

# PR754: WESTMEAD ZS AUGMENTATION

## MAJOR PROJECT BUSINESS CASE

Project	Description
Primary Driver	Network Connection
Project Category	Brownfield Augex
Publish Date	

Approvals	Name	Designation	Date
Prepared	Andrew Ma	Engineering Analyst	Feb 2018
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Approved			

Revision	Amendment	Date

## 1.0 Background

Westmead ZS was commissioned in 1978 to supply the Westmead Health Precinct and other surrounding loads. The Westmead Health Precinct includes Westmead Hospital, Westmead Children’s Hospital and supporting departments, research facilities and accommodation. This health precinct accounts for approximately two thirds of the entire Westmead ZS load. The substation also supplies the Western Sydney University and other residential and commercial loads. The Westmead Health Precinct is a high voltage customer supplied via 4 dedicated 11kV feeders. Being the primary supply of a vital regional health facility, the supply security of Westmead ZS is extremely important.

The Westmead Health Precinct is currently undergoing a \$1 billion expansion which will result in large increase in demand. Other contributors to load growth include the establishment of the Parramatta Light rail and increasing population and commercial activity. The load for the Hospital campus is forecast to grow from the current 17 MVA peak to up to 56 MVA by 2035. However, the funding for the latter stages of the expansion post 2024 is uncertain at this point and therefore the load forecast beyond 2024 is also uncertain. Should the latter stages of the expansion continue, the resultant total zone substation load will reach up to 64.7MVA, which greatly exceeds the current N-1 capacity of 35MVA. However, even without the later stages of the hospital expansion, the substation’s firm capacity will be exceeded prior to 2024.



## Westmead Hospital Campus forecast

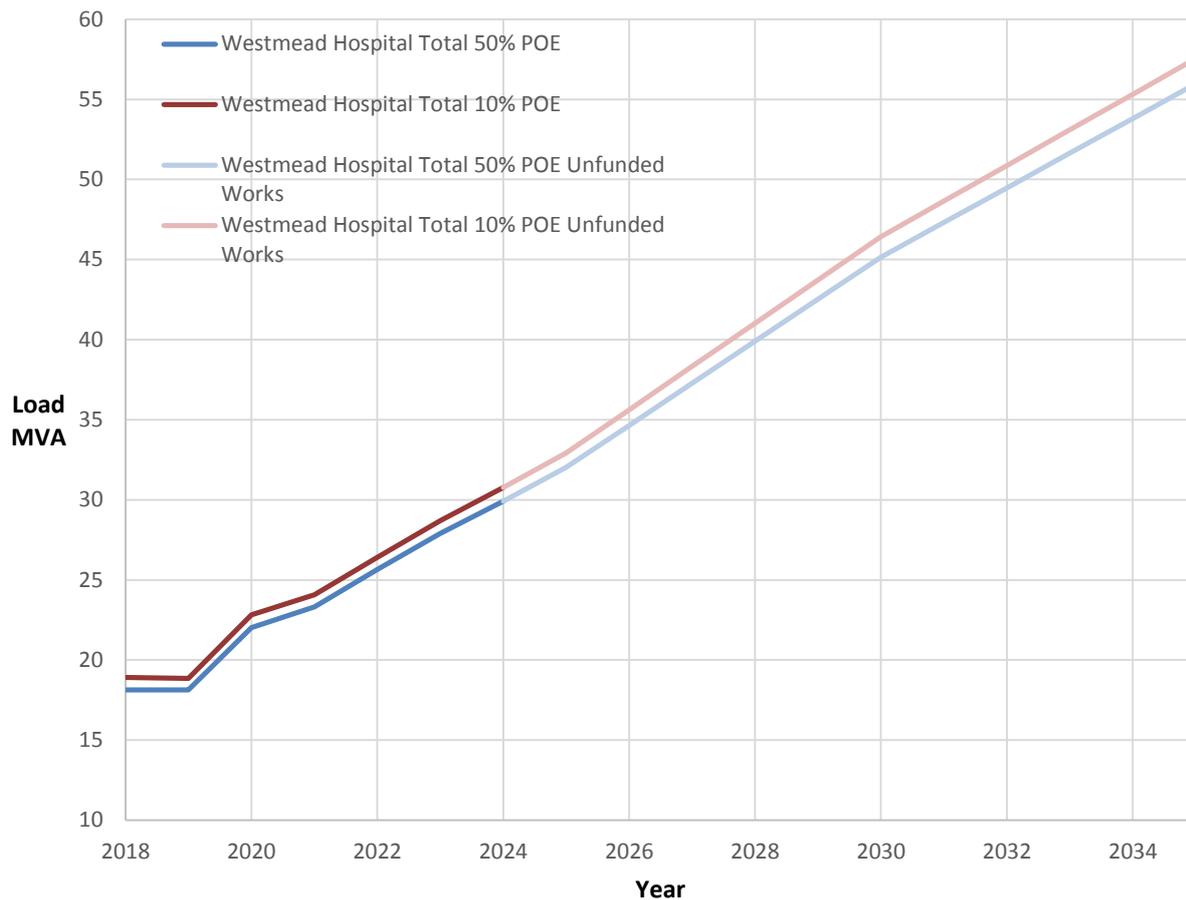


Figure 2 – 50% POE and 10%POE forecast calculated using internal data and Total Diversified Site MD provided by ARUP

## 2.0 Need/Opportunity

The Westmead Redevelopment project is currently in progress and The Westmead Health Precinct is a critical high voltage customer. The increasing demand resulting from the hospital expansion will create load at risk. This is unacceptable as Westmead Hospital is a vital regional health facility. While the value of augmenting Westmead ZS can be quantified by the cost of unserved energy, there is inherent value in providing security of supply to the Westmead Health Precinct which can be quantified via other methods which are outside the scope of this business case.

Even when only considering funded works prior to the end of 2024, the firm capacity of Westmead ZS will be exceeded in 2021. All works prior to 2024 for the Westmead Redevelopment are fully funded and are currently in the design or implementation phase. Therefore, one can expect approximate minimum load growth of 13MVA. This growth in demand is the major driver for the increasing load at Westmead ZS. Furthermore, the West Sydney Local Health District has already officially applied for the connection of 6.03 MVA of load in 2016. This increasing demand due to this connection alone will place Westmead ZS close to its firm capacity.

Advice received from the Greater Sydney Commission in relation to the Greater Parramatta Olympic Peninsula (GPOP) and particularly the Westmead Precinct suggest a ramping up of development activity in the area. This has not been fully considered in this business case at the time of writing. Early indications based on forecast levels of growth suggest higher VCR risk costs (See Appendix – GPOP version of VCR calculations).

## 2.1 Forecast Demand

Figure 3 below shows the 50% POE and 10% POE forecast for Westmead ZS with and without the unfunded portions of the Westmead Redevelopment. These forecasts show that the substation’s firm capacity will be exceeded well before the end of the funded works.

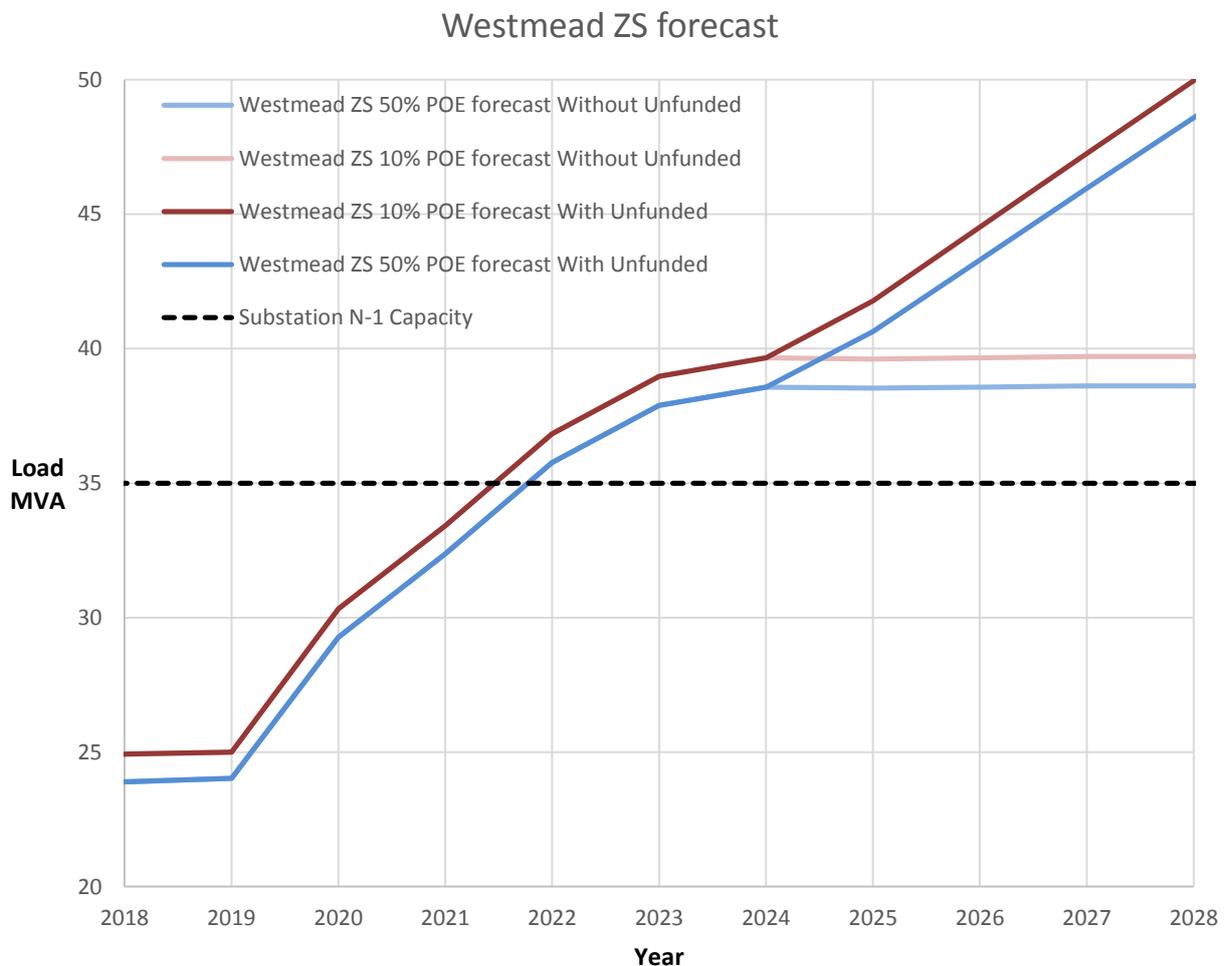


Figure 3 – Westmead ZS 50% POE and 10% POE forecast

## 2.2 Existing Supply

The Westmead Health Precinct is supplied by Westmead ZS and is supplied by 4 dedicated 11kV feeder cables connected to a private switch board adjacent to the zone substation. The substation has 70 MVA installed capacity and 35 MVA N-1 capacity and is situated on an easement in the northern corner of the precinct. The zone substation is supplied by Baulkham Hills TS via 33kV feeders 466 and 477 which both have a capacity 50MVA.

The 4 cables supplying the customer switchboard include two 3 x 300mm<sup>2</sup> 3 core Copper cables and two 2 x 800mm<sup>2</sup> single core Copper cables with ratings of 1200 amps and 1600 amps respectively. The total capacity of these cables is 106.7 MVA which allows for 87.2 MVA of spare feeder capacity at the current summer feeder peak demands. Therefore, there is sufficient feeder capacity for the Westmead Redevelopment including capacity for unfunded works.

The main constraints are the sub-transmission and zone transformer capacity. The zone substation will require an additional transformer by 2021 and an additional 33kV subtransmission may be required during the later stages of the expansion to maintain sufficient under feeder contingency situations.

### 2.3 Load at Risk

On the basis of the load forecast for Westmead ZS calculated from the existing internal forecast and the total diversified site maximum demand provided by ARUP. Westmead Zone substation will have 5.6 MVA of load at risk by 2025.

Zone Substation	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Westmead ZS	-	-	-	0.8	2.9	3.6	5.6	8.3	11.0	13.6	16.2	18.8

Table 1 - Load at risk (MW) before project

### 2.4 Energy at Risk

In the scenario where no investment is made to address the load at risk, the energy at risk over the forecast period is estimated as follows:

Zone Substation	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Westmead ZS	0	3	16	46	87	100	154	235	337	454	589	766

Table 2 - Energy at Risk (MWh) before project

## 3.0 Project Value

The redevelopment of the Westmead Health Precinct requires the connection of up to 46.5 MVA of new load. By establishing additional subtransmission capacity to facilitate these connections, the following VCR risk costs would be addressed and available as benefits to the project proposal.

### 3.1 Potential Project Benefits (VCR Risk Costs only)

Zone Substation	PV of VCR Risk Costs
Westmead ZS	\$19.1m

Table 3 - VCR Risk Costs

### 3.2 Project Costs

The elimination of load at risk at Westmead ZS will require the installation of an additional 33kV 35 MVA transformer, 33kV and 11kV busbar. The current substation site contains a bund for an additional transformer however, new control buildings will be required to accommodate the new 11kV and 33kV switchgear. The site has limited area to accommodate new buildings so a priority will be to negotiate the acquisition of additional land from the land owners.

An additional 33kV sub-transmission feeder will be required if the later underfunded stages of the precinct redevelopment eventuate. However, this will not be required until the 2024/25-2029/30 regulatory period. The augmentations for Westmead ZS in the 2018/19-2023/24 regulatory period is estimated to cost \$12.8 million.

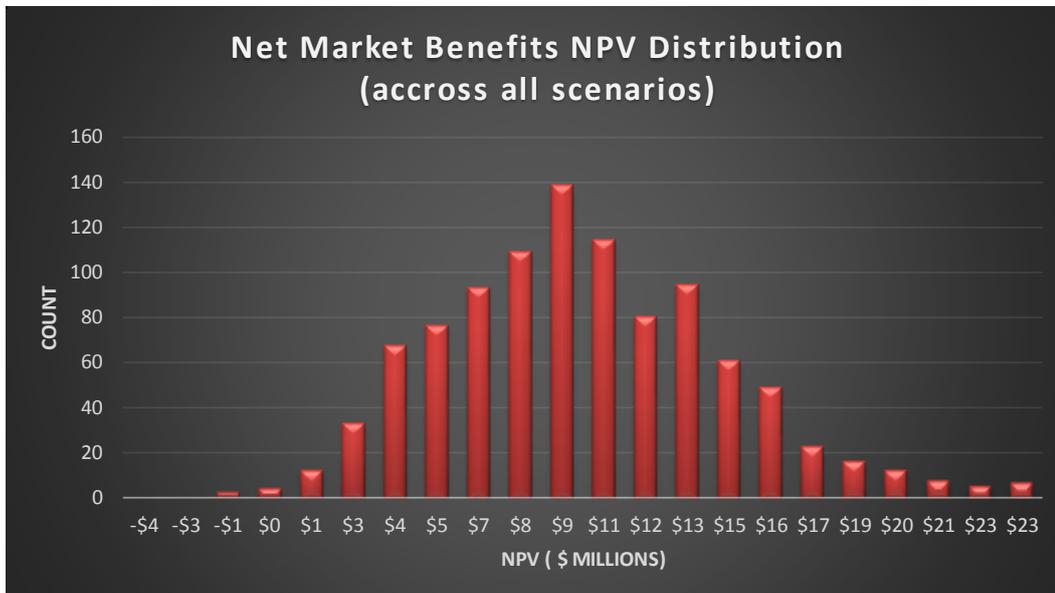
## 4.0 Conclusion

Based on the rates of growth, the limited existing capacity and the importance of the Westmead Health Precinct, Westmead ZS will require capacity augmentation within the 2018/19-2023/24 regulatory period. This document has not fully considered a ramping up of development activity in the area as a result of the Greater Sydney Commission's initiatives for greater land use density which is currently in a feasibility stage.

## 5.0 Appendices

### 5.1 Probabilistic VCR – Westmead ZS Augmentations

Probabilistic VCR Template v4 Westmead SDF Version.xlsm			
	PV investme nts (\$m)	PV Market Benefits (\$m)	NPV (\$m)
Deterministic Assessment	\$ 9.0	\$ 10.8	\$ 1.9
<b>Proabablistic Assessment</b>	<b>\$ 9.5</b>	<b>\$ 18.9</b>	<b>\$ 9.4</b>
PV of Risk Costs (Potential Market Benefits)		\$ 19.1	
		% Risk	
<b>Risk of Negative Market Benefits</b>			<b>1%</b>



**Probabilistic VCR Template v4 Westmead GOP Version.xlsm**

	PV investme nts (\$m)	PV Market Benefits (\$m)	NPV (\$m)
Deterministic Assessment	\$ 9.0	\$ 46.1	\$ 37.1

<b>Proabablistic Assessment</b>	<b>\$ 9.6</b>	<b>\$ 54.9</b>	<b>\$ 45.5</b>
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PV of Risk Costs (Potential Market Benefits) \$ 56.5

% Risk

**Risk of Negative Market Benefits 0%**

