

OPTIONS EVALUATION REPORT (OER)

Lismore SVC Replacement

OER 000000001287 revision 3.0



Ellipse project no.: P0005907

TRIM file: [TRIM No]

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

Project category: Prescribed - Replacement

Approvals

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Date submitted for approval	16 December 2016	

Change history

Revision	Date	Amendment
0	25 June 2016	Initial issue
1	27 October 2016	Update to 2016/17 dollars and SFAIRP/ALARP data
2	15 November 2016	Update to format
3	16 December 2016	Minor amendment – added Ellipse project no.

1. Need/opportunity

The Static Var Compensator (SVC) at Lismore Substation has been in service since 1999 and uses a control system design and equipment that is not used elsewhere on the TransGrid network. Due to the difference in design, the ongoing support and access to spare parts for the control system is limited meaning TransGrid is unlikely to be able to recover from a failure of the SVC control system, or the thyristor valves operated by the control system. A full replacement would be required upon the failure of these items, resulting in the SVC being inoperable for up to 18 months. The SVC is located at a critical point of supply where there is a need to ensure that the reactive power supply remains available.

2. Related needs/opportunities

Nil.

3. Options

All dollar values in this document are expressed in un-escalated 2016/17 dollars.

Base Case

The Base Case for this Need is to keep the SVC in service with no change to its control system. This approach does not address aging system as the SVC moves past its nominal lifetime of 20 years. The risk cost of \$3.41m per annum will increase as the components age and their probability of failure increases.

The key drivers for this risk cost are market impacts and energy not served due to the failure of the SVC, as well as the increased replacement costs required to accelerate the recovery.

Increasing maintenance on the equipment cannot reduce the probability of failure in order to reduce the risk cost.

Option A — SVC Control and Valve Replacement [[OFR 1287A](#), [OFS 1287A](#)]

This option is to address the limited ongoing support for the SVC control system by carrying out the replacement of the SVC control and valve systems.

The scope of works includes the replacement of the control system, thyristor valves and valve based electronics for the TCR, cooling skid, and protection system.

The expected capital costs for the option total \$10.5m. This costing is estimated using TransGrid's "Success" estimating system.

The residual risk associated with this option upon completion of the project amounts to \$132k per annum (base case risk cost = \$3.41m). The risk reduction is realised through the reduction in the probability of failure for all assets.

4. Evaluation

Evaluation of the proposed options has been completed using the ALARP (As Low as Reasonably Practicable) regulatory requirements and economic considerations. The results of this evaluation are outlined below.

4.1 Commercial evaluation

The result of commercial evaluation for each of the options is summarised in the Table 1.

Table 1 – Commercial evaluation (\$ million)

Option	Description	Total capex	Annual opex	Annual post project risk cost	Economic NPV @10%	Financial NPV @10%	Rank
Base Case	Run-to-fail	N/A	-	3.41	N/A	N/A	2
A	SVC Control and Valve Replacement	10.5	-	0.132	12.8	11.3	1

The commercial evaluation is based on:

- > Economic life of the assets is assumed 20 years, hence this assessment period has been applied.
- > Capital cost is not escalated and it does not include capitalised interest.

Sensitivities on economic NPV for the option with changing discount rates are shown in Table 2.

Table 2 – Discount rate sensitivities (\$ million)

Option	Description	Economic NPV @13%	Economic NPV @6.75%
A	SVC Control and Protection Replacement	8.4	20.1

4.2 SFAIRP/ALARP Evaluation

Options to reduce the network safety risk as per the risk treatment hierarchy have been considered in other lifecycle stages of the asset, and it has been determined that no reasonably practicable options exist to reduce the risk further than those capital investment options listed in **Error! Reference source not found..**

Evaluation of the proposed options has been completed against the SFAIRP (So Far As Is Reasonably Practicable)/ALARP (As Low As Reasonably Practical) obligation, as required by the Electricity Supply (Safety and Network Management) Regulation 2014 and the Work Health and Safety Act 2011. The Key Hazardous Events and the disproportionality multipliers considered in the evaluation are as follows:

- > Conductor drop/structure failure - 6 times the bushfire risk , 6 times the safety risk and 10% of the reliability risk (applicable to safety)

The results of this evaluation are summarised in the tables below.

Table 3 – Feasible options (\$ thousand)

Option	Description	CAPEX	Expected Life	Annualised CAPEX
Base	Do nothing	N/A	N/A	N/A
A	SVC Control and Valve Replacement	10,500	20 years	\$520

Table 4 – Annual risk calculations (\$ thousand)

Option	Annual Residual Risk			Annual Risk Savings		
	Safety Risk	Reliability Risk	Bushfire Risk	Safety Risk	Reliability Risk	Bushfire Risk
Base	0	295	0	N/A	N/A	N/A
A	0	11	0	0	284	0

Table 5 - Reasonably practicable test (\$ thousand)

Option	Network Safety Risk Reduction ¹	Annualised CAPEX	Reasonably practicable ² ?
A	28	520	No

4.3 Preferred Option

The outcome of the SFAIRP/ALARP evaluation is that Option A is not reasonably practicable, and therefore not required to satisfy the organisation's SFAIRP/ALARP obligations.

The option to address the condition of the identified assets, Option A – SVC Control and Valve Replacement, is the preferred option for all assets identified.

This option has been selected due to its technical viability and reduction in reliability risk. This option provides significant technical benefits and provides the greatest positive Net Present Value (NPV).

Capital and operating expenditure

There is negligible difference in predicted ongoing operational expenditure between the option and the Base Case.

Regulatory Investment Test

A Regulatory Investment Test for Transmission (RIT-T) is not required as this is an asset replacement project with no augmentation component.

5. Recommendation

It is recommended that SVC Control and Valve Replacement be scoped in detail.

¹ The Network Safety Risk Reduction is calculated as 6 x Bushfire Risk Reduction + 3 x Safety Risk Reduction + 0.1 x Reliability Risk Reduction

² Reasonably practicable is defined as whether the annualised CAPEX is less than the Network Safety Risk Reduction

Attachment 1 – Commercial evaluation report

Option A NPV calculation

Project_Option Name			Lismore SVC Replacement - Option A		
1. Financial Evaluation (excludes VCR benefits)					
NPV @ standard discount rate	10.00%	\$11.31m	NPV / Capital (Ratio)	1.08	
NPV @ upper bound rate	13.00%	\$7.29m	Pay Back Period (Yrs)	0.27 Yrs	
NPV @ lower bound rate (WACC)	6.75%	\$18.10m	IRR%	27.40%	
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%	\$12.78m	NPV / Capital (Ratio)	1.22	
NPV @ upper bound rate	13.00%	\$8.41m	Pay Back Period (Yrs)	3.22 Yrs	
NPV @ lower bound rate (WACC)	6.75%	\$20.14m	IRR%	29.46%	
Benefits					
Risk cost	As Is	To Be	Benefit	VCR Benefit	\$0.26m
Systems (reliability)	\$0.29m	\$0.01m	\$0.28m	ENS Penalty	\$0.03m
Financial	\$3.11m	\$0.12m	\$2.99m	All other risk benefits	\$2.99m
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$3.28m
People (safety)	\$0.00m	\$0.00m	\$0.00m		
Environment	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$3.02m
Reputation	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
Total Risk benefits	\$3.41m	\$0.13m	\$3.28m		
Cost savings and other benefits			\$0.00m	Benefits in the economic NPV**	\$3.25m
Total Benefits			\$3.28m	**excludes ENS penalty	
Other Financial Drivers					
Incremental opex cost pa (no depreciation)			\$0.00m	Write-off cost	\$0.00m
Capital - initial \$m			-\$10.46m	Major Asset Life (Yrs)	20.00 Yrs
Residual Value - initial investment			\$0.00m	Re-investment capital	\$0.00m
Capitalisation period			3.00 Yrs	Start of the re-investment period	0.00 Yrs