed.

In addition, we note that for any non-network solution to be effective it would need to locate near, and essentially connect to, the new load connection points. We consider that any such co-location would be extremely difficult at the required capacity given the substantial land requirements for many non-network options, the planning approvals, issues with community acceptance and these being in addition to and in competition with the underlying developments expected in these areas. Further, the lack of substantial existing customer demand in the area negates the potential for demand reduction approaches.

Table 12 below summarises the expected network support requirements out to 2028/29 for any non-network solutions to form standalone options under the central scenario. We note that the requirements would increase further beyond 2028/29 as more customers connect to the Menangle Development Area. Our preliminary preferred network option would likely be commissioned in 2027/28 and therefore the FY25 and FY26 values are indicative of the load at risk and the energy at risk that is expected to exist prior to the commissioning of our network option.

**Table 12 – Network support required for a standalone option under the central scenario**

| Year | Peak load reduction required (MW) | Days required | Hours required | Total MWh required |
|---|---|---|---|---|
| FY25 | 1.1 | 5 | 13 | 6 |
| FY26 | 7.0 | 117 | 445 | 555 |
| FY27 | 11.3 | 265 | 1,325 | 2,279 |
| FY28 | 17.3 | 364 | 3,217 | 7,486 |
| FY29 | 28.2 | 365 | 6,881 | 24,582 |

Table 13 below sets out the requirements for non-network options to defer network expenditure in a cost effective manner, i.e., for them to be coupled with a network option in order to form a combined credible option.

Given that the comprehensive NPV assessment of the network options is yet to be undertaken (and will be part of the DPAR), the deferral assessment has been undertaken in this screening report using the preliminarily preferred network option, Option 2.

**Table 13 – Network support required to defer a network option under the central scenario**

| Deferral period | Deferral year | Peak demand reduction required (MW) | Days required | Hours required | Total MWh required | Deferral value[5] |
|---|---|---|---|---|---|---|
| 1 year | FY28 | 17.3 | 364 | 3,217 | 7,486 | $1.30 million |
| 2 years | FY28 | 17.3 | 364 | 3,217 | 7,486 | $2.60 million |
| | FY29 | 28.2 | 365 | 6,881 | 24,582 | |

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

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

[5] The deferral value is calculated as the net present value of deferring the preliminary preferred network option by one year using the central scenario's discount rate.

## 4.2 Assessment of specific non-network technologies

In addition to our general assessment of whether non-network options are likely able to form a potential credible option on a standalone basis, or form a significant part of a potential credible option for the Menangle Development Area, we have considered individual non-network technologies. Our assessment is summarised in Table 14.

**Table 14 – Assessment of non-network technologies**

| Non-network technology | Assessment |
|---|---|
| Grid-scale storage | Not feasible because it would not defer network investment. |
| VPP | Not feasible because the precincts being addressed in the Menangle Development Area are new developments. Uptake initially requires customers to connect to the network, which is not feasible with the existing network infrastructure. |
| Residential BESS | Not feasible because it would not defer network investment. It also requires customers to connect to the network, which is not feasible with the existing network in the development area. |
| Commercial direct load control | Not feasible because the precincts being addressed in the Menangle Development Area are new developments. Uptake initially requires customers to connect to the network, which is not feasible with the existing network infrastructure. |
| Behaviour demand response | Not feasible because the precincts being addressed in the Menangle Development Area are new developments. Uptake initially requires customers to connect to the network, which is not feasible with the existing network infrastructure. |

Endeavour Energy acknowledges that non-network solutions may be able to assist in future as demand continues to grow following the establishment of the initial network supply assets for the Menangle Development Area. We are expecting rooftop solar penetration of 30 to 40% in the new development area, however this will not be installed until the new residential dwellings are constructed which will not commence until the require network assets are commissioned.

## 4.3 Consideration of SAPS options

Under the NER, RIT-D and RIT-D application guidelines, Endeavour Energy is required to consider whether a SAPS option can fully or partly address an identified need. In practice, this relates to consideration of whether an identified need could be fully or partly addressed by converting part of our distribution network forming part of the interconnected national electricity system to a regulated SAPS.[6] Regulated SAPS are set out in section 6B of the National Electricity Law (NEL), which defines a SAPS as a system that:[7]

- generates and distributes electricity; and
- does not form part of the interconnected national electricity system.

We consider that there is not a SAPS option that could form a potential credible option on a standalone basis, or that could form a significant part of the credible option, in this RIT-D. In particular, the load requirements of the greenfield development area are significant and therefore could not be supported by a network that is not part of the interconnected national electricity system with the ability to draw on grid-connected generation sources. In forming this conclusion, we have considered both the potential to convert part of our distribution network to a regulated SAPS as well as the potential to build a new SAPS (given the greenfield nature of the network development in this area).

[6] See definition of 'SAPS option' in the NER.

[7] Section 6B(6) of the NEL.

We note that this conclusion does not preclude the development of embedded generation and storage by specific loads to meet part of their supply needs and/or as back-up to their grid connections. Such developments fall outside of the definition of a SAPS and are coupled with those loads continuing to also require their full demand to be able to be met from the grid.

# 5. Conclusion

The Menangle Development Area is forecast to require approximately 46MVA of electricity supply capacity by 2031, and 92MVA by 2042, under the central demand forecast. The current Menangle Park mobile substation and the supporting 11 kV network provides only 5.7MVA of firm capacity and 15MVA of total capacity. This does not provide sufficient supply capacity to meet the expected customer demand requirements from the new developments proposed in the Menangle area, which form part of the NSW Government's plan to support Greater Sydney's growing population through the development of new communities in land release areas, including the Greater Macarthur Growth Area.

Based on the extent of the forecast demand for the Menangle Development Area, the expected cost of network options and the capacity of the existing network to support non-network technologies, it is not considered feasible that a non-network solution will form a potential credible option on a standalone basis, or form a significant part of a potential credible option for this RIT-D. Further, SAPS options are unlikely to contribute to meeting the identified need because the size of greenfield development cannot be supported by a network that is not part of the interconnected national electricity system. Consequently, an Options Screening Report is not intended to be prepared for this RIT-D in accordance with clause 5.17.4(c) of the NER.

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

**CONTACT**

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Endeavour Energy

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