31 January 2023

Attachment 5.6.c: Major Projects – Augex and connections

Ausgrid's 2024-29 Regulatory Proposal

Empowering communities for a resilient, affordable and net-zero future.

Ausgrid

1. INTRODUCTION

1.1. What is the purpose of this document?

This document is to provide a summary of the need, options, timing, costs and benefits for the group of major projects that are augmentation and connections driven, and that we have identified in our proposed standard control services (**SCS**) capital expenditure (**capex**) for the 2024-29 regulatory period.

The purpose is to provide the Australian Energy Regulator (**AER**), its consultants, and our stakeholders with a high level view of the need for each individual project, and to show that our analysis of timing, options and cost estimates are efficient and prudent as required by the National Electricity Rules (**NER**).

1.2. Where does this document fit in Ausgrid's proposal?

The underlying strategy and planning context for developing the remaining group of other major projects is described in Ausgrid's proposed capital expenditure (**Attachment 5.1 – Proposed capital expenditure**). This information is critical to understanding how Ausgrid has developed its program within the context of its total forecast capex. The key elements of **Attachment 5.1 – Proposed capital expenditure** that should be read alongside this document include:

- Section 4 which explains the capital planning process; and
- Section 15 which explains how our total capex meets the requirements of clause 6.5.7 of the NER.

Attachment 5.1 – Proposed capital expenditure also identifies a list of supporting attachments containing further information on our capital planning process, key inputs and results of the AER replacement expenditure (**repex**) model.

1.3. Structure and contents

This document provides a list of all other major projects proposed to augment the network and/or enable the connection of new customers, where capital expenditure is forecast to be incurred in the 2024-29 regulatory period. A description of each of these projects is provided, including identifying the need, options, timing, costs and benefits. For some network augmentations, the cost estimates are probability weighted to reflect that there are uncertainties over the likelihood of prospective loads to be materialised, which can impact the scope and/or timing of a major project. Project justifications are grouped by voltage type for ease of reconciling to the AER's review categories. Underpinning documentation, including methodologies, area plans, cost benefit analysis (**CBA**) and planning studies, is available in separate reports.

2. PORTFOLIO OF PROJECTS

The table below identifies various network investments where we expect to incur forecast SCS capex in the 2024-29 regulatory period to enable the connection of new customers and augment the network. **Table 1** provides the name of the project, expected start and end date, the forecast capex on SCS in the 2024-29 period and the total direct costs.

Table 1. Project list for other major projects (chronological order)

Project name	Cost ($m, real FY24)		Start	End
	2024-29	Total		
Other Major Projects				
1. New 33kV supply to [redacted] Willoughby STS (connection)	2.8	4.3	2022	2025
2. New 132/33kV Transformer Macquarie STS (augex)	5.3	7.1	2022	2026
3. 20% New Zone Substation Williamtown (augex component)	4.3	4.3	2025	2029

Of the $19 million of combined expenditure proposed for network augmentation ($13 million) and connections ($6 million) in major projects during the 2024-29 period, $12 million will come from works in the projects listed above. These investments are driven by major customer connections and prospective developments that will require new assets if confirmed. Details of these projects are presented in the following chapters of this document.

The augmentation expenditure not covered by this document consists of prospective projects at earlier stages of development, which may or may not be materialised as they depend upon major customer developments. Similarly, the connection expenditure not covered by this document consists of relatively small non-contestable works to connect two major customers (approximately $0.6 million each) and prospective major customer developments that may or may not be materialised, for which a probability of proceeding between 10% and 50% has been assigned.

It should be noted that CBA has only be applied to Project 2 above. It has not been applied to non-contestable customer connections (i.e. Project 1), because all loads will be unserved if the connection is not actioned. The calculation of benefits from the reduction of expected unserved energy will result in values considerably higher than the network investments required to connect the customer. As the cost of the non-contestable connection will be recovered by a cost reflective tariff applied to the customer, with no impact for the customer base, the commercial viability of this type of projects is secured. CBA has also not been applied to the initiative proposed by the NSW government in the Williamtown area (i.e. Project 3), because this proposal is at early stages of development.

The following sections provide an overview of the proposed other major network investments, presented in order of commencement date.

Project 1 – New 33kV supply to [redacted] at Willoughby STS

Project Description

Ausgrid has received a connection application from [redacted] (the customer) to supply a new data centre at a site located within 500m of Willoughby 132/33kV Sub-transmission Substation (**STS**), in the Lower North Shore network area. The customer has requested an initial N-1 supply of 68MVA, which is expected to double in the medium term.

The customer will directly fund the installation of 33kV underground feeders from the customer's substation site to Willoughby STS; however, as the STS supplies substantial loads and works within substations have inherent safety and network security risks, Ausgrid requires direct control over works undertaken within the STS site. As a result, Ausgrid will carry out the connection works at Willoughby STS (i.e. non-contestable works), up to a Point of Demarcation between contestable and non-contestable works outside Willoughby STS. The non-contestable works will be included in the pool of costs to be recovered via the Individually Calculated Tariff (**ICT**) for this customer.

Therefore, a project is proposed to enable non-contestable connection works to connect the customer at Willoughby STS.

Willoughby STS was commissioned in 1968. It is equipped with three 120MVA 132/33kV transformers, with provision to accommodate a fourth transformer in the future, and four sections of 33kV switchgear comprising twenty-eight 33kV oil circuit breakers. It is supplied by four 132kV feeders from Transgrid's Sydney East 330/132kV Bulk Supply Point (**BSP**) via Lindfield 132kV Sub-transmission Switching Station (**STSS**).

Willoughby STS currently provides supply to two 33/11kV zone substations, as well as several major customers connected at 33kV including Sydney Trains, Lane Cove Tunnel, Sydney Metro and the Gore Hill Technology Park. A geographical overview of Willoughby STS and surrounding areas is presented in **Figure 1.**

Figure 1. Overview of Willoughby STS and surrounding areas

To meet the customer requirements, the ultimate supply arrangement is needed by FY25. The direct cost of the non-contestable connection works is estimated to be $4.3 million, of which $2.8 million is forecast to be incurred in the 2024-29 period.

Project Need

The customer has requested an initial permanent N-1 supply for up to 68MVA maximum load, with an ultimate supply that could reach 140MVA. The customer also requested the ultimate arrangement to be available in FY25.

Options

Due to the proximity of the customer site to Willoughby STS, the most cost-effective solution is the provision of 33kV supply from Willoughby STS.

Consideration was given to provide 132kV supply via Royal North Shore Hospital (**RNSH**) feeders. However, this option was not pursued because it is materially more expensive and will not be able to meet the proposed date for the ultimate arrangement. In addition, it will require 132kV network reinforcements in the Lower North Shore area.

Given the magnitude of the load requirements, 11kV supply options were not considered as the ultimate supply option.

Due to the load magnitude and staging requirements, the load will be initially supplied at 11kV and ultimately at 33kV. As a result, the customer has determined to proceed with the 33kV supply as the permanent supply option.

The preferred option will comprise an initial installation of two new 33kV feeders from Willoughby STS to the customer's substation, each capable of supplying a maximum demand of 68MVA. These works will include a provision to enable the future installation of two additional 33kV feeders, also be rated to be able to supply a maximum demand of 68MVA under emergency conditions.

The non-contestable connection works will include the installation of appropriate duct banks and 33kV cables between the terminations of Ausgrid's 33kV switchgear inside Willoughby STS, and the Point of Demarcation between contestable and non-contestable works outside Willoughby STS. This will also include communications, control and protection system modifications to enable this connection, as well as the works required to upgrade designated 33kV feeder bays at Willoughby STS.

These works will be undertaken with due consideration of the future Willoughby STS 33kV switchgear replacement project.

It should be noted that Ausgrid will be able to recover the cost of the non-contestable connection works on an ongoing basis via Distribution Use of System Charges (DUOS) as well as ancillary service fees, by applying an Individually Calculated Tariff (**ICT**) to the customer.

As the non-contestable connection works of the only credible option are less than $6 million, Ausgrid is not required to undertake the Regulatory Investment Test for Distribution (**RIT-D**) for this project.

Timing

Based on customer requirements, the ultimate supply arrangement must be available by FY25.

Project Cost & Benefits

The proposed solution involves the installation of 33kV high capacity feeders from the 33kV feeder bays at Willoughby STS to the Point of Demarcation between contestable and non-contestable works

outside of Willoughby STS, upgraded and new 33kV feeder bays, and termination works as well as communications, control and protection system upgrades at Willoughby STS to enable the connection of the customer and meet service requirements. The direct cost is estimated to be $4.3 million, and the corresponding cash flow is outlined in **Table 2.**

Table 2. Project Cashflows - New 33kV supply to [redacted] Willoughby STS (real $FY24 million)

	Prior	FY25	FY26	FY27	FY28	FY29	Post
Preferred Option	1.5	2.8	-	-	-	-	-

Taking into consideration that the entire customer load will be unserved if the network connection is not implemented or delayed, the benefits of avoided network risks derived from implementing this connection will be significant and will provide a positive net benefit for the customer.

The works within Willoughby STS and up to the Point of Demarcation are classified as non-contestable, and as such they would be carried out and funded by Ausgrid, noting that non-contestable costs will be recovered from the customer via an ICT.

The 33kV work from the interface area just outside of Willoughby STS to the customer's site is deemed as contestable and will be managed and funded by the customer.

Project 2 – New 132/33kV Transformer at Macquarie STS

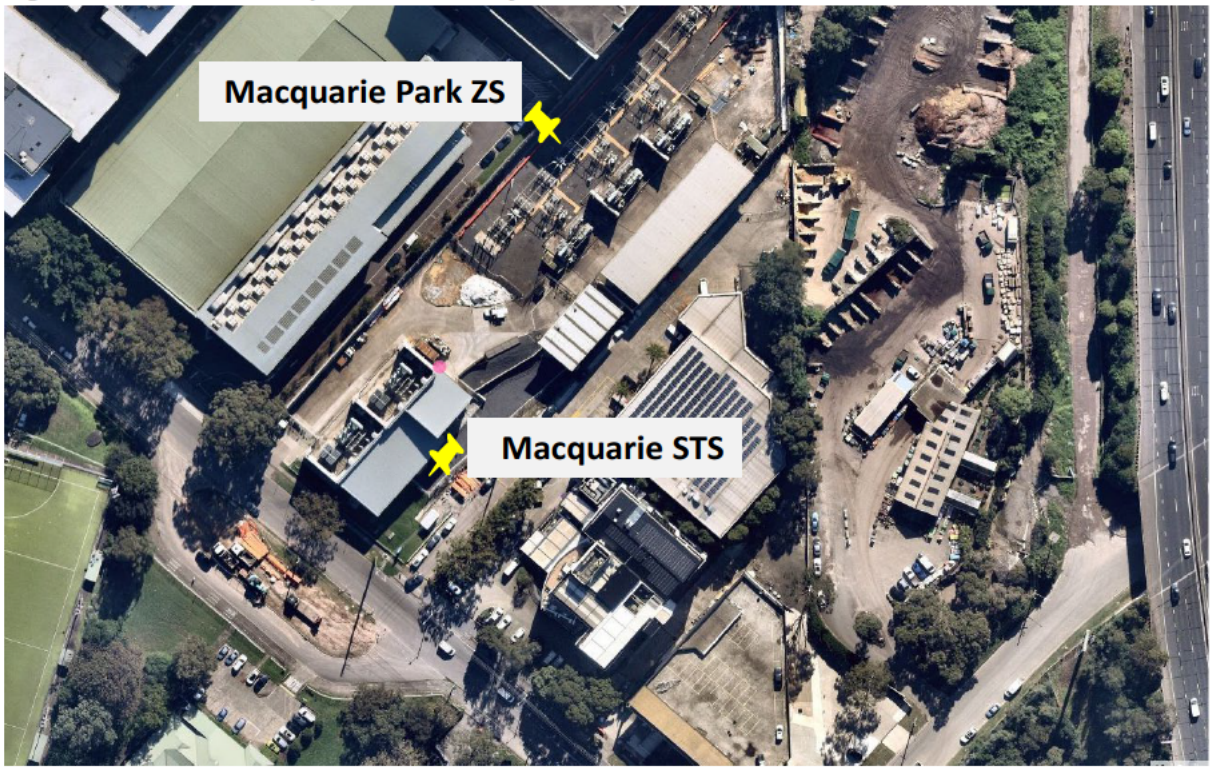
Project Description

Ausgrid has received several connection applications in the Macquarie Park network area, to supply new data centres located in relative proximity to the recently commissioned Macquarie 132/33kV Sub-transmission Substation (**STS**). These customers have plans to expand data centre services concurrently. As these developments proceed, a network augmentation will be required in the area to be able to meet the combined load requirements in the medium term. Therefore, a project is proposed to install an additional 120MVA 132/33kV transformer at Macquarie STS.

The project to establish Macquarie STS has been recently commissioned. It was constructed to supply and connect three large data centre customers located in the Macquarie Park area. As these loads are significant (i.e. 133MVA of combined load requirements) and available spare 11kV capacity in the area is not sufficient to support these loads, it is considered that a 33kV supply is the most efficient way to supply these customers going forward. A new STS has been co-located on the same site as the existing Macquarie Park Zone Substation (**ZS**) and is equipped with two 120MVA 132/33kV transformers and three sections of 33kV switchgear comprising sixteen 33kV gas insulated switchgear (**GIS**) circuit breakers.

A geographical overview of Macquarie STS and the adjacent area is presented in **Figure 2.**

Figure 2. Overview of Macquarie STS and adjacent area.



The direct cost of the proposed solution is estimated to be $7.1 million, of which approximately $5.3 million is forecast to be incurred in the 2024-29 period.

Project Need

At present, total demand committed by three data centres is 133MVA, which can be supplied from the current network arrangement at Macquarie STS. In addition, load requirements totalling 151MVA have been received for planning review.

Additional applications have been received from data centres. As these applications progress, the combined additional load will result in the need to augment the network, and the resulting network investment is likely to be completed in the 2024-29 regulatory period.

In accordance with the NER, Ausgrid has an obligation to make an offer of connection to these customers.

Options

Due to the proximity of the prospective new customers to Macquarie STS, the most cost-effective solution is the provision of 33kV supply from Macquarie STS. The initial review of these additional load requirements concluded that a 33kV connection will continue to be the most efficient way to supply these loads. An expansion of Macquarie STS is required to accommodate the load increase and involves the installation of a third 120MVA 132/33kV transformer unit at Macquarie STS and associated 132kV and 33kV switchgear equipment.

Consideration was given to provide direct supply at 132kV to these customers. However, this option was not pursued because it would result in unnecessary duplication of network investments, which would be materially more expensive and less space efficient. Each customer would have to install switching equipment and substations to reduce the voltage to the required internal level, occupying areas in their properties which otherwise could be used for their core business activities.

Given the magnitude of the load requirements, 11kV supply options were not considered. There are technical limitations associated with installing multiple 11kV feeders to a single large load customer, such as multiple switching stations, implementation of complex protection schemes to manage the operation and separate metering points at 11kV.

As a result, the installation of an additional transformer at Macquarie STS is the preferred option to enable 33kV supply to the prospective customers.

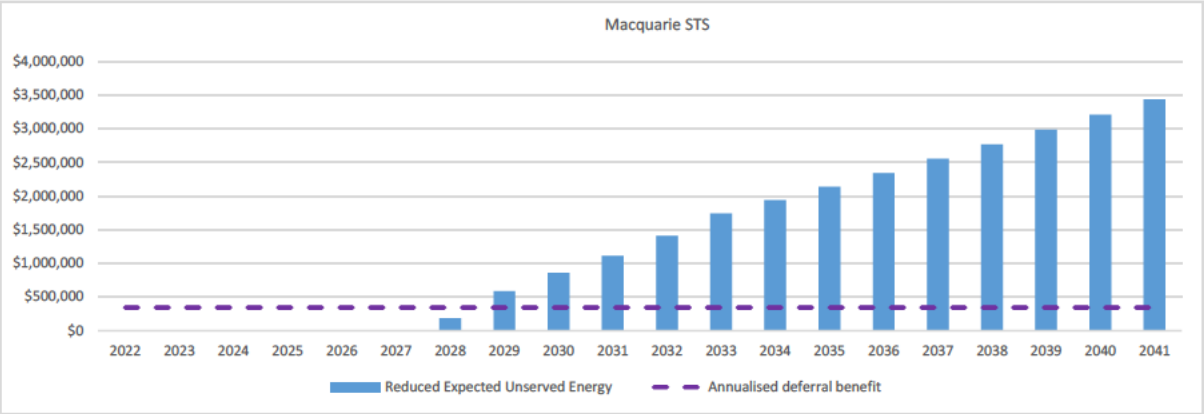
As these prospective customers will utilise the majority of the new asset, specific tariff arrangements will be established to recover the cost of the augmentation from the beneficiaries. These customers will be charged a cost reflective network price, determined from this network augmentation investment, plus allocated costs from the use of the upstream system via Distribution Use of System Charges (**DUOS**).

As part of the NER requirements, a regulatory investment test for distribution (**RIT-D**) will be conducted on this project. If during the RIT-D consultation a non-network option is found to offer a cost-effective alternative to the preferred network option, the solution will be modified accordingly.

Timing

The optimal timing is determined as the crossing point between the annualised benefits of avoiding Expected Unserved Energy (**EUE**) and the annualised value of deferring the network augmentation. Based on expected loads from committed customers and new connection applications, the new transformer is required by FY29. However, two data centre customers have committed to make a direct contribution of $1.3 million to support development/design work on the project and advance this project to FY26, in order to secure N-1 supply requirements for their proposed data centre developments.

Figure 3. Cost-Benefit Analysis – New Macquarie STS Transformer No.3



Project Cost & Benefits

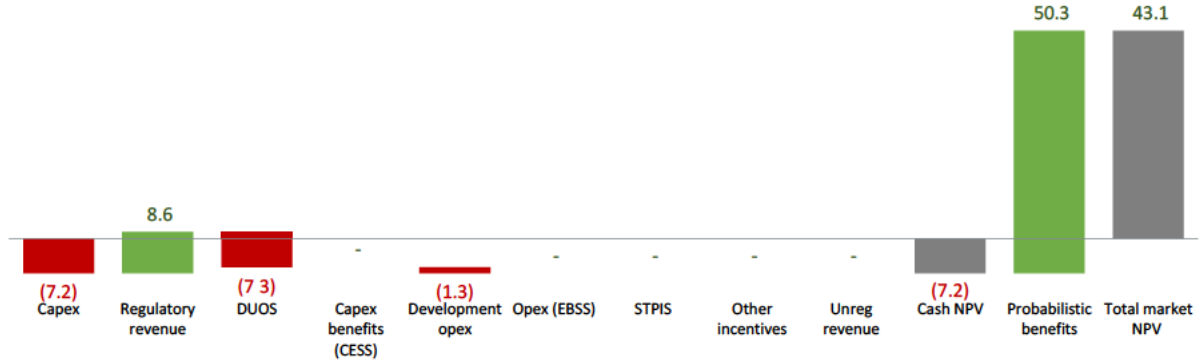
The proposed solution involves the installation of a third 120MVA 132/33kV transformer unit and associated switchgear equipment. The direct cost is estimated to be $7.1 million, and the corresponding cash flow is outlined in **Table 3.**It should be noted that customers will provide a direct contribution estimated to be $1.3 million, to support development/design work on the project.

Table 3. Project Cashflows - New 132/33kV Transformer No.3 Macquarie STS (real $FY24 million)

	Prior	FY25	FY26	FY27	FY28	FY29	Post
Preferred Option	1.8	4.3	1.1	-	-	-	-

Taking into consideration benefits of avoided network risks derived from implementing this solution, the network investment will provide a net benefit of $43.1 million over the standard life of the asset.

Figure 4. Market NPV – New 132/33kV Transformer No.3 Macquarie STS ($ million)



Project 3 – 20% New Zone Substation Williamtown area

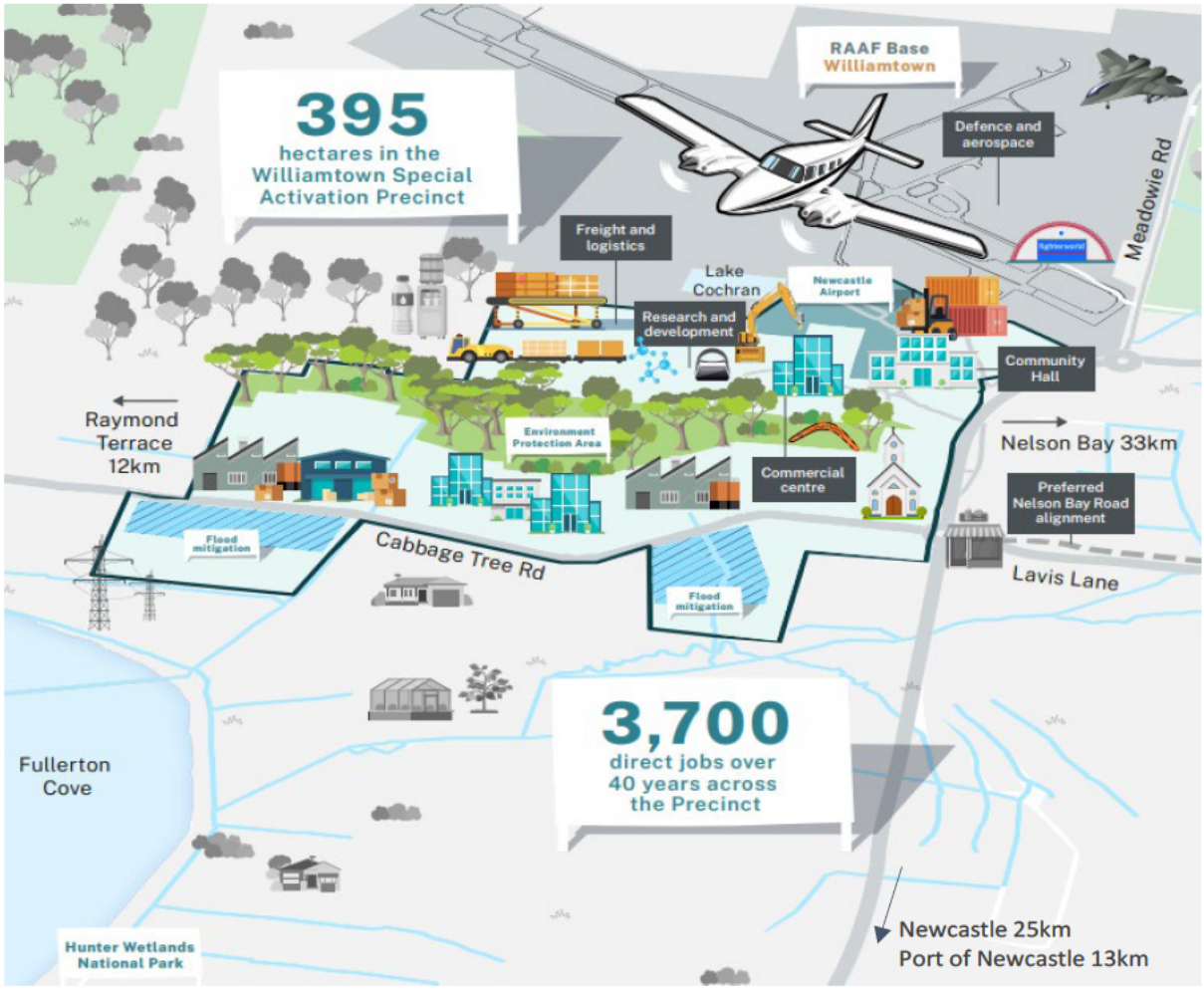
Project Description

The NSW Government has plans to build a Special Activation Precinct in the Williamtown area, next to the Royal Australian Air Force base. The objective is to create a defence, aeronautics and aerospace hub to attract new and existing businesses related to these industries and boost the local economy.

This will result in new commercial and industrial loads that will grow over the next decades. To enable this development, it is anticipated that a new zone substation will have to be established in the area, capable to accommodate both existing and prospective loads.

An illustrative view of the proposed Williamtown precinct is presented in the **Figure 5**.

Figure 5. Williamtown Special Activation Precinct



From [Williamtown Special Activation Precinct Draft Master Plan (nsw.gov.au)]

As this proposal is at a very early stage of development, there are uncertainties over the timing or the likelihood of this project to proceed. Therefore, the establishment of a new zone substation in the Williamtown area is included as a conditional project. At present, the probability assigned to this project to proceed is 20%. This project is expected to be initiated and completed in the 2024-29 period and the allowance considered is $6.6 million (equivalent to 20% of the expected cost of installing a new zone substation and associated 33kV and 11kV connections in the area). Of this allowance, 70% of the expenditure is considered augmentation and the remaining 30% replacement expenditure.

Project Need

The proposed precinct is located south of RAAF Base Williamtown and the Newcastle Airport. The proposed area for the precinct is 395 hectares and the land will be rezoned to allow for new commercial and industrial use.

If development objectives succeed in creating the industrial hub in this precinct, it is expected that prospective commercial/industrial load requirements may reach between 50MVA and 100MVA in over 30 years. Initial new loads could be managed by the existing Williamtown 33/11kV Zone Substation, which has a capacity of 26MVA and a current load of 7MVA. However, in the medium term the load ramp up may be such that no spare capacity will be available and network augmentation investments will be required.

Expected loads from the precinct may exceed available capacity in the area within the next 5-10 years.

Options

At this early stage of development, it is not possible to determine specific network options to supply the prospective loads. The most prudent approach is to establish an allowance based on the available evidence supporting the development. The resulting provision consist of the following:

- A cost that reflects the need to establish a new zone substation in the area, as the prospective loads could materially exceed the available capacity; and
- A probability of the project to proceed estimated to be 20%, which is given to developments where the documented evidence of the project is limited to media coverage and a master plan for the Williamtown Special Activation Precinct published in April 2022.

No consideration has yet been given to assess the ability of non-network solutions to assist in meeting the identified need.

If the new loads are realised, this will provide an opportunity to advance replacement of the existing 11kV switchgear at Williamtown Zone Substation, which otherwise is to be replaced after 2040.

Timing

A Cost Benefit Analysis is yet to be calculated, as the corresponding load profile is not available and detailed options analysis cannot be developed. Despite this, it is reasonable to assume that the NSW government Williamtown special activation precinct, supported by the Snowy Hydro Legacy Fund, will become an active initiative in the 2024-29 period.

Project Cost & Benefits

The proposed solution considers an allowance equivalent to 20% of the cost of establishing a new zone substation in the area. The resulting direct cost of the network augmentation component is estimated to be $4.3 million, and the corresponding cash flow is outlined in **Table 4.**

Table 4. Project Cashflows – 20% New Zone Substation Williamtown area (real $FY24 million)

	Prior	FY25	FY26	FY27	FY28	FY29	Post
Preferred Option	-	0.2	0.7	1.7	1.4	0.3	-

If the prospective development goes ahead, it is very likely that benefits of avoided network risks will be derived from implementing this solution, but at present it is not possible to calculate expected unserved energy values. Further information is required to be able to estimate a net present value.