Western Sydney Aerotropolis

2019-24 Capital Expenditure Plan

January 2019

Endeavour Energy

Contents

1. Overview

The Western Sydney Aerotropolis is approximately 11,200 hectares of rural land encompassing the Western Sydney Airport, the Sydney Science Park, and Western Sydney Employment Lands. This area forms the basis of the Greater Sydney Commission's vision of a 'third city' for Sydney. Electricity infrastructure in the area is insufficient to cater for the planned development of the region and investment will be needed to facilitate the opening of the Western Sydney Airport in 2026 and subsequent increase in load demand from the broader Aerotropolis growth area.

In our initial proposal submitted to the AER in April 2018, we outlined our plans to augment our network to cater for increased demand driven by development of the Western Sydney Aerotropolis – formerly the Western Sydney Airport Growth Area. Due to uncertainty around the timing of the construction of the airport, which provides the catalyst for subsequent regional development, we submitted our plans as a contingent project. We estimated the cost of the project to be $61.2m (real 2018-19).

AER Draft Decision

Although stakeholders generally supported including this project as a contingent project, the AER did not approve our contingent project on the basis we had not demonstrated that it was reasonably required to meet the capex objectives. The feedback we received from the AER and stakeholders on our proposed contingent project can be summarised as follows:

1. **Is investment required?**

   At the time of our submission, the airport had not yet commenced construction works and detailed plans for the Aerotropolis development had not been published. While the AER considered investment would be required some stakeholders questioned whether investment would be necessary.

2. **When is investment required?**

   Assuming the airport and surrounding areas are developed as anticipated the next key issue raised by the AER and stakeholders is when investment would be required in electricity network infrastructure to support this growth area. The AER considered that some form of investment would be required whilst some stakeholders questioned whether network investment, if required, was required in 2019-24 rather than a later period.

3. **How much investment is required?**

   There were concerns that our plans relied on prospective long-term forecasts that extended beyond 2050. Stakeholders questioned the robustness of our demand forecasts and whether they adequately considered distributed energy resources (DER) that may be utilised by customers within the Aerotropolis in the future.

4. **Has the most efficient option been selected?**

   Based on the above issues the AER considered that while investment is needed during the 2019-24 period, a lower cost option should be considered. Stakeholders shared the concern that our proposed solution sought to provide much of the capacity required over the next few decades within the 2019-24 period increasing the risk of asset stranding. There was a consensus that our initial proposal was not consistent with our staged investment approach that we used to service other growth areas. The AER and stakeholders required additional evidence that we had fully considered alternate investment solutions and selected the most efficient option.

5. **Who should pay?**

   Stakeholders have also raised concerns with the funding arrangements of the Aerotropolis network costs and sought further clarity. There is a clear expectation that the airport should pay for the network dedicated to it.

Greater Investment Certainty

Since submitting our proposal, construction of the airport has commenced. Western Sydney Airport has also confirmed that a connection to the electricity network will be required by 2024 to meet their obligations to the Australian Government.

In addition, further information on supply needs have become available with detailed plans for the Aerotropolis' development now released and additional infrastructure investments confirmed by Commonwealth and State Governments. This provides us with greater certainty on the projected development timeframe and supply requirements that we will need to cater for during 2019-24.

There is now sufficient certainty on the need and timing of investment to include the costs associated with this project in our revised capex forecast rather than proposing it as a contingent project.

Our Revised Investment Plan

We have reassessed the feasible investment options and revised our plan in response to the AER and stakeholder feedback outlined above. We now propose to spend $39.3 million (real, 2018-19) to construct a single 132kV feeder and utilise the existing 33kV network to cater for the early stages of development.

We believe this option is the most efficient investment as it:

- is a lower cost option than we initially proposed;
- will involve staging investment which will allow us the flexibility to respond to capacity constraints as they arise in future regulatory periods;
- does not rely on long-term demand forecasts and reduces the risk of asset underutilisation;
- will also allow us to better account for increased prevalence of DER and technological improvements in our future investment plans for the region;
- facilitates a timely connection of the airport and allows development of Western Sydney Aerotropolis precincts to proceed as planned over the short to medium term.

This approach defers parts of the project we initially proposed and reflects our ongoing commitment to deliver cost effective projects and pass through the cost savings to our customers in the form of lower charges in the short-medium term.

We will continue to consult with stakeholders on how we should deliver this project. As required by the National Electricity Rules (the Rules), we will perform a RIT-D assessment of the project. This will allow us to further invite stakeholder input in our investment plans and consider the feasibility of efficient non-network opportunities. We plan to commence this process during FY20.

This document outlines our proposed investment to cater for load growth forecast for the Western Sydney Aerotropolis and supplements details previously provided in our regulatory proposal and in our responses to the AER's information requests following our proposal submission. Notably, it outlines how we plan to meet the growth area's supply needs, explains why it is efficient and how it achieves the capital expenditure objectives and reflects the capital expenditure criteria.

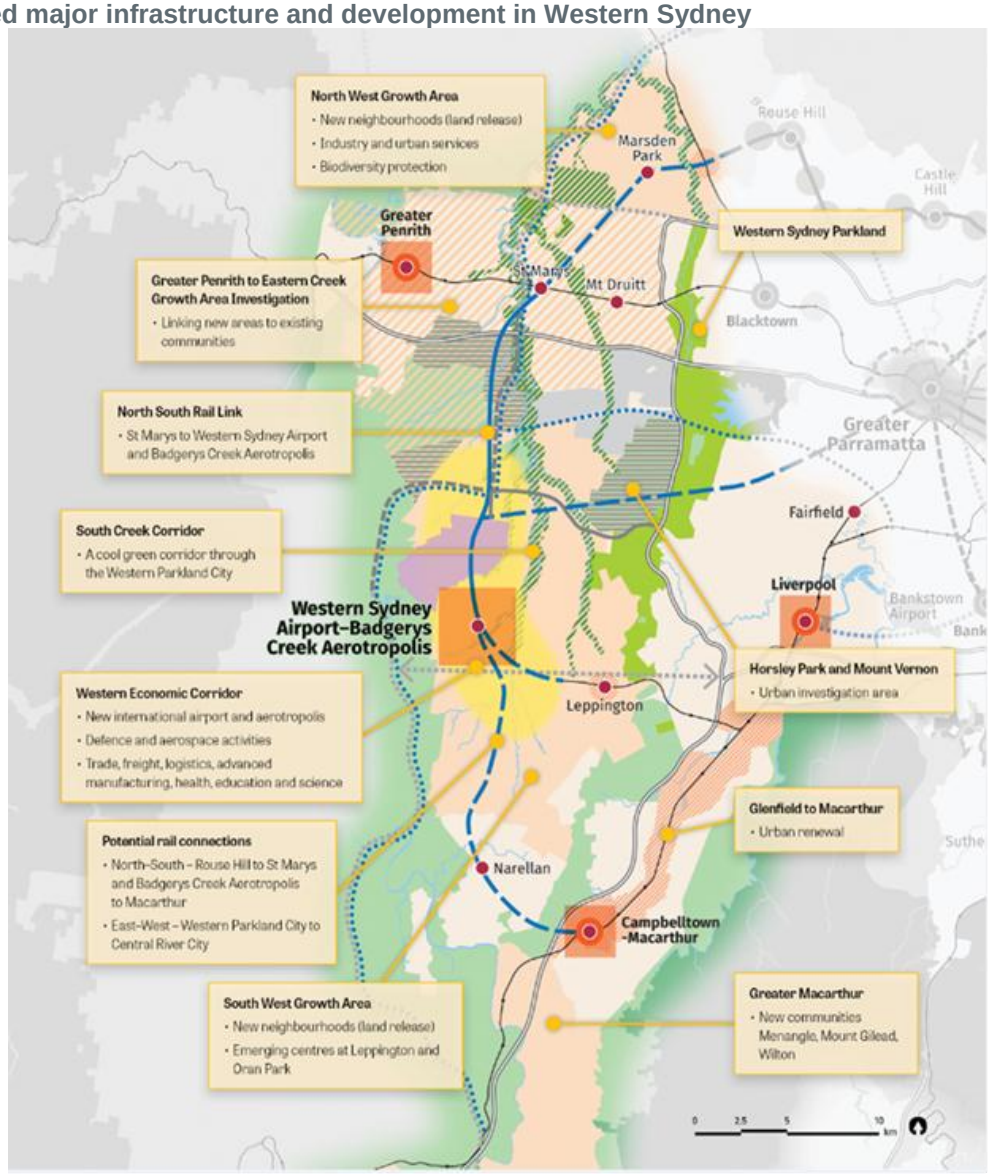
2. Is Investment Required?

With construction of the airport now underway, it is clear investment in electricity infrastructure will be required to cater for increasing load in the surrounding growth area. In this section, we provide additional information about the airport and development that will occur in the Western Sydney Aerotropolis. This information demonstrates that the significant planned growth will require Endeavour Energy to undertake significant network investment during 2019-24 to enable these developments to progress as planned.

The Western Sydney Aerotropolis

To manage Sydney's population growth and meet the needs of existing and future residents, the Greater Sydney Commission's *Metropolis of Three Cities* outlines a vision to align land use, transport and infrastructure planning to reshape Greater Sydney as three unique but connected cities. The plan aims to coordinate growth and deliver benefits more equally and equitably to residents across Greater Sydney. As shown below, the Western Sydney Aerotropolis is a key element for planning future infrastructure and development across Western Sydney.

Figure 1: Planned major infrastructure and development in Western Sydney



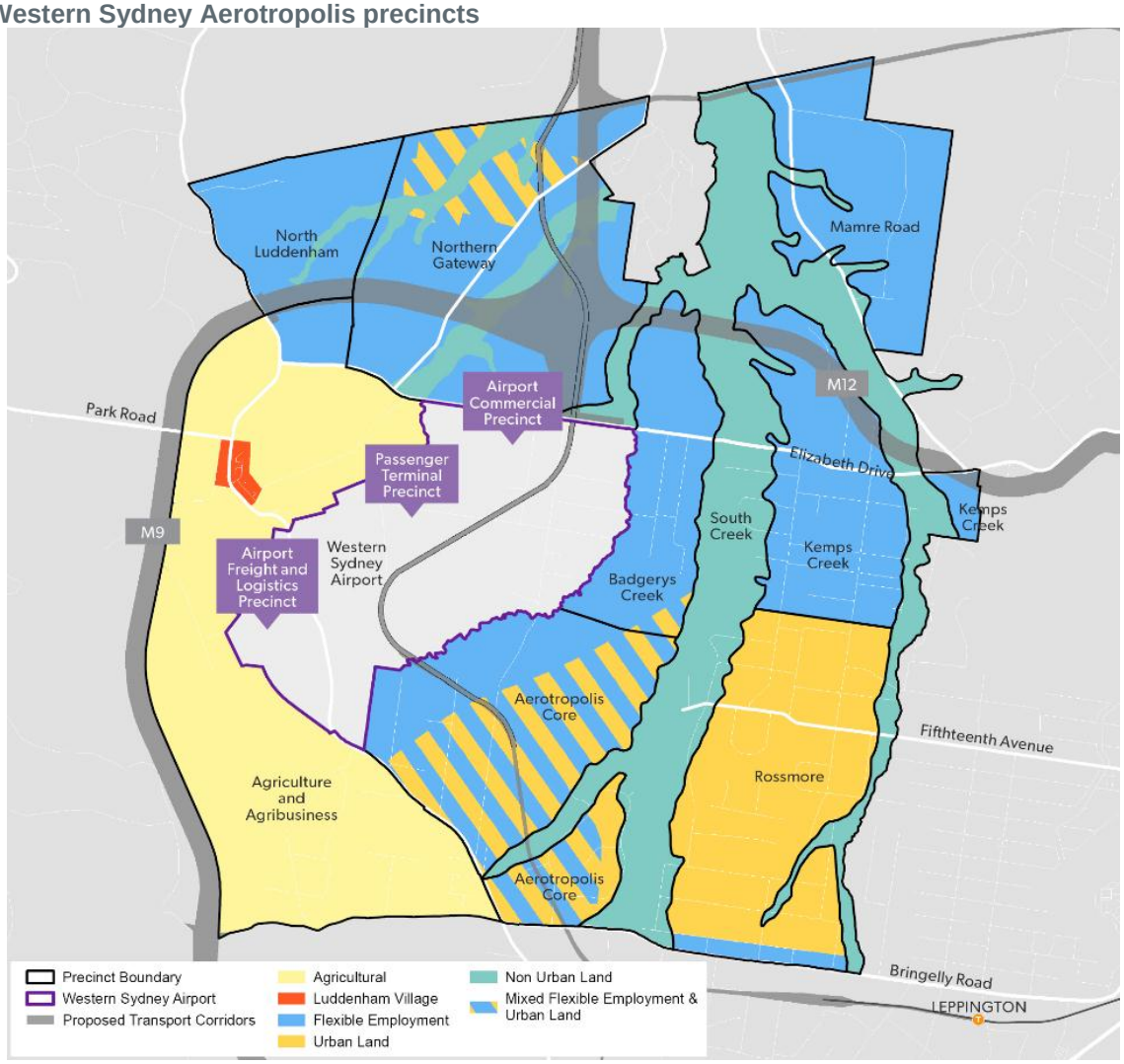
Source: Greater Sydney Commission

Giving effect to this vision, the Western Sydney City Deal is an agreement struck between the Commonwealth, State and eight Western Sydney councils to invest in significant infrastructure, lifestyle and amenity assets, and to improve employment opportunities. The City Deal was signed in March 2018 and leverages additional jobs, housing and liveability improvements from the Australian Government's investment in the Airport.

The NSW Department of Planning and Environment (DPE), as the authority responsible for coordinating major development across NSW, recognises the 11,200-hectare Western Sydney Aerotropolis will become Greater Sydney's newest economic hub at the heart of the emerging Western Parkland City – Sydney's 'third city'. The DPE's Land Use and Infrastructure Implementation Plan for Stage 1 of the Aerotropolis (the plan) provides further details on the future development within the Aerotropolis growth area.

The plan breaks the land around the Western Sydney Airport site into nine precincts, and selects three of those precincts – Aerotropolis Core, Northern Gateway and South Creek as priority for immediate planning, with rezoning to be completed by the end of 2019. The plan builds on the Western Sydney City Deal's infrastructure and governance agreements to frame the development of the Aerotropolis.

Figure 2: Western Sydney Aerotropolis precincts



Source: NSW Department of Planning and Environment

An outline of the planned Aerotropolis development as detailed in the DPE's Land Use and Infrastructure Implementation Plan (published August 2018) and importance to the regional economy is outlined below.

2.1 Population Growth

The population of the Western Parkland City is projected to grow from 740,000 in 2016 to 1.1 million by 2036, and to well over 1.5 million by 2056. The city will be established on the strength of the WSA which is at the core of the Western Sydney Aerotropolis - formerly the Greater Sydney Airport Growth Area. This change of title reflects a focus on growth of the precincts surrounding the airport site and the plan for a polycentric city capitalising on the established centres of Liverpool, Greater Penrith and Campbelltown-Macarthur.

2.2 Transport Infrastructure

Air

New city-shaping transport and the airport will make the city the most connected place in Australia. The Australian Government has committed up to $5.3 billion in equity over 10 years to develop Western Sydney Airport at Badgerys Creek. Operational from 2026, the airport will be a full-service airport capable of catering for domestic and international passengers as well as freight services. The airport will open with a single runway and facilities to handle 10 million passengers. Unlike Sydney Airport, it will operate 24 hours a day and not be subject to curfew restrictions.

Table 1: Indicative airport activity forecasts

	Stage 1 operations (2026-30)	First runway capacity	Long term (2063)
Annual passengers	10 MAP	37 MAP	82 MAP
Peak hour passengers	3,300	9,500	18,700
Total annual air traffic movements	63,000	185,000	370,000
Total busy hour annual air traffic movements	21	49	85

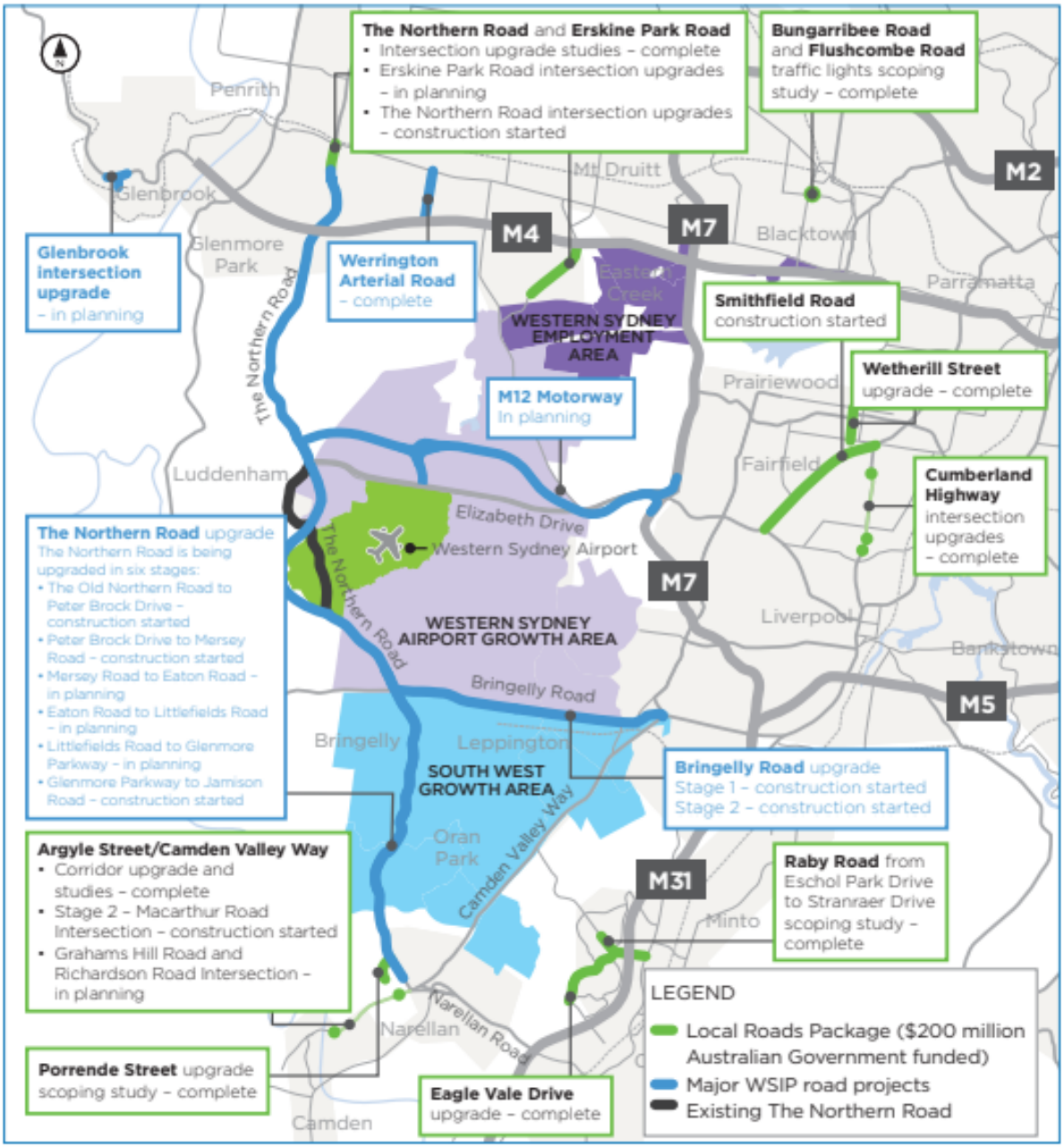
Source: Western Sydney Airport

Road

The DPE's plan will deliver road and transport linkages that will capitalise on the economic gains from the new airport while boosting the local economy and liveability of Western Sydney. Through the Western Sydney Infrastructure Plan, the Australian and NSW Governments have announced $3.6 billion towards the upgrade and construction of new roads to support the region's economy.

Much of this program targets improving access to and from the Aerotropolis with the most significant project involving the construction of a new east-west motorway to the airport between the M7 Motorway and The Northern Road (to be known as the M12 Motorway).

Figure 3: Western Sydney Infrastructure Plan map



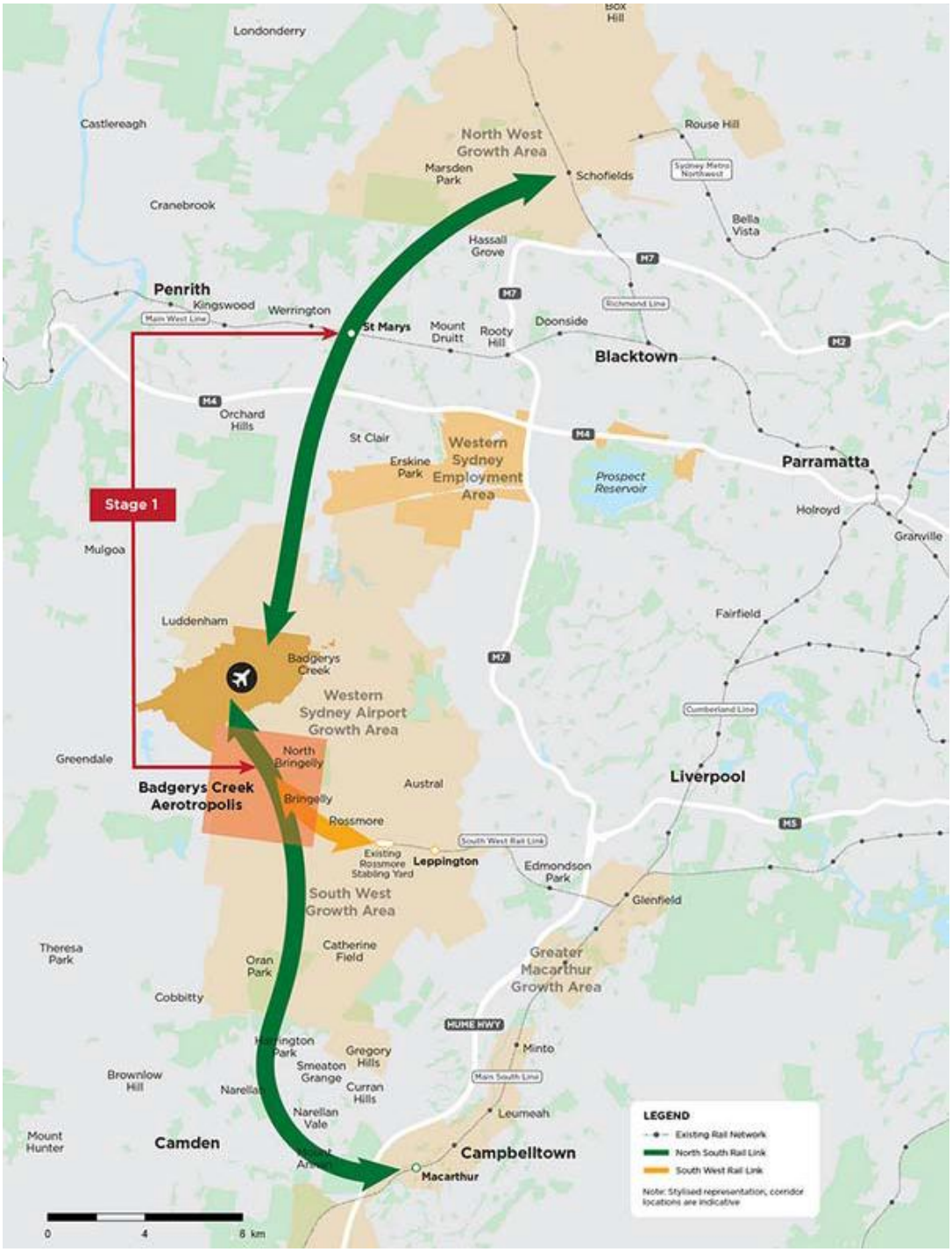
Source: NSW Roads and Maritime Services

Rail

A signature infrastructure project from the Western Sydney City Deal is the first stage of the North–South Rail Link from St Marys on the existing metropolitan rail network to the Aerotropolis Core via Western Sydney Airport. The Federal and State Governments will jointly fund the $7 billion delivery of the project in time for its opening in 2026.

Ultimately, the North South Rail Link will link Sydney's North West Growth Area at Schofields to the South West Growth Area at Macarthur via the airport, Aerotropolis business park and surrounding precincts. The route and station locations for the rail link will be finalised in the coming months.

Figure 4: North South Rail Link



Source: Greater Sydney Commission

2.3 Freight

There are plans for Aerotropolis to become a central hub for the state's freight network. The Western Sydney Freight Line corridor has been proposed to provide a dedicated freight rail connection between the Southern Sydney Freight Line near Yennora and the Outer Sydney Orbital with connection to potential new intermodal terminals in the Western Parkland City.

The freight line, which is under investigation, will open opportunities for freight, logistics and related industries to better connect to global markets. This will support the established Western Sydney Employment Area, a key freight and logistics hub.

The Aerotropolis will accommodate this planned new freight infrastructure, as well as freight and logistics development enabling flexible employment precincts to support the increasing freight task and changes in global freight requirements. The Aerotropolis will provide a much-needed extension of Western Sydney Employment Area.

2.4 Employment and Education

The Aerotropolis will make a significant contribution to 200,000 new jobs planned for Western Sydney over the next 20 years. The cornerstone of economic growth in the region is the new 24/7 airport, opening opportunities for jobs in tourism, hospitality, warehouse and logistics, manufacturing, retail, aviation and air transport industries. A high employment agribusiness precinct is planned to leverage the airport by providing new domestic and export opportunities for NSW farmers.

A business park will also be a key feature of the Aerotropolis Core Precinct. With planning work set to be completed by mid-2019, the business park will open before Airport operations begin in 2026. Since submitting our proposal in April 2018, a number of local, national and multi-national organisations have committed to establishing operations at the Aerotropolis Core business park.

The Aerospace Institute within the Aerotropolis Core will include a world class science, technology, engineering and mathematics (STEM) university, a high performance secondary school and an advanced vocational education and training (VET) facility. This integrated education facility will be an anchor institute in the growing Aerotropolis. The University of Newcastle, University of NSW, University of Wollongong, and Western Sydney University have recently agreed to collaborate in order to deliver the higher education institution within the Aerotropolis Core precinct.

The Western Sydney Employment Area immediately to the north of the Aerotropolis was created to act as a long-term metropolitan land supply for industrial and employment activities. It is expected to secure more than 60,000 jobs over the next 30 years and more than 200,000 jobs once fully developed. Its significance has been enhanced with the commitment to the Western Sydney Airport.

The Sydney Science Park is a $5b project that will create an internationally recognised epicentre for research and development in the heart of Western Sydney. Set over 280ha, Sydney Science Park will be a fully integrated community that will create more than 12,000 knowledge based jobs, cater to over 10,000 students and be home to over 10,000 residents. The park will be the largest and fastest growing employment area in Sydney.

It will include an Aerospace Institute which will provide a world-class aerospace and defence industries precinct and promote employment in technology, research and innovation industry and produce knowledge-intensive jobs close to areas of high population growth. A feasibility study has projected that the precinct could create approximately 5,000 jobs and over $15 billion of gross value added over the next 30 years.

2.5 Housing

The main focus of the Western Sydney Aerotropolis is employment lands, however areas for employment and residential development to the immediate north and south of the Western Sydney Airport will start to be rezoned as early as 2019. Ultimately, up to 60,000 new homes are planned for the Aerotropolis.

3. When Is Investment Required?

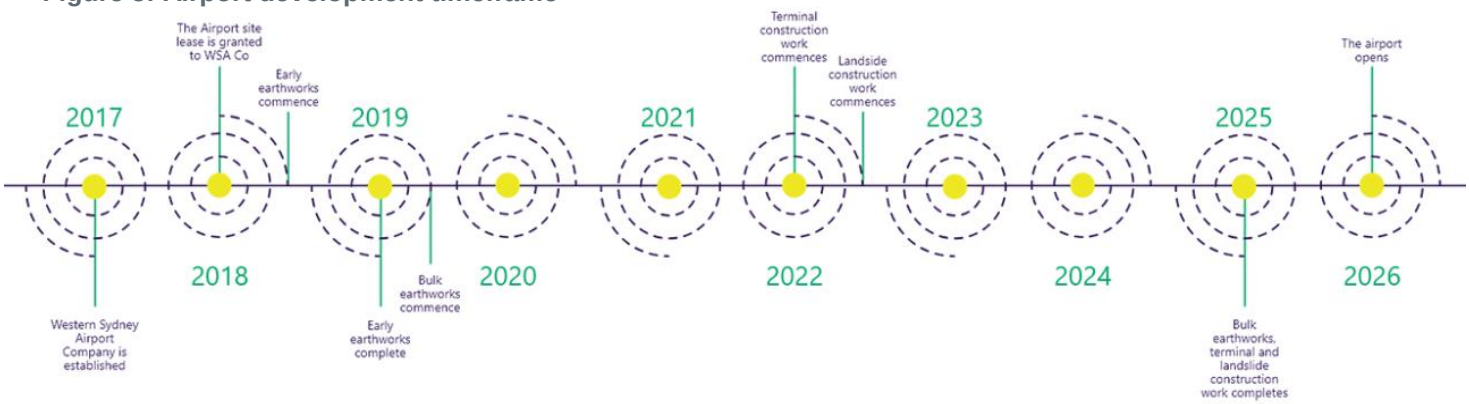
In this section, we provide additional evidence as to why investment in our electricity network will be required during the 2019-24 period to cater for the growth described in the section above.

3.1 Development timeframe

The Western Sydney Airport will be a full functioning airport from 2026 with a second runway planned for Stage 2. As mentioned earlier, the airport will be at the centre of a coordinated plan to develop the area as Sydney's 'third city'. As the provider of key enabling infrastructure, Endeavour Energy has been engaged in numerous planning forums and consultation activities to plan development of this new city.

With planning and environmental approvals completed, construction of the airport commenced on 24 September 2018. Western Sydney Airport has appointed expert airport construction firm Bechtel as its delivery partner to help manage construction and ensure the airport is open to passengers, airlines and freight operators, on schedule in 2026.

Figure 5: Airport development timeframe



Source: Western Sydney Airport

The DPE's plan recognises the timely and efficient provision of enabling infrastructure is a key consideration to realise the full potential of the planned development of the airport and Aerotropolis precincts. Limited electricity infrastructure means significant investment is required by both Endeavour Energy and Western Sydney Airport to unlock this planned development. We are working with Western Sydney Airport, developers, planning authorities and all tiers of government to ensure timely delivery of trunk electricity infrastructure.

The indicative construction schedule for the Stage 1 airport development works is outlined in Figure 6. For the timely delivery of network infrastructure, the schedule indicates that augmentation of the Endeavour Energy network will need to commence during the middle of the 2019-24 regulatory control period.

Western Sydney Airport has advised us that as part of establishing operations and gaining appropriate and national and international licences, full utility connections need to be established and completed prior to their testing phase, which begins approximately 24 months before the airport becomes operational. They have recently confirmed with us a network connection will be required by the end of 2024 in order to meet their obligations to the Australian Government and to complete commissioning in 2025, with operation beginning in 2026. The connection will be required to service the airport, including a 80,000m2 full-service 24-hour terminal building as well as the activated parts of the 200 hectare onsite business park. This confirmation from WSA is provided as Attachment 0.12.

Work on augmenting existing electricity network infrastructure has commenced. A section of TransGrid's 330kV overhead transmission network crosses the site of the planned runway and is being relocated underground. This relocation is scheduled for completion in mid-2019 with WSA to pay the costs for this work. Relocation and removal of existing Endeavour Energy overhead distribution assets from the airport site are in progress and expected to be completed in 2019. A visitors centre is also expected to open in late 2019 to provide the general public information about construction progress.

3.2 Greater Investment Certainty

We proposed to include the costs associated with expanding our network to cater for the growth around the Aerotropolis as a contingent project in out regulatory proposal. This was because the full extent and nature of the supply requirements was still subject to a significant degree of uncertainty.

Since submitting our proposal, WSA confirmed their load and timing requirements for supply to be made available by 2024. This notification and other development announcements provides sufficient certainty to allow this investment to be included in our capex allowance for 2019-24. As the cost of this project was not included in the AER's assessment in the draft determination, nor provided for elsewhere by Endeavour Energy in the capex proposal, we propose the forecast cost of this project to be added to the AER's $1.70b draft capex determination.

With respect to timing certainty, there is a concerted effort by Federal, State and Local Government to ensure growth will occur in the Western Sydney Aerotropolis. This is backed by a $3.6b investment in roads and a new rail line, which has bipartisan support. In addition, a new Western Sydney and Aerotropolis Authority (WSAA) has recently been established to coordinate development and delivery of infrastructure in the area. Whilst there will always be uncertainty in demand forecasts, we share the view of planners and developers that development cannot occur without timely provision of electricity connection capacity.

We note the AER did not accept our investment for the Aerotropolis in their draft decision. Western Sydney Airport has raised concerns with us about the uncertainty of securing AER approval for this investment on the basis it is needed to provide important enabling infrastructure for the whole of the region, which is an important priority for Federal, State and Local governments.

3.3 Proposed Investment Solution

We have changed the investment solution we plan to undertake. To deliver the required capacity to service the Aerotropolis development and broader growth area, we initially proposed to construct two 132kV supply feeders.

Following stakeholder concerns that this option relied uncertain long-term forecasts, we have reassessed investment options and now propose a lower cost option that involves constructing a single 132kV feeder and utilising the limited capacity in our 33kV network to deliver supply for the early stages of development.

This option is a lower cost, less capital-intensive option and will provide us the opportunity to monitor actual growth and investigate non-network solutions for servicing expected long-term growth. Further detail on our proposed investment is provided in section 5.

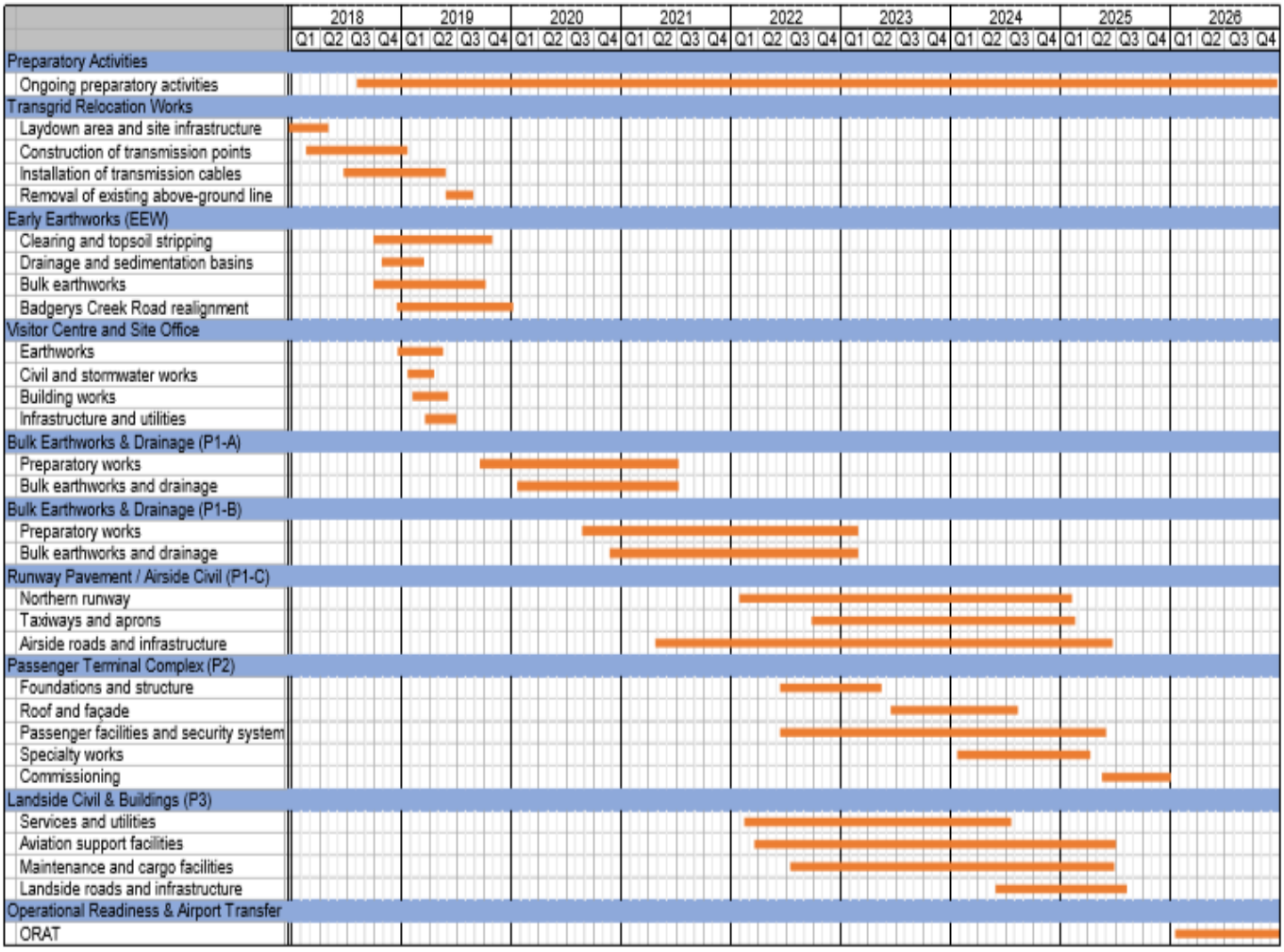
3.4 Legislative Requirements

The Airports Amendment Act (2015) provides a mechanism to authorise the development of the Western Sydney Airport. This is achieved through the Airport Plan which was published by the Australian Government in December 2016. The plan specifies the Australian Government's requirements for the airport and acts as a planning instrument to guide the initial development.

Requirements relating to the Airport Plan are included in several clauses within Division 4A of the Airports Act. Clause 96C(5) includes a requirement for the Airport Plan to set out conditions to be complied with in relation to the airport development. These conditions are outlined in Section 3.10 of the Airport Plan and include a requirement that a Construction Plan setting out the program and timetable for carrying out Stage 1 development be approved. A Construction Plan was published in September 2018 with the indicative construction schedule provided in Figure 6.

In relation to electricity requirements, Section 3.5.4 of the Airport Plan specifies that Stage 1 development will require a N-1 level of reliability to the Airport site.

Figure 6: Airport construction works timeframe



Source: Western Sydney Airport

4. How Much Investment Is Required? (Demand Forecast)

In this section, we provide additional evidence supporting our demand forecast which is a key determinant of the investment that will be required to support the Western Sydney Aerotropolis.

4.1 Overview

Demand forecasts allow us to assess potential future capacity shortfalls and impacts of unserved energy which may drive the case for network investment. The forecast included in our business case indicated an increase in load demand from 6MVA in 2020 to 176MVA in 2035. Ultimate load requirements were forecast to reach 850MVA over a 40-year period.

The AER raised the following concerns with our demand forecasts, which underpinned our business case for the Aerotropolis:

- They are indicative and plan for the potential future expansion of the airport in 2050;
- Do not include detailed electricity needs of the airport;
- Do not account for the potential of DER; and
- Do not account for the uncertainty of long-term forecasts (beyond 40 years).

The demand forecasts included in our proposal reflected our best estimate of the load increase from the planned development for the growth area. We have updated our load forecasts based on the latest information. It confirms that new load growth will be significant and as the existing area is rural and remote from existing capacity sources, investment in sub-transmission infrastructure is necessary. However, our investment during 2019-24 will seek to satisfy load demand forecasts for the short and medium term rather than long-term.

4.2 Updated Demand Forecasts

Our demand forecasting methodology was outlined in our regulatory proposal and explained in further detail in Attachment 7.01. In their draft decision, the AER considered that our forecasts were justified and reflected a realistic expectation of demand over 2019-24. Our approach to forecasting demand for the Aerotropolis is consistent with the approach outlined in our regulatory proposal and updated forecasts are provided in Table 2 below.

Table 2: Aerotropolis demand load forecast by driver

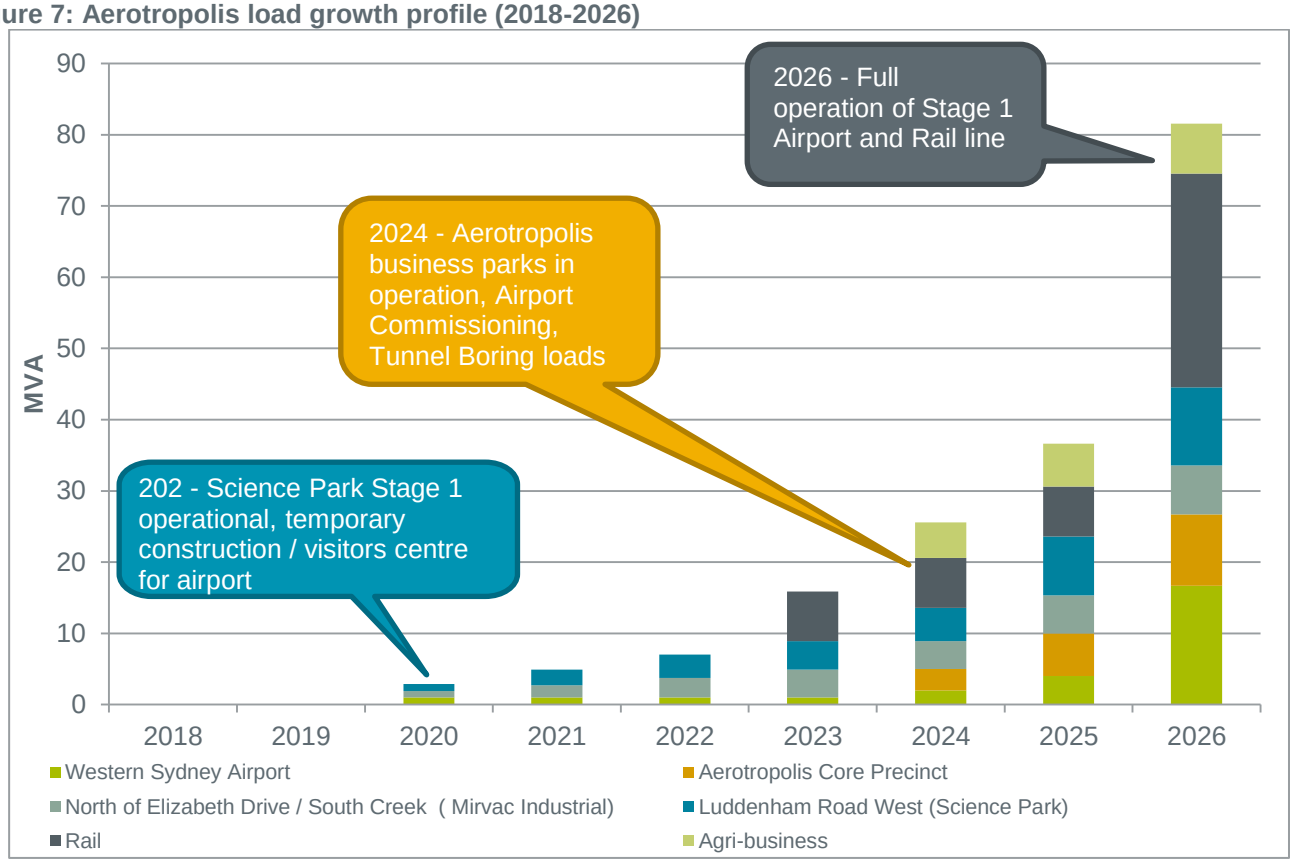
Demand Forecast (MVA)	2020	2021	2022	2023	2024	2025	2026	2035
Western Sydney Airport	1.0	1.0	1.0	1.0	2.0	4.0	16.7	35.4
Aerotropolis Core Precinct	-	-	-	-	3.0	6.0	10.0	20.0
North of Elizabeth Drive / South Creek (Mirvac Industrial)	0.9	1.7	2.7	3.9	3.9	5.3	6.9	18.3
Luddenham Road West (Science Park)	1.0	2.2	3.3	4.0	4.7	8.3	11.0	39.0
Rail				7.0	7.0	7.0	30.0	40.0
Agri-business					5.0	6.0	7.0	8.0
Aerotropolis Load Forecast (MVA)	**2.9**	**4.9**	**7.0**	**15.9**	**25.6**	**36.6**	**81.6**	**160.7**

We expect the increase in demand during the initial stages of the Aerotropolis development will be mainly driven by the airport, the North-South Rail Link and other spot loads in growth area precincts. Our forecast is based on load applications received to date. We have reviewed these applications and applied adjustments to reflect our previous experience and local knowledge of development planning which typically results in a forecast that is lower than requested in applications.

Examples of our adjustments include:

- Elizabeth Drive/South Creek (Mirvac Industrial): We have applied a 21% reduction to the forecasts provided by Mirvac to account for load diversity.
- Luddenham Road West (Science Park): We have applied a diversity factor that results in a 30% reduction in load forecast. The forecast also considers the reduced load from a proposed microgrid.
- Rail: Sydney Metro have indicated 40MVA will be required for Stage 1 of the North South Rail Link. We have reduced this to 30MVA based on our previous experience with rail and motorway projects.
- Agri-business Precinct: In feasibility studies low, medium and high load scenarios were modelled (5MW, 10MW and 15MW respectively). We have adopted the low growth scenario which is net of potential microgrid and distributed generation opportunities.

Figure 7: Aerotropolis load growth profile (2018-2026)



Whilst there is always a level of uncertainty in growth forecasts, recent information suggests development is being brought forward when compared to timing information available 12-18 months ago. Since submitting our proposal, new information has become available regarding the Aerotropolis development area, most notably:

- Establishment of an agribusiness precinct which will involve intensive agriculture production (e.g. hundreds of hectares of glasshouses) that will target export opportunities that the new 24-

hour airport will provide. The relocation of Sydney Markets has been announced as part of the establishment of this precinct.

- Confirmation of the Aerotropolis Core as an initial precinct. This includes the commitment to establish a shared university campus and a new business park that will focus on advanced manufacturing and aerospace industries. A number of multinational companies have signed agreements to establish a presence at this location.
- Announcement of a North-South Rail Link connecting to the airport planned for operation in 2026, which also enables higher densities near the proposed rail stations. Transport NSW has advised of a Stage 1 load requirement of 40MVA in 2026 (traction, station loads, tunnel ventilation) and tunnel boring machine loads during the construction phase. This has not been included in any previous forecasts.

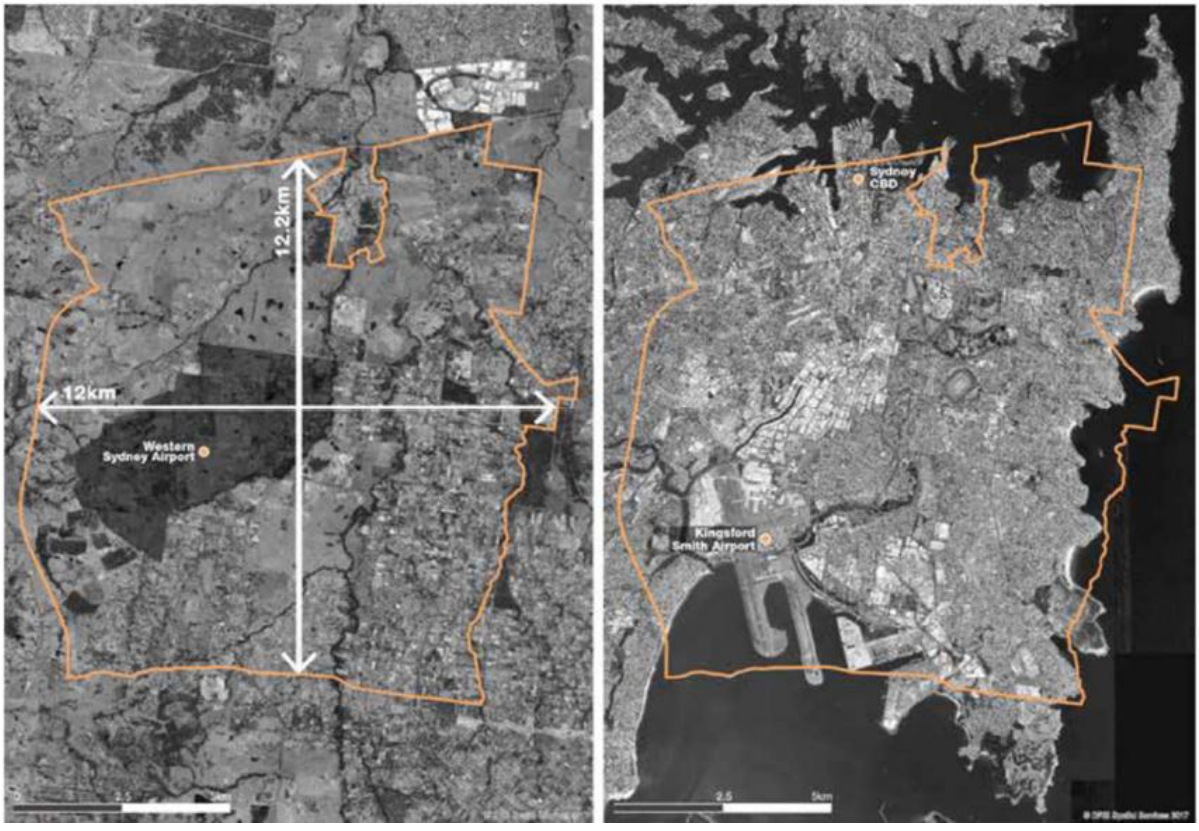
Comparison to Sydney Airport

The AER noted in their draft decision the energy usage per customer at Sydney Airport was significantly below that forecast for WSA. We believe comparing passenger numbers between the two airports does not provide an accurate indication of the augmentation work we will need to undertake during 2019-24 to cater for development in the Aerotropolis precincts.

The airport land area is 1674 Ha compare to the total of 11,200 Ha for the entire growth area i.e. 15%. Load wise we also expect the airport itself to be also approximately 15% of the Aerotropolis at maturity.

Figure 8 below illustrates the scale of the development area by overlaying the equivalent Aerotropolis boundaries over Sydney CBD and Sydney Airport. This conveys the scale of the Aerotropolis growth area which dwarfs Sydney Airport by comparison. With no 132kV assets in this area and only limited capacity from nearby 33kV assets, this provides a better indication of the investment needed to deliver electricity supply to the growth area.

Figure 8: Aerial comparison of the Aerotropolis and Greater Sydney CBD



Source: NSW department of Planning and Environment

4.3 Distributed Energy Resources (DER)

Our forecasts take into account known planned use of DER. For instance, our load forecasts for the Sydney Science Park and Agribusiness precinct assumes development of microgrid with on-site generation which requires a thin grid connection for the earlier stages. However, we anticipate that there will be opportunities for greater non-network supply solutions particularly for Stage 2 of the airport development.

Our staged approach will create option value and ensure that our future investment plans can appropriately incorporate and respond to greater take up of DER and avoid installing network assets which will potentially be underutilised.

There have been preliminary enquiries for large grid scale renewable generation without energy storage in the area. As this is intermittent, it requires a network with adequate strength to enable the export of the renewable generation to the grid and adjacent customers. Whilst these enquiries have a high degree of uncertainty, in such scenarios, large-scale intermittent local generation is likely to prompt the need for additional augmentation in the network.

5. Investment Options

In this section, we assess the feasible investment options to cater for the expected load growth and identify the most efficient option.

5.1 Overview

The Western Sydney Airport is the catalyst which will drive load growth throughout the broader Aerotropolis growth area for decades to come. Electricity infrastructure in the surrounding area is manifestly inadequate to provide the capacity necessary to cater for the sharp increase in demand forecast as the region

The need for Endeavour Energy to invest over the 2019-24 is driven by the requirement to provide a connection point for Western Sydney Airport to enable commencement of operations as planned in 2026. In addition to the airport, the investment planned for 2019-24 will allow infrastructure projects to progress as planned and will cater for growth in the Aerotropolis Core, Northern Gateway and Kemps Creek precincts. This investment will facilitate planning for several zone substations to accommodate load growth and enable customers to connect to the network.

As previously mentioned, we planned to augment our 132kV network to cater for our demand forecasts. This approach stems from our findings from our 2013 Area Study of the Broader Western Sydney Employment Area (BWSEA) which found establishing 132kV supply to the area around the WSA was more cost effective than providing 33kV supply. A scoping study undertaken in 2016 determined that the surrounding 33kV network did not have enough capacity to support the initial stages of development. This further supported undertaking a 132kV supply strategy to service the WSA region.

This project was forecast to cost $61.2 million and was proposed as a contingent project in our regulatory proposal.

5.2 AER Draft Decision

In their draft decision, the AER determined that we did not demonstrate the proposed contingent project was reasonably required to achieve the capex objectives. Specifically, they considered our proposed project:

- Did not reflect a realistic expectation of demand and cost inputs required to achieve the capex objectives; and
- Did not reflect the efficient costs of achieving the capex objectives.

Although the AER recognised we would need to augment the network to provide a timely connection point for the airport, a key concern shared by other stakeholder groups was that our proposed investment sought to provide capacity to meet long-term demand forecasts. It was considered our plan would result in assets being underutilised for many years and not reflect investment that is in the long-term interest of customers.

The AER determined that using demand forecasts up to 2063 were not a reasonable basis for the capacity of connection that we would be required to provide during 2019-24.

A further criticism was that we did not adequately explore other potential augmentation to utilised the existing network to meet the initial stages of demand for the Aerotropolis up to 2030. The AER noted that our proposed investment was contrary to our general staging approach to greenfield augex.

We have acted on this feedback and reassessed both the technical and economic feasibility of the various options to cater for the WSA connection and rapid increase in load expected for the surrounding area. Our review sought to investigate potential opportunities to augment the 33kV network and efficient ways to stage investment over a longer timeframe.

We have assessed three options. The table below outlines the cost of each respective option. A summary of our assessment is included in the following sections.

Table 3: Cost assessment of investment options

	Option 1 2 x 132kV feeders	Option 2 Augment 33kV network	Option 1A Staged version of Option 1
Stage 1 Investment (2019-24)	$61.2m	$25.0m	$39.3m
Stage 2 Investment (post 2024)	$0	$61.2m	$29.0m
NPV Ranking under growth scenario:			
Low (50% of medium)	2	3	1
Medium (our base case provided)	=1	3	=1
High (medium +10%)	1	3	2

5.3 Option 1 - Two 132kV Supply Feeders

This option establishes a transmission ring for the Aerotropolis development area which is much larger than the airport itself. This involves construction of two 132kV supply feeders along a route that traverses the Aerotropolis and surrounding growth area. A132kV feeder ring will be established between the switching stations located to the north and south of the WSA site. This will provide the required N-1 contingency.

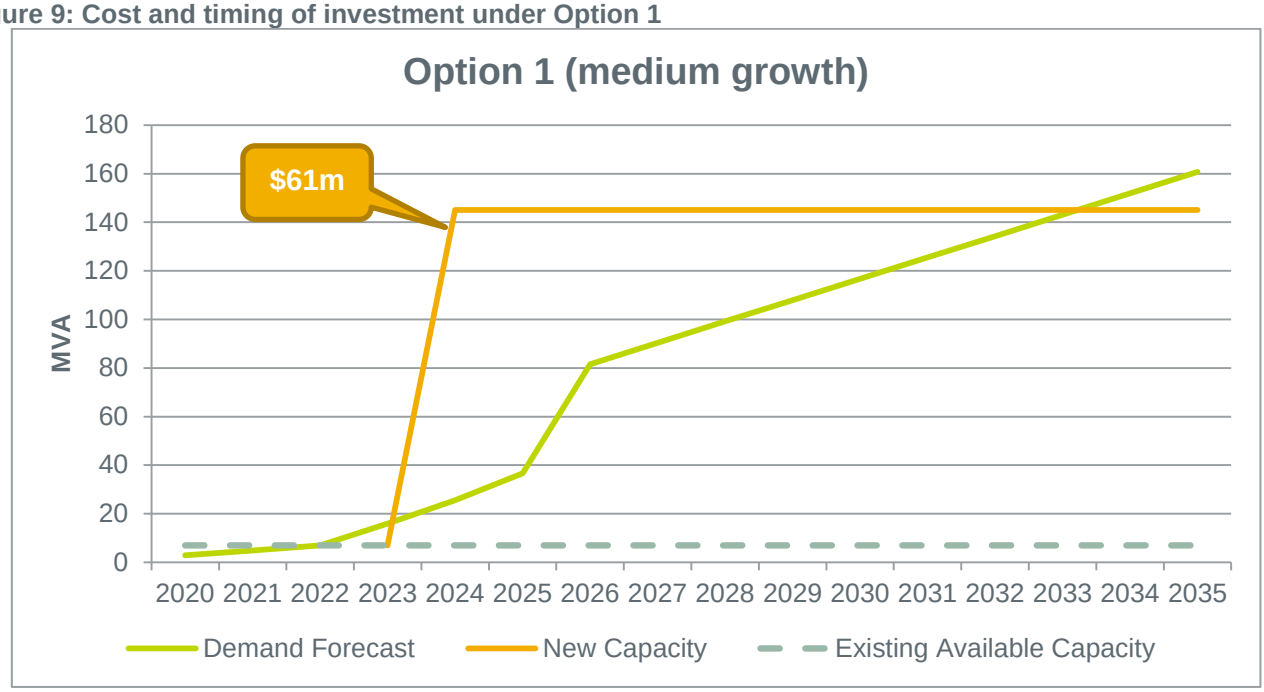
This was previously our preferred investment option as it will satisfy load demand increases expected from the Aerotropolis growth area for the medium to long-term. Furthermore, this option aligns with our single transformation overall supply strategy. Unlike other options considered, this option will not defer, nor require any additional significant augmentation in future regulatory periods.

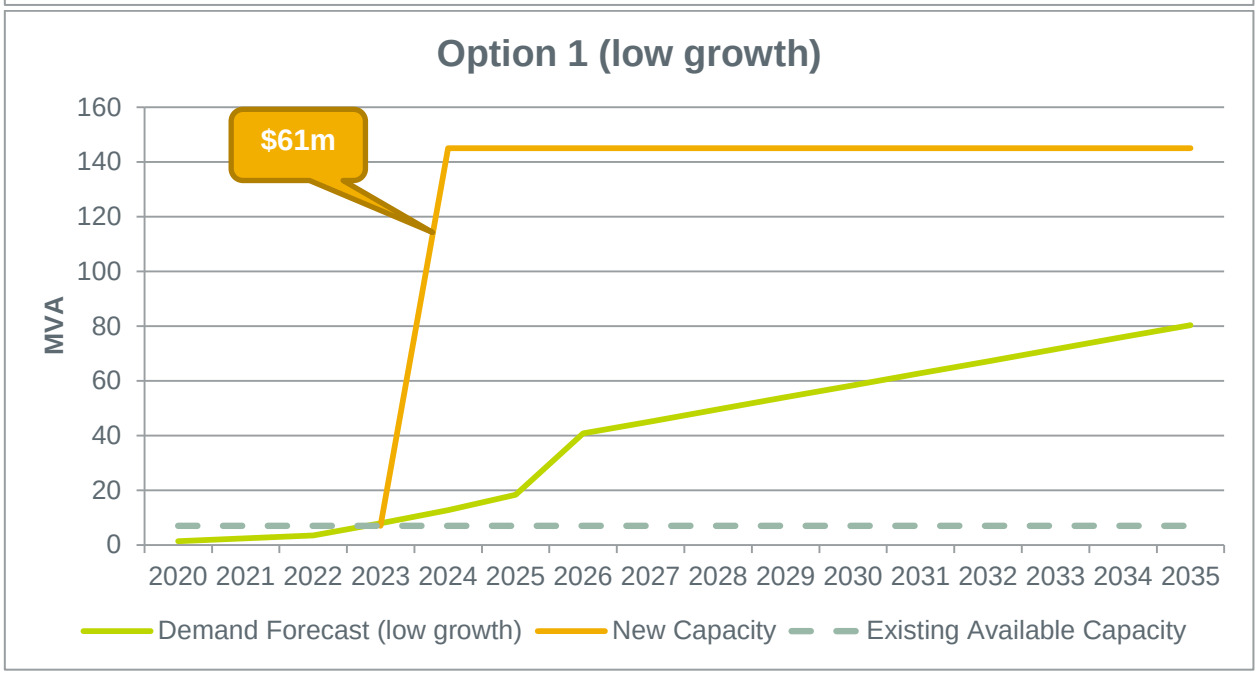
This option is based on developing two interconnected supply points to the airport that would also become a 132kV backbone supplying (ultimately) up to 4 to 5 substations additional to the airport. All assets are considered “shared” as they will ultimately be used by many thousands of individual customers.

This option provides a means for establishing a 132kV connection point for the airport. WSA will need to fund all assets to step down voltages from 132kV, including two 132/33kV substations and internal 33kV reticulation. These customer funded costs are expected to be in the order of $80-100m.

Although the project will be triggered by timing requirements for the WSA, the proposed 132kV infrastructure will provide significant capacity to supply the needs of the surrounding development outside of the airport site. We acknowledge that if forecast load levels fail to materialise, there could be underutilisation of capacity within the sub-transmission network in the short and medium term. Figure 9 below shows the when the additional capacity will be provided under this option for both a medium load growth scenario (our base case) and a low growth scenario.

Figure 9: Cost and timing of investment under Option 1





Details of this option was provided in Attachment 10.32 of our regulatory proposal. The total cost of delivering this investment was estimated to be $61.2m, all of which was expected to be incurred during the 2019-24 period. With the exception of load forecasts which have been updated for the latest information, the information in the business case remains accurate and relevant.

Table 4: Cost breakdown of Option 1

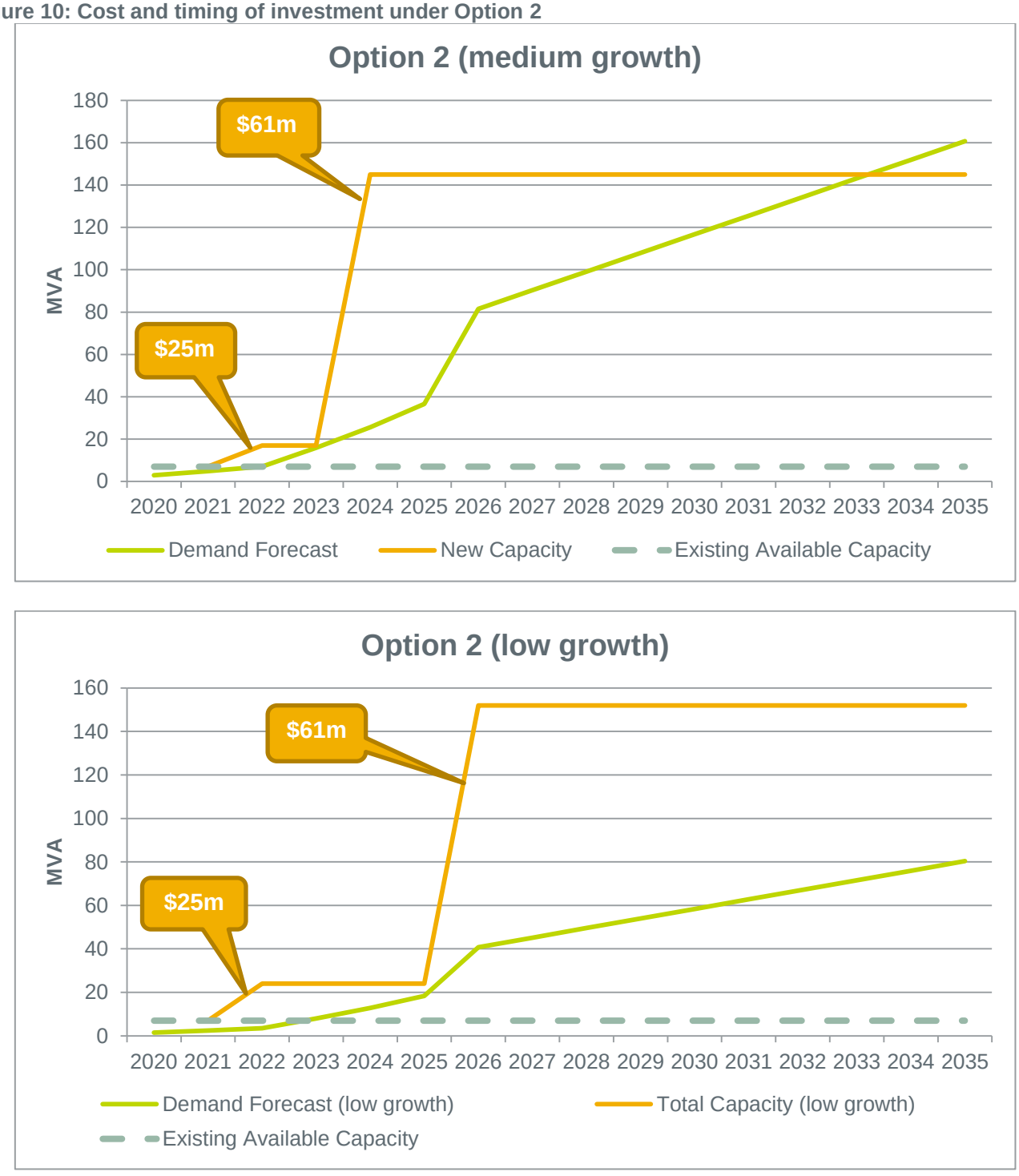
Description of Works	Estimated Cost
132kV Feeder Works Required	
Relocate and Terminate 132kV Fdr 93X Kemps Creek BSP to Elizabeth Dr	$1,078,000
Reconfigure & Terminate 132kV 93X South	$92,500
Establish 132kV feeder – Kemps Creek BSP to Airport North Switching Station (SS)	$9,465,000
Establish 132kV link feeder – Airport North SS to Airport South SS	$16,994,000
Establish 132kV feeder –Airport South SS to Bringelly ZS	$10,429,000
132kV feeder works Kemps Creek BSP to Airport North SS – Environmental works	$171,200
132kV feeder works Airport North SS to Airport South SS - Environmental works	$171,600
132kV feeder works Airport South SS to Bringelly ZS - Environmental works	$171,600
Sub Total	**$38,572,900**
Substation Construction Works Required	
Construct indoor 132kV Airport North Switching Station	$8,400,000
Construct indoor 132kV Airport South switching Station	$8,400,000
Airport North SS - Environmental works	$63,400
Airport South SS - Environmental works	$63,400
Extend Bringelly ZS outdoor switchyard	$4,500,000
Purchase additional land required to allow expansion of Bringelly ZS	$1,170,000
Expansion of Bringelly ZS - Environmental works	$63,800
Sub Total	**$22,660,600**
Total Cost	**$61,233,500**

5.4 Option 2 - 33kV Augmentation Option

We have re-examined the option to augment our 33kV network as an alternative to providing 132kV supply. Our analysis revealed the existing 33kV network in the area has only 7MVA of capacity available in the existing 33kV network under N conditions, and the network is already overloaded under N-1 conditions.

As shown in Figure 10, augmentation of the surrounding 33kV network would require an investment of $25m during 2019-24 and would require Stage 2 132kV augmentation works between 2 to 4 years later based on various growth scenarios. The 4 year deferral is based on a low growth scenario where there is zero development outside the airport. Receipt of several connection enquiries and new information regarding the Sydney Airport Metro Rail line means it is very likely Stage 2 will be required 2 years later rather than 4 years.

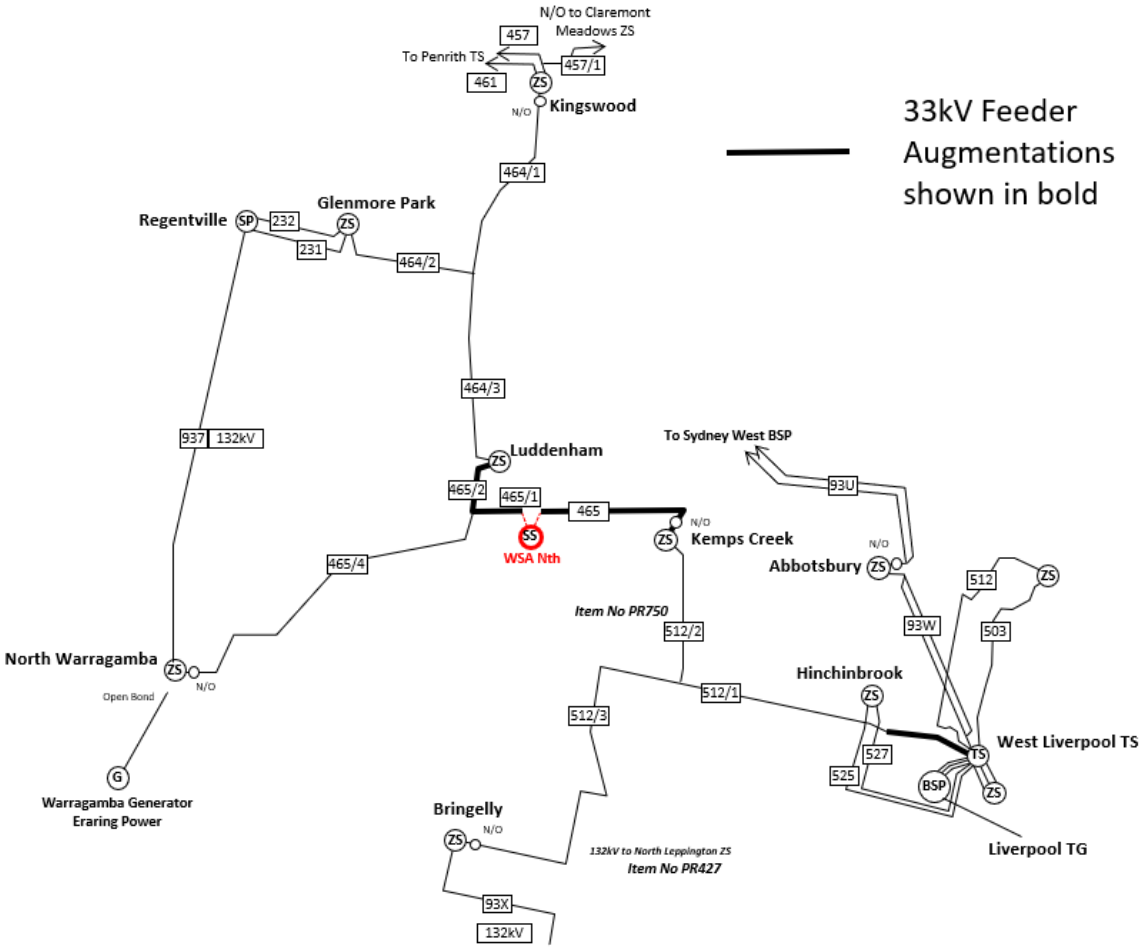
Figure 10: Cost and timing of investment under Option 2



Our analysis reveals this option does not serve the long term interests of consumers as the NPV of capital investment required is higher with this approach. Importantly, there is also a high likelihood that the new 33kV assets will become redundant within a relatively short period. This approach would also be

contrary to our strategy of moving away from using two stages of transformation between grid exit points and distribution voltages. Single stage voltage transformation is a demonstrably more cost effective approach.

Figure 11: Option 2 planned network augmentation



5.5 Option 1A - Staged Approach (Staged version of Option 1)

We reviewed whether an alternative, more flexible approach can be taken to meet the Aerotropolis supply needs. We looked at ways to cater for forecast load in the short to medium term and determined that a staged approach can deliver a technically feasible solution at a lower cost than our previous preferred 132kV option.

Under this approach, the project is delivered in two stages with only the first stage required within the 2019-24 period. This 'hybrid' approach would incur some additional costs in total for the two stages, however NPV analysis shows that the staged option is marginally better. A significant advantage of staging investment is that it will allow us to monitor actual rates of load growth prior to undertaking investment in Stage 2 infrastructure. This provides us with flexibility in tailoring plans to effectively respond to the impact emerging technologies and energy markets will have on demand.

Stage 1

Stage 1 would include establishing only one 132kV feeder from Bringelly to Western Sydney Airport with limited N-1 redundancy provided via utilising the existing 33kV network. This solution provides a firm (N-1) capacity of 20MVA and a connection capacity under N conditions of 60MVA at 33kV to the airport.

With 132kV connection capacity available (at N security) for other large loads such as the airport. This option delivers significantly less capacity than the 132kV dual feeder option.

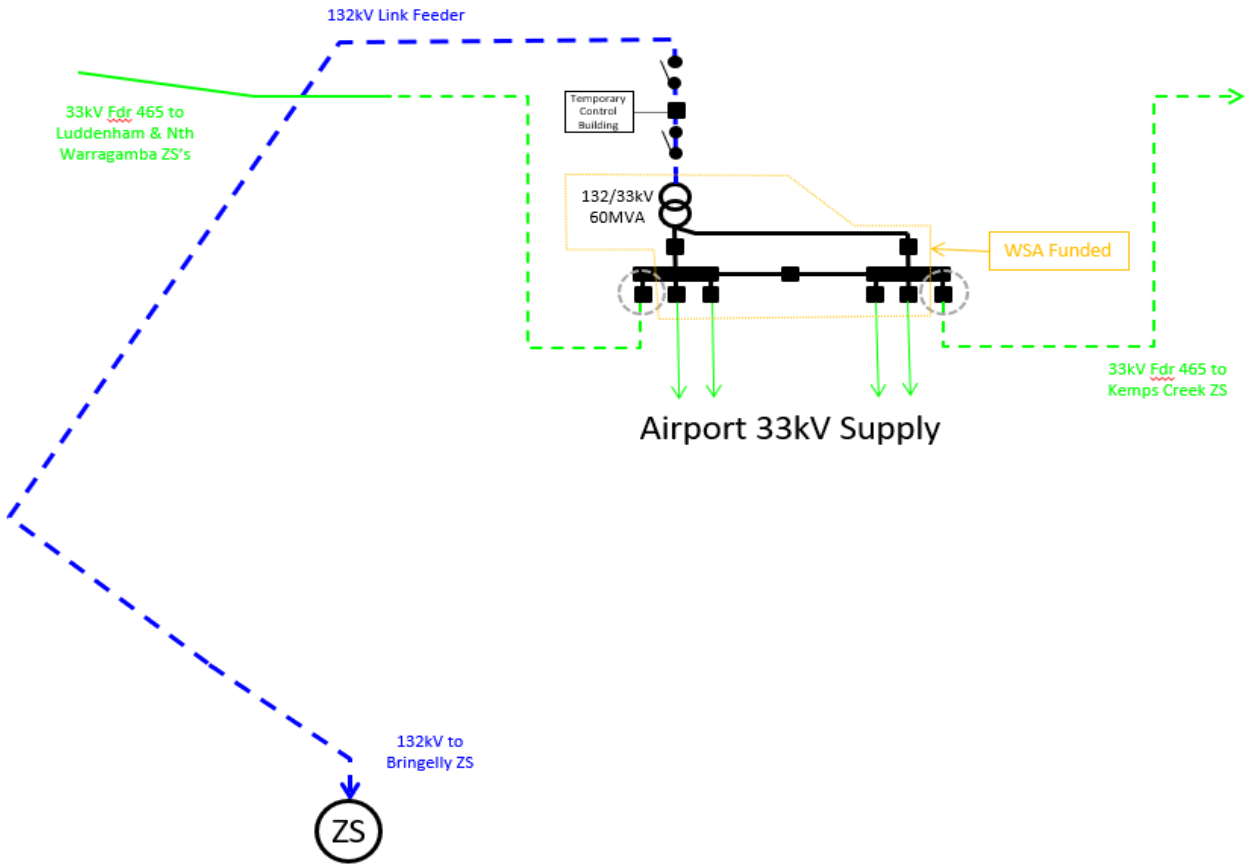
Importantly, this option will facilitate connection for rail load which Sydney Metro has recently advised will be 30-40MVA for initial operations in 2026, increasing to 80MVA for ultimate operation of Stage 1 of the airport project. This load would be provided via the 132kV feeder and not be capable through the 33kV option. They advise ultimate load for the complete Sydney Metro – Western Sydney Airport Project is estimated to be 160MVA. This notification is provided as Attachment 0.13.

Stage 1 investment will cost $39.3m and will include the works outlined in Table 5 below. A line diagram of these works is provided in Figure 12.

Table 5: Cost breakdown of Option 1A

Description of Works	Estimated Cost ($M)
132kV Feeder Works Required	
132kV feeder Bringelly ZS to WSA Sth	$10.6
132kV feeder WSA Sth to WSA Nth	$17.2
Sub Total	**$27.8**
Substation Construction Works Required	
Bringelly ZS works (extend 132kV busbar and add new feeder bay)	$5.7
Sub Total	**$5.7**
Other Works Required	
Terminate 33kV 465 from Luddenham ZS	$1.9
Terminate 33kV 465 from Kemps Creek ZS	$1.9
Est. outdoor 132kV CB including demountable control building	$1.0
Additional 2 x 33kV CB	$1.0
Sub Total	**$5.8**
Total ($M)	**$39.3**

Figure 12: Option 1A planned network augmentation

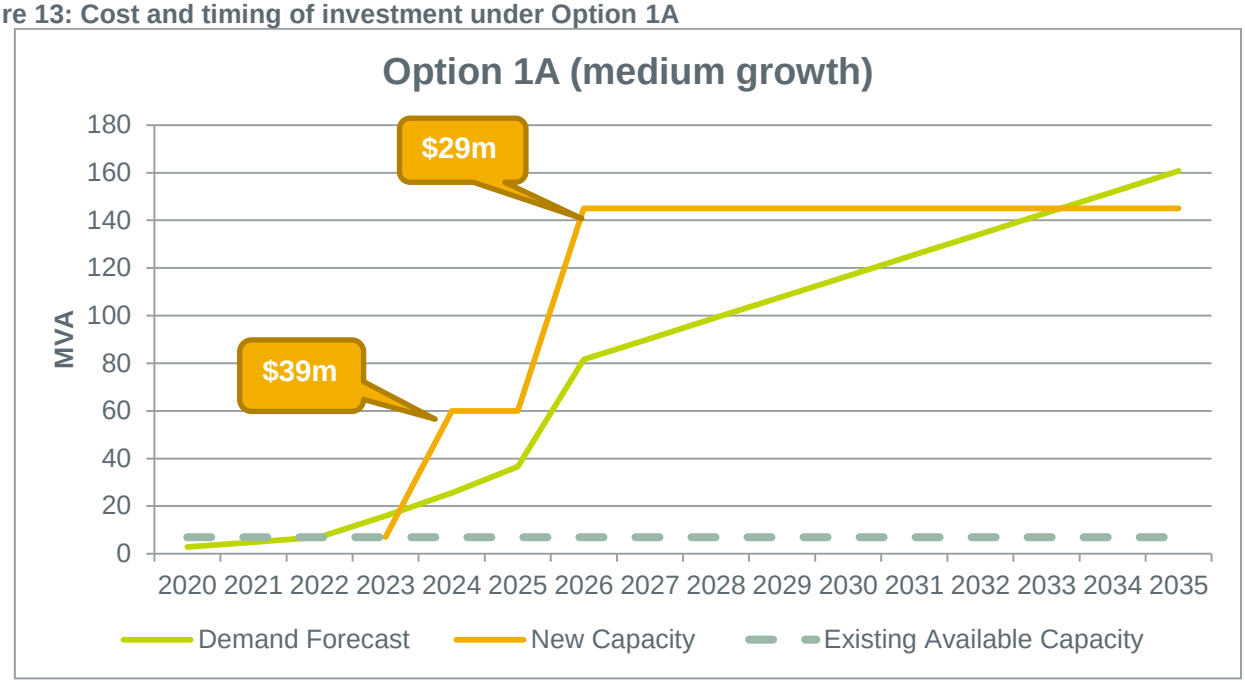


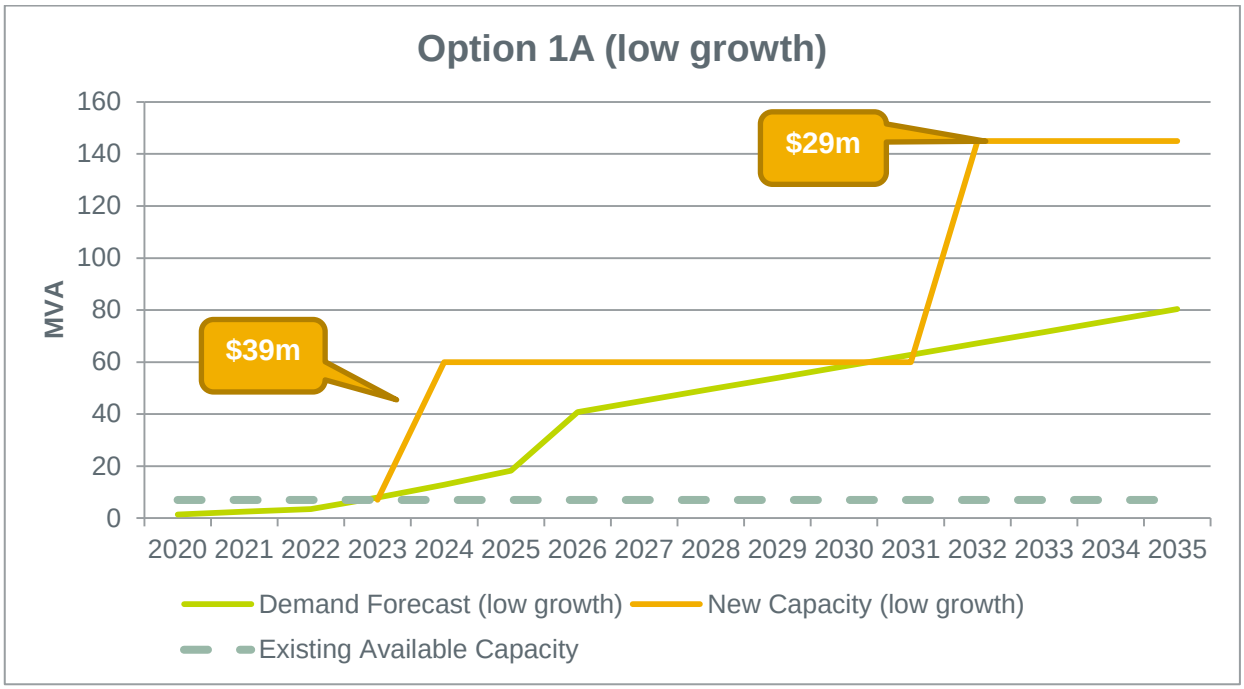
Stage 2

The current scope for Stage 2 includes augmentation to a dual 132kV supply feeder arrangement corresponding with Option 1. The cost of Stage 2 is estimated to be $29.0m and will not be required until after the 2019-24 period. The Stage 2 options are currently being reviewed as part of joint planning with TransGrid.

We note that this planned scope for Stage 2 investment may change subject to the progress of development within the Aerotropolis and future demand growth. A significant advantage of this option is that it provides us with the flexibility to monitor demand and respond to more certain load forecasts to efficiently meet the Aerotropolis energy requirements as they emerge. This approach allows for the potential for a deferred or reduced Stage 2 investment if there are fewer or smaller load constraints within the Aerotropolis than we currently expect. This benefit is displayed in Figure 13.

Figure 13: Cost and timing of investment under Option 1A





6. Who Should Pay?

The cost for establishing the electrical infrastructure needed for the Aerotropolis development will be incurred by both WSA Co and Endeavour Energy.

We understand that Western Sydney Airport will establish an embedded 33kV network to distribute electricity within the airport precinct. This will require construction of substations and underground feeders to provide supply to the airport operations and businesses that are established within the Aerotropolis business park. Western Sydney Airport will bear the full cost of these contestable works and will be responsible for the long-term maintenance and replacement of these assets in their reticulated network.

The Aerotropolis will receive supply at 132kV from the Endeavour Energy network. This will require us to augment our sub-transmission network to allow the connection of the airport and Aerotropolis precincts. The new 132kV infrastructure that we plan to construct will not only facilitate the connection of the Aerotropolis, but will provide the necessary “backbone” planned to service the region surrounding the airport site. With no nearby sub-transmission assets, this investment is necessary to effectively service the Western Parklands City, with the airport connection to this infrastructure just a component of these plans.

The 132kV network will ultimately be used by thousands of new residential, commercial and industrial customers supplied by up to five zone substations and therefore will form part of the shared network. Whilst the airport development has initiated the construction of these network assets during the 2019-24 period, WSA will not be the sole users of these new assets. As a result, Endeavour Energy will fund the $39.3m investment in the shared network over 2019-24.

Any additional work which we need to undertake to specifically cater for the airport’s connection will be paid for by WSA. These costs will be determined in accordance to Endeavour Energy’s capital contributions/connections policy. To be clear, WSA will be subject to our new policy as outlined in the revised regulatory proposal. As highlighted in our regulatory proposal, the proportion of total connection costs paid by customers connecting to our network area is amongst the highest in NEM. Continuing with this approach will help to ensure existing customers do not unfairly pay the cost to augment the network specifically to allow the connection of the airport.

7. Summary

Western Sydney Aerotropolis will be developed in stages over time. Our network investment to cater for load growth within the Aerotropolis will adopt the same staged approach.

With aviation demand in Sydney forecast to double to 87 million annual passengers over the next 20 years, the Western Sydney Airport will provide much needed capacity that ensures Sydney remains Australia's gateway to the world. It has been estimated that failure to deliver this capacity could risk $34 billion to the economy by 2060.

Endeavour Energy's investment plans will be important to facilitate not only the initial development of the airport, but also growth from the broader Aerotropolis growth areas that will develop around the airport. Our planned investment meets the expectations of governments, developers and planners. Most importantly, as it will unlock significant economic benefits that will be shared by residents and businesses across Western Sydney, it meets the expectations of our customers.

The investment we will undertake during 2019-24 is lowest cost (in NPV terms) of the technically feasible options available. We have revised our approach to only deliver the capacity required to cater for load growth over the short to medium term. This will allow us to defer investment in the 132kV network until there is greater certainty about future demand forecasts.

Our staged approach aligns with the staged delivery of the airport and development in the surrounding precincts. It also corresponds to our general approach to network planning for greenfield growth. This approach better balances the need for us to provide capacity to enable significant infrastructure projects to be delivered as planned whilst maintaining capital cost restraint.

The cost of this investment is lower than we initially proposed. It reflects prudent and efficient expenditure, is in the long term interest of customers, satisfies the capital expenditure objectives, and reflects the capital expenditure criteria in the Rules.