

OPTIONS EVALUATION REPORT (OER)



ActewAGL - Molonglo Establishment

OER- 00000001695 revision 2.0

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Approvals

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Date submitted for approval	14 December 2016	

Change history

Revision	Date	Amendment
0	15/11/16	Initial Issue
1	13/12/2016	Updated description and feasibility of Option A. Clarified risks and updated NPVs.

1. Need/opportunity

ActewAGL via joint planning has advised TransGrid that the proposed new Molonglo Zone Substation will now require connection to the current A-1 line, Canberra (TransGrid) to Woden (ActewAGL). This is due to alternative land acquisition for the zone substation in the Molonglo District and consequential transmission line cut-in works.

Note by 2020 A-1 line will be Canberra to Woden tee Stockdill.

Furthermore ActewAGL have advised they are able to delay establishment of the zone substation at Molonglo by installing a mobile 132/11 kV substation (currently Tennent zone substation, but will be released as spare following the commissioning of Angle Creek zone substation in 2017)¹.

The planned Need Date for Molonglo Substation remains as winter 2021. This Need Date will be monitored via the Joint Planning process and ActewAGL will be requested to submit a work request form and supporting justification documentation so that TransGrid can commit resources to make the required connection.

2. Related needs/opportunities

- > Need DCN335 – Second supply to the ACT
- > Need 1443 – Canberra 132 kV Connection of ActewAGL Strathnairn ZS (formerly West Belconnen ZS)

3. Options

Base case

The base case under this Need is to “do nothing”. In practice, this means refraining from any capital investment for the foreseeable future.

As outlined in NOS-1695, the risk cost of the Base Case is assessed to be \$2.81 million per year. The risk cost of not addressing this Need is therefore composed of the following components:

- > exposing customer load of 4.24 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)

$$VCR \text{ risk cost} = \text{load at risk} * \text{probability of cables not available for one day}^2 * VCR^3$$

$$\therefore VCR \text{ risk cost} = 4.24 \text{ MW} * 24 \text{ hrs} * \$26,930/\text{MWh}$$

$$\therefore VCR \text{ risk cost} = \$2.74 \text{ million per annum}$$

Reliability Risk Cost

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

$$\therefore Reliability \text{ risk cost} = \$2.74\text{m} + \$0.05\text{m}^4 = \$2.79 \text{ million per annum}$$

¹ Refer TransGrid and ActewAGL Joint Planning Minutes 1/09/2016.

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 residential figure of \$26,930/MWh.

Financial Risk Cost

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

Reputational Risk Cost

Reputational risk cost = external consultations & communications costs = \$10,000⁶

Total Risk Cost

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

∴ Total risk cost = \$2.81 million per annum

Option A – Tee-connect Molonglo Substation

This option is to tee-connect ActewAGL's new Molonglo Substation to Line A-1. The TransGrid components of work will consist of protection setting changes which will be completed under OPEX.

The temporary mobile substation proposed for Molonglo lacks a 132 kV busbar and can therefore only be tee connected to the transformer (as without the busbar, a loop-in connection is not possible).

Furthermore there are currently insufficient telecommunications bearers to provide the duplicated paths required to protect a potential A-1 line Canberra to Woden tee Stockdill tee Molonglo. The cost of these telecommunications bearers is expected to be very high. Also it is against ActewAGL's current guidelines to have two tee's on a 132 kV transmission line.

In addition, this arrangement is the least secure connection option as a trip on any section of A-1 line would take out of service the entire line from Canberra, Stockdill, Molonglo, and Woden.

This option is therefore technically unfeasible as it is against ActewAGL guidelines. Therefore, this option is not being considered further.

Option B – Establish a 132 kV busbar and switchyards at Stockdill substation and loop in/out Line A-1 between Molonglo and Canberra, whilst tee-connecting Molonglo zone substation

This option is to tee-connect Molonglo zone substation to Line A-1 between the committed Stockdill substation and Woden, and establish a 132 kV busbar at the committed Stockdill tee. That is, convert the committed Stockdill tee into a loop in/out arrangement.

OFS-1695B estimates that the expenditure for this option is \$3.35m spread over 36 months.

The post-project risk cost of Option B 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 (Unserviced Energy)

*VCR risk cost = load at risk * probability of outage of Molonglo connection⁷ * VCR*

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

*VCR risk cost = 4.24 MW * $\left\{\frac{0.073*1}{8760}\right\}$ * \$26,930/MWh*

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

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

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

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

$\therefore VCR \text{ risk cost} = 4.24 \text{ MW} * 0 * \$26,930/\text{MWh}$

$\therefore VCR \text{ risk cost} = \0 per annum

Non-network Solutions

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

4. Evaluation

4.1 Technical evaluation

Both the Base Case and Option B are technically feasible. Option A is not feasible.

Table 1 – Technical Evaluation

Option	Description	Meets the DNSP requirements
Base case	'Do Nothing'	No
A	Tee-connect Molonglo substation	No
B	Establish a 132 kV busbar and switchyards at Stockdill substation and loop in/out Line A-1 between Molonglo and Canberra, whilst tee-connecting Molonglo zone substation	Yes
C	Non-network	No

4.2 Commercial evaluation

TransGrid is required to meet the planning requirements contained in Schedule 5.1 of the National Electricity Rules, and its [Utility Services Licence issued under the Utilities Act 2000 \(ACT\)](#).

Option B would meet those requirements whereas the Base Case would not. Option B would also reduce the \$2.81 million per annum risk cost to zero.

The commercial evaluation of the technically feasible options is set out in Table 2.

The full financial and economic evaluations are shown in Appendix A.

Table 2 – Commercial evaluation

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	2.81	0	0	2
B	Establish a 132 kV busbar and switchyard at Stockdill Substation and loop in/out Line A-1 between Molonglo and Canberra, whilst tee-connecting Molonglo ZS	3.35	0.067	0	16.32	(2.69)	1

The commercial evaluation is based on:

- > A 10% discount, 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 on the discount rate give the following NPVs:

Table 1 - Preferred Option

Option	Description	Economic NPV @ 6.75% (\$m)	Economic NPV @ 13% (\$m)
B	Establish a 132 kV busbar and switchyards at Stockdill substation and loop in/out Line A-1 between Molonglo and Canberra, whilst tee-connecting Molonglo zone substation	24.80	11.53

4.3 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 option.

4.4 Preferred Option

The preferred option is to establish a 132 kV busbar at switchyard at Stockdill substation and loop in/out Line A-1 between Molong and Canberra, tee-connecting Molonglo zone substation (Option B). This option would:

- > enable TransGrid to meet its supply obligations under the National Electricity Rules.
- > significantly reduce TransGrid’s risk exposure and reduce the risk from \$2.81m p.a. to zero.

Capital and Operating Expenditure

The yearly incremental operating expenditure of Option B is estimated to be 2% of the upfront capital cost of the option, which equates to \$0.067 million, escalated at a rate of 2.9% per annum.

Regulatory Investment Test

No RIT-T is required for the preferred option is estimated to cost less than \$6 million.

5. Recommendation

Based on the economic evaluation and compliance obligation mentioned above, Option B is the preferred option, as it has the most economic benefits and meets all of TransGrid and ActewAGL's statutory and regulatory obligations for transmission of electricity in the ACT.

Furthermore, Option B:

- > enables TransGrid to meet its supply obligations under the National Electricity Rules.
- > significantly reduces TransGrid's risk exposure and reduces the risk from \$2.81m p.a. to zero.

It is therefore recommended that an RPS be completed for the connections to Line A-1 as described in Option B, pending a detailed work request being issued by ActewAGL.

Appendix A – Financial and Economic Evaluation

Project_Option Name

1695 - Option B - Loop in/out A-1 line at Stockdill and Tee con

1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	-\$2.69m	NPV / Capital (Ratio)	-0.80
NPV @ upper bound rate	13.00%	-\$2.54m	Pay Back Period (Yrs)	Not measurable
NPV @ lower bound rate (WACC)	6.75%	-\$2.85m	IRR%	-4.47%

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%	\$16.32m	NPV / Capital (Ratio)	4.87
NPV @ upper bound rate	13.00%	\$11.53m	Pay Back Period (Yrs)	1.22 Yrs
NPV @ lower bound rate (WACC)	6.75%	\$24.80m	IRR%	58.85%

Benefits

	As Is	To Be	Benefit		
Risk cost				VCR Benefit	\$2.74m
Systems (reliability)	\$2.79m	\$0.00m	\$2.79m	ENS Penalty	\$0.00m
Financial	\$0.01m	\$0.00m	\$0.01m	All other risk benefits	\$0.07m
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$2.81m
People (safety)	\$0.00m	\$0.00m	\$0.00m		
Environment	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$0.07m
Reputation	\$0.01m	\$0.00m	\$0.01m	*excludes VCR benefits	
Total Risk benefits	\$2.81m	\$0.00m	\$2.81m	Benefits in the economic NPV**	\$2.81m
Cost savings and other benefits			\$0.00m	**excludes ENS penalty	
Total Benefits			\$2.81m		

Other Financial Drivers

Incremental opex cost pa (no depreciation)	-\$0.07m	Write-off cost	\$0.00m
Capital - initial \$m	-\$3.35m	Major Asset Life (Yrs)	50.00 Yrs
Residual Value - initial investment	\$1.54m	Re-investment capital	\$0.00m
Capitalisation period	3.00 Yrs	Start of the re-investment period	2031-32