

OPTIONS EVALUATION REPORT (OER)

Haymarket 132 kV Connection – Replacement of Ausgrid Cables 9S6/1 and 9S9/1

OER 000000001448 revision 4.0



Ellipse project description: Haymarket 132 kV Connection – Replacement of Ausgrid Cables 9S6/1 and 9S9/1

TRIM file: [TRIM No]

Project reason: Capability - Asset Replacement for end of life condition

Project category: Prescribed - Replacement

Approvals

Author	Ronny Schnapp	Network and Connection Analysis Engineer
Reviewed	Charbel Lahoud	Network and Connection Analysis Engineer
Endorsed	Vincent Ong	Network and Connection Analysis Manager
	Azil Khan	Investment Analysis Manager
Approved	Andrew Kingsmill	Manager / Network Planning
Date submitted for approval	[Publish Date]	

1. Need/opportunity

Ausgrid is presently revising their 132 kV cable retirement program for the inner metropolitan area. Ausgrid has informed TransGrid that at this time, they plan to replace 132 kV cables 9S6/1 and 9S9/1 Haymarket to Pymont STS in 2022/23. The replacement is being considered as “like-for-like” and solely driven by the condition of the cables.

Ausgrid has requested via the Joint Planning process that TransGrid carry out appropriate works to disconnect the existing cables and connect and commission the new cables at the Haymarket Substation end.

2. Related needs/opportunities

> Need 43 – Powering Sydney’s Future

Need 1448 is independent of Need 43. These Needs are related only in that they apply to the same geographical area.

3. Options

Base Case

The base case under this Need is to “do nothing”. In practice, this means refraining from any capital investment, i.e. not facilitating the connection of Ausgrid’s replacement cables at Haymarket Substation.

As outlined in [NOS-1448](#), the risk cost is assessed to be \$249.19 million per year. The risk cost of not addressing this Need is therefore composed of the following components:

- > exposing customer load of 269 MW to risk of being unsupplied.
- > damage to TransGrid’s reputation (negative media coverage).
- > litigation by customers/consumer groups.

The total cost of these risks has been calculated in TransGrid’s Investment Risk Tool thus:

VCR Risk Cost (Unserviced Energy)

$$VCR \text{ risk cost} = \text{load at risk} * \text{probability of cables not available for one day}^1 * VCR^2$$

$$\therefore VCR \text{ risk cost} = 269 \text{ MW} * 24 \text{ hrs} * \$38,350/\text{MWh}$$

$$\therefore VCR \text{ risk cost} = \$247.59 \text{ million per annum}$$

Reliability Risk Cost

$$Reliability \text{ risk cost} = VCR \text{ risk cost} + \text{litigation costs}$$

$$\therefore Reliability \text{ risk cost} = \$247.4\text{m} + \$0.5\text{m}^3 = \$248.09 \text{ million per annum}$$

Financial Risk Cost

$$Financial \text{ risk cost} = \text{internal investigation costs} = \$0.25^4$$

¹ This is a snapshot of the risk cost during a single day of summer 2022/23.

² TransGrid’s Investment Risk Tool bases the Value of Customer Reliability (VCR) on figures published by AEMO in its *Value of Customer Reliability Review - Final Report*, September 2014. In this case we use the mixed residential/industrial figure of \$38,350/MWh.

³ This component is an assumed litigation risk cost of this event.

⁴ This component is an assumed financial risk cost of this event.

Reputational Risk Cost

Reputational risk cost = external consultations & communications costs = \$0.85⁵

Total Risk Cost

Total risk cost = Reliability risk cost + Financial risk cost + Reputational risk cost

∴ Total risk cost = \$249.19 million per annum

Option A — Associated Works to Facilitate Replacement of Ausgrid 132 kV Cables 9S6/1 and 9S9/1 at Haymarket Substation <OFR-1448A, OFS-1448A>

The following works are required by TransGrid under this option:

- > Disconnect the existing 9S6/1 and 9S9/1 Haymarket to Pymont STS 132 kV cables at Haymarket Substation.
- > Connect the two newly installed Ausgrid cables at Haymarket Substation to the same 132 kV cable switchbays.
- > Make any necessary upgrades/changes to secondary systems at Haymarket Substation, including metering and control systems.

This option has been assessed for feasibility in [OFS-1448](#). The estimated un-escalated capital cost of the option is \$543,000 ± 25% in 2016-17 AUD.

The post-project risk cost of Option A is assessed to be zero.

This is based on the extremely low probability of failure of the two cable connection points considering TransGrid historical outage rates and restoration times for switchbays. The post-option risk cost is therefore composed of the VCR risk cost, thus:

VCR Risk Cost (Unserved Energy)

*VCR risk cost = load at risk * probability of outage of Ausgrid cable connections at Haymarket⁶ * VCR*

$$VCR \text{ risk cost} = \text{load at risk} * \frac{[\text{connection point 1 outage rate}] * [\text{connection point 1 outage duration}]}{[\text{Total hours in a year}]} \\ * \frac{[\text{connection point 2 outage rate}] * [\text{connection point 2 outage duration}]}{[\text{Total hours in a year}]} * VCR$$

$$VCR \text{ risk cost} = 269 \text{ MW} * \left\{ \frac{0.073 * 1}{8760} \right\} * \left\{ \frac{0.073 * 1}{8760} \right\} * \$38,350/\text{MWh}$$

$$\therefore VCR \text{ risk cost} = 269 \text{ MW} * 0 * \$38,350/\text{MWh}$$

∴ VCR risk cost = \$0 per annum

Non-network Solutions

No feasible non-network solutions have been identified to address this Need.

⁵ This component is an assumed reputational risk cost of this event.

⁶ Based on TransGrid historical outage rates for connection points (7.3%) and restoration time (1 hour).

4. Evaluation

Commercial Evaluation

Both the Base Case and Option A are technically feasible.

TransGrid is required to meet the planning requirements contained in Schedule 5.1 of the National Electricity Rules and the NSW Transmission Network Design and Reliability Standard. Option A would meet those requirements whereas the Base Case would not. Option A would also reduce the \$249.19 million per annum risk cost to zero.

The commercial evaluation of the technically feasible options is set out in Table 1.

Table 1: Commercial Evaluation of the Technically Feasible Options

Option	Description	Capex (\$m)	Ongoing Opex (\$m)	Yearly Post Project Risk Cost (\$m)	Financial NPV (\$m)	Economic NPV (\$m)	Rank
Base case	'Do nothing' (Leave the substation as is and do not facilitate/allow connection of Ausgrid's cables to Haymarket Substation.	0	-	249.19	0	0	2
A	Associated Works to Facilitate Replacement of Ausgrid 132 kV Cables 9S6/1 and 9S9/1 at Haymarket Substation	0.543	-	0	11.76	1,916.07	1

The commercial evaluation is based on:

- > a 10% discount rate, with sensitivities based on TransGrid's current AER-determined pre-tax real regulatory WACC of 6.75% for the lower bound and 13% for the upper bound.
- > the applied sensitivities appear in the table, below, for the preferred Option A.

Option	Description	Economic NPV @ 13% (\$m)	Economic NPV @ 6.75% (\$m)
A	Associated Works to Facilitate Replacement of Ausgrid 132 kV Cables 9S6/1 and 9S9/1 at Haymarket Substation	1,451.67	2,718.76

ALARP Evaluation

An ALARP assessment is triggered by the following hazard and the disproportionate factor:

- > Unplanned outage of HV equipment → 3 times the safety risk reduction and taking 10% of the reliability risk reduction as being applicable to safety.

However, as this will only produce 30% of the benefit derived in the economic evaluation, a full ALARP evaluation will not produce an alternative preferred solution.

Capital and operating expenditure

The operating expenditure is expected to be the same for both options, i.e. the cost of maintaining two cable switchbays. Therefore the incremental opex component has not been included in the analysis.

Regulatory Investment Test

The preferred option is not subject to the RIT-T as it is below the \$6 million threshold required.

5. Recommendation

Based on the economic evaluation above, Option A is the preferred option to address the Need as it:

- > enables TransGrid to meet its supply obligations under the National Electricity Rules.
- > significantly reduces TransGrid's risk exposure and reduces the yearly risk cost from \$249.19 million to zero.

It is therefore recommended that a PAD be issued by PMO for the necessary works to disconnect Ausgrid's existing cables and connect the replacement cables at Haymarket Substation.

Appendix A - Financial and Economic Evaluation Reports

Project_Option Name

Need 1448 - Option A - Connect Cables

1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	\$11.76m	NPV / Capital (Ratio)	21.66
NPV @ upper bound rate	13.00%	\$8.82m	Pay Back Period (Yrs)	Not measurable
NPV @ lower bound rate (WACC)	6.75%	\$16.85m	IRR%	273.37%

2. Economic Evaluation (includes VCR benefits but excludes tax benefits from non-cash transactions, ENS penalty and overall tax cost)

NPV @ standard discount rate	10.00%	\$1,916.07m	NPV / Capital (Ratio)	3528.67
NPV @ upper bound rate	13.00%	\$1,451.67m	Pay Back Period (Yrs)	Not measurable
NPV @ lower bound rate (WACC)	6.75%	\$2,718.76m	IRR%	11542.03%

Benefits

Risk cost	As Is	To Be	Benefit	VCR Benefit	\$247.59m
Systems (reliability)	\$248.09m	\$0.00m	\$248.09m	ENS Penalty	\$0.00m
Financial	\$0.25m	\$0.00m	\$0.25m	All other risk benefits	\$1.60m
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$249.19m
People (safety)	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$1.60m
Environment	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
Reputation	\$0.85m	\$0.00m	\$0.85m	Benefits in the economic NPV**	\$249.19m
Total Risk benefits	\$249.19m	\$0.00m	\$249.19m	**excludes ENS penalty	
Cost savings and other benefits			\$0.00m		
Total Benefits			\$249.19m		

Other Financial Drivers

Incremental opex cost pa (no depreciation)	-\$0.01m	Write-off cost	\$0.00m
Capital - initial \$m	-\$0.54m	Major Asset Life (Yrs)	40.00 Yrs
Residual Value - initial investment	\$0.16m	Re-investment capital	\$0.00m
Capitalisation period	2.00 Yrs	Start of the re-investment period	0.00 Yrs