

OPTIONS EVALUATION REPORT (OER)



Substation Security Zone (SSZ) Condition

OER 000000001366 revision 1.0

Ellipse project no.: P0008000

TRIM file: [TRIM No]

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

Project category: Prescribed - Asset Renewal Strategies

Approvals

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Date submitted for approval	14 December 2016	

Change history

Revision	Date	Amendment
0	21 October 2016	Initial issue
1	14 December 2016	Update to format

1. Need/opportunity

Current TransGrid maintenance practices rely heavily on the ability to remotely interrogate, configure and modify Ethernet enabled devices located in substations. This is achieved using the Substation Security Zone (SSZ) which is a closed secure network residing within the overall TransGrid Corporate Data Network (CDN).

Due to the sensitive nature of the network, it is important that its integrity is maintained to prevent unauthorised access. This is best achieved by routinely updating the network to provide good industry practice cybersecurity and ensure compatibility with modern substation based devices and the underlying communications network.

The current iteration of the SSZ was established between 2013 and 2015. Since then, the underlying communications network has increased capability and capacity, meaning the opportunity exists to upgrade the SSZ to take advantage of the additional capacity. There is also a need to address the condition of redundant SSZ gateways, routers and firewalls, physical security and security protocols of the SSZ network.

The SSZ network has been identified for replacement in order to address the above issues and opportunities.

2. Related Needs/opportunities

The following related Needs should be considered when addressing this need:

- > Need ID 1254 – Supervisory Control And Data Acquisition (SCADA) SCADA-EMS NM4 Replacement
- > Need ID 1365 – Telecommunications SDH Network Condition

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 run the SSZ network to failure. This approach does not address the financial risk resulting to TransGrid from a hardware failure or the cybersecurity risk resulting from out of date security protocols, routers, and firewalls. The risk cost associated with the SSZ is \$15.75m per annum. The main driver of this risk cost is the financial consequence for TransGrid of a long-term failure of the network due to hardware failure.

Increasing the maintenance of the network cannot reduce the likelihood of a hazardous event occurring due to a breach or failure of the SSZ.

Option A — Full System Upgrade [[OFR 1366A](#), [OFS 1366A](#)]

This option covers the replacement of the entire SSZ network. This includes the replacement of the Gateway Server, and the firewall and DMZ network between the Gateway and Sydney West Data Centre; installation of dedicated, lockable cabinets at all 99 sites; selection, installation and commissioning of a modern secure access software platform; and decommissioning of the current network.

The expected total capital cost to implement this option is \$4.40m. This costing is estimated using TransGrid's "Success" estimating system.

The residual risk associated with this option upon completion of the project amounts to \$1.73m per annum (base case risk cost = \$15.75m). The risk reduction is realised through the reduction in the probability and consequence of failure of the SSZ hardware and the reduction in likelihood of a cyber-security incident due to installation of modern and vendor supported security systems.

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 technically feasible options is summarised in 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	-	15.75	N/A	N/A	2
A	Full System Upgrade	4.41	-	1.73	67.30	66.40	1

The commercial evaluation is based on:

- > Economic life of the assets is assumed 10 years, hence this assessment period has been applied
- > Write-offs have not been estimated
- > Capital cost is not escalated and it does not include capitalised interest

Sensitivities on economic Net Present Value (NPV) for the options 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	Full System Upgrade	55.81	83.38

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 Table 1.

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:

- > Unplanned outage of High Voltage (HV) equipment - 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	Run-to-fail	N/A	N/A	N/A

Option	Description	CAPEX	Expected Life	Annualised CAPEX
A	Full System Upgrade	4,400	10 years	440

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	597	0	N/A	N/A	N/A
A	0	420	0	0	177	0

Table 5 – Reasonably practicable test (\$ thousand)

Option	Network Safety Risk Reduction ¹	Annualised CAPEX	Reasonably practicable ² ?
A	17.70	440	No

Options A is not reasonably practicable.

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 – Full System Upgrade, is the preferred option based on the commercial evaluation.

This option has been selected due to its technical viability and reduction in financial risk. This option provides significant technical benefits and provides a positive NPV.

Capital and operating expenditure

There is negligible difference in predicted ongoing operational expenditure between the option and 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 to proceed with scoping Option A – Full System Upgrade 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		Option A - Complete Replacement			
1. Financial Evaluation (excludes VCR benefits)					
NPV @ standard discount rate	10.00%	\$66.39m	NPV / Capital (Ratio)	15.09	
NPV @ upper bound rate	13.00%	\$55.05m	Pay Back Period (Yrs)	Not measurable	
NPV @ lower bound rate (WACC)	6.75%	\$82.26m	IRR%	149.49%	
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%	\$67.30m	NPV / Capital (Ratio)	15.30	
NPV @ upper bound rate	13.00%	\$55.81m	Pay Back Period (Yrs)	Not measurable	
NPV @ lower bound rate (WACC)	6.75%	\$83.38m	IRR%	150.76%	
Benefits					
Risk cost	As Is	To Be	Benefit	VCR Benefit	\$0.18m
Systems (reliability)	\$0.60m	\$0.42m	\$0.18m	ENS Penalty	\$0.00m
Financial	\$15.15m	\$1.31m	\$13.84m	All other risk benefits	\$13.84m
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$14.02m
People (safety)	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$13.84m
Environment	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
Reputation	\$0.01m	\$0.00m	\$0.01m	Benefits in the economic NPV**	\$14.02m
Total Risk benefits	\$15.75m	\$1.73m	\$14.02m	**excludes ENS penalty	
Cost savings and other benefits			\$0.00m		
Total Benefits			\$14.02m		
Other Financial Drivers					
Incremental opex cost pa (no depreciation)			\$0.00m	Write-off cost	\$0.00m
Capital - initial \$m			-\$4.40m	Major Asset Life (Yrs)	10.00 Yrs
Residual Value - initial investment			\$0.00m	Re-investment capital	\$0.00m
Capitalisation period			2.00 Yrs	Start of the re-investment period	0.00 Yrs