Aerotropolis Foundation Supply

Notice on screening for non-network options
October 2021

Endeavour Energy

CONTACT

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

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1. Introduction

The Greater Sydney Commission has established a clear, overarching vision for Sydney that includes the development of a third city in Western Sydney ('Western Parkland City'), underpinned by the Commonwealth government's investment in the new Western Sydney International (Nancy Bird Walton) Airport as well as the development of the Sydney Metro-Western Sydney Airport line and road infrastructure.

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

The full development of the area is estimated to result in more than 100,000 jobs and 100,000 homes.[1,2] Based on Endeavour Energy's load density forecasts and the proposed zoning of the area, the ultimate load of the area is estimated to be between 600MVA and 800MVA.

While the total ultimate demand of the Aerotropolis area and the Western Parkland City will develop over the next 50 years, there are requirements for connection of major loads in the short- to medium-term that require distribution network augmentation. We are therefore initiating a Regulatory Investment Test for Distribution (RIT-D). Specifically, the following major loads are expected to connect in the next few years and be supported by the proposed new feeder (that is to be assessed under this RIT-D):

- Sydney Science Park in 2021/22;
- Northern Gateway and University of Sydney Employment Lands in 2022/23;
- Adams Rd precinct (a warehousing and logistics estate adjacent to the Western Sydney Airport) in 2022/23;
- Western Sydney Airport in 2023/24; and
- Sydney Metro – Western Sydney Airport line in 2024/25.

We have already received formal connection applications for Western Sydney Airport, Sydney Metro and Sydney Science Park for their initial and future power requirements.

A number of these new loads are backed by Government commitments, for example:

- the Australian Commonwealth Government and the NSW Government have committed to the Western Sydney Airport, with commercial operations starting in 2026;[3] and
- the NSW Government recently granted planning approval for the Sydney Metro – Western Sydney Airport line, with testing occurring one year prior to its commissioning in 2026.[4] Sydney Metro have already started work on construction supplies, with significant load required for tunnel boring machines and other associated construction.

[1] https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/Western-Sydney-Aerotropolis/Western-Sydney-Aerotropolis-explained

[2] https://www.planning.nsw.gov.au/News/2020/Planning-for-the-biggest-jobs-boom-in-NSW-history

[3] DPIE, *Western Sydney Airport: Airport Plan*, July 2020, p. viii. Details on the Western Sydney Airport are available from https://www.westernsydneyairport.gov.au/. Prime Minster press release on Sydney Metro and Western Sydney Airport available from https://www.pm.gov.au/media/new-agreement-keeps-sydney-metro-western-sydney-airport-jobmaker-project-track

[4] DPIE, *Sydney Metro – Western Sydney Airport: State Significant Infrastructure Assessment*, July 2021, p 6. Prime Minster press release on Sydney Metro and Western Sydney Airport available from https://www.pm.gov.au/media/new-agreement-keeps-sydney-metro-western-sydney-airport-jobmaker-project-track

In addition, the NSW Government has already rezoned all land around the Aerotropolis in preparation for these developments.

'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 Western Sydney Aerotropolis 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 2024/25, based on the connection enquiries received to date.[5]

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 Aerotropolis area was included as part of our regulatory proposal to the Australian Energy Regulator (AER) for the current regulatory control period[6] and also discussed in our most recent Distribution Annual Planning Report (DAPR).[7]

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

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

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

This section sets out the key assumptions and methodologies that underpin the identified need for this RIT-D. These assumptions have been used in making our determination that that there will not be a non-network

[5] While a number of loads are expected to connect prior to 2024/25, we have interim supply arrangements in-place for these loads. These interim arrangements are expected to become insufficient from 2024/25.

[6] Endeavour Energy, *Revised Regulatory Proposal*, January 2019, p 21-22.

[7] Endeavour Energy, *Distribution Annual Planning Report*, December 2020, p 67.

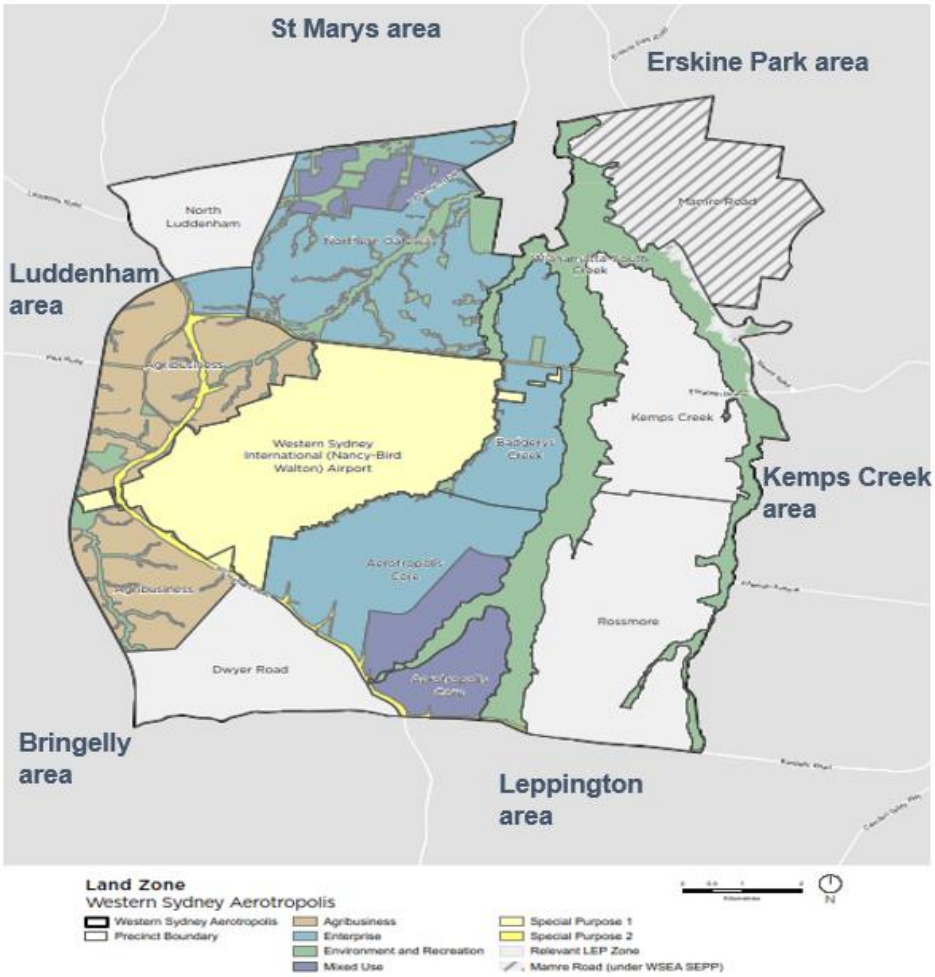
option that is a potential credible option on a standalone basis, or that forms a significant part of a potential credible option, ie, in accordance with NER clause 5.17.4(c).

2.1 Relevant area of our network

The area referred to as 'Aerotropolis' covers the currently mainly rural area that is bound by the existing established locations of Erskine Park, St Marys, Luddenham, Bringelly, Leppington and Kemps Creek. The land area is approximately 11,000 hectares.

Figure 1 shows the Land Use Zoning for the area and the boundary of the precincts within the Aerotropolis.

Figure 1 – Western Sydney Aerotropolis Precinct Land Zones[8]



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

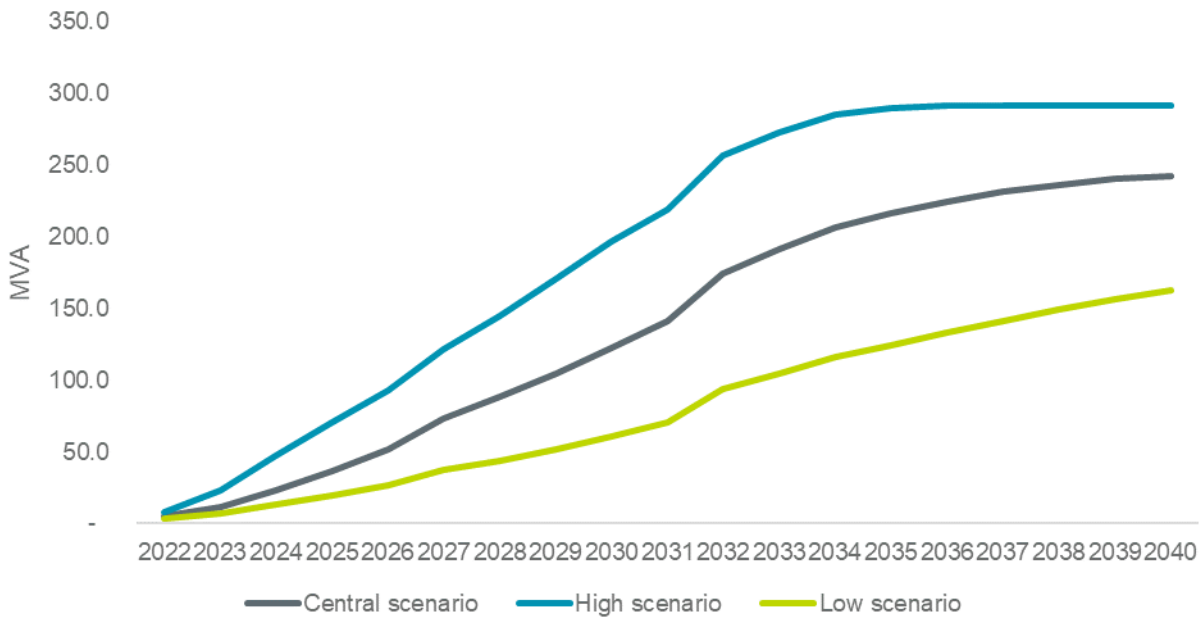
[8] NSW Government, *Western Sydney Aerotropolis Summary of Key Planning Documents*, December 2019, p. 11.

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

2.2 Load forecasts

Figure 2 below shows our forecast peak summer load forecasts under a central, low and high demand scenario for the Aerotropolis area.

Figure 2 – Aerotropolis Foundation Supply (132kV) Demand Forecasts, 2022-2040



Each scenario reflects different assumptions regarding the timing and quantity assumed for future load connections. In particular, we have considered different growth rates and different eventual load requirements for the five key loads outlined earlier:[9]

- Sydney Science Park;
- Northern Gateway and University of Sydney Employment Lands;
- Western Sydney Airport;
- Adams Rd precinct; and
- Sydney Metro – Western Sydney Airport line.

The aggregate new loads across the three scenarios can be summarised as follows:

[9] In addition, there are a range of other significant related loads expected to connect to other feeders in the same area in the next few years – namely: (1) Mirvac Enterprise Precinct and Sydney Water Factory in 2022/23; (2) new agribusiness load stemming from a new large government-designated agricultural precinct in 2024/25; and (3) Aerotropolis core (Airport CBD and Western Parklands City Centre) in 2024/25. These three loads are presented here for additional context only and have not been included in any of the demand forecasts in this report, since they are expected to connect to different feeders than the one to be covered by the RIT-D for the Aerotropolis foundation supply.

- the central scenario assumes that these five key customer connections eventually total 243 MVA in 2039/40;
- the low scenario assumes the same five key customer connections as under the central scenario, albeit at lower growth rates and with only 80 per cent of the total load assumed in the central scenario eventually connecting (ie, under the low scenario, demand reaches 194 MVA in 2039/40); and
- the high scenario assumes the same five key customer connections as under the central scenario, but with higher growth rates and with 120 per cent of the total load assumed in the central scenario eventually connecting (ie, under the high scenario, demand reaches 292 MVA in 2039/40).

The range of demand reflected across the three scenarios is considered to represent the extreme of the lower and upper bounds of future demand in the Aerotropolis area. The variation between scenarios can also be considered to capture some of these loads going ahead as currently anticipated, where others have a slower or faster trajectory, as well as contributions to overall load growth from other smaller loads that is anticipated in the area. Noting that we have received formal connection applications for Western Sydney Airport, Sydney Metro and Science Park, and the potential portfolios effects, we consider the central scenario is the most likely.

While all customer connections are assumed to occur between 2022/23 and 2024/25, load drawn for each customer continues to increase for a number of years after before becoming constant. Specifically, the five key loads remain constant from the following years:

- Sydney Science Park from 2040/41;
- Northern Gateway (multiple developers) from 2040/41;
- Adams Rd precinct from 2030/31;
- Western Sydney Airport from 2026/27 before a step-up in 2031/32 (and constant from then); and
- Sydney Metro – Western Sydney Airport line from 2033/34.

Due to the confidentiality of these forecast loads, we are not able to present a further breakdown of the composition of demand under each scenario.

The combined demand forecasts shown above are based on currently available information derived from the plans of NSW government planning groups, infrastructure providers and private developers. There is a degree of uncertainty with regards to the demand requirements, as they are dependent upon individual commercial decisions of the development proponents, which has been reflected in the different load scenarios shown above.

As outlined in section 2.4 below, there is no capacity to connect these loads to the existing distribution network after 2024/25. All existing loads in the area will remain supplied by the existing zone substations.

The table below presents a breakdown of load types for the spot load connections under the central demand forecast based on connections analysis undertaken by our capacity planning team, using information provided in the network connection enquiry/application and what we know about the load being considered for connection. Due to confidentiality, we have aggregated loads to broad types of customers.

Table 1 Breakdown of load types for spot load connections[10]

Load	Commercial	Industrial	Residential	Total
MVA	222	33	15	270

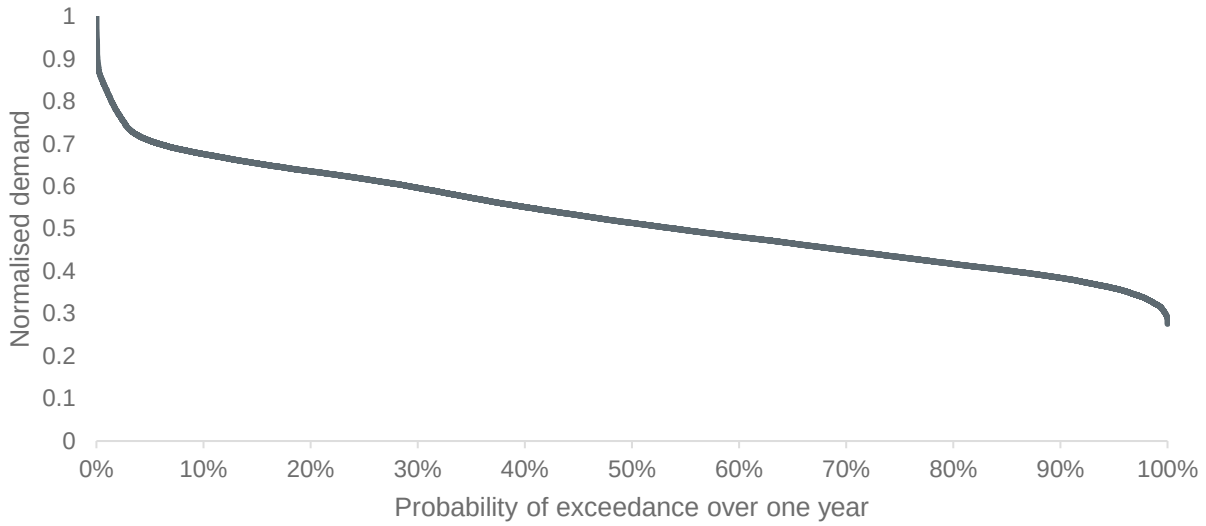
2.3 Expected pattern of use

Since the forecast loads are yet to connect, we have assessed the identified need using a composite demand profile, created by scaling an existing load profiles that we expect will have similar demand characteristics as the forecast load (e.g. time and seasonal demand variations).

Specifically, the composite demand profile is comprised of a North West Metro load profile for the metro forecasted load, and a Wetherill Park zone substation load profile (an existing commercial/industrial site) for the remaining loads. The existing supply capacity to the area has been included in our assessment of the identified need, particularly covering the interim supply capacity to the Metro, Science Park and Western Sydney Airport (outlined line section 2.4 below).

Figure 3 presents the normalised load duration curve (LDC) assumed for the Aerotropolis load based on the composite demand profile.

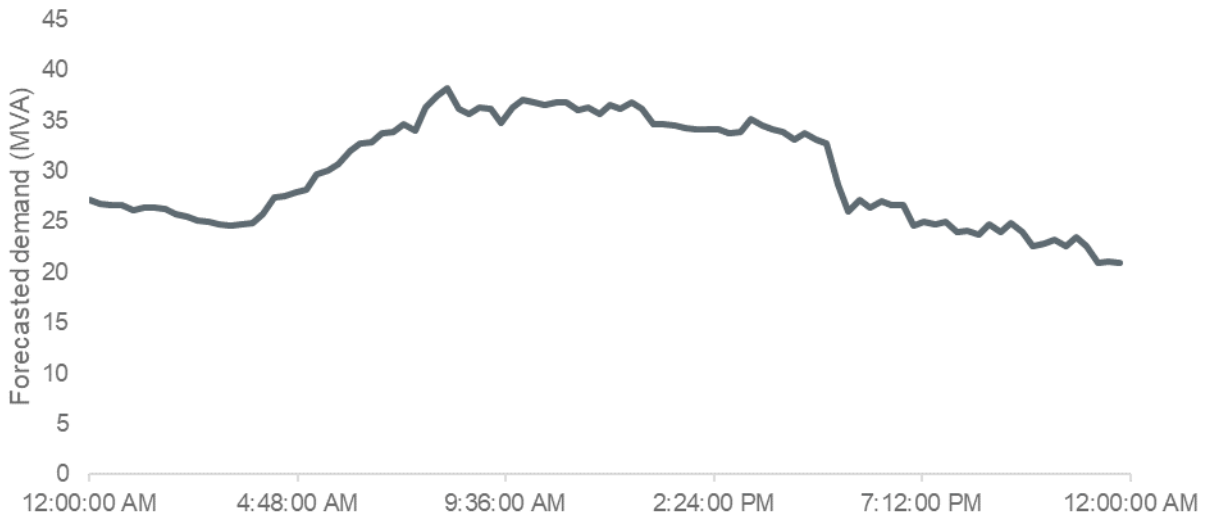
Figure 3 – Normalised LDC assumed for Aerotropolis



Similarly, Figure 4 presents the peak load profile for summer assumed for the Aerotropolis load based on the composite demand profile.

[10] Table 1 sets out a breakdown of load types for undiversified spot load, which is the maximum system load. The applicable diversity factor for the spot loads is 90 per cent, which translates to a diversified spot load of 243 MVA.

Figure 4 – Peak summer day profile assumed for Aerotropolis



2.4 Existing network

The existing distribution network in the Aerotropolis area is insufficient to meet the supply needs of the Aerotropolis area from 2024/25, even under the low demand scenario outlined above (which we consider to be an extreme lower bound).

The existing network is a low capacity 33kV network that was originally designed to meet the existing and historical rural and residential load base. The current network is also predominantly overhead construction and will likely require future replacement or relocation due to the road widening development throughout the area to cater for the increased transport requirements of the Aerotropolis.

The new load connections require high capacity 132kV connection to customer locations and so it is not possible to use the existing 33kV zone substations to supply these connections via the existing distribution systems.

To cater for the early construction period of the major customers in Aerotropolis, the following supply arrangements are currently in-place as interim supplies until a permanent solution is able to be commissioned:

- Metro rail line construction phase supply (including for their tunnel boring requirements) with interim supply from Claremont Meadows, Kemps Creek and Bringelly zone substations;
- Sydney Science Park initial supply from Luddenham zone substation (ZS), including an 11kV feeder re-arrangement to ensure secure interim supply; and
- Western Sydney International airport initial supply from the 33kV network via connection to Feeder 465 at Elizabeth Drive.

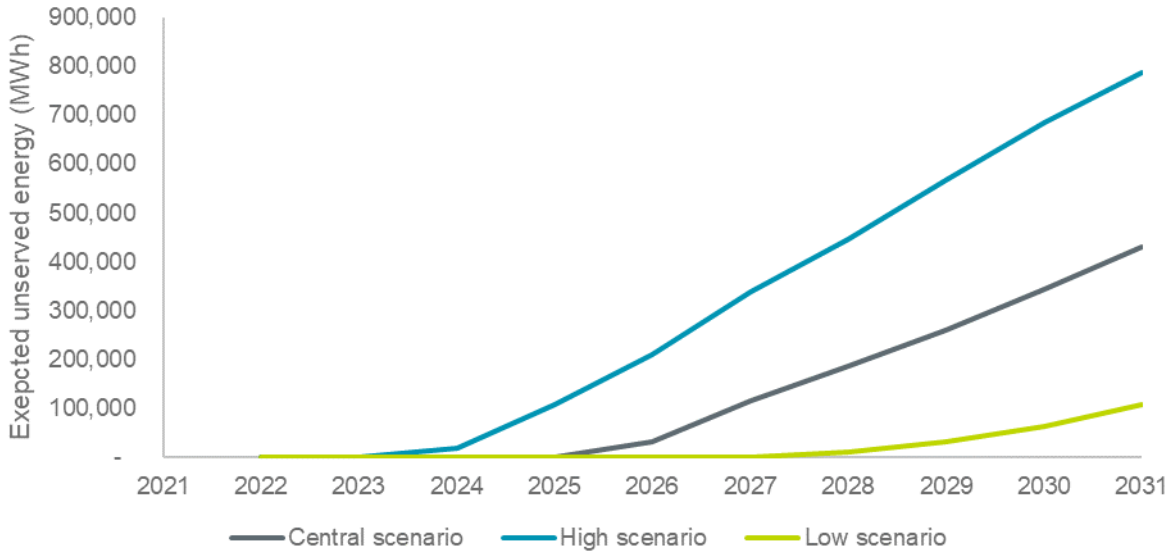
The existing supply capacity to the area has been included in our assessment of the identified need, including these interim supply capacities.

2.5 Expected unserved energy if action is not taken

If network augmentation is not undertaken, there will be significant unserved energy in our network in the next few years. For example, both the Metro and the Sydney Science Park load points are forecast to exceed their existing interim supply arrangements by 2023/24.

Figure 5 below presents the estimated unserved energy if no action is taken under each of the three demand scenarios. We have only presented the next ten years to enable the differences to be clearly seen in the initial years (but we note that the unserved energy forecasts are expected to increase significantly after 2031).

Figure 5 – Expected unserved energy under the base case (ie, with no investment)



We propose to cap the expected future unserved energy, in MWh, as part of the forthcoming DPAR NPV assessment, as the uncapped value of unserved energy will otherwise become unrealistically high (since, in reality, we would undertake investment to avoid widespread customer outages). Using the very large uncapped values has the potential to distort the comparison of net market benefits between credible options. The approach of capping USE in the base case is in-line with other RIT-Ds (and RIT-Ts) and does not affect the ranking of the overall options.[11,12]

2.6 Proposed scenarios for the forthcoming RIT-D NPV assessment

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

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

[11] We note that this is also consistent with the approach proposed by Dr Biggar in his review of the Powering Sydney's Future RIT-T (see: Biggar, D., *An Assessment of the Modelling Conducted by TransGrid and Ausgrid for the "Powering Sydney's Future" Program*, May 2017, p. 27). While Dr Biggar suggests capping the 'congestion cost' (calculated as the unserved energy valued at the VCR) in such assessments, we consider it more intuitive to cap the underlying unserved energy, in MWh, and continue to value it at the appropriate VCR. This is the approach that has been adopted by other DNSPs and is effectively equivalent to the approach proposed by Dr Biggar.

[12] See for example: Ausgrid, *Ensuring reliable supply for the Sydney Airport network area*, Final Project Assessment Report, 6 March 2020, p. 15.

A summary of the key variables/framework expected to be used for each scenario is provided in Table 2 below.

Table 2 – Proposed scenarios for the forthcoming RIT-D NPV assessment

Parameter/ scenario	Central scenario	High benefits	Low benefits
Capex	Central estimates	-25%	+25%
Demand	Central demand forecast (see section 2.2)	High demand forecast (see section 2.2)	Low demand forecast (see section 2.2)
VCR	Load-weighted AER VCR	+30%	-30%
Discount rate	3.26%	2.22%	4.30%

We propose to assess all credible options across a 20-year assessment period.

3. Proposed network options to meet the identified need

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

3.1 Option 1 – 132 kV option from South Erskine Park ZS to Bringelly ZS, mixed overhead and underground lines following an Endeavour Energy easement

Option 1 involves the construction of a 26.5km 132kV feeder with 275MVA capacity that spans between South Erskine Park zone substation (ZS) to the Bringelly ZS. The feeder will have both overhead sections over a distance of 10.6km and a longer 15.9km section that is underground, using our existing distribution corridor.

An anticipated drawback of Option 1 is that it may require complex environmental assessment and prolonged community consultation due to the overhead portion. The requirement for additional consultation is also likely to be increased because of the need for us to acquire a separate easement. We have direct, recent experience of the community consultation and environmental assessment required for overhead line projects through our recent Grange Avenue project, which has highlighted the potential for extended delays. Several specific features of Option 1 suggest that prolonged community consultation would be required, including that it would be likely to require significantly taller poles being used (due to the 132kV overhead conductor required) and would also require joint use (including the 11kV and low-voltage on the same new poles), resulting in considerably higher visibility of overhead conductor for nearby residents. We have also observed that there is a much higher acceptance of underground cable solutions in community feedback in consultation, with low or negligible opposing feedback (eg, the recent consultation for the transmission supply for Box Hill receiving little or no community feedback opposing the underground solution).

Recent experience with other projects involving overhead lines has demonstrated that the risk that this consultation could lead to delays, risking the ultimate technical feasibility of this option (i.e., its ability to meet the identified need by 2024/25). For the purposes of the DPAR assessment, we plan to assume that this option is technically feasible. However, we will investigate further the potential impact of any delay under this option, and its effect on the expected net benefits of Option 1 in the forthcoming DPAR.

Option 1 has another disadvantage relating to the overhead line section, in that this section would in all likelihood need to be relocated to an underground position in future, as part of the planned widening of Luddenham Road (expected in the next 7 to 10 years). The planned M12 motorway is expected to cross Luddenham Road and lead to the upgrade of the road from its current rural design to an urban road. While it is difficult to determine this cost to a high degree of accuracy at this stage, we estimate this relocation cost could be around $20 million. While the future relocation cost may not be borne directly by Endeavour Energy or other NEM participants (and so would not be captured in the RIT-D analysis), these costs represent an economic cost to the wider community. Moreover, there is a risk that the RMS permitting process and/or Penrith City Council may refuse permits or approvals for overhead lines, due to the complication with future development plans. This would again result in this option being not technically feasible.

Since constructing Option 1 requires impacting joint use poles, there is expected to be substantive outages during construction. This does not apply for Option 2 or Option 3 as they do not involve joint use poles.

Notwithstanding the issues with Option 1 outlined above, we propose to include Option 1 in the DPAR NPV assessment in order to understand its potential net benefit compared to the other options.

The total cost of this option is estimated to be $106.1 million. Assuming no delays arising from consultation processes, construction could start in 2021/22 and be completed in 2024/25, with commissioning of the feeder in the same year as construction is complete.

Table 3 Scope of works for Option 1

Scope	Description	Cost Estimate ($M)
Mains	132kV 275MVA 26.5km overhead-underground hybrid construction from 26.5km line route from South Erskine Park ZS to Bringelly ZS • 10.6 km overhead line route • 15.9 km underground line route • Including a 4.0km section of the route to provide supply to the Sydney Metro Stabling Facility to be located at Orchard Hills. • Switching station enabling connection of Sydney Metro Stabling Facility. • Using existing cable ducts on The Northern Road and road reserves on line route. • Associated protection and communications fibre. • New easement costs	97
Substation Connection Enablement	South Erskine Park ZS Connection Works • Use feeder bay provided in existing design for connection of the new feeder • Circuit Breaker and Secondary systems (CTs/VTs, SCADA).	0.6
	Bringelly ZS Connection Works • Extend existing 132kV busbar. • Connect the new feeder • Relocate existing 132kV feeders 9L6 (Oran Park ZS) and 2C5 (South Leppington). • Relocate existing 11kV Feeders and Capacitor Banks • Establish new control room	8.5
Total	132 kV option from South Erskine Park ZS to Bringelly ZS, mixed overhead and underground lines following an Endeavour Energy easement	**106.1**

3.2 Option 2 – 132 kV option from Sydney West BSP (TransGrid) to Bringelly ZS, using TransGrid's 330 kV easement and existing distribution corridor

Option 2 involves the construction of a 27km 132kV feeder with 275MVA capacity that spans from South Erskine Park ZS to Bringelly ZS. The feeder uses TransGrid's 330kV easement and existing distribution corridor.

There are a number of perceived difficulties with this option at this stage, namely:

- it may be difficult to obtain a connection point at TransGrid's Sydney West bulk supply point (BSP) for the northern termination of the proposed feeder, due to feeder bay availability.
- the line route follows TransGrid's 330kV transmission corridor, which would pose access issues for Endeavour Energy in carrying out routine inspection and maintenance; and
- there is a need to acquire additional easements for the sections coming out of the TransGrid 330kV easement and into Endeavour Energy's distribution corridor.

Notwithstanding these potential practical difficulties, we propose to include Option 2 in the DPAR NPV assessment to compare its net benefit with those of the other options.

Option 2 would not suffer from the significant outages during construction that Option 1 does since there are no joint use poles impacted.

The total cost of this option is estimated to be $104.1 million.

Construction could start in 2021/22 and be completed in 2024/25, with commissioning of the feeder in the same year as construction is complete.

Table 4 Scope of works for Option 2

Scope	Description	Cost Estimate ($M)
Mains	132 kV 275 MVA 26.8 km overhead-underground hybrid construction from Sydney West BSP to Bringelly ZS • 12.7 km overhead line route • 14.1 km underground line route • Using existing cable ducts on The Northern Road and road reserves on line route. • Associated protection and communications fibre. The following have not been included in this cost estimate: • 4.0km section of the route to provide supply to the Sydney Metro Stabling Facility to be located at Orchard Hills. • Switching station enabling connection of Sydney Metro Stabling Facility.	93.6
Substation Connection Enablement	South West Connection Works • Use feeder bay provided in existing design for connection of the new feeder • Circuit Breaker and Secondary systems (CTs/VTs, SCADA).	2.0
	Bringelly ZS Connection Works • Extend existing 132kV busbar. • Connect the new feeder • Relocate existing 132kV feeders 9L6 (Oran Park ZS) and 2C5 (South Leppington). • Relocate existing 11kV Feeders and Capacitor Banks • Establish new control room	8.5
Total	132 kV option from Sydney West BSP (TransGrid) to Bringelly ZS, using TransGrid's 330 kV easement and existing distribution corridor	**104.1**

3.3 Option 3 – 132 kV option from South Erskine Park ZS to Bringelly ZS, underground, mostly in public road reserve with limited need for easements.

Option 3 involves the construction of a 26.5km 132kV feeder with 275MVA capacity that spans the same route as Option 1 between South Erskine Park ZS and the Bringelly ZS. The feeder will be located entirely underground, mostly in public road reserve and have limited need for easements.

This option utilises the same line route as Option 1 but is placed completely underground to avoid the difficulties and risks identified with the overhead portion of Option 1 (as outlined above).

The total cost of this option is estimated to be $66 million. Construction could start in 2021/22 and to be completed in 2024/25, with commissioning of the feeder in the same year as construction is complete.

There is a notable reduction in cost for this option when compared to Option 1 and Option 2 since it is entirely underground. The above ground components of Option 1 and Option 2 add significantly to their estimated easement costs as a result of high land values in the area.

Option 3 would not suffer from the significant outages during construction that Option 1 does since there are no joint use poles impacted.

Table 5 Scope of works for Option 3

Scope	Description	Cost Estimate ($M)
Mains	132kV 275MVA 26.5km Underground construction • 26.5km line route from South Erskine Park ZS to Bringelly ZS using a total underground feeder construction. • Including a 4.0km section of the route to provide supply to the Sydney Metro Stabling Facility to be located at Orchard Hills. • Switching station enabling connection of Sydney Metro Stabling Facility. • Using existing cable ducts on The Northern Road and road reserves on line route. • Associated protection and communications fibre.	57.0
Substation Connection Enablement	South Erskine Park ZS Connection Works • Use feeder bay provided in existing design for connection of the new feeder • Circuit Breaker and Secondary systems (CTs/VTs, SCADA).	0.6
	Bringelly ZS Connection Works • Extend existing 132kV busbar. • Connect the new feeder • Relocate existing 132kV feeders 9L6 (Oran Park ZS) and 2C5 (South Leppington). • Relocate existing 11kV Feeders and Capacitor Banks • Establish new control room	8.5

Total	132 kV option from South Erskine Park ZS to Bringelly ZS, underground, mostly in public road reserve with limited need for easements.	**66.1**

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

We have also considered whether there are other credible options that could also meet the identified need. The table below summarises three other options we have considered and outlines the reasons why these options are not proposed to be progressed any further as part of this RIT-D.

Table 6 – Options considered but not progressed

Option	Reason(s) for not progressing
33kV supply option	Extensively augmenting the existing 33kV network to provide supply into the Aerotropolis would involve establishment of duplicate 33kV feeders from Mount Druitt Transmission Substation, Glenmore Park (Regentville BSP) and West Liverpool Transmission Substation, with route lengths of between 30-40km and with considerable design and construction issues (including major road crossings) to be overcome. The estimated cost of this 33kV supply option is in excess of $200 million and is not expected to provide any greater market benefits than the three options outlined above. This option is therefore not considered 'commercially feasible' under the RIT-D.
Single 132kV feeder and use of existing 33kV network (as discussed in our regulatory proposal for the current period[13])	At the time of our regulatory proposal, we put forward an option which reflected a single 132kV feeder, combined with use of the existing 33kV network. This option is not now considered 'technically feasible' under this RIT-D, since it solely focused on connecting the new airport load and would not be sufficient to cover the other major loads that are now also seeking connection to our network.
Staging any of the three 132 kV options outlined above	We have considered whether it is possible to stage any of the 132 kV options, to reflect the timing of future major load connections. Given the size of the initial loads that are anticipated to connect and their initial expected demand, the full capability of the 132 kV options will be required from 2024/25 even under the low demand scenario (which is considered an extreme lower bound). In addition, due to the proposed underground cable construction of (all or part of) the 132kV feeder, it cannot be constructed with a lower capacity and subsequently augmented over time as load increases, since this would require several repetitive reconstruction events on the

[13] Endeavour Energy, *Revised Regulatory Proposal*, January 2019, p 21-22.

	feeder making it disruptive to the greater Aerotropolis area including road opening and restoration of newly built or widened roads. Overall, staging of the options is not considered ‘technically feasible’ under the RIT-D.

4. Assessment of non-network solutions

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

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

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

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

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

Table 7 below sets out the requirements that a non-network option would need to satisfy in order to form a stand-alone credible option (ie, without being combined with a network solution).

A viable non-network option must be capable of reducing the estimated shortfall on the network between South Erskine Park and Bringelly zone substations to retain supply to all customers. Under the central scenario, by the end of 2024/25, a shortfall is estimated to exist for 146 days in the year and is at a maximum of about 97 MWh per day in the summer period. By 2027/28, a shortfall is estimated to exist for 365 days in the year and at a maximum of about 1,046 MWh per day in the summer period under the central scenario. The requirement for non-network solutions is therefore substantive in both the number of days expected to be required and the magnitude of the support needed.

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

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

Table 7 – 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	11.2	146	620	1,289
FY26	26.9	308	5,213	32,212
FY27	47.9	364	8,517	117,042
FY28	63.3	365	8,760	187,386

Table 8 below sets out the requirements for non-network options in order to cost effectively defer network expenditure, ie, to be coupled with a network option in order to form a combined credible option.

Given that the comprehensive NPV assessment of the network options is yet to be undertaken (and will be part of the forthcoming DPAR), the deferral assessment has been undertaken in this screening report

using the preliminarily preferred network option, Option 3 (which is the lowest cost and lowest risk option out of the three network options outlined above).

Table 8 – Network support required to defer a network option under the central scenario

Deferral period	Deferral year	Peak load reduction required (MW)	Days required	Hours required	Total MWh required	Deferral value[14]
1 year	FY25	11.2	146	620	1,289	$2.2M
2 years	FY25	11.2	146	620	1,289	$4.4M
	FY26	26.9	308	5213	32,212	
	Total	26.9	454	5833	33,501	

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

Similarly, the amount of load reduction that would be required in order to enable a deferral of network augmentation by one year is also 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.

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 Aerotropolis RIT-D, we have individually considered both demand management and new generation/storage below.

4.2.1 Demand management

The existing demand in the Aerotropolis area is based on the existing rural/residential areas served by the Luddenham, Bringelly and Kemps Creek zone substations.

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

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

- a mix of transport, logistics and warehousing taking advantage of the access points to major motorways in the area for road transport (M4 and M7 motorways are nearby);

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

- industries supporting the growth and development of the Western Sydney Area, including building products and concrete batch processing centres; and
- manufacturing.

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

The magnitude of demand reduction required to achieve a one-year deferral of network investment (as outlined in Table 8 above), given the limited capacity of existing load to reduce demand, makes the use of demand management impractical as part of a combined option.

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

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

4.2.2 Generation and/or storage

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

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

Energy storage could contribute to peak demand after sunset but this would involve a significant cost (and would also require comparable network augmentation to operate). For example, for a BESS to meet the worst day in 2024/25 under the central demand forecasts it would need to be at least 11.5MVA/110MWh (not including any additional margin for if that year ended up being a higher POE year), which we consider would cost between $50-100 million, depending on the forecast assumptions.

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

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

4.2.3 Other non-network technologies

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

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

5. Conclusion

The development of a third city in Western Sydney, including the new Western Sydney Airport as well as the development of the Sydney Metro-Western Sydney Airport line and other key developments, is forecast to add significantly to electricity demand in Endeavour Energy's distribution network in the short- to -medium-term. Currently, there are at least five major loads that are exploring connection to our network and whose load directly affects the identified need for this RIT-D, of which Western Sydney Airport, Sydney Metro and Sydney Science Park have already Submitted formal connection applications. Under our central forecasts, these new loads connecting are expected to add more than 50 MVA in aggregate by 2025/26 and rise to over 240 MVA by 2039/40.

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

We note that for future network developments in the Aerotropolis area, each project will require a similar screening for feasible non-network options under their respective RIT-Ds and, if deemed feasible, Endeavour Energy will release a Non Network Options Report requesting proposals and conduct an economic evaluation with the various network options. At this stage, these expected developments and timings are as follows:

- a Sydney Metro switching station in 2023/24;
- a new zone substation within the Northern Gateway precinct in 2023/24;
- a new Science Park zone substation or switching station in 2024/25;
- 132kV BSP capability from TransGrid's Kemps Creek substation in 2024/25;
- a new zone substation in the Mirvac enterprise precinct in 2026/27;
- Western Sydney Airport 132kV switching station in 2029/30;
- Aerotropolis core zone substation for the airport CBD and city centre in 2029/30; and
- Agribusiness zone substation or switching station in 2034/35.

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

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