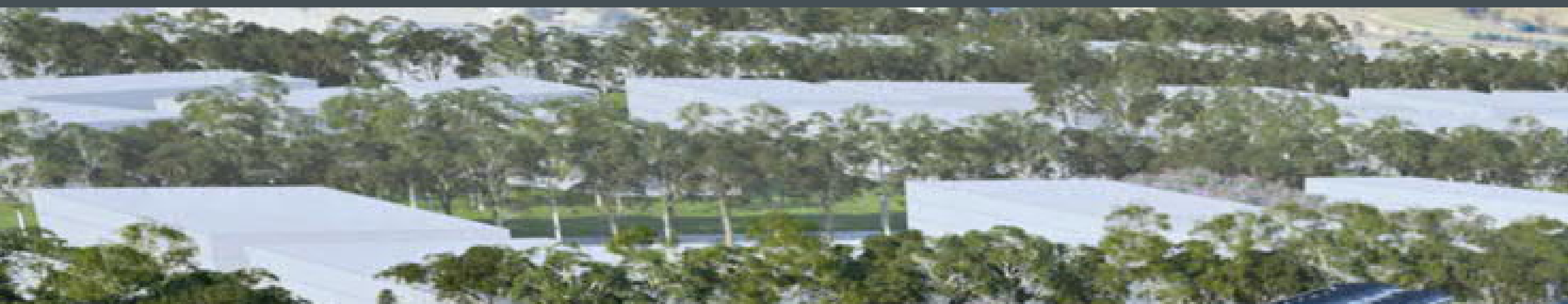
RIT-D Final Project Assessment Report

Providing Supply to the Sydney Science Park and the Surrounding Area

7 October 2022



Endeavour Energy

CONTACT

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consultation@endeavourenergy.com.au

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1. Executive summary

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

The purpose of this report is to demonstrate the basis for selection of the preferred option to provide supply to the Sydney Science Park development and surrounding areas.

Sydney Science Park comprises part of the Western Sydney 'Aerotropolis' area, which is a greenfield development of a new city covering 11,000 hectares of land and 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. Sydney Science Park covers approximately 288 hectares of the total area and is expected to have load of 45 MVA by 2036.

The identified need for this investment is 'reliability corrective action' since investment is required to comply with our NER obligations to connect customers. The timing of the identified need for this RIT-D is determined by when the expected load requiring connection will exceed the existing network capacity. This is currently expected to be in 2024/25, based on the connection enquiries received to date.

This FPAR follows publication of a Draft Project Assessment Report (DPAR) on 29 June 2022 which invited written submissions on the materials contained in the DPAR. On publication of the DPAR Endeavour Energy opened a six-week consultation period, during which time no submissions were received.

Two options were determined to be credible in addressing the network need and have been assessed against a do nothing base case. These are:

- Option 1 – establishment of a 132/22kV zone substation with staged installation of two 45MVA transformers; and
- Option 2 – establishment of a 132/22kV zone substation with installation of two 45MVA transformers at the time of commissioning.

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

Both credible options involve establishing a new zone substation for Sydney Science Park and connecting to the 132kV Aerotropolis backbone feeder. This new zone substation will have two 45MVA transformers. However, the timing of the installation of the two transformers differs between the options. In particular, Option 1 involves installing the first transformer at the time of commissioning (2024/25) and deferring the second transformer to 2033/34, while Option 2 involves installing both transformers at the time of commissioning.

The economic assessment of the credible options is show in table 1. Option 2 provides the greatest net present value (NPV) of the market benefits considered in the 15-year assessment period. Expected unserved energy (USE) is the key driver of market benefits and is monetised using the Value of Customer Reliability (VCR).

Table 1 – Economic assessment of credible options (weighted results)

Option	Description	Project capex nominal ($m)	PV of market benefits ($m)	PV of costs ($m)[1]	NPV ($m)	Rank
1	Establishment of 132/22kV Sydney Science Park Zone Substation, with staged installation of transformers	27.4	5,490.6	12.1	5,478.4	2
2	Establishment of 132/22kV Sydney Science Park Zone Substation, with simultaneous installation of transformers at commissioning	27.4	5,512.3	13.8	5,498.5	1

Note [1] Present Value (PV) of costs includes the terminal value of the assets, particularly material in this case, where the asset life extends beyond the assessment period. We've used a 15 year assessment period and the assets generally have a 40-year life. This recognises that the long-lived assets in this investment will remain in place at the end of the assessment period with the potential to continue to provide benefits to our customers and the community.

Considering the capital cost, value of market benefits, identified risks and NPV, the preferred option is Option 2.

Sensitivity analysis was undertaken across a range of assumptions including forecast load growth, discount rate, VCR and capital expenditure. In each scenario considered, Option 2 remained the preferred option – providing a high degree of confidence in this result.

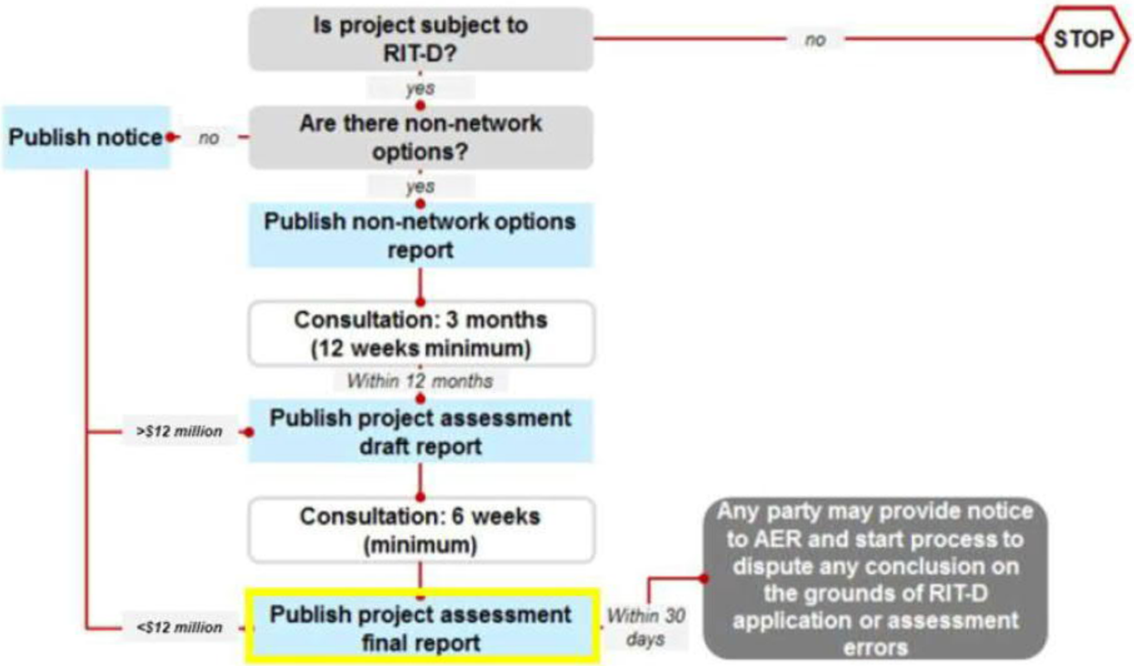
This FPAR represents the final step of the consultation process in relation to the application of the RIT-D process undertaken by Endeavour Energy regarding providing supply to the Sydney Science Park and the surrounding areas.

2. RIT-D process

This FPAR has been prepared by Endeavour Energy in accordance with the requirements of clause 5.17.4 of the National Electricity Rules. This report describes the application of the Regulatory Application Test – Distribution (RIT-D) for providing supply to Sydney Science Park and surrounding areas. The RIT-D process is summarised in figure 1 below.

Endeavour Energy adopts a process of exploring feasible methods of supply in assessing the ability to supply development applications. However, for greenfield sites, Endeavour Energy needs to determine the length of time that the existing network will be able to sustain the prevailing precinct development rate. Endeavour Energy needs to balance timely investment with the ramping up of demand as development progresses.

Figure 1 – Overview of the RIT-D process



2.1 Completion of RIT-D Process

This FPAR represents the final step of the consultation process in relation to the application of the RIT-D process undertaken by Endeavour Energy regarding providing supply to the Sydney Science Park and the surrounding areas. It follows publication of a screening notice and DPAR, both of which were published in June 2022.

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

2.2 Contact details

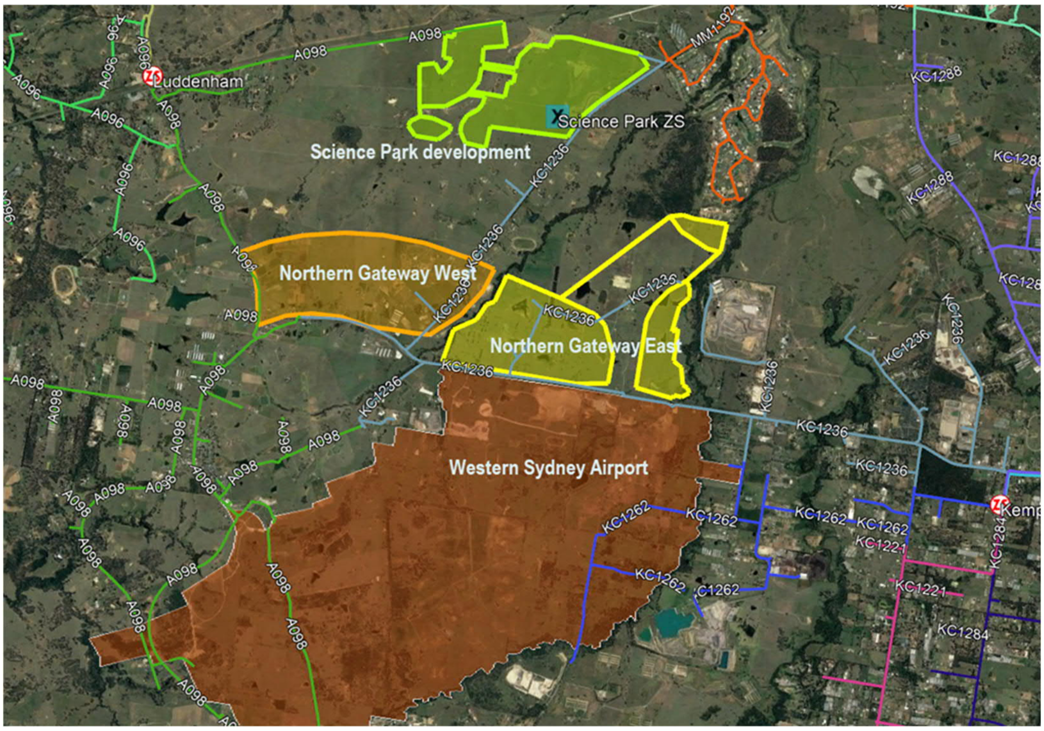
All enquiries regarding this FPAR should be directed to Endeavour Energy's Portfolio Management Office at consultation@endeavourenergy.com.au.

3. Context of the project

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. This includes the Sydney Science Park development, which covers an area of approximately 288 hectares – figure 2 – and is expected to have a demand of 45 MVA by 2036. The expected demand for Sydney Science Park includes residual demand associated with the Northern Gateway Development.

Figure 2 – Overview of the location of the Sydney Science Park development in our supply area



We have already applied the RIT-D to determine the most efficient means of providing the foundation supply to the Aerotropolis precinct – a 132kV backbone feeder.[1] This FPAR represents the final step in the RIT-D process to determine the most efficient means of providing supply to Sydney Science Park and the surrounding areas from the 132kV backbone.

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

4. Network need

Sydney Science Park has been designed as a mixture of commercial, educational, residential and industrial facilities and is expected to have load of 45 MVA by 2036, which includes approximately 20MVA of expected residual load from the Northern Gateway area. It is being developed to create an internationally recognised epicentre for research, development, education, commercialisation and innovation. Figure 3 below shows our forecast demand under a central, low and high demand scenario for Sydney Science Park and the surrounding areas (section 7.4.1 provides a description of these demand scenarios).

It also demonstrates that the existing distribution network in the development area is insufficient to meet the supply needs of Sydney Science Park. In particular, the initial load development can be serviced by 6MVA of available capacity at Luddenham zone substation, but this capacity is expected to be exceeded by 2024/25. If network augmentation is not undertaken, there will be significant unserved energy in our network over the next decade – figure 4.

Figure 3 – Sydney Science Park demand forecasts from 2021/22 to 2035/36

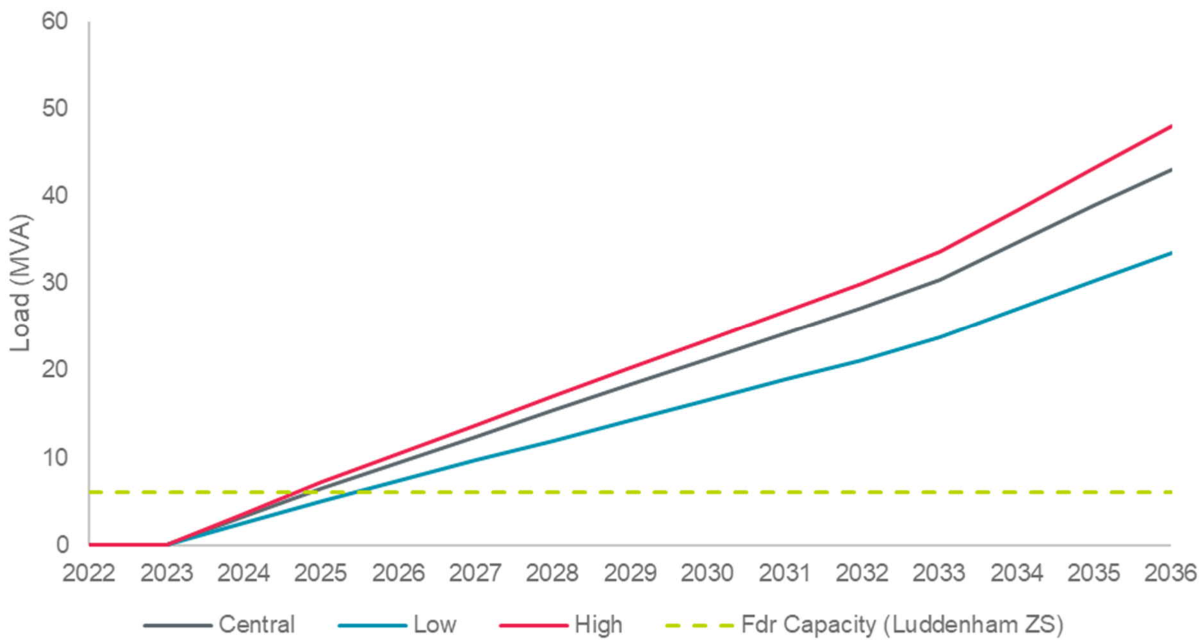
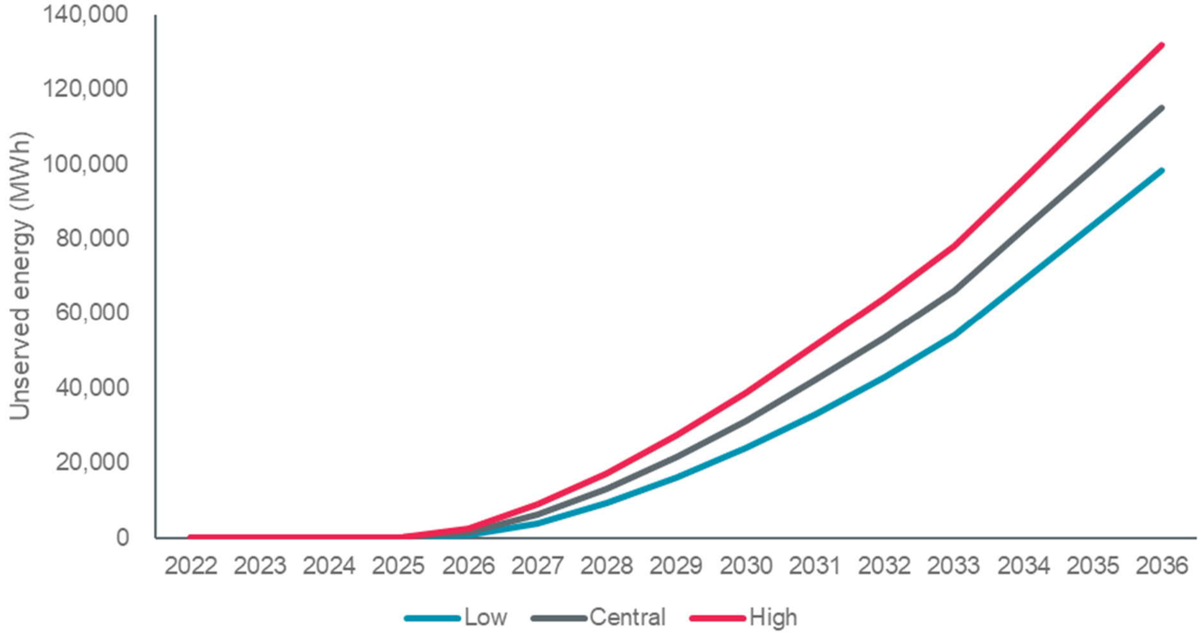


Figure 4 – Forecast unserved energy for Sydney Science Park under low, central and high scenarios



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

'Identified need' for this Regulatory Investment Test for Distribution (RIT-D)
We have undertaken a Regulatory Investment Test for Distribution (RIT-D) to investigate, and consult on, how to most efficiently provide supply to new customers in the Sydney Science Park and the surrounding areas. 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 customer connection enquiries received to date.

5. Preferred option

The option that presents the greatest net market benefit and thus considered as the preferred option is Option 2. This option is the establishment of a 132/22kV zone substation at Sydney Science Park with two 45MVA transformers installed at time of commissioning. The site will be energised by connection to the 132kV Aerotropolis foundation supply backbone feeder.

The total cost of this option is expected to be $27.4 million in 2022/23 dollars and construction is expected to commence in 2022/23 with commissioning in 2024/25. A detailed breakdown of the scope of this option is provided in section 6.

Option 2 is slightly higher cost (in present value terms) than Option 1 due to installing both transformers at the time of commissioning. However, it leads to higher net market benefits than Option 1 because it is expected to eliminate all load at risk into the foreseeable future. In contrast, installing only a single transformer upfront as part of Option 1 would lead to significant load at risk by 2033/34 due to increasing growth in load. Further, our capital cost estimates do not include the additional preliminary design and project management costs associated with staging the second transformer under Option 1. Including these costs would further reinforce Option 2 as the preferred option.

6. Credible options considered

There were several options considered to meet the identified need, of which two network-based options were determined to be credible. Non-network options were considered as part the screening notice but were not considered to be credible due to the large greenfield development requirements. The credible options are listed below, and this section provides more information on the scope and cost of these options.

- Base case — a 'no proactive action' option of utilising the existing 11kV network to service the total 43 MVA load by 2036;
- Option 1 — the staged installation of a 132/22kV Zone Substation with two 45MVA transformers; and
- Option 2 — the installation of a two 132/22kV 45MVA transformer substation by FY2025.

6.1 Base case – Utilising the existing 11kV network to service the total 43 MVA load by 2036

A baseline risk position has been established based on a 'no proactive intervention' option.

The 'no proactive intervention' option includes the extension of two 11kV feeders into the 22kV network area from the Luddenham 33/11kV zone substation. With the use of 3 MVA 11/22kV autotransformers, this forms the basis of existing capacity available in the area, noting that the Luddenham zone substation (which has 15MVA firm capacity) has limited available capacity.

As this work is already nearing completion and allows for capacity from the closest adjacent zone substation to be made available in the subject area, the cost of this work has not been included in the NPV analysis as it has already been incurred, in this case by the developer. Further 11kV extensions are not easily possible due to the physical limitations of the existing assets.

The 'no proactive intervention' approach carries significant risks, the most consequential of these being:

- involuntary load shedding, as this development will exhaust existing capacity and attract load at risk from FY25 onwards; and
- financial risk-cost of not meeting NEM statutory obligations, which is estimated at $800,000 per annum once capacity is exhausted.

In terms of risk cost assessment, the 'no proactive intervention' option provides a base case where the risks are valued by applying a Value of Customer Reliability (VCR) to the forecast expected unserved energy. The VCR used by Endeavour Energy in its modelling is based on values published by the AER on its Values of Customer Reliability Report in December 2021. Table 2 shows the annualised risk cost of 'no proactive intervention'. In total, these risks sum to $4 billion. Given this, a 'no proactive action' approach is non-feasible.

Table 2 – Risk cost of 'no proactive intervention'

	No Intervention Annual Risk Costs									
	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31
Risk cost ($M)	0	0	0	1.6	53.5	246.7	518.7	858.6	1,244.0	1,244.0

6.2 Option 1 – The staged installation of 132/22kV Zone Substation with two 45MVA transformers

Option 1 involves construction of a new zone substation for Sydney Science Park with one 45MVA transformer installed in 2024/25, with installation of a second 45MVA transformer deferred until 2033/34. This substation would connect to the 132kV Aerotropolis backbone feeder. Although this option would address concerns regarding unserved energy in the short term, only installing a single 45MVA transformer is expected to lead to significant load at risk by 2033/34.

The cost of this option is expected to be $27.4 million in 2022/23 dollars and construction is expected to commence in 2022/23 with commissioning of the zone substation and first transformer in 2024/25. Table 3 provides an overview of the scope of works, and the cost of those works, for Option 1.

Table 3 – Scope of works Option 1

Scope	Description	Cost Estimate ($M)
Zone Substation	Establishment of a zone substation at Sydney Science Park: • Establish a new indoor control building to accommodate 22kV switchboards and other equipment • Single 132/22kV 45MVA transformers at time of commissioning, with a second installed in 2033/34 • 132kV indoor busbar with two 132kV circuit breakers, bus section circuit breakers and two 132kV transmission circuit breakers • 132kV and 22kV protection equipment and communication works • Associated 22kV distribution works • Consideration of rooftop solar panels to offset carbon emissions associated with the substation building • Consideration of space for future incorporation of a grid battery	$20.8
Transmission Connection	Connection of zone substation to transmission network: • Connection to the 132kV Aerotropolis backbone feeder with cables matching the size and type to ensure supply capacity	$1.6
Distribution	Construction of distribution feeders: • Establish ten 22kV distribution feeders • Establish three 22/11kV autotransformers	$5.0
Total	Construction of Sydney Science Park zone substation with connection to the Aerotropolis backbone feeder and establishment of distribution feeders	**$27.4**

Endeavour Energy notes that additional preliminary design and project management costs associated with the staging of the second transformer have not been included in this cost estimate. These costs are not considered to be material to the outcome of this RIT-D because they are small in context of total project costs.[2]

6.3 Option 2 – The installation of a two 132/22kV 45MVA transformer substation by FY2025

Option 2 involves construction of a new zone substation for Sydney Science Park with two 45MVA transformers installed in 2024/25. The scope of works is largely similar to that of Option 1, i.e., the substation would connect to the 132kV Aerotropolis backbone feeder. However, two transformers would be installed at the time of commissioning, as opposed to the staged installation of the transformers in Option 1. Installing the two transformers at the time of commissioning the zone substation is expected to eliminate all load at risk into the foreseeable future.

The total cost of this option is expected to be $27.4 million in 2022/23 dollars and construction is expected to commence in 2022/23 with commissioning in 2024/25. Operating costs are assumed to be 0.4 per cent of the capital cost. Table 4 provides an overview of the scope of works, and the cost of those works, for Option 2.

[2] These costs could be up to $300,000 dollars, or one per cent of total project costs.

Table 4 – Scope of works for Option 2

Scope	Description	Cost Estimate ($M)
Zone Substation	Establishment of a zone substation at Sydney Science Park: • Establish a new indoor control building to accommodate 22kV switchboards and other equipment • Two 132/22kV 45MVA transformers at time of commissioning • 132kV indoor busbar with two 132kV circuit breakers, bus section circuit breakers and two 132kV transmission circuit breakers • 132kV and 22kV protection equipment and communication works • Associated 22kV distribution works • Consideration of rooftop solar panels to offset carbon emissions associated with the substation building • Consideration of space for future incorporation of a grid battery	$20.8
Transmission Connection	Connection of zone substation to transmission network: • Connection to the 132kV Aerotropolis backbone feeder with cables matching the size and type to ensure supply capacity	$1.6
Distribution	Construction of distribution feeders: • Establish ten 22kV distribution feeders • Establish three 22/11kV autotransformers	$5.0
Total	Construction of Sydney Science Park zone substation with connection to the Aerotropolis backbone feeder and establishment of distribution feeders	**$27.4**

6.4 Options considered but not taken further

The initial supply to the Sydney Science Park precinct has been established with the development of two 11kV feeders from Luddenham zone substation (along with the associated 11/22kV transformers). These developments have been triggered by applications to connect. However, the magnitude of the Sydney Science Park development is expected to outstrip the supply that will be made available from these additional feeders. Further, the capacity of Luddenham zone substation will become constrained due to the development and load uptake on these feeders.

Endeavour Energy therefore considered augmenting Luddenham zone substation to meet the identified need of establishing supply to the Sydney Science Park precinct. However, this option has not been progressed due to difficulties associated with acquiring additional land around the zone substation. Further, were land available, augmentation of the Luddenham zone substation will not be viable due to its distance from the Sydney Science Park precinct.

7. Modelling & Assumptions

7.1 Assumptions

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

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

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

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

The time period chosen for the NPV analysis was 15 years.

7.1.1 Energy at risk and expected unserved energy

A core justification for this project is based on load at risk and energy not able to be supplied to customers waiting to connect. This is different to a situation where already connected customers risk losing supply. The same VCR value has been applied as a default position to the energy at risk values established from the connection requests received. For a greenfield development such as this, where the forecast demand rapidly exceeds the available capacity in the network, the VCR benefits to be captured from implementing a project to address network constraints can quickly rise to extremely large amounts. The Energy at Risk (EAR) has been estimated from the annual peak demand forecasts and load duration curves. EAR was capped at a constant value based on 2028/29 levels.

7.1.2 Load profile characteristics

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

Specifically, the composite demand profile is based on the Aerotropolis load profile, which incorporates Wetherill Park zone substation load profile (an existing commercial/industrial site). The existing supply capacity to the area has been included in our assessment of the identified need.

Figure 5 below presents the normalised load duration curve (LDC) assumed based on the composite demand profile, while figure 6 presents the peak load profile for summer assumed for the load from the high voltage connections associated with Sydney Science park based on the composite demand profile.

Figure 5 – Normalised LDC assumed for customer connections associated with Sydney Science Park

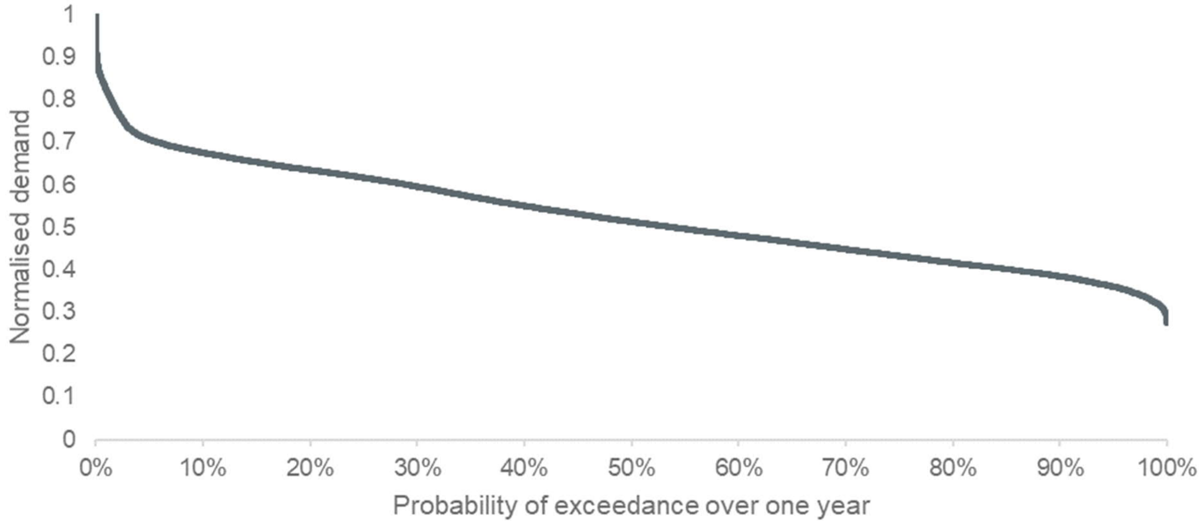
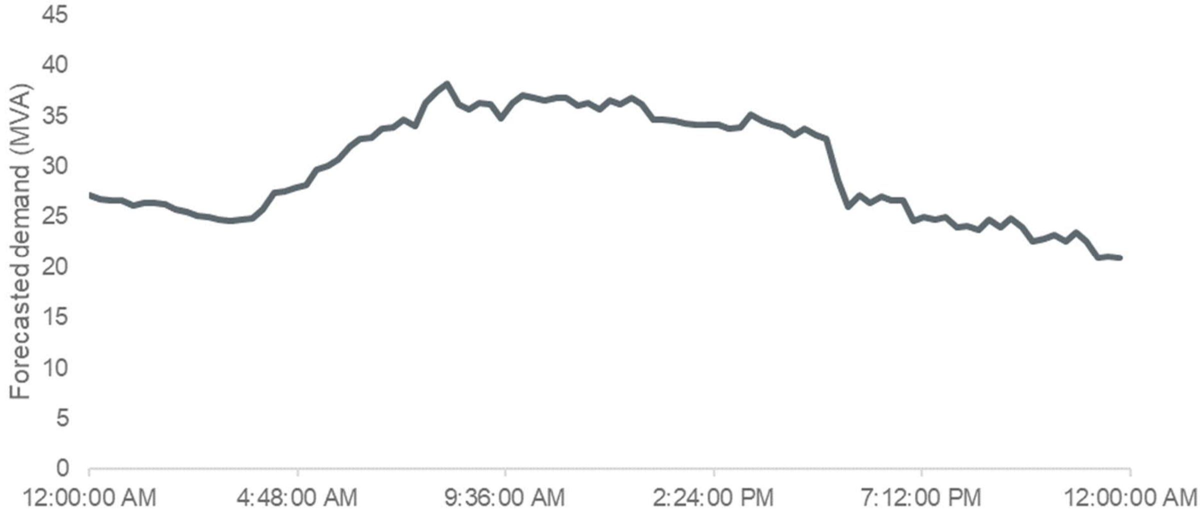


Figure 6 – Peak summer day profile for customer connections associated with Sydney Science Park



7.1.3 Value of customer reliability

The value of unserved energy is calculated using the Value of Customer Reliability (VCR). This represents an estimate of the value electricity consumers place on a reliable electricity supply. Endeavour Energy used a VCR of $39.67 per kWh in the evaluation which is based on the 2021 VCR values provided by the AER, weighted in accordance with the composition of the commercial, industrial and residential load within Science Park and the surrounding area. A breakdown of this calculation is provided in the table below.

Table 5 – Forecasted load types for the major connection points

Parameter	Commercial	Residential
Demand composition of Sydney Science Park	73%	27%
AER VCR	$46,180	$22,040
Demand weighted VCR		**$39,662**

7.2 Classes of market benefit considered

7.2.1 Changes in involuntary load shedding

Changes in involuntary load shedding and the associated customer interruptions caused by network outages are the sole market benefits that are considered material and have been quantified in this RIT-D assessment.

Increasing the supply capability in Science Park and the surrounding area increases the supply available to meet the growth in demand within these areas. This will provide greater reliability for this region by reducing potential supply interruptions and consequent risk of involuntary load shedding. The present rules only allow for consideration of changes in involuntary load shedding for connected customers. The establishment of supply in a greenfield area where potential customers would otherwise have to go without supply is therefore captured using changes in involuntary load shedding.

7.3 Classes of market benefit not considered to be material

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

- differences in timing of expenditure;
- changes in voluntary load curtailment;
- option value;
- changes in load transfer capacity;
- changes in costs to other parties; and
- changes in electrical losses.

These are further detailed below.

7.3.1 Differences in timing of expenditure

Differences in the timing of expenditure relates to the potential for a credible option to change the timing (or configuration) of other future investments to be made by or for the RIT-D proponent. Importantly, this relates to distribution investments that address identified needs other than those addressed by the credible option. Given that this investment is concerned with establishing supply in the greenfield area of Sydney Science Park, we do not consider differences in the timing of expenditure to be material for this RIT-D.

7.3.2 Changes in voluntary load curtailment

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

Endeavour Energy has not estimated any market benefits associated with changes in voluntary load curtailment as there is insufficient capacity in the existing customer base to deliver sufficient voluntary demand reduction.

7.3.3 Option value

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

Due to the certainty of Science Park and the surrounding area being developed, there is little doubt about the need and use of the infrastructure investment and each option is considered equivalent in that respect. Option value has therefore not been considered in the economic analysis.

7.3.4 Changes in load transfer capability

Distribution investments can improve load transfer capacity where a credible option allows end users to gain access to a back-up power supply. This is a market benefit as backed-up power supplies can service end-users in the event of power failure. The primary objective of this project is to facilitate connection of new customers in the Sydney Science park development. Since the areas in and around Sydney Science Park are currently mainly serviced by historical rural and residential standard distribution networks, load transfers to other parts of the network cannot be meaningfully considered until adjacent areas are further developed in the future. Immediate changes to load transfer capacity are therefore not considered material for this RIT-D.

7.3.5 Changes in costs to other parties

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

7.3.6 Changes in electrical losses

Endeavour Energy recognises that there would be small changes in the loss profiles for customers across the network due to changes in the network. Since the majority of customers to be connected will be general customers (rather than site specific), the impact of the small change in loss profile for these customers is unlikely to have significant impact on the network wide distribution loss factors that will be applicable to these and other customers. These changes are captured as part of the complex annual review of distribution loss factors when more information about customer usage patterns is available. Changes in electrical losses have therefore not been modelled for this RIT-D.

7.4 Scenarios and sensitivities

The central scenario parameters and relevant references in the FPAR are summarised in table 6.

Table 6 – Central Scenario Parameters and references in the FPAR

Parameter/scenario	Central scenario
Maximum demand forecasts	Base (expected) growth scenario presented in section 4
Capital costs	Estimates provided in section 6
O&M costs	0.4 per cent of capital spend unless otherwise stated
Value of customer reliability	Base estimates provided in section 7.1.3

7.4.1 Demand forecasts

The maximum demand forecasts have been derived from a projection of the connection and growth of new loads as in figure 3.

The central scenario has been developed from ongoing discussions over several years that Endeavour Energy has had with the developer. It is based on:

- an ultimate load forecast for the precinct;
- a timeframe to reach that ultimate load (the estimated time for this precinct to reach maturity is 20 years); and
- a load ramp up rate assumption (which is linear in this instance).

Probabilistic 'load realisation' factors have been applied to the development derived forecast, which in turn is calibrated by the actual connections applications that we receive over time. This load realisation factor is what differentiates the demand scenarios. In particular, the low scenario uses a lower load realisation factor than the central scenario, while the high scenario has been developed assuming a 100 per cent load realisation factor – suggesting that the full developer derived forecast will be realised in the expected timeframe.

Sydney Science Park is expected to comprise principally commercial load (73 per cent of forecast load types for major connection points), with the remaining 27 per cent expected to be residential load.

7.4.2 Capital costs

Capital cost estimates have been based on standard planning cost estimates of the detailed scope of work including a high-level scope of work. For sensitivity analysis, these estimates have been varied by ± 25%.

7.4.3 Value of customer reliability

This analysis adopts the value of customer reliability values published by AER to calculate the expected unserved energy. The ratio of load types has been estimated and used to calculate the weighted aggregate VCR value and then applied to the energy at risk. Based on the estimated load composition of the subject area, a demand composition weighted VCR value of $39.67 per kWh has been derived and used in the RIT-D analysis. A variation of ±25% has been used for sensitivity testing in accordance with AER guidelines.

7.4.4 Discount rates

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

7.4.5 Summary of sensitivities

Table 7 below describes the variations in input parameters used for the purpose of defining various scenarios.

Table 7 – Variables for sensitivity testing

Parameter/scenario	Central scenario	High benefits	Low benefits
Capex	Central estimates	-25%	+25%
Demand	Central demand forecast (see section 4)	High demand forecast (see section 4)	Low demand forecast (see section 4)
VCR	39,662	49,578	29,747
Discount rate	3.26%	2.22%	4.30%

8. Results of analysis

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

8.1 Central case results

Table 8 presents the economic analysis of the options under the central case scenario, including the present value of the various benefits and costs.

Option 2 is slightly more expensive in present value terms than Option 1, due to installing both transformers at the time of commissioning. However, it is expected to eliminate all load at risk into the foreseeable future.

Option 1, on the other hand, is cheaper in present value terms because $4 million dollars of investment on the second transformer is deferred to FY34. However, Option 1 would lead to significant load at risk by 2033/34.

Overall, Option 2 has the greatest net market benefit and is thus considered the preferred option.

Table 8 – Central case results

Option	Description	Project capex nominal ($m)	PV of USE ($m)	PV of other factors (reliability etc $m)	PV of costs ($m)[1]	NPV ($m)	Rank
1	The staged installation of 132/22kV Zone Substation with two 45MVA transformers	$27.4	5,353.8	7.1	12.1	5,348.8	2
2	The installation of a two 132/22kV 45MVA transformer substation by FY2025	$27.4	5,375.1	7.1	13.7	5,386.5	1

Note [1] Present Value (PV) of costs includes the terminal value of the assets, particularly material in this case, where the asset life extends beyond the assessment period. We've used a 15 year assessment period and the assets generally have a 40-year life. This recognises that the long-lived assets in this investment will remain in place at the end of the assessment period with the potential to continue to provide benefits to our customers and the community.

8.2 Sensitivity and scenario assessment

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

- forecast demand, and hence quantity of involuntary load shedding;
- value of customer reliability;
- investment costs; and
- discount rate.

In each scenario considered (and also the weighted scenario), Option 2 remained the preferred option – providing a high degree of confidence in this result.

8.3 Economic timing

The economic timing of the preferred option may be taken to be the point where network capacity is insufficient to connect new customers.

The Supply to the Sydney Science Park and Surrounding Area requires connection capacity to be made available as soon as the existing available capacity in the network is exhausted. Based on current demand forecast, this is expected to occur in 2024/25. Consequently, this date is seen as the economic timing for this project.

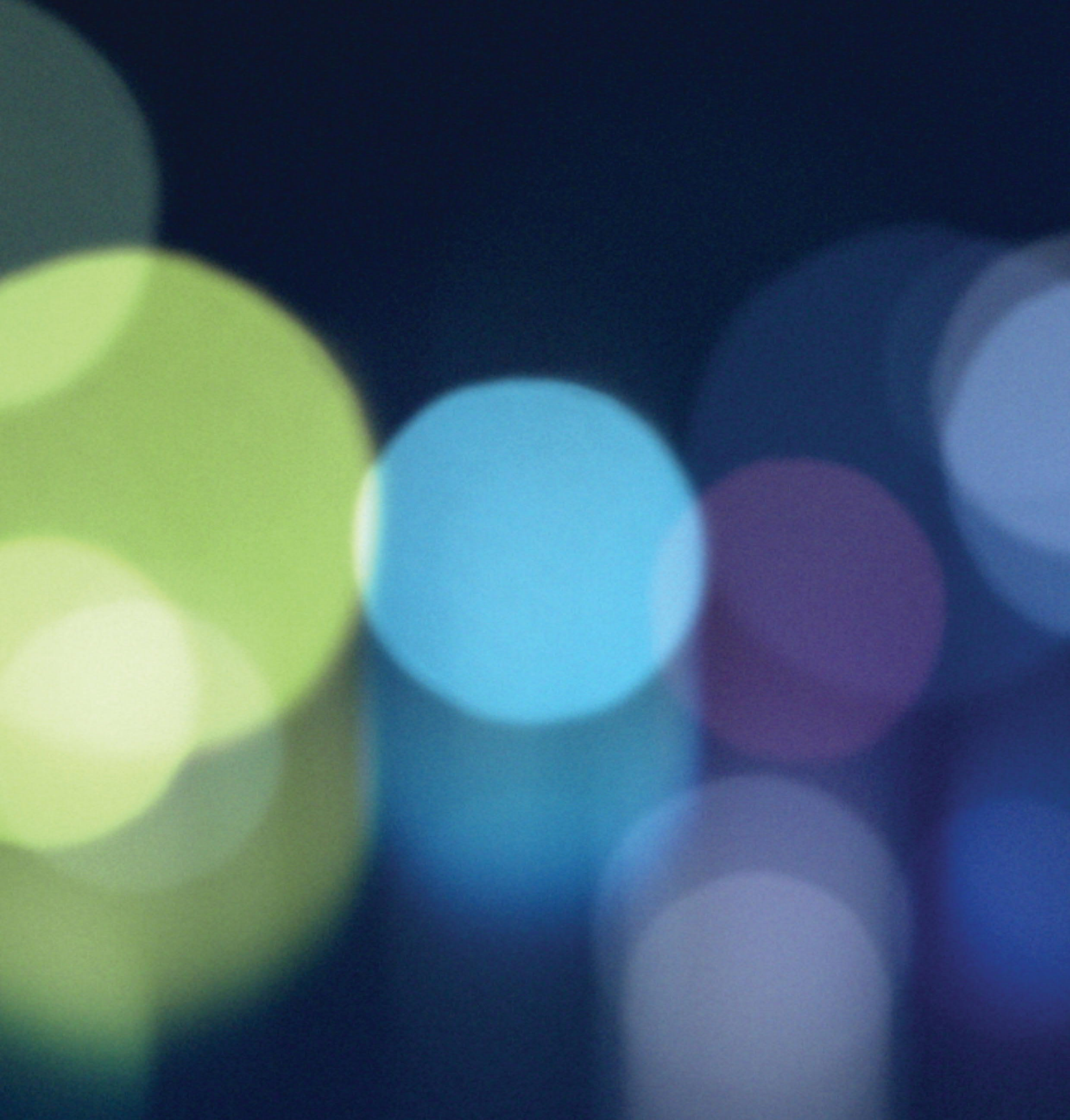
9. Conclusion

The development of Sydney Science Park is associated with the Western Sydney Airport growth precinct development, which is driving significant cross sector investment across Sydney's Western Parklands City. Significant load growth owing to the connection of Sydney Science Park requires the establishment of additional connection and capacity capability to the network in the region.

This FPAR has identified two credible network-based options that can technically meet the required network demand. Each consists of establishing a 132/22kV zone substation at Sydney Science Park in 2024/25, with a single 45MVA transformer installed at time of commissioning with a second deferred to 2033/34 (Option 1) or two 45MVA transformers installed at time of commissioning (Option 2). Each were considered in an economic evaluation, and Option 2 was selected as the preferred option.

Option 2 involves construction of a new zone substation for Sydney Science Park with two 45MVA transformers installed in 2024/25, with the zone substation connecting to the 132kV Aerotropolis foundation supply backbone feeder. Installing two transformers at the time of commissioning means that Option 2 is marginally more expensive than Option 1. However, installing the two transformers upfront facilitates eliminating all unserved energy into the future – offsetting the relatively higher costs through greater market benefits of reduced unserved energy.

Sensitivity analysis was conducted and found there to be no change to the central scenario results, which provides a high degree of certainty that this option can best meet the future requirements of customers in the area and provides the best value for customers in the Endeavour Energy franchise.



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