PR754 Westmead ZS Augmentation

Case for Investment

October 2021

Endeavour Energy

Endorsements

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1. Executive summary

This Case for Investment recommends the augmentation of Westmead zone substation to supply the Westmead precinct developments on the basis that nominated option represents the highest value (economic benefit), and that a project value of $12.5 Million be approved for consideration in the FY22 Portfolio Investment Plan. This project was included within the submission to the current regulatory control period and last published DAPR.

Westmead ZS supplies 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 and is currently undergoing a $1 billion expansion which will result in large increase in demand. In addition to the Health Precinct, Westmead ZS supplies the surrounding residential and commercial areas. The overall additional loads in the area in the coming years and will lead to load at risk if no proactive intervention is taken.

The Regulatory Investment Test – Distribution (RIT-D) process for this project has already commenced and a Non-Network Options Report will be published after approval of this CFI is granted. If a feasible and cost-effective Non-Network Option submission is received, the Economic Analysis for this project will be revisited to assess the Non-Network Option.

To address the load at risk, the following network options were examined:

- Option 1 – Establish a third 35 MVA 33/11kV transformer supplying a new third 11kV bus section and supplied by new third 33kV feeder from Baulkham Hills TS;
- Option 2 – Establish a third 35 MVA 33/11kV transformer supplying the Westmead Hospital switchboard directly and supplied by a new third 33kV feeder from Baulkham Hills TS;
- Option 3 – Establish a third 45 MVA 132/11kV transformer supplying the Westmead Hospital switchboard directly and supplied by a new third 132kV feeder from West Parramatta ZS; and
- Option 4 – Establish three new distribution 11kV feeders from West Parramatta ZS and Northmead ZS to offload Westmead ZS's 11kV network.

This CFI utilised the Houston Kemp model to carry out a cost benefit analysis to compare all options. The cost benefit analysis showed that Option 3 had the highest NPV and is therefore the preferred option. Sensitivity analysis was carried out by adjusting the discount rate, capital cost and involuntary load shedding. The sensitivity tests showed that an adjustment on all variables confirmed that Option 3 remained the preferred option.

The preferred option proposes to establish a third 45 MVA132/11kV transformer that will directly supply Westmead Hospital's switchboard. The new transformer will be supplied by a new 132kV transmission feeder from West Parramatta ZS. The estimate for this option is $12.5 Million plus a contingency of $1.5 Million and is expected to be spread over three years from FY22 to FY24.

It is recommended that:

- The RIT-D process commences for this project to screen for non-network options;
- The project proceeds to preliminary release with preferred Option 3 which recommends capital expenditure to augment Westmead ZS. Preliminary release enables development of project definitions, detailed design, environmental assessment and preliminary market engagement activities in accordance with Company Procedure GRM0051;
  and
- The CFI will be finalised at the completion of the RIT-D process and a final approval will then be submitted to the confirm if the scope will include a non-network option and if the recommended timing of investment of the preferred network option will change.

2. Purpose

This Type 4 Case for Investment recommends the augmentation Westmead ZS to supply the developments at Westmead Hospital and the surrounding area on the basis that nominated option represents the highest value (economic benefit), and that a project value of $12.5 Million be approved for consideration in FY22 Portfolio Investment Plan.

There was no Type 2 CFI for this project however it was included within the FY20-24 regulatory submission, and the last published DAPR.

3. Need/opportunity to be addressed

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 residential and commercial loads in the surrounding area.

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 crucial. This precinct is currently undergoing a $1 billion expansion which will result in large increase in demand. Figure 1 below shows the planned development included in the Westmead Health Precinct expansion.

Other contributors to load growth include the adjacent Western Sydney University campus and Parramatta Light Rail.

Figure 1 – Westmead Precinct Master Plan

Table 1 below shows the expected demand forecast for Westmead ZS over the next 10 years.

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Forecast Demand (MVA)	29.4	31.5	37.7	41.2	45.0	47.6	54.2	59.8	64.2	67.0
Load At Risk (MVA)	-	-	2.7	6.2	10.0	12.6	19.2	24.8	29.2	32.0

Table 1 – Westmead ZS Demand Forecast

Westmead ZS currently has an N-1 capacity of 35MVA. Based on the above forecast, Westmead ZS will exceed its N-1 capacity in 2024.

Furthermore, it is noted that with the continued increasing load forecast into the long term, it is anticipated that a second zone substation will be required in Westmead precinct in the future.

4. Consequence of 'no proactive intervention'

Table 1 shows the anticipated constraints at Westmead ZS. The "Do Nothing" approach will result in significant expected unserved energy in the development precincts from 2024 onwards. It also carries with it significant reputational risks of negative media coverage and NSW Government dissatisfaction if Endeavour Energy is unable to meet supply requirements for this area.

In terms of Risk Cost assessment, the "Do Nothing" option provides a base case where the risks are valued by applying a Value of Customer Reliability (VCR) to the forecast expected unserved energy. The VCR values used by Endeavour Energy in its modelling are the same as those published by AER. This approach was endorsed by the AER during the determination process. Table 2 shows the annualised risk cost of no proactive intervention.

	2024	2025	2026	2027	2028
Risk cost ($)	22,000	119,471	368,720	650,028	2,058,730

Table 2 – Risk cost of 'no proactive intervention'

5. Description of proposed method to address need or opportunity and options considered

Option 1 – Establish 33/11kV 35 MVA transformer, 11kV bus section and 33kV transmission feeder

This option involves installing a third 33/11kV 35MVA transformer that would be tail ended onto a new 33kV feeder from Baulkham Hills TS. The 11kV side of the transformer would be connected to a new 11kV bus section. This option addresses the load at risk however due to being a 33kV option, this would result in the need of a 132kV feeder from West Parramatta ZS to supply the future second Westmead ZS at a later time. This requirement has been modelled in the economic assessment of this option.

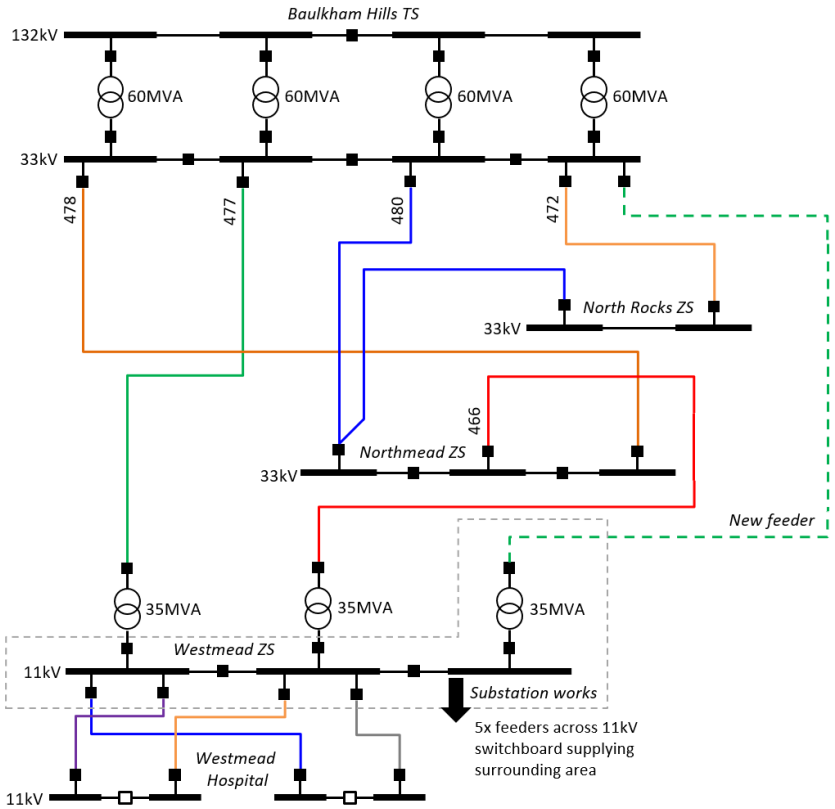

Figure 2 – Option 1 schematic

Option 2 – Establish 33/11kV 35 MVA transformer and 33kV transmission feeder

This option involves installing a third 33/11kV 35MVA transformer that would be tail ended onto a new 33kV feeder from Baulkham Hills TS. The 11kV side of the transformer would be directly connected to Westmead Hospital's 11kV switchboard. Similarly to Option 1, this option also addresses the load at risk however due to also being a 33kV option, this would also result in the need of a 132kV feeder from West Parramatta ZS to supply the future second Westmead ZS at a later time. This requirement has been modelled in the economic assessment of this option.

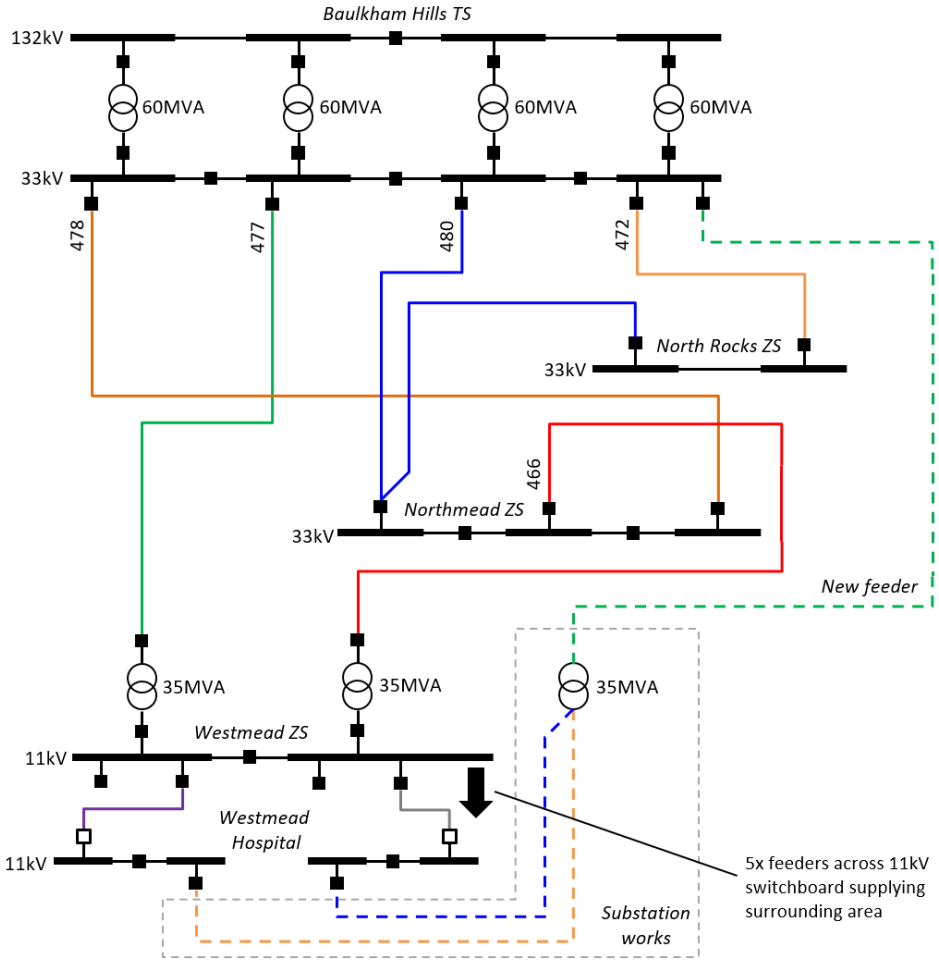

Figure 3 – Option 2 schematic

Option 3 – Establish 132/11kV 45 MVA transformer and 132kV transmission feeder

This option involves installing a third 132/11kV 45MVA transformer that would be tail ended onto a new 132kV feeder from West Parramatta ZS. The 11kV side of the transformer would be directly connected to Westmead Hospital's 11kV switchboard. This option also addresses the load at risk and the 132kV feeder can be utilised in the future to supply the second zone substation. The greatest benefit of this option is that it provides the hospital with primary and backup supplies from two separate bulk supply points (Holroyd BSP and Sydney West BSP). This option potentially may require a section of the proposed 132kV feeder to be relocated if developments result in road layout changes in the Cumberland Hospital area. This potential relocation cost has been included in the economic assessment.

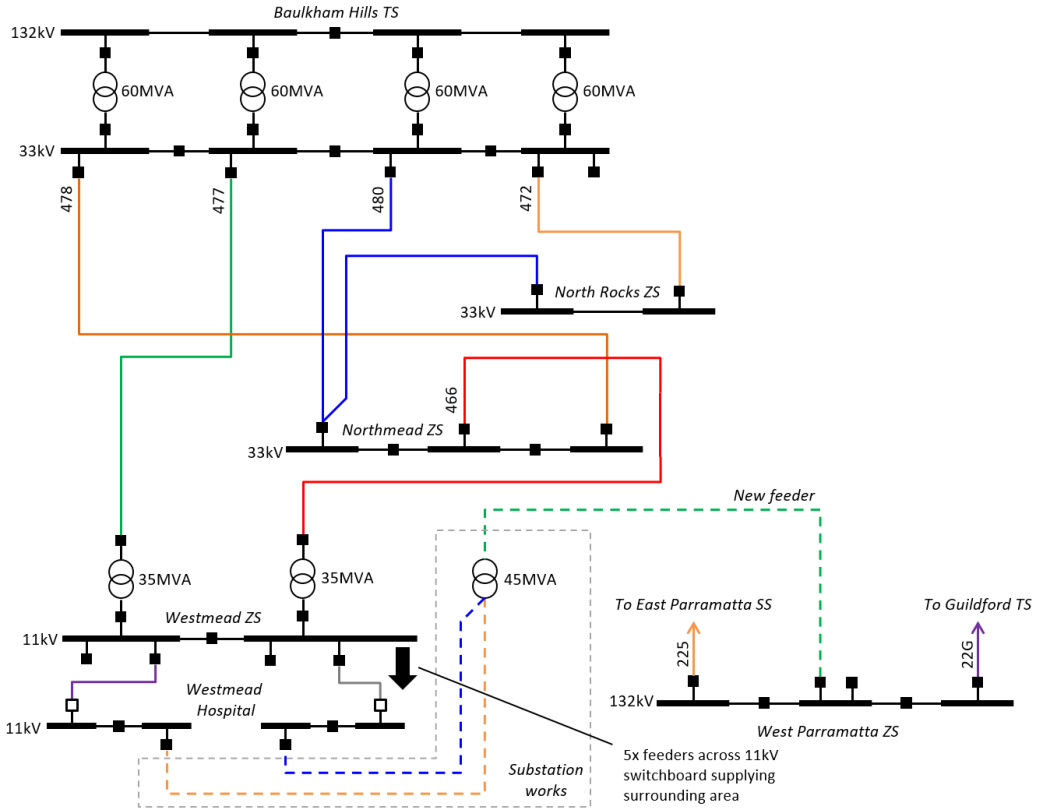

Figure 4 – Option 3 schematic

Option 4 – Establish new distribution feeders

This option proposes to establish two new 11kV feeders from Northmead ZS and one new 11kV feeder from West Parramatta ZS. This will allow a total of 10MVA to be transferred from Westmead ZS to the two other zone substations. This option would only serve to defer the installation of the third transformer by two years and hence has been modelled in the economic assessment.

6. Non-network consideration

Electricity Distributors in NSW operate under the licence requirement (under the NSW Electricity Supply Act 1995) to investigate non-network alternatives to network augmentation for specific capital expenditure projects. The National Electricity Rules (NER) requires Distribution Network Service Providers (DNSP) to investigate non-network (demand management) options by utilising a thorough consultation process as part of planning for major network upgrades.

The NER calls for a regulatory investment test for distributors (RIT-D) process to be used in identifying the solution delivering the highest net market benefit in removing the network limitation. A “screening test” is performed for all network limitations where the most expensive credible option is greater than $5 Million.

The screening test identified that a Non-Network Option (NNO) is feasible and a Non-Network Options Report will be issued requesting submissions for non-network alternatives. If an NNO is identified, the Economic Evaluation for this project will be revised to assess whether the NNO is has a greater benefit compared to the other options. This provisional CFI will require confirmation once the RIT-D process is complete.

7. Detailed costs and benefits analysis

The Houston Kemp model (HK model) was utilised in the economic evaluation of the viable options. Endeavour Energy's Unserved Energy Template was used to calculate the expected unserved energy that was used as an input to the HK model.

The assumptions used in the HK model are:

- A study period of 30 years;
- The commercial discount rate was set to 3.26%;
- A VCR of $38,805;
- A maintenance cost estimate based on 0.4% of the project cost; and
- The benefits of options are based on the avoided unserved energy.
- The benefits of avoided unserved energy have been capped to the level five years after commissioning of the options.

Capital cost							[Do not insert or delete rows from this table]
Number	Option name	Capex component	Amount	Start year	End year	Commission year	Asset life
1	Option 1	Sub build FY22 15%	1,725,000	2022	2022	2024	50
1	Option 1	Sub build FY23 45%	5,175,000	2023	2023	2024	50
1	Option 1	Sub build FY24 40%	4,600,000	2024	2024	2024	50
1	Option 1	Future 132kV feeder	8,846,300	2035	2035	2035	50
2	Option 2	Sub build FY22 15%	1,620,000	2022	2022	2024	50
2	Option 2	Sub build FY23 45%	4,860,000	2023	2023	2024	50
2	Option 2	Sub build FY24 40%	4,320,000	2024	2024	2024	50
2	Option 2	Future 132kV feeder	8,846,300	2035	2035	2035	50
3	Option 3	Sub build FY22 15%	1,875,000	2022	2022	2024	50
3	Option 3	Sub build FY23 45%	5,625,000	2023	2023	2024	50
3	Option 3	Sub build FY24 40%	5,000,000	2024	2024	2024	50
4	Option 4	Dist works	2,723,000	2035	2035	2024	50
4	Option 4	Sub build FY22 15%	1,875,000	2024	2024	2026	50
4	Option 4	Sub build FY23 45%	5,625,000	2025	2025	2026	50
4	Option 4	Sub build FY24 40%	5,000,000	2026	2026	2026	50

Figure 5 – Capital cost input into Houston Kemp model

Results of the Houston Kemp model used for this evaluation summarised in the table below.

	Description	Capex ($M)	NPV ($M)	Rank
1	Install 3rd 33/11kV 35MVA TX, 3rd 11kV bus section, supplied from Baulkham Hills TS	11.5	46.5	3
2	Installed 3rd 33/11kV 35MVA TX, direct hospital supply, supplied from Baulkham Hills TS	10.8	47.1	2
3	Install 3rd 132/11kV 45MVA TX, direct hospital supply, supplied from Holroyd BSP via West Parramatta ZS	12.5	49.0	1
4	Distribution works to enable load transfers to Northmead ZS and West Parramatta ZS	2.7	39.7	4

Table 3 – Economic evaluation

Net present value for each option						
Number	Option name	Unit	PV 'market benefits'	PV avoided 'risk cost' benefits	PV Costs	NPV	Rank
1	Option 1	$	60,237,633		-13,702,151	46,535,483	3
2	Option 2	$	60,237,633		-13,101,679	47,135,954	2
3	Option 3	$	60,237,633		-11,286,947	48,950,687	1
4	Option 4	$	51,427,030		-11,764,614	39,662,417	4
5		$					
6		$					
7		$					
8		$					
9		$					
10		$					
11		$					
12		$					
13		$					
14		$					
15		$					

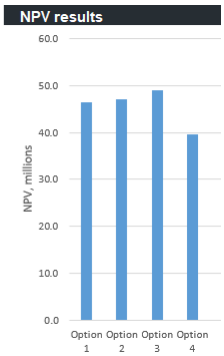

Figure 6 – Houston Kemp model output

In additional to the Houston Kemp model, Copperleaf was used to quantify additional risks and benefits in alignment with Endeavour Energy's Value Framework 2.0. The values of these risks and benefits have been added to the risks and benefits from the Houston Kemp model below.

Option	Description	HK Model PV $M		Copperleaf PV $M		Total $M	Rank	Assessment Description
		Benefits	Costs	Benefits	Costs	NPV		
	No proactive intervention						5	Non-preferred as will lead to unacceptable risk or higher cost for customers if opportunity not captured
1	Install 3rd 33/11kV 35MVA TX, 3rd 11kV bus section, supplied from Baulkham Hills TS	60.2	13.7	3.9	0.1	50.3	3	Technically feasible, lower net benefits
2	Installed 3rd 33/11kV 35MVA TX, direct hospital supply, supplied from Baulkham Hills TS	60.2	13.1	3.9	0.1	50.9	2	Technically feasible, lower net benefits
3	Install 3rd 132/11kV 45MVA TX, direct hospital supply, supplied from Holroyd BSP via West Parramatta ZS	60.2	11.3	3.9	0.6	52.2	1	Preferred
4	Distribution works to enable load transfers to Northmead ZS and West Parramatta ZS	51.4	11.8	3.9	0.1	43.4	4	Technically feasible, lower net benefits

Table 4 – NPV including Houston Kemp and Copperleaf results

The rankings in are based on the highest NPV of combined risks and benefits from the Houston Kemp model and Copperleaf and shows that the preferred option is Option 3.

8. Listing of benefits, risks and residual risks considered

The proposed options for this project have various benefits and risks. These are summarised in the tables below.

Benefit	Description	Model	Option 1 PV $M	Option 2 PV $M	Option 3 PV $M	Option 4 PV $M
Value of avoided unserved energy	The NER states that quantifiable economic market benefits (needs) include changes in involuntary load shedding.	Endeavour Energy's Unserved Energy Template was used to estimate the involuntary load shedding that can be prevented as a result of proactive action. The involuntary load shedding was utilised by the HK model along with a Value of Customer Reliability to calculate a market benefit.	60.238	60.238	60.238	51.427
Value of avoided customer complaints	The proactive action of this project will avoid potential customer complaints due to Endeavour Energy not meeting its obligation to supply customers with energy.	This benefit value was modelled using Copperleaf's Avoided Customer Complaints value model.	0.374	0.374	0.374	0.374
Value of avoided reputation risk	The proactive action of this project will avoid potential deterioration of Endeavour Energy's reputation due to failure of supply energy to Westmead Hospital.	This benefit value was modelled using Copperleaf's Reputational Risk Matrix value model.	3.543	3.543	3.543	3.543

Table 5 – Benefits

Risk	Description	Model	Option 1 PV $M	Option 2 PV $M	Option 3 PV $M	Option 4 PV $M
Potential damage to transmission/distribution feeders	The options of this project create potential situations where the public may dig and damage the transmission or distribution feeders.	This risk cost was modelled using Copperleaf's Financial Risk value model.	0.114	0.114	0.011	0.079
Potential customer complaint due to construction activity	Option 3 of this project requires underboring of Parramatta Park. Being a World Heritage listed site, there is the potential for community complaints.	This risk cost was modelled using Copperleaf's Customer Complaints value model.	-	-	0.003	-
Potential reputational risk due to construction activity	Option 3 of this project requires underboring of Parramatta Park. Being a World Heritage listed site, there is the potential Endeavour Energy to receive negative media coverage.	This risk cost was modelled using Copperleaf's Reputational Risk Matrix value model.	-	-	0.581	-
Potential need for asset relocation	Option 3 of this project presents a 132kV feeder of which a section may require relocating due to ongoing developments in the Cumberland precinct.	This risk was modelled as a risk cost in the Houston Kemp model.	-	-	0.564	0.564

Table 6 – Risks

8.1 Safety Considerations

The constraints analysed at Westmead ZS area are capacity related and there are no known safety issues with the existing network assets. In analysing expected unserved energy for the constraint we have considered the impact of potential widespread outages. The proposed investment solutions will be designed to current network standards to ensure safe operation of the network for our staff and general public. The proposed solution reduces the expected unserved energy and is considered SFAIRP.

9. Sensitivity and Scenario Analysis

Sensitivity tests have been applied to the economic evaluation in the Houston Kemp model and results are shown below. The output demonstrates that Option 3 remains the most favourable option in all sensitivity tests.

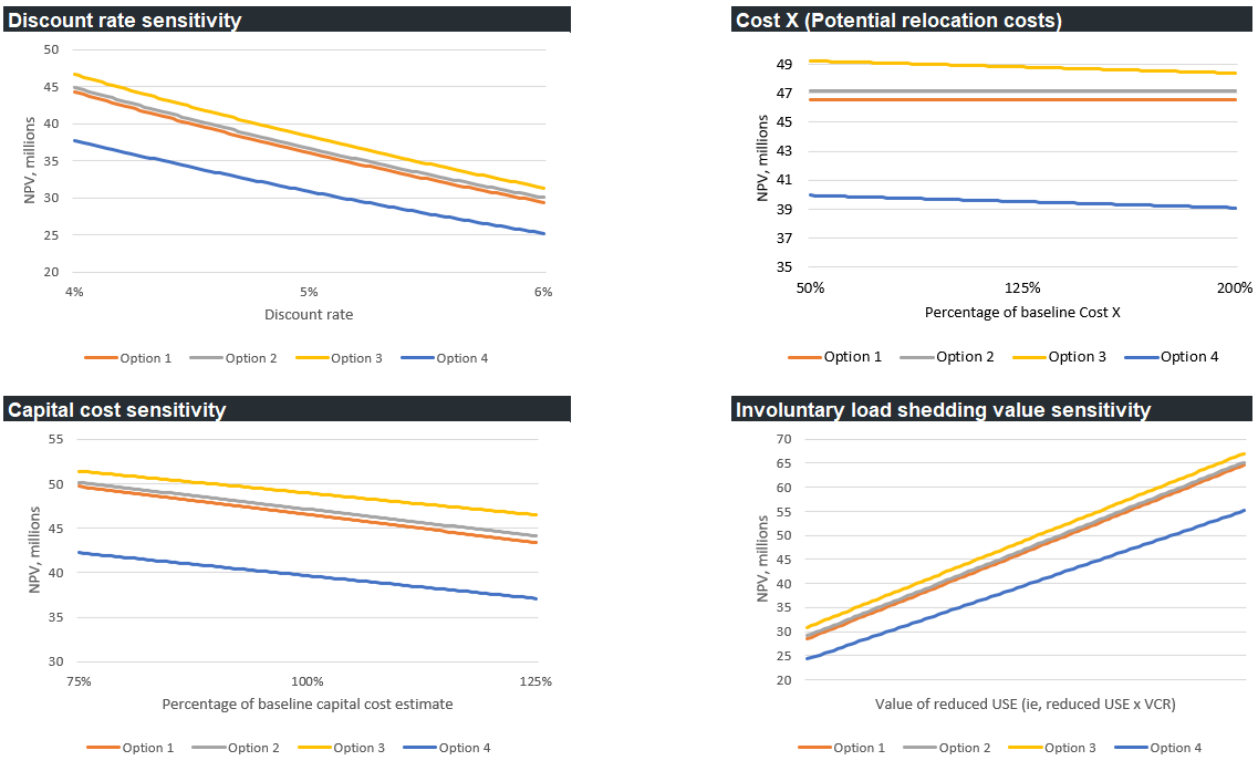

Figure 7 – Sensitivity analysis

Scenario analysis has been carried out by the model. The parameters of the scenario analysis are presented below.

User Interface

Scenarios	
Scenario selection	
Scenario	Scenario 1

Scenario weighting	Scenario 1	Scenario 2	Scenario 3
Weighting	0.50	0.25	0.25

General inputs

General	Unit	Value	Selection	Scenario 1	Scenario 2	Scenario 3	User defined
Commercial discount rate	Percent	3.26%	Central	Central	High	Low	Central

Cost inputs

Cost	Unit	Value	Selection	Scenario 1	Scenario 2	Scenario 3	User defined
Capital cost	Percent	100%	Central	Central	High	Low	Central
Planned routine maintenance and refurbishment	Percent	100%	Central	Central	High	Low	Central
Unplanned corrective maintenance	Percent	100%	Central	Central	High	Low	Central
Decommissioning costs	Percent	100%	Central	Central	Central	Central	Central
Non-network option provider costs	Percent	100%	Central	Central	High	Low	Central
Cost X	Percent	100%	Central	Central	High	Low	Central
Cost Y	Percent	100%	Central	Central	Central	Central	Central
Cost Z	Percent	100%	Central	Central	Central	Central	Central

Benefit inputs

Avoided 'risk cost' benefits	Unit	Value	Selection	Scenario 1	Scenario 2	Scenario 3	User defined
Reliability and security risk costs	Scenario	NA	Central	Central	Low	High	Central
Safety and health risk costs	Scenario	NA	Central	Central	Low	High	Central
Environmental risk costs	Scenario	NA	Central	Central	Low	High	Central
Legal/regulatory compliance risk costs	Scenario	NA	Central	Central	Low	High	Central
Financial risk costs	Scenario	NA	Central	Central	Low	High	Central

Market benefits	Unit	Value	Selection	Scenario 1	Scenario 2	Scenario 3	User defined
Involuntary load shedding - VCR	$/MWh	38,805	Central	Central	Low	High	Central
Involuntary load shedding - MWh	Scenario	NA	Central	Central	Low	High	Central
Difference in timing of unrelated expenditure	Scenario	NA	Central	Central	Low	High	Central
Difference in timing of unrelated expenditure	Percent	100%	Central	Central	Low	High	Central
Voluntary load curtailment - VCR	$/MWh	38,805	Central	Central	Low	High	Central
Voluntary load curtailment - MWh	Scenario	NA	Central	Central	Low	High	Central
Costs for non RIT-D proponent parties	Percent	100%	Central	Central	Central	Central	Central
Electricity energy losses	$/MWh	100	Central	Central	Central	Central	Central
Change in load transfer capacity and the capacity for embedde	Percent	100%	Central	Central	Central	Central	Central
Other classes of market benefits	Percent	100%	Central	Central	Central	Central	Central

Figure 8 – Houston Kemp model scenario parameters

Variable	Scenario 1 – baseline	Scenario 2 – low benefits	Scenario 3 – high benefits
Capital cost	Estimated network capital costs	25% increase in the estimated network capital costs	25% decrease in the estimated network capital costs
Value of customer reliability (VCR)	$38.8/kWh (from EE 2020 VCR report)	$27.2/kWh 30% lower than baseline	$50.4/kWh 30% higher than baseline
Discount rate	3.26% (WACC)	2.22%	3.76%
Maintenance costs	Estimated network maintenance costs	25% decrease in the estimated network maintenance costs	25% increase in the estimated network maintenance costs
Cost X (Potential relocation cost)	100%	50% decrease to baseline	100% increase to baseline
Scenario weighting	50%	25%	25%

Table 7 – Summary of scenarios investigated

The scenarios have been weighted as 50% for Scenario 1 being the most likely with Scenarios 2 and 3 being given a weighting of 25%. The weighted NPV for each option is shown below.

Option	Scenario 1 NPV ($M)	Scenario 2 NPV ($M)	Scenario 3 NPV ($M)	Weighted NPV ($M)	Option ranking
Option 1	46.5	-1.5	152.7	61.1	3
Option 2	47.1	-0.8	153.2	61.7	2
Option 3	49.0	0.8	154.8	63.4	1
Option 4	39.7	-0.9	121.0	49.9	4

Table 8 – Weighted net present value of options

Net present value for each option		Scenarios				
Number	Option name	Scenario 1	Scenario 2	Scenario 3	Weighted NPV	Rank
1	Option 1	46,535,483	-1,539,694	152,739,786	61,067,764	3
2	Option 2	47,135,954	-768,718	153,170,932	61,668,531	2
3	Option 3	48,950,687	836,368	154,786,958	63,381,175	1
4	Option 4	39,662,417	-870,781	120,987,537	49,860,397	4
5		0	0	0		
6		0	0	0		
7		0	0	0		
8		0	0	0		
9		0	0	0		
10		0	0	0		
11		0	0	0		
12		0	0	0		
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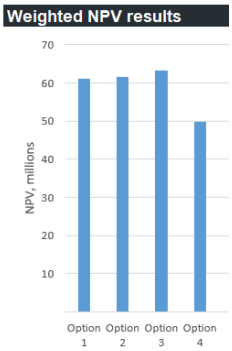

Figure 9 – Houston Kemp scenario analysis output

The scenario assessment shows that Option 3 evidently has a higher NPV and is therefore the preferred option.

10. Detailed description and costs of preferred option

The preferred option proposes to establish a new 45 MVA 132/22kV transformer at Westmead ZS that will supply the Westmead Hospital's switchboard directly. The new transformer will be supplied by a new 132kV feeder from West Parramatta ZS.

Project Scope of Works

The scope of works for the preferred network option includes:

- Zone Substation:
  - One 132/11kV 45MVA transformer
  - Associated 11kV zone sub cabling works
- Transmission Lines:
  - Establishment of a 132kV Feeder from West Parramatta to Westmead ZS with 800mm^2 cables.

A markup of the transmission feeder route is shown in Figure 10.

The cost estimate breakdown for these works is shown in Figure 11.

Figure 10 – 132kV feeder route

PROJECT: PR754 — Westmead ZS Augmentation Option 3 - 132/11kV Trf Only — AUU 5

Plan	Work Centre	Work Packet	Resource Hrs Estimate	Resource Hrs Actual	Labour Cost Estimate	Labour Cost Actual	Store Costs Estimate	Store Costs Actual	Plant Costs Estimate	Plant Costs Actual	Direct Charges Estimate	Direct Charges Actual	Total Costs Estimate	Total Costs Actual	Contingency	
	Plan	1.0	1,280	-	$ 184,946	$ -	$ -	$ -	$ 1,410	$ -	$ -	$ -	$ 186,356	$ -	$ 16,900	
	Preliminary	1.1	1,280	-	$ 184,946	$ -	$ -	$ -	$ 1,410	$ -	$ -	$ -	$ 186,356	$ -	$ 16,900	9%
D-AUU-5-001-01	Project Management	1.1.1	1,120	-	$ 167,608		$ -		$ 1,387		$ -		$ 168,995	$ -	$ 16,900	
D-AUU-5-001-01	NIOs & PDs	1.1.2	160	-	$ 17,338		$ -		$ 23		$ -		$ 17,361	$ -	$ -	
	Design	2.0	770	-	$ 82,597	$ -	$ -	$ -	$ 23	$ -	$ -	$ -	$ 82,620	$ -	$ 3,603	
	Elect Design	2.1	680	-	$ 73,604	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 73,604	$ -	$ 3,603	5%
D-AUU-5-002-01	Elec Pkt	2.1.1	120	-	$ 11,029		$ -		$ -		$ -		$ 11,029	$ -	$ 1,103	
D-AUU-5-002-01	Protection Pkt	2.1.2	220	-	$ 24,996		$ -		$ -		$ -		$ 24,996	$ -	$ 2,500	
D-AUU-5-002-01	SCADA Pkt	2.1.3	140	-	$ 15,907		$ -		$ -		$ -		$ 15,907	$ -	$ -	
D-AUU-5-002-01	Earthing	2.1.4	200		$ 21,672		$ -		$ -		$ -		$ 21,672	$ -	$ -	
	Civil Mech	2.2	40	-	$ 3,508	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,508	$ -	$ -	
D-AUU-5-002-02	Civil/Mech Pkt	2.2.1	40		$ 3,508		$ -		$ -		$ -		$ 3,508	$ -	$ -	
D-AUU-5-002-02	Architect	2.2.2	-		$ -		$ -		$ -		$ -		$ -	$ -	$ -	
	Transmission	2.3	-	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
D-AUU-5-002-03	Trans Mains Pkt	2.3.1	-	-	$ -		$ -		$ -		$ -		$ -	$ -	$ -	
	Environment	2.4	50	-	$ 5,484	$ -	$ -	$ -	$ 23	$ -	$ -	$ -	$ 5,507	$ -	$ -	
D-AUU-5-002-04	Environmental Pkt	2.4.1	50	-	$ 5,484		$ -		$ 23		$ -		$ 5,507	$ -	$ -	
	Build	3.0	4,941	-	$ 413,218	$ -	$ 161,732	$ -	$ 52,516	$ -	$ 11,536,440	$ -	$ 12,163,906	$ -	$ 1,440,384	
	Zone Sub	3.1	1,320	-	$ 103,833	$ -	$ 6,854	$ -	$ 7,522	$ -	$ 3,008,557	$ -	$ 3,126,766	$ -	$ 541,991	17%
	Procurement	3.1.1	-	-	$ -	$ -	$ -	$ -	$ 896	$ -	$ 2,005,057	$ -	$ 2,005,953	$ -	$ 195,315	10%
D-AUU-5-003-01-01	Transformers	3.1.1.1	-		$ -		$ -		$ -		$ 1,750,000		$ 1,750,000	$ -	$ 175,000	
D-AUU-5-003-01-01	Switchgear	3.1.1.2	-		$ -		$ -		$ -		$ 95,000		$ 95,000	$ -	$ 9,500	
D-AUU-5-003-01-01	Steelwork & Busbars/Fittings	3.1.1.3	-		$ -		$ -		$ -		$ -		$ -	$ -	$ -	
D-AUU-5-003-01-01	Major Equipment Storage	3.1.1.4	-		$ -		$ -		$ -		$ 55,350		$ 55,350	$ -	$ 5,535	
D-AUU-5-003-01-01	On Site Security	3.1.1.5	-		$ -		$ -		$ -		$ -		$ -	$ -	$ -	
D-AUU-5-003-01-01	Landscaping	3.1.1.6	-		$ -		$ -		$ -		$ -		$ -	$ -	$ -	
D-AUU-5-003-01-01	Control Panels	3.1.1.7	-		$ -		$ -		$ 208		$ 11,300		$ 11,508	$ -	$ 575	
D-AUU-5-003-01-01	SCADA Hardware	3.1.1.8	-		$ -		$ -		$ 174		$ 4,192		$ 4,366	$ -	$ 218	
D-AUU-5-003-01-01	Protection Relays	3.1.1.9	-		$ -		$ -		$ 514		$ 29,215		$ 29,729	$ -	$ 1,486	
D-AUU-5-003-01-01	Minor Equipment	3.1.1.10	-		$ -		$ -		$ -		$ 60,000		$ 60,000	$ -	$ 3,000	
	Construct - Building	3.1.2	-	-	$ -	$ -	$ -	$ -	$ -	$ -	$ 975,000	$ -	$ 975,000	$ -	$ 333,000	34%
D-AUU-5-003-01-02	Civil Costs - Refer to Civil Estimate	3.1.2.1	-		$ -		$ -		$ -		$ 975,000		$ 975,000	$ -	$ 273,000	
D-AUU-5-003-01-02	Relocation of Existing Assets	3.1.2.2	-		$ -		$ -		$ -		$ -		$ -	$ -	$ 60,000	
		3.1.2.3	-		$ -		$ -		$ -		$ -		$ -	$ -	$ -	
	Construct - Elec	3.1.3	1,320	-	$ 103,833	$ -	$ 6,854	$ -	$ 6,626	$ -	$ 28,500	$ -	$ 145,813	$ -	$ 13,676	9%
D-AUU-5-003-01-03	Subs Elec	3.1.3.1	736		$ 54,839		$ 6,854		$ 6,298		$ 5,000		$ 72,992	$ -	$ 7,299	
D-AUU-5-003-01-03	Protection	3.1.3.2	360		$ 30,110		$ -		$ -		$ -		$ 30,110	$ -	$ 3,011	
D-AUU-5-003-01-03	HV Test	3.1.3.3	216		$ 17,913		$ -		$ 201		$ -		$ 18,113	$ -	$ 906	
D-AUU-5-003-01-03	Metering	3.1.3.4	8		$ 970		$ -		$ 127		$ 23,500		$ 24,598	$ -	$ 2,460	
	Removal of 11kV Switchgear & Disposal		-		$ -		$ -		$ -		$ -		$ -	$ -	$ -	
	Trans Mains	3.3	3,621	-	$ 309,385	$ -	$ 154,878	$ -	$ 44,994	$ -	$ 8,527,883	$ -	$ 9,037,140	$ -	$ 898,393	10%
	Construct - Mains	3.3.3	3,621	-	$ 309,385	$ -	$ 154,878	$ -	$ 44,994	$ -	$ 8,527,883	$ -	$ 9,037,140	$ -	$ 898,393	10%
D-AUU-5-003-03-03	Mains	3.3.3.1	3,148		$ 256,177		$ 154,878		$ 44,994		$ 8,527,883		$ 8,983,932	$ -	$ 898,393	
D-AUU-5-003-03-03		3.3.3.2	-		$ -		$ -		$ -		$ -		$ -	$ -	$ -	
D-AUU-5-003-03-03	Project Management	3.3.3.3	473		$ 53,208		$ -		$ -		$ -		$ 53,208	$ -	$ -	
	Commission	4.0	270	-	$ 23,274	$ -	$ -	$ -	$ 12	$ -	$ -	$ -	$ 23,286	$ -	$ -	
	Commission 1	4.1	270	-	$ 23,274	$ -	$ -	$ -	$ 12	$ -	$ -	$ -	$ 23,286	$ -	$ -	
	Stage 1	4.1.1	270	-	$ 23,274	$ -	$ -	$ -	$ 12	$ -	$ -	$ -	$ 23,286	$ -	$ -	
D-AUU-5-004-01	Subs Elec	4.1.1.1	-		$ -		$ -		$ -		$ -		$ -	$ -	$ -	
D-AUU-5-004-01	Protection	4.1.1.2	240		$ 20,688		$ -		$ 12		$ -		$ 20,700	$ -	$ -	
D-AUU-5-004-01	Switching	4.1.1.3	30		$ 2,586		$ -		$ -		$ -		$ 2,586	$ -	$ -	
D-AUU-5-004-01	Changeover	4.1.1.4	-		$ -		$ -		$ -		$ -		$ -	$ -	$ -	
	Stage 2	4.1.2	-	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
D-AUU-5-004-02	Subs Elec	4.1.2.1	-		$ -		$ -		$ -		$ -		$ -	$ -	$ -	
D-AUU-5-004-02	Protection	4.1.2.2	-		$ -		$ -		$ -		$ -		$ -	$ -	$ -	
	Closure	5.0	60	-	$ 8,979	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,979	$ -	$ -	
	Close	5.1	60	-	$ 8,979	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,979	$ -	$ -	
D-AUU-5-005	Project closure (PCR etc.)	5.1.1	60		$ 8,979		$ -		$ -		$ -		$ 8,979	$ -	$ -	
	Totals		7,321	-	$ 713,014	$ -	$ 161,732	$ -	$ 53,961	$ -	$ 11,536,440	$ -	$ 12,465,147	$ -	$ 1,460,886	12%

Assumed CPI = 2.5%	YEAR 1st	2nd	3rd	4th	5th	Total
% Spend	15%	45%	40%			100%
Cost Breakdown	$ 139,306.02	$ 417,918	$ 371,483	$ -	$ -	$ 928,707
CPI	$ -	$ 10,448	$ 18,574	$ -	$ -	$ 29,022

(Note: CPI is not applied to direct charge above)

= Assume no CPI for 1st Year

= Only change percentages

Total (inc CPI): $ 12,500,000

Contingency: $ 1,500,000

Revision C
Date 07/07/2021

Westmead ZS Option 3
132/11kV 45MV Trf + No 132kV/11kV Swgr + 132kV Bay exists at West Parramatta ZS

Figure 11 – Cost estimate

Project Costs and Timing

The project cost is estimated to be $12,500,000 to augment Westmead ZS. A contingency amount of $1.5 Million (12% of the project costs) has been built into the cost estimates covering unforeseen site conditions which may arise and cause delays. The forecast zone substation construction expenditure will occur from FY22 to 2024 as shown in the table below.

Estimated Cost	FY22	FY23	FY24	Total
Component	15%	45%	40%	
Project cost (nominal) ($)	1,875,000	5,625,000	5,000,000	12,500,000
Continency ($)				1,500,000
Total ($)	**1,875,000**	**5,625,000**	**5,000,000**	**14,000,000**

Table 9 – Project expenditure spread

11. Recommendation and next steps

It is recommended that:

- The RIT-D process is commenced for this project to screen for non-network options;
- The project proceeds to preliminary release with preferred Option 3 which recommends capital expenditure to establish a third transformer and third feeder to supply the Westmead Precinct. Preliminary release enables development of project definitions, detailed design, environmental assessment and preliminary market engagement activities in accordance with Company Procedure GRM0051.

12. Referenced documents and appendices

[1] **Westmead ZS Capacity Constraint**
Need and/or Opportunity Statement - February 2020.
H:\SPB\Filing\Zonesub\Westmead\PR754 Westmead ZS Augmentation\NOS\Westmead ZS NOS Final.pdf

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