

OPTIONS EVALUATION REPORT (OER)



Strengthening Far West NSW Network

OER- 00000001698 revision 1.0

Ellipse project no(s): P0010132

TRIM file: [TRIM No]

Project reason: Reliability - To meet overall network reliability requirements

Project category: Prescribed - Augmentation

Approvals

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Date submitted for approval	12 December 2016	

Change history

Revision	Date	Amendment
0	28/10/2015	Initial issue
1	12/12/2016	General update

1. Need/opportunity

In a study commissioned by TransGrid¹, Ernst & Young (EY) has identified a number of projects which, should they eventuate, would result in additional spot loads imposed on the TransGrid network and may impact the TransGrid network development plan. The EY study identifies, an additional 354 MW in demand forecasts over the upcoming planning horizon. Of these additional loads, there are potential mining loads in the Broken Hill area which, if established, would have an adverse impact on the network.

TransGrid has analysed the impact of the additional loads and has determined that establishment of a large block load of the proposed magnitude at Broken Hill Substation would cause operation of the network outside of the *satisfactory operating state*.

Under these circumstances, TransGrid would not be able to connect the mine(s) to the HV network, unless network upgrades were completed.

TransGrid's analysis hence determines that voltage issues at Broken Hill and Buronga substation and rating issues on line X2 necessitates a solution if the uncommitted projects were to occur within the current planning horizon.

TransGrid has estimated a 75% weighted likelihood of the Need date eventuating within the 2018-23 regulatory period.

2. Related needs/opportunities

> [Need DCN564 Carpentaria Exploration Ltd - Hawsons Iron Project connect to X2-BKH-BRG](#)

This project was for an initial customer connection investigation for Hawsons Iron that did not progress to an application to connect.

> [Need 1570 - Reinforcement of South Western Network](#)

Establishment of a 275 kV interconnector between Buronga in NSW and Robertsown in South Australia.

> [Need 1649 - Reliability of Supply to Broken Hill](#)

Improvement of unserved energy minutes in line with IPART recommendations for energy reliability.

3. Options

Base case

The Base Case under this Need is to “do nothing”. It involves not facilitating the mine load connection to the network.

The primary risk for TransGrid of not addressing the identified need is non-compliance with the NER, particularly clause 5.2 (Obligations), which requires TransGrid to facilitate connections to the network. The results are anticipated to include, inter alia, the following:

- > application of a fine similar to the civil penalty as defined in the National Electricity Law (1996).²
- > damage to TransGrid's reputation (negative media coverage).
- > litigation by customers/consumer groups.

¹ EY 2016, Expansion of demand scenarios, Ernst and Young, 10 October 2016.

² As the standard has not been signed off by the Minister at time of writing, it is uncertain whether any fines may apply for non-compliance. However, we have assumed that a fine similar to that stipulated in the NEL clause 2AA is entirely within the realm of possibility.

The worst-case total cost of these risks has been calculated in the investment risk tool:

There is a financial risk of receiving a fine similar to the civil penalty as defined in the NEL.

$$\text{civil penalty} = [\$105k + (\$10k * 365)] = \mathbf{\$3.80 \text{ million per annum}}$$

There is a reputational risk cost (\$0.09 million) and reliability risk cost (\$0.50 million).³

The total risk cost is:

$$\text{total risk cost} = \mathbf{\$4.39 \text{ million per annum}}$$

Option A — Install 2 x 20 MVar Cap Banks at Broken Hill 220/22 kV Substation and an SVC at Buronga 220 kV Switching Station [OSA 1698, OFS 1698A]

The following works would be required by TransGrid under this option at Buronga Switching Station:

- > Installation of one 220 kV +/- 50 MVar SVC and associated POW Circuit Breaker switchbay.
- > Installation of control, protection and cabling associated with the SVC and switchbay.
- > Connect to TransGrid SCADA network with appropriate remote access to enable/disable and change settings.

The following works would be required by TransGrid under this option at Broken Hill Substation:

- > 2 x 220 kV 20 MVar capacitor banks at Broken Hill Substation and associated POW Circuit Breaker switchbays.
- > Installation of control, protection and cabling associated with the capacitors and switchbays and remote control access over TransGrid SCADA.
- > Modification of the Broken Hill X2 Line Current Transformer secondary metering and indication core ratios to an appropriate ratio to improve the transfer capability of the X2 line.

This option has been assessed for feasibility in OFS 1698A. The estimated un-escalated capital cost of the option is \$25.5 million ± 25% in 2016-17 AUD.

Non-network Solutions

Whilst generation options exist they have not been assessed to address this Need due to the higher capital cost and the much higher operating cost of this solution. No other feasible non-network solutions have been identified to address this Need.

³ These are assumed risk costs if the spot load was not connected.

4. Evaluation

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

Table 1 — Commercial Evaluation of the Technically Feasible Options (\$ million)

Option	Description	Total capex (\$m)	Annual opex (\$m)	Annual post project risk cost (\$m)	Economic NPV @ 10% (\$m)	Financial NPV @10% (\$m)	Rank
Base case	'Do nothing'	0	0	4.39	0	0	2
A	Reactive support at Broken Hill 220/22 kV Substation and Buronga 220 kV Switching Station	25.5	0.51	0	7.06	7.06	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 provided in Appendix A;
- > a life of the investment of 50 years and a corresponding residual/terminal value;

The applied sensitivities on the discount rate give the following economic NPVs for the preferred Option A.

Table 3 — Discount rate sensitivities (\$ million)

Option	Description	Economic NPV @ 13%	Economic NPV @ 6.75%
A	Reactive support at Broken Hill 220/22 kV Substation and Buronga 220 kV Switching Station	17.83	1.44

4.1 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.

4.2 Preferred Option

The preferred Option A is to install reactive support at Broken Hill substation and Buronga switching station as it ranks 1 under both commercial and sensitivity analysis.

Capital and operating expenditure

The yearly incremental operating expenditure of Option A is estimated to be 2% of the upfront capital cost of the option, which equates to \$0.51 million, escalated at a rate of 2.9% per annum.

Regulatory Investment Test – Transmission

Option A will be subject to the RIT-T process as it has an estimated cost greater than the mandated \$6 million threshold.

5. Recommendation

Based on the economic evaluation, 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 reduce TransGrid's risk exposure and reduces the annual risk cost from \$4.39m to zero.

Appendix A - Financial and Economic Evaluation Reports

Project_Option Name

Need 1698 - Option A - Reactive support at Broken Hill and Bu

1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	\$7.06m	NPV / Capital (Ratio)	0.28
NPV @ upper bound rate	13.00%	\$1.44m	Pay Back Period (Yrs)	0.14 Yrs
NPV @ lower bound rate (WACC)	6.75%	\$17.83m	IRR%	14.11%

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%	\$7.06m	NPV / Capital (Ratio)	0.28
NPV @ upper bound rate	13.00%	\$1.44m	Pay Back Period (Yrs)	6.65 Yrs
NPV @ lower bound rate (WACC)	6.75%	\$17.83m	IRR%	14.11%

Benefits

Risk cost	As Is	To Be	Benefit	VCR Benefit	
<i>Systems (reliability)</i>	\$0.00m	\$0.00m	\$0.00m	ENS Penalty	\$0.00m
<i>Financial</i>	\$4.39m	\$0.00m	\$4.39m	All other risk benefits	\$4.39m
<i>Operational/compliance</i>	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$4.39m
<i>People (safety)</i>	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$4.39m
<i>Environment</i>	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
<i>Reputation</i>	\$0.00m	\$0.00m	\$0.00m	Benefits in the economic NPV**	\$4.39m
Total Risk benefits	\$4.39m	\$0.00m	\$4.39m	**excludes ENS penalty	
Cost savings and other benefits			\$0.00m		
Total Benefits			\$4.39m		

Other Financial Drivers

Incremental opex cost pa (no depreciation)	-\$0.51m	Write-off cost	\$0.00m
Capital - initial \$m	-\$25.50m	Major Asset Life (Yrs)	50.00 Yrs
Residual Value - initial investment	\$11.73m	Re-investment capital	\$0.00m
Capitalisation period	3.00 Yrs	Start of the re-investment period	2024-25