5.16

Project justifications for augmentation major projects

Ausgrid

Content

1 INTRODUCTION

1.1 What is the purpose of this document?

This document is to provide a summary of the need, options, timing and costs for the significant augmentation major projects identified in our proposed standard control services (SCS) capital expenditure (capex) for the 2019-24 regulatory period.

The purpose is to provide the AER, its consultants, and our stakeholders with a high level view of the need for major augmentation projects, and to show that our analysis of timing, options and cost estimates are efficient and prudent as required by the National Electricity Rules (the Rules).

1.2 Where does this document fit with other material in our Regulatory Proposal?

Attachment 5.01 (Ausgrid's proposed capital expenditure) provides important context on how we developed our major augmentation projects. This information is critical to understanding how Ausgrid has developed its major projects program within the context of its total forecast capex. The key elements of Attachment 5.01 that should be read alongside this document include:

- Section 2 which explains the capital planning process
- Section 3 which explains how our total capex meets the requirements of clause 6.5.7 of the Rules
- Section 5 which explains Ausgrid's growth driven program,.

Attachment 5.01 also identifies a list of supporting attachments with further information on our capital planning process, key inputs and customer connection forecasts.

1.3 Structure and contents

The document provides a list of the significant major projects where we forecast to incur a capital cost in the 2019-24 regulatory period. We then provide a description of each of these projects including identifying the need, options, timing and costs. In many cases, we have provided a reference document that is available to the AER and its consultants upon request such as our detailed Area Plans and cash flow analysis.

These capex requirements for these projects have been treated as a probability weighted capex forecast, subject to the probability of development proceeding in the area. Underpinning documentation, including methodologies, area plans, cost benefit analysis and planning studies, is available on request.

2 PORTFOLIO OF PROJECTS

Table 1 below identifies the most significant subtransmission augmentation projects where we expect to incur forecast SCS capex in the 2019-24 regulatory period. The table provides the name of the project, expected start and end date, and the forecast SCS capex in the 2019-24 period.

Table 1. Project life for Subtransmission Augmentation Projects

Project name	Cost ($m, real FY19		Start	End
	2019-24	Total		
1. Macquarie Park STS	32.3	33.6	2018	2023
2. Rozelle STS	21.7	22.9	2019	2022
3. Alexandria STS Augmentation	3.0	3.4	2018	2021
4. White Bay Zone Substation	2.2	2.4	2018	2022
5. Pyrmont STS transformer	1.6	1.8	2022	2025

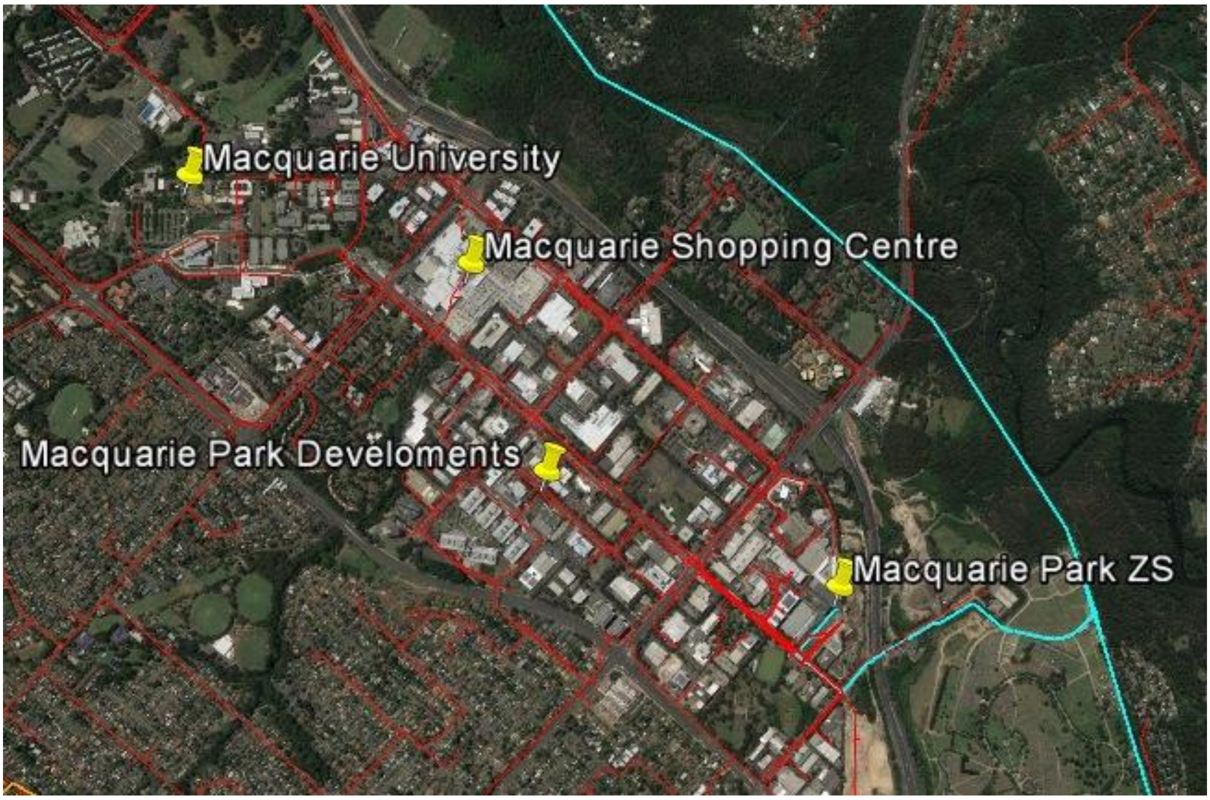
3 PROJECT 1 – MACQUARIE PARK STS

3.1 Project description

The project is to provide 33kV supply capacity to the Macquarie Park Precinct in the Carlingford area of Ausgrid's network to supply at least two major customers initially, and more customers in the future as well as provide for expansion of Macquarie University. The preferred option is to establish a new 132/33kV Macquarie Park Subtransmission substation (STS).

This project has been allocated a probability of 75% of proceeding, based on the anticipated need to augment the Ausgrid Subtransmission network using this proposed solution. The allocated project cost[1] is $33.6 million, of which $32.3 million is forecast to be incurred in the 2019-24 period. It is expected to be due for completion during the second half of 2022.

Figure 1. Macquarie Park STS



3.2 Need

The Macquarie Park industrial, commercial and educational precinct is principally served by Macquarie Park 132/11kV Zone Substation, with supply at 11kV to local and nearby areas shared with Epping and Top Ryde zone substations.

Significant development activity is increasing the electrical load in this area and there are several prospective major proposals at various stages, including:

[1] Note this project is classified as conditional because the likelihood that the project will proceed is not yet confirmed at this time. The project cost is the result of multiplying the total cost of the network solution by 75%, which is the assumed probability that the project will proceed at the time proposed.

- Telecommunication and information technology facilities
- Macquarie University educational and commercial developments
- High density residential redevelopment.

The timing for these additional loads is yet to be established, however, some are quite advanced. An opportunity exists for a strategic, scale-efficient and cost-effective investment in shared network assets to benefit multiple customers.

3.3 Options

We examined the following options:

1. 11kV supply from Macquarie Park zone substation and/or Top Ryde zone substation, including 11kV network augmentation and expansion of Top Ryde zone substation.
2. 11kV supply from a new 132/11kV zone substation.
3. 33kV supply from a new 132/33kV STS.
4. Consideration of demand management.

Some of the expected development will be supplied from the 11kV network. However, it would not be practical or cost-effective to supply all of these loads at 11kV. The supply to larger connections at 33kV will be more efficient and cost-effective, and will retain 11kV capacity for the smaller developments. Establishing a 132/33kV Macquarie Park STS in the area provides a strategic and integrated approach to address the long term needs in the area, and this is the preferred solution.

3.4 Timing

The timing is determined by timing of customer load take up, with some customer assets already under construction. It is anticipated that construction work will have to start in 2018 to enable project completion by September 2022.

3.5 Demand Management

The driver for the scope and timing of the planned work is the need to provide connections, capacity and the relevant reliability to meet the requirements of the major customer connections. As detailed discussions with customers on the proposed connections remain in progress, no significant investigation into non-network options has been conducted. As customer decisions are firmed up, a detailed assessment will be completed.

As part of the Rules requirements, a Regulatory Investment Test for Distribution (RIT-D) is expected to be conducted on the project. This will inform interested parties of the opportunity identified, and invite submissions from non-network proponents. Where the RIT-D process or any consequent tender for non-network solutions indicates that a non-network scope of work offers an improved cost benefit outcome, the selected solution to the need will be modified accordingly.

3.6 Costing

We undertook a site specific estimate of the costs of the preferred solution, using the Business Planning and Consolidation (BPC) tool outlined in Attachment 5.03.

The proposed solution involves the construction of a new STS, connected to an existing 132kV overhead line that passes the prospective site, and equipped with two 132/33kV transformers, a 132kV indoor busbar and a 33kV indoor busbar. The overall cost is multiplied by 75% because this is the likelihood of proceeding allocated to this project. Note that the cost of acquiring land for the new site is not included in these estimates.

The cash flow for the project is outlined in Table 2 below.

Table 2. Project cash flows ($m, real FY19)

	Previous years	2019/20	2020/21	2021/22	2022/23	2023/24	Later years
Network Option	1.3	1.3	10.5	18.1	2.4	-	-

4 PROJECT 2 – ROZELLE 132/33KV STS

4.1 Project description

The project is to construct a 33kV busbar and switch room at the Rozelle 132/33kV STS in the Inner West region of Ausgrid's network by late 2021 to provide a firm, permanent 33kV connection point for the WestConnex motorway development and other future loads such as White Bay passenger terminal, White Bay zone substation and potentially the Western Harbour Tunnel and Metro West if they proceed.. The upgrade of Rozelle STS will also include replacement of the existing 132/33kV 30MVA Transformer 2 with a 60MVA unit. Other large customer connections are anticipated in this area in the future. Hence, this project is scoped to allow for future connections. The total project cost is $22.9 million, of which $21.7 million is forecast to be incurred in the 2019-24 period. It has been allocated 100% probability of proceeding, based on the current connection contract status with WestConnex.

Figure 2. Rozelle STS

4.2 Need

Rozelle 132/33kV STS is situated close to where Victoria Rd crosses the Parramatta River. It predominantly functions as a transmission switching station, interconnecting Drummoyne, Leichhardt, Pyrmont and City Central substations. Currently, the only 33kV local supply customer is the existing Sydney Trains network, and there is no 33kV busbar. Distribution to Rozelle and adjacent suburbs is at 11kV, and there is no other accessible 33kV source.

The initial catalyst for this augmentation is the permanent supply needs of the M4-M5 Link component (stage 3) of the WestConnex motorway which is currently under construction. It includes a major tunnel interchange in the vicinity of Rozelle. The requirement is for firm (n-1) supply to a significant load (principally for tunnel ventilation and lighting) for which 11kV supply would be technically more complex and more expensive.

Significant other increases to the 33kV load are also expected, such as:

- Major transport infrastructure developments
- Urban Growth's White Bay Precinct development
- Overseas Cruise Terminal proposal at White Bay

The timing for these additional loads is yet to be established. However, Ausgrid's existing Rozelle STS site is well located to service these anticipated loads and has potential for capacity expansion, and so provides the opportunity for a strategic and cost-effective investment in shared network assets to benefit multiple customers.

4.3 Options

The WestConnex motorway (stage 3) requires provision of electrical supply from two separate 33kV connection points, one from in the vicinity of Rozelle and the other one from in the vicinity of St Peters, or provision of two supplies from a common source.

Options to provide capacity for the motorway needs and other anticipated load in Rozelle, as well as surrounding areas include:

1. Augmentation of Rozelle STS.
2. Construction of a new 132/33kV STS in the Rozelle area.
3. Expansion of the new Alexandria STS.
4. Some connection from Willoughby STS.
5. A combination of the above.
6. Consideration of demand management.

The preferred option, to address the immediate known requirements and to make provision for anticipated load at minimal incremental cost, is to refurbish the existing Rozelle STS, providing WestConnex with supply for the Rozelle interchange from Rozelle STS, and supply for the St Peters area from another source (Alexandria STS). Refer to Project 3 below for details.

This option provides flexibility as to how to supply future developments in the area can be met. The project described has been initiated.

4.4 Timing

The timing is determined by the WestConnex construction timetable. The selected option is the most cost-effective and is best placed to meet the supply timing needs. It is anticipated that construction work will have to start in 2018 to enable project completion by October 2021.

4.5 Demand Management

The driver for the scope and timing of the planned work at Rozelle STS is the need to provide a connection, capacity and the relevant reliability to meet the requirements of the major customer connection for Sydney Motorway Corporation (SMC).

The connection request from SMC is for a supply of 30MVA + 10% (33MVA) with N-1 reliability, and this load cannot be supplied with the current equipment and existing load on Rozelle STS. Rozelle STS currently supplies only one major customer Sydney Trains, via an N supply arrangement.

As the majority of the cost is associated with enabling the connection of multiple customers to Rozelle STS, a reduction in demand from the existing and new customers would have only a modest impact on the overall cost of the project. Consequently, no significant demand management investigation has been conducted at this stage.

As part of the Rules requirements, a RIT-D will be conducted on the project. This will inform interested parties of the opportunity identified, and invite submissions from non-network proponents. Where the RIT-D process or any consequent tender for non-network solutions indicates that a non-network scope of work offers an improved cost benefit outcome, the selected solution to the need will be modified accordingly.

4.6 Costing

We undertook a site specific estimate of the costs of the preferred solution, using the BPC tool outlined in Attachment 5.03.

The proposed solution involves the construction of a new switchroom building suitable to accommodate three bus sections of indoor 33kV switchgear, the retirement of the existing 132/33kV 30MVA Transformer 2 to be replaced with a new 132/33kV 60MVA transformer, and the installation of 33kV duct lines to facilitate 33kV supply connections to the new switchroom.

The connecting 33kV cables are the responsibility of SMC.

The cash flow for the project (real 18/19 dollars in millions) is outlined in the table below:

Table 3. Project cash flows ($m, real FY19)

	Previous years	2019/20	2020/21	2021/22	2022/23	2023/24	Later years
Network Option	1.3	3.8	13.5	4.4	-	-	-

5 PROJECT 3 – ALEXANDRIA STS

5.1 Project description

The project is to upgrade the Alexandria 132/33kV STS in the Eastern Suburbs Area of Ausgrid's network to meet the electrical demand of an additional large data centre and transport infrastructure projects in the area. The project is to add a third 132/33kV transformer with minor associated works at Alexandria.

The total project cost is $3.4 million, of which $3.0 million is forecast to be incurred in the 2019-24 period.

Figure 3. Alexandria STS

5.2 Need

The Alexandria area consists of high density residential, industrial and commercial loads. Alexandria STS is a critical supply location for major transport and other infrastructure assets such as the WestConnex motorway project, Sydney Airport and major data centres. The area is geographically constrained with significant infrastructure congestion challenges to be overcome in order to provide electrical supply solutions.

Alexandria 132/33kV STS was commissioned in 2017. The Alexandria STS is equipped with two 132/33kV transformers initially, but was designed for four 132/33kV transformers ultimately.

This project is treated as a conditional project, but has been allocated a probability of 100% of proceeding based on the status of development and customer connection requirements.

5.3 Options

We examined the following options:

1. Installation of a third 132/33kV transformer at Alexandria STS and supply at 33kV.
2. Supply at 11kV from Green Square Zone Substation.
3. Consideration of demand management.

In the case of Option 2, there is not sufficient spare capacity available at Green Square Zone Substation to supply the customer connection load. Further, Green Square Zone Substation is already operating at its ultimate transformer capacity, and hence there is no room for augmentation. Consequently this is not a viable option.

Alexandria STS is the closest source of supply to the customer load centre and has been designed for expansion within the existing site. Option 1 is the most viable network option both in terms of the capacity and constructability. Thus, option 1 is the preferred option as it provides the opportunity to better utilise an existing asset to provide capacity for significant new infrastructure load in the area in the most cost-effective way.

5.4 Timing

To meet the expected due date of 2020, Ausgrid expects that construction work would need to start in 2018.

5.5 Demand Management

The driver for the scope and timing of the planned work is the need to provide connections, capacity and the relevant reliability to meet the requirements of the major customer connections. As detailed discussions with customers on the proposed connections remain in progress, no significant investigation into non-network options has been conducted. As customer decisions are firmed up, a detailed assessment will be completed.

As part of the Rules requirements, a RIT-D may be conducted on the project. This would inform interested parties of the opportunity identified, and invite submissions from non-network proponents. Where the RIT-D process (or similar consultation) or any consequent tender for non-network solutions indicates that a non-network scope of work offers an improved cost benefit outcome, the selected solution to the need will be modified accordingly.

5.6 Costing

We undertook a site specific estimate of the costs of the preferred solution, using the BPC tool outlined in Attachment 5.03.

The proposed solution involves the procurement, installation and commissioning of an additional 132/33kV 120MVA transformer at Alexandria STS. There is no need to install associated 132kV or 33kV switchgear at this time. The overall cost is then multiplied by 100% because this is the likelihood of proceeding allocated to this project.

The cash flow for the project is outlined in the table below.

Table 4. Project cash flows ($m, real FY19)

	Previous years	2019/20	2020/21	2021/22	2022/23	2023/24	Later years
Network Option	0.5	2.4	0.6	-	-	-	-

6 PROJECT 4 – WHITE BAY ZONE SUBSTATION

6.1 Project description

The project is to establish a new 33/11kV Zone Substation in the vicinity of White Bay in the Inner West area of Ausgrid's network. The purpose will be to supply additional residential and commercial loads generated by the development of the "Bay Precinct" managed by Urban Growth (a NSW government agency). The Zone Substation would take 33kV supply from Rozelle STS (described as Project 2). The need for this project is currently anticipated to arise around 2028, but the pace of local development could accelerate under the management of Urban Growth. Supply transfers to other zone substations would be used to delay this project if feasible. This project is treated as a conditional project, allocated a probability of 10%, based on the assessed need to augment the Ausgrid Subtransmission network with this proposed solution. The allocated project cost[2] is \$2.4 million, of which \$2.2 million is forecast to be incurred in the 2019-24 period.

Figure 4. White Bay project area

6.2 Need

The need for this project is driven by the plan to develop the White Bay area into a residential / commercial precinct under the "Bays Precinct" development managed by Urban Growth. There is also an anticipated development in the White Bay Cruise Terminal area. Both of these developments are at an early stage, with no detailed load and timeframe information. However, the pace of the local development is anticipated to accelerate due to Urban Growth's involvement.

6.3 Options

We examined the following options initially:

1. 33kV supply from Rozelle STS.
2. New 132/11kV zone substation.

[2] Note this project is classified as conditional because the likelihood of the project proceeding is not yet certain at this time. The project cost is the result of multiplying the total cost of the network solution by 10%, which is the probability of the project proceeding at the time proposed.

3. New 33/11kV zone substation.
4. 11kV supply from Leichhardt or Camperdown zone substation.
5. Consideration of demand management.

Considering the nature of enquiries received in the area, it appears that development will result in a number of separate applications, which implies that 11kV distribution to multiple sites will most likely be the preferred solution. With this pattern of development Option 1 is not a viable cost effective solution.

There is existing short term 11kV capacity available in the adjacent zones like Leichhardt and Camperdown zones. However, these zones are located much farther away from the load centres and would require extensive, and hence expensive, 11kV works. Hence, Option 4 is not likely to be cost effective for the medium to long term development in the area.

Option 2 would be more expensive than Option 3 mainly due to additional 132kV works.

Option 3 – A new 33/11kV zone in the area is the preferred option catering for medium to long term development. Further, 33kV supply to the new zone is viable, given that the refurbishment of Rozelle STS has been assigned 100% probability of proceeding.

6.4 Timing

At this stage the development in the White Bay area is not committed, but the requirement could arise as early as 2022.

6.5 Demand Management

The driver for the scope and timing of the planned work is the need to provide connections, capacity and the relevant reliability to meet the requirements of the major customer connections. As discussions on the proposed connections are at an early stage, no significant investigation into non-network options has been conducted. As planning and customer decisions are firmed up, a detailed assessment will be completed.

As part of the Rules requirements, a RIT-D is expected to be conducted on the project. This will inform interested parties of the opportunity identified, and invite submissions from non-network proponents. Where the RIT-D process or any consequent tender for non-network solutions indicates that a non-network scope of work offers an improved cost benefit outcome, the selected solution to the need will be modified accordingly.

6.6 Costing

We undertook a site specific estimate of the costs of the preferred solution, using the BPC tool outlined in Attachment 5.03.

The proposed solution involves the construction of a new 33/11kV zone substation equipped initially with two 33/11kV 19MVA transformers. The new White Bay zone substation will be supplied from Rozelle STS by means of installing two 1km underground feeders. The overall cost is multiplied by 10% because this is the likelihood of proceeding allocated to this project. The cost of acquiring land for the new site is not included in these estimates. However it is possible that a suitable site might be made available by Urban Growth: the developers of the White Bay area.

The cash flow for the project is outlined in the table below.

Table 5. Project cash flows ($m, real FY19)

	Previous years	2019/20	2020/21	2021/22	2022/23	2023/24	Later years
Network Option	0.2	0.6	1.5	0.1	-	-	-

7 PROJECT 5 – PYRMONT STS

7.1 Project description

The project is to provide increased transformer capacity to maintain reliability of supply at 33kV from the Pyrmont 132/33kV STS in the Pyrmont, Camperdown and Blackwattle Bay area of Ausgrid's network. This will be in response to an anticipated additional demand associated with information technology infrastructure and other commercial loads. Installation of additional transformer capacity would be required to meet operational requirements for maintenance of the electrical plant at the substation after the anticipated load increase. This arises because a large proportion of the load is already almost constant, meaning that it varies only slightly with time of day or season, contrary to the typical pattern of most loads. The result is that there may not be windows of opportunity available to take a transformer out of service for maintenance. One of the three transformers is half the rating of the others, and the project would be to replace this with a full-rated transformer, or to add another transformer in parallel with the low-rated one.

This project has been allocated a probability of 50%, based on the assessed likelihood of the need to augment the Ausgrid network with this proposed solution. The allocated project cost[3] is $1.8 million, of which $1.6 million is forecast to be incurred in the 2019-24 regulatory period.

Figure 5. Pyrmont STS

7.2 Need

Pyrmont is close to Sydney's CBD and is characterised by high density residential and commercial load, including the following:

- A large data centre facility

[3] Note this project is classified as conditional because the likelihood of the project proceeding is not confirmed at this time. The project cost is the result of multiplying the total cost of the network solution by 50%, which is the assessed probability of the project proceeding at the time proposed.

* Star City casino
* Darling harbour precinct public, commercial and residential infrastructure
* Barangaroo precinct infrastructure.

Electrical network interconnections are limited on this peninsula area. A new data centre is anticipated with an almost constant load, and this would further impact on Ausgrid's ability to maintain reliability unless additional transformer capacity is installed.

Pyrmont STS is equipped with three 132/33kV transformers: two rated 120MVA, and the third 60MVA. When one of the 120MVA transformers is out of service for any reason, the load is at risk if it exceeds 60MVA during the outage. The reliance of this class of customer on firm supply, and their capability to meet part of their load from another source at these periods, will need to be studied. Demand Management would need to be carefully considered before committing to the project.

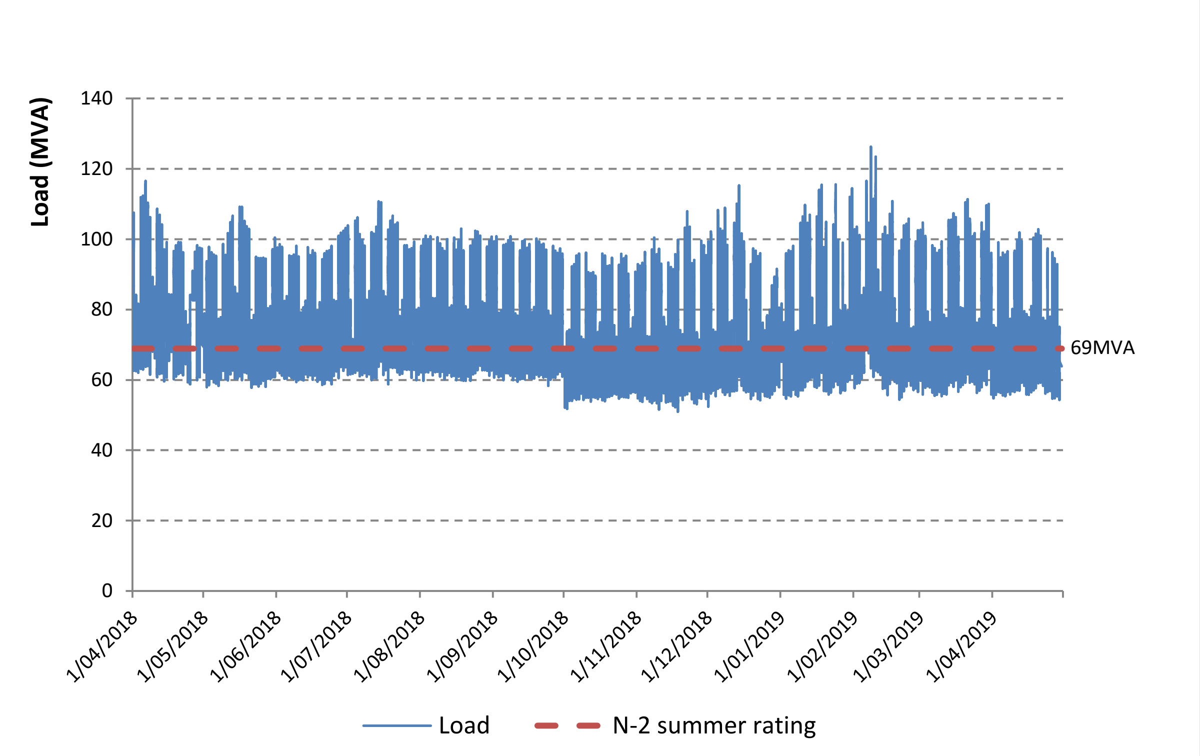


Figure 6. Pyrmont STS 2018/19 forecast load (excluding uncommitted 33kV spot loads)

The above graph shows that to take a single element (120MVA transformer) out of service for maintenance at any time of the year would leave a risk exposure for load shedding in the event of the failure of the second 120MVA transformer.

The network solution to securing the required capacity would be to replace the 60MVA transformer by a 120MVA transformer, or to add a 60MVA transformer in parallel with the existing one. The optimal solution has yet to be determined.

This project is treated as a conditional project, allocated a probability of 50% likely to proceed based on the reliability of the network required to meet operational requirements for maintenance of the electrical plant at the substation should the additional load eventuate.

7.3 Options

We examined the following options as part of the Camperdown Blackwattle Bay Area Plan process:

1. Upgrade existing 60MVA transformer Tx3 to 120MVA unit at Pyrmont STS.
2. Installation of fourth 60MVA 132/33kV transformer at Pyrmont STS.
3. Consideration of demand management.

Subject to the outcomes of a demand management review, the next most cost-effective solution to ensure that reliability can be maintained is Option 1.

7.4 Timing

We would use cost benefit analysis to identify the optimal time to upgrade the network. The timing would be triggered by growth in the area and the completion date could be as early as 2024.

7.5 Demand Management

The driver for the scope and timing of the planned work is the need to provide connections, capacity and the relevant reliability to meet the requirements of major customer connections. As discussions on the proposed connections are at an early stage, no significant investigation into non-network options has been conducted. As customer decisions are firmed up, a detailed assessment will be completed.

As part of the Rules requirements, a RIT-D may be conducted on the project. This would inform interested parties of the opportunity identified, and invite submissions from non-network proponents. Where the RIT-D process (or similar consultation) or any consequent tender for non-network solutions indicates that a non-network scope of work offers an improved cost benefit outcome, the selected solution to the need will be modified accordingly.

7.6 Costing

We undertook a site specific estimate of the costs of the preferred solution, using the BPC tool outlined in Attachment 5.03.

The proposed solution that has been costed involves the retirement of the 132/33kV 60MVA transformer at Pyrmont STS and subsequent replacement with a new 132/33kV 120MVA transformer. The overall cost is then multiplied by 50%, which is the likelihood of the project proceeding allocated to this project.

The cash flow for the project is outlined in the table below.

Table 6. Project cash flows ($m, real FY19)

	Previous years	2019/20	2020/21	2021/22	2022/23	2023/24	Later years
Network Option	-	-	-	0.1	0.2	1.4	0.1