Addressing increased customer demand in the Macquarie Park area

NOTICE ON SCREENING FOR SAPS AND NON-NETWORK OPTIONS

31 March 2023

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Addressing increased customer demand in the Macquarie Park area

Notice on screening for SAPS and non-network options – March 2023

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1 Introduction

The future combined load increases from several major customers in the Macquarie Park supply area is anticipated to cause significant constraints on the existing Ausgrid 11kV network and a long term 33kV supply strategy presents an opportunity to support all customers efficiently.

Ausgrid has received two connection applications in the Macquarie Park network area to supply major loads located near the recently commissioned Macquarie 132/33kV subtransmission substation (STS). The two connection applications have both requested secured “N-1” supply. Ausgrid considers that these additional customer loads are most efficiently met by installing a third 120MVA 132/33kV transformer at the Macquarie 132/33kV STS. These major customers have committed to make a direct contribution to the investment, to facilitate the timing of the expansion of the STS being brought forward.

As these major customers are expected to utilise nearly 90% of the asset, specific tariff arrangements will be established to recover the majority of the cost of the augmentation from the beneficiaries (i.e., the new major customers), taking into account their share in the capacity added to the network.

Ausgrid has also received further enquiries from other major customers relating to connection at Macquarie Park. The accommodation of any further additional major customer load at Macquarie Park is likely to require the construction of a new STS, which would be considered as part of a future RIT-D.

Ausgrid will commence consultation with the Ryde City Council and the local community shortly after perspective drawings and a program of work is finalised. This will help to develop a construction plan that minimises impacts during construction. Ausgrid will keep the community informed as the project progresses through notification letters and the Ausgrid website.

No exemptions listed in the NER clause 5.17.3(a) apply and therefore Ausgrid is required to apply the RIT-D to this project. This notice has been prepared under cl. 5.17.4(d) of the NER and summarises Ausgrid’s determination that no SAPS and non-network option forms all or a significant part of any potential credible option for this RIT-D. It sets out the reasons for Ausgrid’s determination, including the methodologies and assumptions used. A full discussion of asset conditions and the identified need can be found in the Final Project Assessment Report (FPAR) for addressing increased customer demand in the Macquarie Park area.

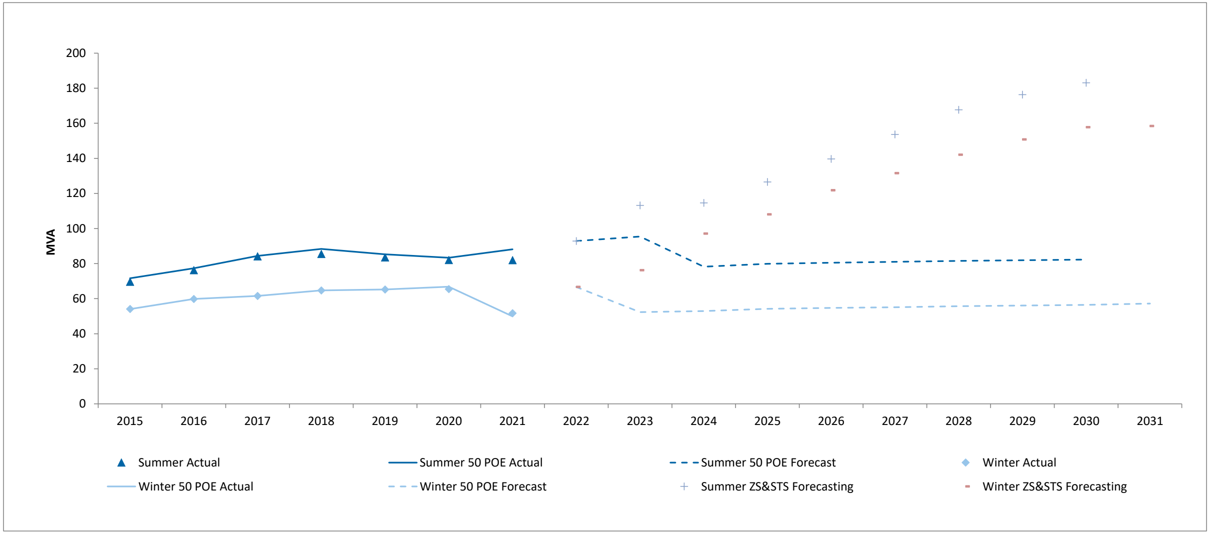
2 Forecast load and capacity

2.1 Demand forecast

Figure 1 below shows the combined historical actual demand, the 50% Probability of Exceedance level (50 POE) weather corrected historical actual demand and the 50 POE forecast demand in both winter and summer at Macquarie Park zone substation (ZS) and Macquarie STS including the projected major load increases described in Section 1 above.

The Macquarie Park (ZS) has a total capacity of 171.5 MVA and a firm capacity of 114.3 MVA. In 2020/21, the maximum demand on zone substation was 82.0 MVA at 3:00pm AEDT on 1 March 2021. The weather corrected demand at the 50 POE level was 86.1 MVA. The power factor at the time of winter maximum demand was 0.98.

Figure 1: Demand forecast combined Macquarie Park ZS and Macquarie STS

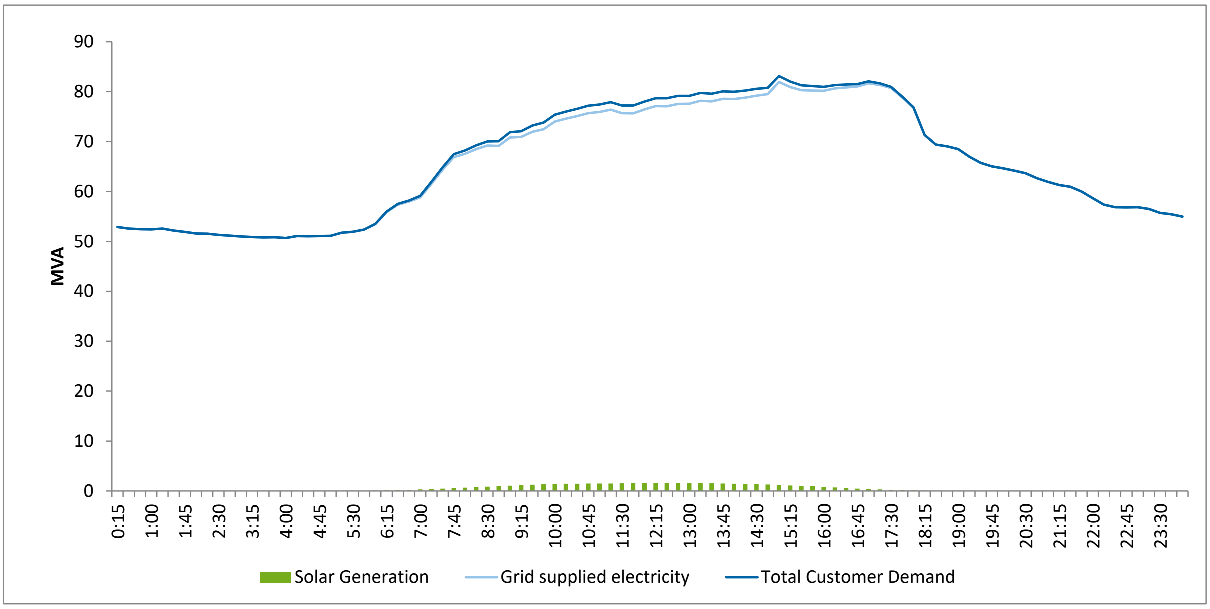


2.2 Pattern of use

Over the past 7 years, annual maximum demand at Macquarie Park ZS has typically occurred in summer between 2:15pm and 3:45pm AEDT.

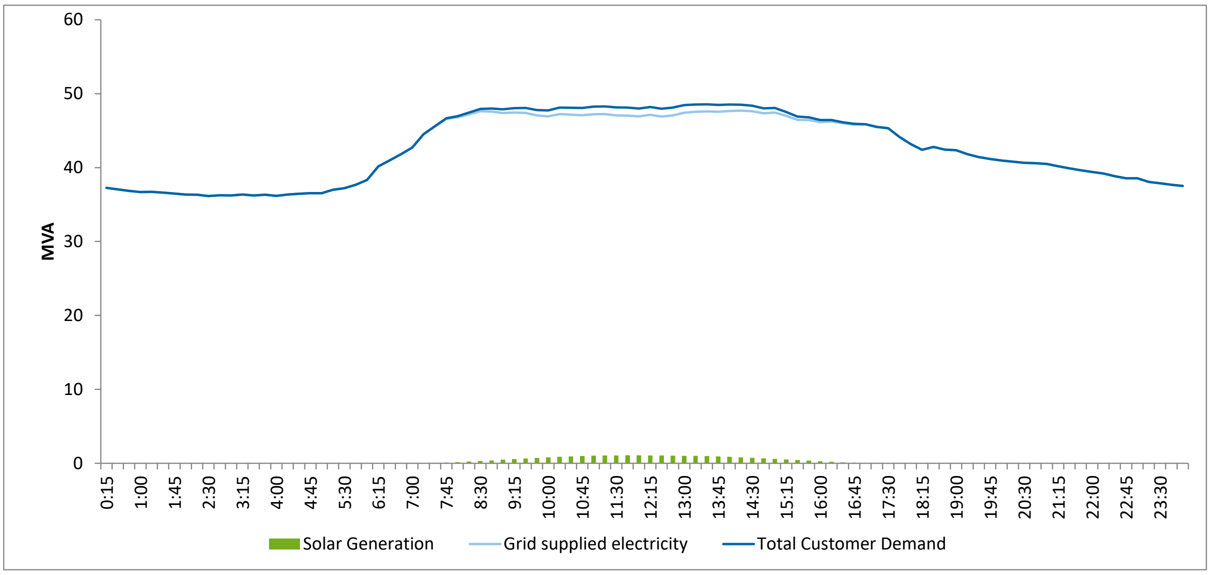
There is a total Solar PV capacity of approximately 5.5 MW connected to Macquarie Park ZS. At the peak time of 3:00pm AEDT on 1 March 2021, these PV systems are estimated to have been generating 2.4 MW. Figure 2 shows the load trace on this day including the contribution from customer solar power systems.

Figure 2: Summer peak day demand profile and PV contribution at Macquarie Park ZS on 1 March 2021



Over the past 7 years, the time of winter peak has typically occurred between 8:45 am and 2:15pm AEST. At the peak time of 2:15am AEST on 16 June 2021, the estimated generation from PV systems is 1.08 MW. Figure 3 below shows the load profile for the peak demand day 16 June 2021 including the contribution from customer installed solar power systems.

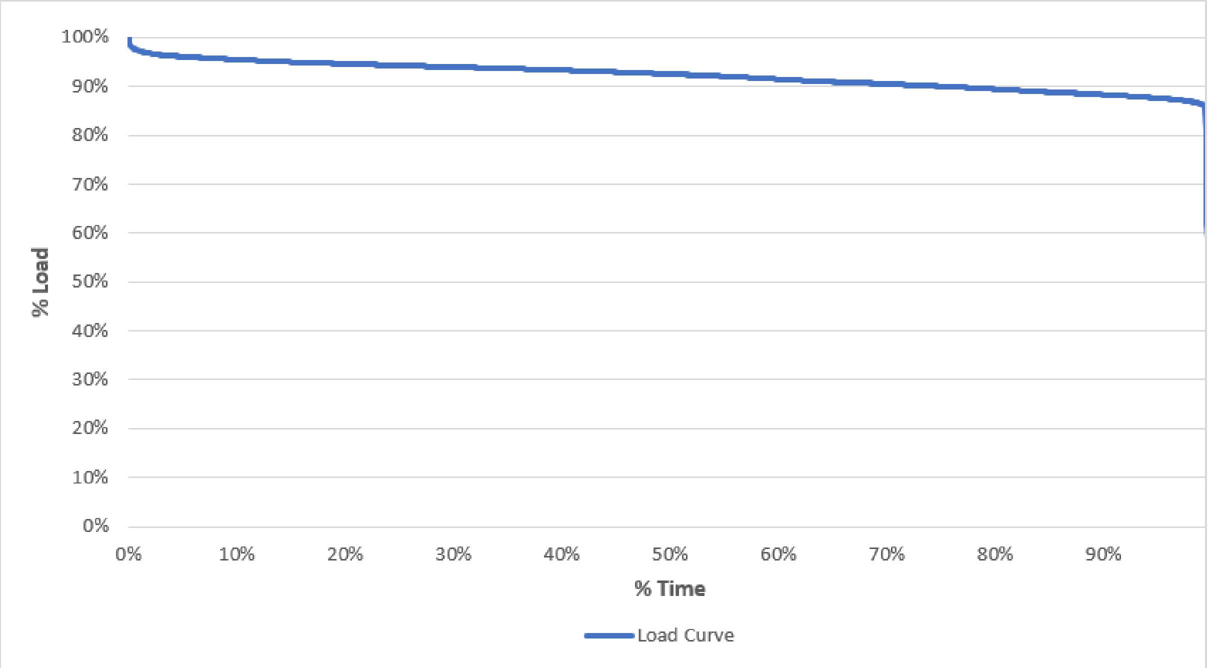
Figure 3: Winter peak day demand profile and PV contribution at Macquarie Park ZS on 16 June 2021



Macquarie Park ZS has a load transfer capacity of 29.1 MVA or about 48% of the weather corrected POE50 peak of 88.1 MVA for summer of 2020/21. However, there is no load transfers associated with the existing STS and associated 33kV data centre loads.

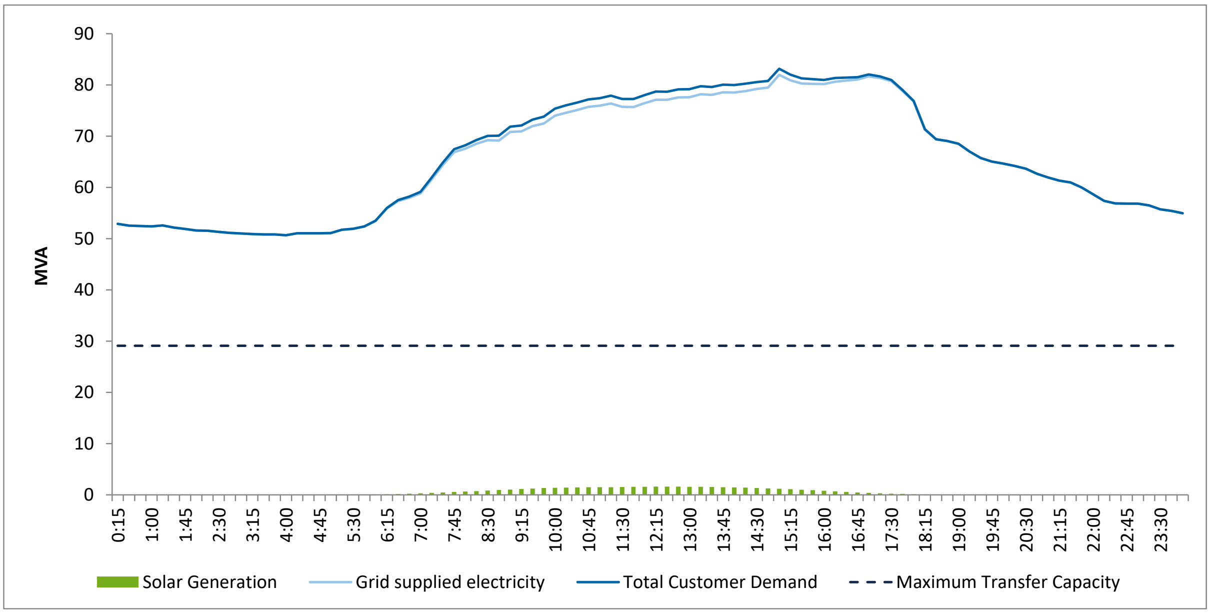
The load duration curve used in the analysis is presented in the Figure 4 below. It is assumed that the load types supplied will not change substantially into the future and therefore the load duration curve will maintain its characteristic shape.

Figure 4: Macquarie Park area load duration curve



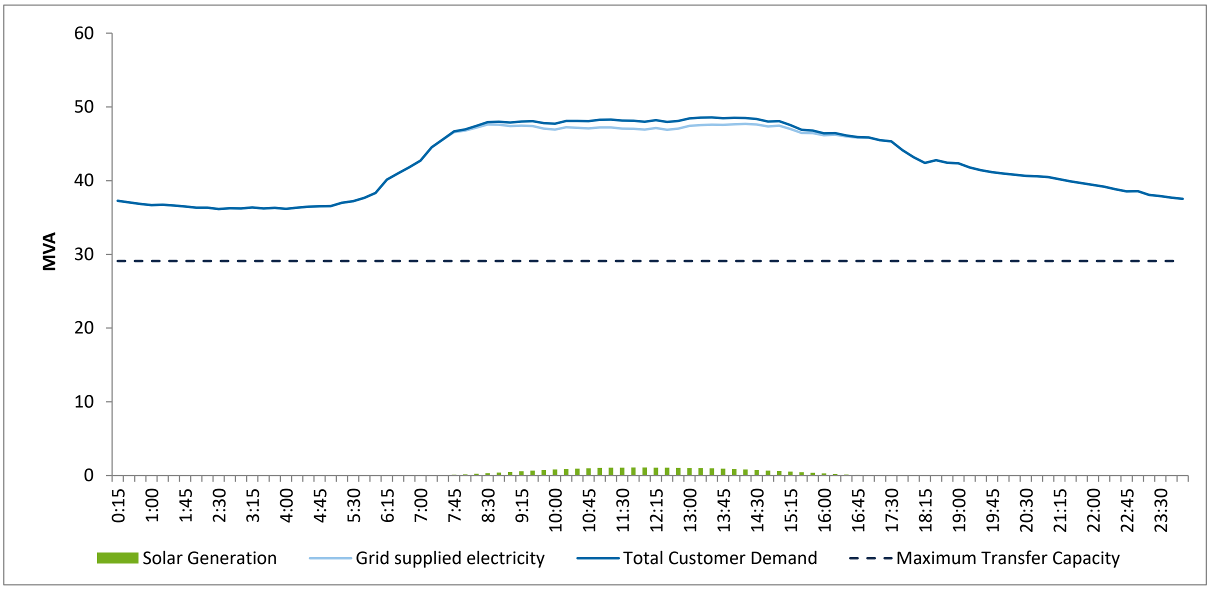
In the event of a network outage on the summer maximum demand day and following realisation of the maximum transfer capacity through network switching, there is a maximum shortfall of around 52.9 MVA when compared to the actual peak (non-weather corrected). The shortfall would occur for most of the day as seen in Figure 5 below.

Figure 5: Summer maximum demand profile at Macquarie Park on 1 March 2021



Similarly, for the winter peak demand day, the shortfall would also be for most of the day after realising the maximum load transfer capacity as seen in Figure 6. The maximum shortfall would be around 18.6 MVA when compared to actual peak (non-weather corrected).

Figure 6: Winter peak day demand profile and PV contribution at Macquarie Park on 16 June 2021



2.3 Customer characteristics

The majority of customers in the Macquarie Park area are supplied from Macquarie Park ZS which serves a mixture of residential and non-residential customers. A breakdown of the customer characteristics for the 2021/22 period are as follows:

Table 1: Macquaire Park customer characteristics

Item	Residential	Small Non-Residential	Large Non-Residential	Total
Number of Customers	3,044	693	200	3,937
% of Customers	77.3%	17.6%	5.1%	
Annual Consumption (MWh)	16,958	20,883	360,326	398,167
% of Annual Consumption	4.3%	5.2%	90.5%	
Number of Solar Customers	217	14	22	253
% of Customers with Solar	7.1%	2.0%	11.6%	
Average Annual Consumption (MWh)	6	30	1,802	101

3 Proposed preferred network option

This section provides details of credible options that Ausgrid has identified as part of its network planning activities to date. All costs in this section are in real $2022/23, unless otherwise stated.

Table 2: Summary of the credible options considered

Overview	Key components	Estimated capital cost (including decommissioning costs)
Option 2 – Install a new transformer in 2026 (with capital contribution)	• construction of a new transformer bay, including civil works to install an additional 132 kV circuit breaker; • installation of a new 120 MVA 132/33 kV transformer unit; • modifications and upgrades in the 132 kV busbar bolted assemblies and flexible connections to achieve the required throughput busbar rating; and • installation of 132 kV cable connections to the new transformer and 33kV cable connections from the new transformer to the existing 33 kV switchroom.	$7.4 million ($8.7million less $1.3 million of direct capital contribution from the two major customers)

Ausgrid also considered an additional option that has not been progressed. The table below summarises Ausgrid's consideration and position on each of these potential options.

Table 3: Network options considered but not progressed

Option	Reason why option was not progressed
11 kV options	Given the magnitude of the load requirements, 11 kV supply options are not considered able to assist with meeting the identified need given the underlying 11 kV network is near capacity. In addition, there are technical limitations associated with installing multiple 11 kV feeders to a single large load customer, such as multiple switching stations, complex protection schemes to manage the operation and separate metering points at 11kV. These solutions are therefore not considered technically feasible.
Direct supply at 132 kV to the customers	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. This option is therefore not considered commercially feasible.
Establishing a second Macquarie STS	The option to establish another STS site to be able to provide additional 33kV supply was disregarded because the construction of a new STS would not be delivered in time to meet customer requirements, as a suitable site must be acquired. The costs involved for this option are also considerably higher than the credible options assessed. This option is therefore not considered a credible option to meet the identified need in this RIT-D.

Table 4: Summary of the three scenarios investigated

Variable	Scenario 1 – central demand scenario	Scenario 2 – low demand scenario	Scenario 3 – high demand scenario
Demand	Central forecast	Low forecast	High forecast
VCR	$46.9/kWh across all scenarios		
Discount Rate	3.44% across all scenarios		

Note: The demand forecasts reflect different assumptions regarding the evolution of data centre load.

Ausgrid has weighted each of the demand scenarios equally in the NPV assessment. However, we note that the NPV outcome is positive across all scenarios, therefore the weightings do not influence the RIT-D outcome.

Refer to the Final Project Assessment Report for further details about the options assessment methodology and scenario analysis.

3.1 Preferred option at this stage

Ausgrid considers that Option 2 is the preferred option that satisfies the RIT-D. It involves installing a third 120 MVA 132/33 kV transformer at the Macquarie 132/33 kV STS. Ausgrid is the proponent for Option 2.

While the estimated capital cost of this option is $8.7 million ($2022/23), it also involves a direct capital contribution from the two major customers of $1.3 million meaning that the effective capital cost is $7.4 million. Annual routine operating costs are assumed to be 0.2 per cent of the estimated capital cost (i.e., approximately $17,500/year).

Commissioning of the new transformer is expected in 2025/26.

Refer to the Final Project Assessment Report for this project for further details about the options assessment.

4 Assessment of SAPS and non-network solutions

4.1 Required demand management characteristics

To be considered a feasible option, any demand management solution must be technically feasible, commercially feasible, and able to be implemented in sufficient time by 2025/26 for deferral of the network investment.

4.2 Available demand management funds

To identify the available funds for a possible demand management solution, Net Present Value (NPV) analysis was carried out and the net NPV for the network option is compared against the net NPV of deferral scenarios.

Table 5 below shows the available funds for a deferral of the network investment for 1, 2 and 3 years. The required peak demand reduction is very large due to the proposed major connections affecting the Macquarie Park area.

Table 5: Required demand reduction and available funds at Macquarie Park area

Required peak demand reduction	Available demand management funds ($)		
	1 Yr deferral	2 Yr deferral	3 Yr deferral
60MVA*	$460k	$883k	$1271k

*To be viable, DM solutions must materially reduce demand at times other than at peak due to the replacement driver. Available funds have been calculated accordingly.

- For a 1-year deferral, around 60MVA of demand reduction is required in 2025/26 with total available demand management funds of $460k, which is equivalent to $7.7/kVA/year,
- For 2-year deferral, 60MVA of demand reduction in 2025/26 and 2026/27 with total available demand management funds of $883k, which is equivalent to $7.4/kVA/year, and
- For 3-year deferral, 60MVA of demand reduction is required in 2025/26, 2026/27 and 2027/28 with total available demand management funds of $1271k, equivalent to $7.1/kVA/year

The above figures already account for maximum load transfer capacity out of the load areas and assumes this capacity can be fully realised. This is also the case for determining the feasibility of demand management solutions as outlined in section 4.3 below.

4.3 Options considered

Ausgrid has considered Stand Alone Power Systems (SAPS) and other demand management solutions to determine their commercial and technical feasibility to assist with the identified need for Macquarie Park ZS. Each of the solutions considered is summarised below.

4.3.1 Stand Alone Power Systems (SAPS)

SAPS self-generate, store and supply electricity to connected customers that are physically disconnected to the wider electricity grid. Typical SAPS are made up of solar panels, a battery storage system and a back-up diesel generator.

Ausgrid is currently trialling SAPS with selected customers living in fringe-of-grid areas of Ausgrid's network[1]. The program aims to explore how SAPS can provide an alternative electricity supply solution that improves reliability and safety of our service to remote and rural customers, as well as being sustainable and cost-effective.

Ausgrid's experience with proposals from SAPS providers during the trial has provided insights on the cost of SAPS. On average it would cost $50k-100k or more to supply a typical residential customer (based on their annual energy usage) using a SAPS. Assuming a mid-point SAPS cost of $75k each, the amount of load that that Ausgrid would be able to supply via SAPS using all the available funds would be equivalent to only 6 to 17 residential customers. This is not sufficient to reduce, defer or postpone the proposed preferred network solution.

4.3.2 Other demand management options

As described earlier, the proponents of the two major load connections have made capital contributions to ensure the Macquarie STS 3rd transformer is commissioned by 2025/26 and that secured "N-1" supply is available.

The large load reduction requirement also results in very low funds available of less than $8/kVA/year. There is no demand management solution mix that could meet the required demand reductions with the funds that are available.

[1] https://www.ausgrid.com.au/In-your-community/Stand-Alone-Power-Systems

5 Conclusion

Based on the demand management options considered in Section 4, it is not considered possible that sufficient demand management measures could be feasibly implemented to achieve the required demand reduction to make project deferral technically and economically viable. Consequently, an Options Screening Report has not been prepared in accordance with rule 5.17.4(c) of the National Electricity Rules.