

OPTIONS EVALUATION REPORT (OER)



New 132 kV Line Switchbay at Vineyard BSP for Endeavour Energy Connection of Proposed Box Hill ZS

OER 000000000691 revision 3.0

Ellipse project description: New 132 kV Line Switchbay at Vineyard BSP for Endeavour Energy Connection of Proposed Box Hill ZS

TRIM file: MF1849

Project reason: Other - Customer request

Project category: Prescribed - Augmentation

Approvals

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Date submitted for approval	[Publish Date]	

Change history

Revision	Date	Amendment
0	3/06/2016	Initial Issue
1	27/10/2016	Formatting changes
2	3/11/2016	Updated load at risk
3		Clarified all risk cost breakdowns and updated option costs as per revised OFS.

1. Need/opportunity

In October 2013, the NSW Department of Planning and Infrastructure (DPI) outlined its long term plans for the development of the Vineyard and Riverstone East precincts (as part of the wider approach it calls Precinct Planning). To supply these precincts, Endeavour is proposing to establish a new Box Hill ZS in 2021/22, which will be supplied from TransGrid's Vineyard 330/132 kV Substation. See [NOS-0691](#) for details.¹

The expected Need date for Box Hill ZS to take supply via a new line connection and new switchbay from Vineyard Substation is in summer 2021/22. The timing is to be confirmed with Endeavour Energy through the ongoing Joint Planning process.

Endeavour Energy has requested via the Joint Planning process that TransGrid install a new 132 kV switchbay at Vineyard Substation to connect Box Hill ZS.

2. Related needs/opportunities

Nil.

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 Endeavour Energy's Box Hill ZS.

As outlined in [NOS-0691](#), the risk cost of not addressing this Need is therefore composed of the following components:

- > exposing customer load of 19.92 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)

$$\begin{aligned} VCR \text{ risk cost} &= \text{load at risk} * \text{probability of Mt Gilead going unsupplied for one day}^2 * VCR^3 \\ \therefore VCR \text{ risk cost} &= 19.92 \text{ MW} * 24 \text{ hrs} * \$38,350/\text{MWh} \\ \therefore VCR \text{ risk cost} &= \$18.33 \text{ million per annum} \end{aligned}$$

Reliability Risk Cost

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

$$\therefore \text{Reliability risk cost} = \$18.33\text{m} + \$0.01\text{m}^4 = \$18.34 \text{ million per annum}$$

¹ Need/opportunity Statement 0691 - New 132 kV Line Switchbay at Vineyard BSP for Endeavour Energy Connection of Proposed Box Hill ZS, <<http://thewire/projects/prew/000000000691/Shared%20Documents/Milestone%20Documents/NS-000000000691.docx>>, accessed 7 December 2016.

² This is a snapshot of the risk cost during a single day of summer 2022/23.

³ 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.

⁴ This component is an assumed litigation risk cost.

Financial Risk Cost

Financial risk cost = internal investigation costs = \$10,000⁵

Reputational Risk Cost

Reputational risk cost = external consultations & communications costs = \$34,500⁶

Total Risk Cost

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

∴ Total risk cost = \$18.39 million per annum

Option A — New 132 kV Line Switchbay at Vineyard 330/132 kV Substation for Connection of Endeavour Energy's Proposed Box Hill ZS <OFR-0691A, OFS-0691A>

The following works are required by TransGrid under this option:

- > Construction and commissioning of a new 132 kV line switchbay in the most convenient location on the 132 kV busbar at Vineyard Substation.
- > Connect Endeavour's new Box Hill feeder to the new bay.
- > Install and commission all necessary secondary systems equipment.

This option has been assessed for feasibility in [OFS-0691A](#). The estimated un-escalated capital cost of the option is \$1.46 million ± 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 new connection point 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 Box Hill connection at Vineyard⁷ * VCR*

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

*VCR risk cost = 19.92 MW * $\frac{0.073 * 1}{8760}$ * \$38,350/MWh*

∴ VCR risk cost = 19.92 MW * 0 * \$38,350/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 financial risk cost for this event.

⁶ This component is an assumed reputational risk cost. For this event.

⁷ Based on TransGrid historical outage rates for connection points (7.3%) and restoration time (1 hour).

4. Evaluation

The commercial evaluation of the credible options is summarised in Table 1 below.

Table 1: Commercial Evaluation of the Technically Feasible Options

Option	Description	Total Capex (\$m)	Yearly Opex (\$m)	Yearly Post Project Risk Cost (\$m)	Economic NPV (\$m)	Financial NPV (\$m)	Rank
Base case	'Do nothing' (Do not make new connection).	-	-	18.39	-	-	2
A	Construct a new Vineyard 132 kV Line Switchbay for Endeavour Energy Connection of New Box Hill ZS	1.46	0.03	0.00	126.54	(0.67)	1

The commercial evaluation is based on:

- (a) a 10% discount rate
- (b) a life of the investment of 15 years and a corresponding residual/terminal value
- (c) Discount rate sensitivities based on TransGrid's current AER-determined pre-tax real regulatory WACC of 6.75 percent and 13% appear in Table 3 for the preferred option, A:

Table 3: Discount rate sensitivities (\$ million)

Option	Description	Economic NPV @ 13%	Economic NPV @ 6.75%
A	Construct a new Vineyard 132 kV Line Switchbay for Endeavour Energy Connection of New Box Hill ZS	93.41	184.42

Capital and operating expenditure

The yearly incremental operating expenditure is estimated to be 2% of the upfront capital cost of each option, which equates to \$0.03 million, escalated at a rate of 2.9% per annum.⁸

Regulatory Investment Test – Transmission (RIT-T)

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

⁸ TransGrid Success Database as at May 2016.

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 risk from \$18.39m to zero.

It is therefore recommended that an RPS be completed for the construction of a new 132 kV line switchbay at Vineyard BSP for the connection of Endeavour Energy's proposed Box Hill ZS in 2021/22.

Appendix A - Financial and Economic Evaluation Reports

Project_Option Name

Need 691 - Option A - Construct 132 kV Switchbay

1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	-\$0.67m	NPV / Capital (Ratio)	-0.46
NPV @ upper bound rate	13.00%	-\$0.71m	Pay Back Period (Yrs)	0.02 Yrs
NPV @ lower bound rate (WACC)	6.75%	-\$0.55m	IRR%	1.96%

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%	\$126.54m	NPV / Capital (Ratio)	86.67
NPV @ upper bound rate	13.00%	\$93.41m	Pay Back Period (Yrs)	Not measurable
NPV @ lower bound rate (WACC)	6.75%	\$184.42m	IRR%	505.79%

Benefits

Risk cost	As Is	To Be	Benefit	VCR Benefit	\$18.33m
Systems (reliability)	\$18.38m	\$0.00m	\$18.38m	ENS Penalty	\$0.00m
Financial	\$0.01m	\$0.00m	\$0.01m	All other risk benefits	\$0.10m
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$18.43m
People (safety)	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$0.10m
Environment	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
Reputation	\$0.03m	\$0.00m	\$0.03m	Benefits in the economic NPV**	\$18.43m
Total Risk benefits	\$18.43m	\$0.00m	\$18.43m	**excludes ENS penalty	
Cost savings and other benefits			\$0.00m		
Total Benefits			\$18.43m		

Other Financial Drivers

Incremental opex cost pa (no depreciation)	-\$0.03m	Write-off cost	\$0.00m
Capital - initial \$m	-\$1.46m	Major Asset Life (Yrs)	40.00 Yrs
Residual Value - initial investment	\$0.47m	Re-investment capital	\$0.00m
Capitalisation period	3.00 Yrs	Start of the re-investment period	0.00 Yrs