

OPTIONS EVALUATION REPORT (OER)



Motion Detector Replacement

OER 000000001452 revision 3.0

Ellipse project no.: P0008469

TRIM file: [TRIM No]

Project reason: Capability - Improved Asset Management

Project category: Prescribed - Security/Compliance

Approvals

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Date submitted for approval	29 November 2016	

Change history

Revision	Date	Amendment
0	23 June 2016	Initial issue
1	24 October 2016	Update to 2016/17 dollars and SFAIRP/ALARP data
2	29 November 2016	Update to format
3	30 November 2016	Amendment

1. Need/opportunity

The benefit of replacing motion detectors is to reduce the risk of undetected unauthorised entries, age related defects, high corrective maintenance cost and callout cost for investigating false alarms.

The Need involves:

- > Replacing [REDACTED] motion detectors at [REDACTED] prioritised substations.

The work will be staggered across the duration of the next regulatory control period, 2018/19- 2022/23.

2. Related Needs/opportunities

No related Need is available.

3. Options

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

Base Case

The description and risk costs for the Base Case and other options are provided in Table 1.

Table 1 – Summary of Base Case (\$ millions)

Base Case	Description	Non-escalated capital cost	Residual risk cost pa	Cost saving Benefit realisations pa
Base Case	Do nothing with regards to replacing motion detectors at nominated substations	-	0.73	-
A	Replace motion detectors with modern day equivalents at nominated substations	3.9	0.01	0.019
B	Replace motion detectors with thermo-vision cameras at nominated substation	7.2	0.01	0.015

Option A — Replace motion detectors with modern day equivalents at nominated substations [\[OFS 1452A\]](#)

The option involves replacing [REDACTED] motion detectors with modern day equivalents at [REDACTED] substation sites in the order of priority as per Attachment A. For each site the following has been allowed:

- > Number of motion detectors set out in Attachment A
- > Cabling and associated hardware to support the installation of the [REDACTED]
- > Replacements are to utilise existing conduits and posts, if sufficient remaining life is present in them after detailed project scoping

Option B — Replace motion detectors with thermo-vision cameras at nominated substations [\[OFS 1452B\]](#)

The option involves replacing [REDACTED] motion detectors with [REDACTED] thermo-vision cameras at [REDACTED] nominated substation sites.

Following assumptions are considered to identify the risk cost for Option A and Option B:

- > Probability of Failure (POF):

- Probability that [redacted] motion detector may fail (to perform their intended tasks) per year is [redacted]%¹ (pre investment). For Option A and Option B, probability that motion detector may fail is [redacted] (post investment).
- > Consequences:
- Personal Injury: The likelihood of consequence (LoC) for personal injury has remained [redacted] for both pre and post investment based on the rate of unauthorised entry in TransGrid substation sites.
 - Service Interruption: The LoC for service interruption (electricity) has remained 1% for both pre and post investment. This is based on the fact that both a high voltage electrocution/arc and an unauthorised operation of equipment by an intruder will cause a service interruption.
 - Repair cost to TransGrid substation asset: It is considered that damage to TransGrid asset caused by intruder would cost \$20k considering TransGrid unauthorised entry rate of [redacted] per annum.

Following cost saving benefits are considered for Net Present Value (NPV) calculation:

- > For both Option A and Option B, it considers total \$0.015m savings for callout cost due to false alarms for 44 sites per annum based on irregularities statistics related to security from Jan 2015 to Dec 2015.
- > For Option A, It includes savings for corrective maintenance cost of \$0.004m per annum for 44 sites based on TransGrid defect maintenance expenditure during July to September, 2015.

4. Evaluation

Evaluation of the proposed options has been completed using both commercial considerations and the ALARP (as low as reasonably practical) regulatory requirements. The results of these evaluations are outlined below.

4.1 Commercial evaluation

The result of commercial evaluation for each of the options is summarised in Table 2.

Table 2 – Commercial evaluation (\$ million)

Option	Description	Total capex	Annual opex	Annual post project risk cost	Economic NPV @10%	Financial NPV @10%	Rank
Base Case	Do nothing with regards to replacing motion detectors at nominated substations	N/A	N/A	0.73	N/A	N/A	3
A	Replace motion detectors with modern day equivalent at nominated substations	3.9	0.04	0.01	0.32	(0.48)	1
B	Replace motion detectors with thermo-vision camera at nominated substations	7.2	0.07	0.01	(2.38)	(3.18)	2

The commercial evaluation is based on:

¹ Pre investment POF is revised based on irregularities statistics related to security during Jan, 2015 – Dec, 2015.

² Post investment POF is considered based on experience that the defect rate of replaced electronic device is very low.

- > A 10% discount with sensitivities based on TransGrid's current AER-determined pre-tax real regulatory, WACC of 6.75% (lower bound) and 13% (upper bound).
- > Technical life of motion detector is assumed to be 15 years.
- > Maintenance cost used for the preferred options A and B is 1.0% of the capital cost.

Option A is preferred based on the financial returns and technical solution.

Sensitivities on economic NPV for the options with changing discount rates are shown in Table 3.

Table 3 – Discount rate sensitivities (\$ million)

Option	Description	Economic NPV @13%	Economic NPV @6.75%
A	Replace motion detectors with modern day equivalent at nominated substations	1.40	(0.30)
B	Replace motion detectors with thermo-vision camera at nominated substations	(1.61)	(2.77)

4.2 SFAIRP/ALARP evaluation

In the context of the Network Asset Risk Assessment Methodology, the SFAIRP (So Far As Is Reasonably Practicable)/ALARP (As Low As Reasonably Practical) principle is applicable to the following Key Hazardous Events:

- > Contact with electricity
- > Unauthorised access to site

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 4.

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:

- > Contact with electricity/Unauthorised access to site - 3 times the safety risk cost and 10% of the reliability risk cost

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

Table 4 – Feasible options (\$ thousand)

Option	Description	CAPEX	Expected Life	Annualised CAPEX
Base	Do nothing	N/A	N/A	N/A
A	Replace motion detectors with modern day equivalent at nominated substations	3,900	15 years	260
B	Replace motion detectors with thermo-vision camera at nominated substations	7,200	15 years	480

Table 5 – Annual risk calculations (\$ thousand)

Option	Annual Residual Risk			Annual Risk Savings		
	Safety Risk	Reliability Risk	Bushfire Risk	Safety Risk	Reliability Risk	Bushfire Risk
Base	130	170	0	N/A	N/A	N/A
A	3	3	0	127	162	0
B	3	3	0	127	162	0

Table 6 – Reasonably practicable test (\$ thousand)

Option	Network Safety Risk Reduction ³	Annualised CAPEX	Reasonably practicable ⁴ ?
A	400 ⁵	260	Yes
B	400	480	No

Option A is reasonably practicable.

4.3 Preferred option

The outcome of the SFAIRP/ALARP evaluation is that Option A is the preferred option as it is reasonably practicable and it is also justified from economic evaluation.

Regulatory Investment Test

The Regulatory Investment Test for Transmission (RIT-T) is not required for this Need.

5. Recommendation

It is recommended to progress via Decision Gate 1 (DG1) to detailed scoping for Option A.

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

⁴ Reasonably practicable is defined as whether the annualised CAPEX is less than the Network Safety Risk Reduction

⁵ The Network safety Reduction is calculated as 3 x Safety Risk Reduction + 0.1 x Reliability Risk Reduction. SFAIRP/ALARP calculation is available in PDGS.

Attachment 2 – Commercial evaluation report

Option A NPV calculation

Project_Option Name		Motion Detector Replacement (Option A)			
1. Financial Evaluation (excludes VCR benefits)					
NPV @ standard discount rate	10.00%	-\$0.48m	<i>NPV / Capital (Ratio)</i>	-0.12	
NPV @ upper bound rate	13.00%	-\$0.90m	<i>Pay Back Period (Yrs)</i>	0.08 Yrs	
NPV @ lower bound rate (WACC)	6.75%	\$0.26m	<i>IRR%</i>	7.72%	
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%	\$0.32m	<i>NPV / Capital (Ratio)</i>	0.08	
NPV @ upper bound rate	13.00%	-\$0.30m	<i>Pay Back Period (Yrs)</i>	5.63 Yrs	
NPV @ lower bound rate (WACC)	6.75%	\$1.40m	<i>IRR%</i>	11.38%	
Benefits					
Risk cost	As Is	To Be	Benefit	<i>VCR Benefit</i>	\$0.17m
<i>Systems (reliability)</i>	\$0.17m	\$0.00m	\$0.16m	<i>ENS Penalty</i>	\$0.00m
<i>Financial</i>	\$0.43m	\$0.01m	\$0.42m	<i>All other risk benefits</i>	\$0.54m
<i>Operational/compliance</i>	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$0.71m
<i>People (safety)</i>	\$0.13m	\$0.00m	\$0.13m	 Benefits in the financial NPV*	\$0.56m
<i>Environment</i>	\$0.00m	\$0.00m	\$0.00m	<i>*excludes VCR benefits</i>	
<i>Reputation</i>	\$0.00m	\$0.00m	\$0.00m	 Benefits in the economic NPV**	\$0.73m
Total Risk benefits	\$0.73m	\$0.01m	\$0.71m	<i>**excludes ENS penalty</i>	
Cost savings and other benefits			\$0.02m		
Total Benefits			\$0.73m		
Other Financial Drivers					
Incremental opex cost pa (no depreciation)			-\$0.04m	<i>Write-off cost</i>	\$0.00m
Capital - initial \$m			-\$3.90m	<i>Major Asset Life (Yrs)</i>	15.00 Yrs
Residual Value - initial investment			\$0.00m	<i>Re-investment capital</i>	\$0.00m
Capitalisation period			5.00 Yrs	<i>Start of the re-investment period</i>	0.00 Yrs

Option B NPV calculation

Project_Option Name		Motion Detector Replacement (Option B)			
1. Financial Evaluation (excludes VCR benefits)					
NPV @ standard discount rate	10.00%	-\$3.18m	NPV / Capital (Ratio)	-0.44	
NPV @ upper bound rate	13.00%	-\$3.36m	Pay Back Period (Yrs)	0.00 Yrs	
NPV @ lower bound rate (WACC)	6.75%	-\$2.75m	IRR%	-0.13%	
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%	-\$2.38m	NPV / Capital (Ratio)	-0.33	
NPV @ upper bound rate	13.00%	-\$2.77m	Pay Back Period (Yrs)	11.11 Yrs	
NPV @ lower bound rate (WACC)	6.75%	-\$1.61m	IRR%	3.09%	
Benefits					
Risk cost	As Is	To Be	Benefit	VCR Benefit	\$0.17m
Systems (reliability)	\$0.17m	\$0.00m	\$0.16m	ENS Penalty	\$0.00m
Financial	\$0.43m	\$0.01m	\$0.42m	All other risk benefits	\$0.54m
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$0.71m
People (safety)	\$0.13m	\$0.00m	\$0.13m	Benefits in the financial NPV*	\$0.56m
Environment	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
Reputation	\$0.00m	\$0.00m	\$0.00m	Benefits in the economic NPV**	\$0.73m
Total Risk benefits	\$0.73m	\$0.01m	\$0.71m	**excludes ENS penalty	
Cost savings and other benefits			\$0.02m		
Total Benefits			\$0.73m		
Other Financial Drivers					
Incremental opex cost pa (no depreciation)			-\$0.07m	Write-off cost	\$0.00m
Capital - initial \$m			-\$7.20m	Major Asset Life (Yrs)	15.00 Yrs
Residual Value - initial investment			\$0.00m	Re-investment capital	\$0.00m
Capitalisation period			5.00 Yrs	Start of the re-investment period	0.00 Yrs