OPTIONS EVALUATION REPORT (OER)

Access Card and Intrusion Detection System Replacement

OER 000000001595 revision 2.0

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Approvals

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Date submitted for approval	30 November 2016	

Change history

Revision	Date	Amendment
0	1 November 2016	Initial issue
1	29 November 2016	Update to format
2	30 November 2016	Amendment by Author

1. Need/opportunity

The manufacturer of our current access card and intrusion detection system has indicated that mass production of the spare units as well as the hardware/software maintenance support will cease to exist by mid-2020. Meanwhile by 2020, an estimated 77% of the access card and intrusion detection system will reach end of life. These will expose TransGrid to a significant amount of risk in the areas of physical security, public safety and system reliability if an appropriate action is not considered within a reasonable timeframe.

The Need involves:

- Replacing 103 security systems at 98 sites and depots with modern day equivalent and the associated hardware.
- Installing 9 security systems at 9 sites with modern day equivalent and the associated hardware.

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 residual risk costs for the Base Case and the option are outlined in Table 1.

Table 1 – Summary of Base Case ($ million)

Option	Description	Un-escalated Capital Cost	Residual Risk Cost pa
Base Case	Do nothing with regards to replacing access card and intrusion detection system	-	1.53
A	Replace access card and intrusion detection system	10.04	0.23

Option A — Replace access card and intrusion detection system [OFS 1595A]

This option involves replacing 103 security systems with modern day equivalents at 98 sites and depots. In addition, it includes installing 9 security systems at 9 sites as per Attachment 1. The associated hardware is outlined on Attachment 2. For each site the following has been allowed:

- Cabling to support the installation of the security systems
- Replacements are to utilise existing conduits and cablings, if sufficient remaining life is present in them after detailed project scoping.

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

- Probability of Failure (POF):
  - Probability that security system may fail (to perform their intended tasks) per year is 27.6%[1] (pre investment) and 1%[2] (post investment).
- Consequences:
  - Personal injury: The likelihood of consequence (LoC) for personal injury has remained 0.06% 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 4% per annum.
  - Productivity loss: It includes inconvenience to TransGrid staff worth of $18k per annum for each substation site due to faulty access card system and /or main security system.

Following cost saving benefits are considered for economic evaluation:

- It is expected that replacing the security systems with their modern day equivalents will save approximately $0.32m for non-routine maintenance cost for 99 sites and depots per annum based on TransGrid defect maintenance expenditure from 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 access card and intrusion detection system	N/A	N/A	1.53	N/A	N/A	2
A	Replace access card and intrusion detection systems	10.04	0.1	0.23	0.28	(0.39)	1

[1] Pre investment POF is calculated based on combination of TransGrid's security server lockout events occurred during 2014 – 2015 and also considered that after 2023, the whole fleet will reach end of life. It implies that the systems will fail to perform their intended task. So the probability that access card and intrusion detection system fails is 100% after 2023. So the average rate of failure from 2020 onwards is 27.6% on average per year.

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

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% (lower bound) and 13% (upper bound).
- Technical life of security system is assumed to be 15 years.
- Maintenance cost used for the preferred Option A is 1% of the capital cost.

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

Sensitivities on economic Net Present Value (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 access card and intrusion detection systems	2.66	(1.11)

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 access card and intrusion detection systems	10,040	15 years	670

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	180	230	0	N/A	N/A	N/A
A	10	10	0	170	220	0

Table 6 – Reasonably practicable test ($ thousand)

Option	Network Safety Risk Reduction[3]	Annualised CAPEX	Reasonably practicable[4]?
A	540[5]	670	No

Option A is not reasonably practicable.

4.3 Preferred option

The outcome of the SFAIRP/ALARP evaluation is that Option A presented in Table 4 is not reasonably practicable, and is not required to satisfy the organisation's SFAIRP/ALARP obligations. However, Option A is preferred based on 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 1 – Substation prioritisation

Table 7 lists the substations based on substation criticality ranking in reference to TransGrid Network Security Standard in order to determine the priority of substations from highest to lowest.

Table 7 – Prioritisation of substations

Substation ID	Substation	Priority ranking	Replace/ New Installation
SYS	Sydney South Substation	1	Replace
SYW	Sydney West Substation	2	Replace
SE1	Sydney East Substation	3	Replace
SYN	Sydney North Substation	4	Replace
BFW	Beaconsfield West Substation	5	Replace
CA1	Canberra Substation	6	Replace
HYM	Haymarket Substation	7	Replace
DPT	Dapto Substation	8	Replace
NEW	Newcastle Substation	9	Replace
AR1	Armidale Substation	10	Replace
TA1	Tamworth 330kV Substation	11	Replace
WG1	Wagga 330kV Substation	12	Replace
BBY	Bannaby Substation 500kV	13	Replace
BBY	Bannaby Substation 330kV	14	Replace
WDL	Williamsdale 330kV Substation	15	Replace
ING	Ingleburn Substation	16	Replace
KCR	Kemps Creek Substation	17	Replace
VYD	Vineyard Substation	18	Replace
DMQ	Dumaresq Switching Station	19	Replace
YSN	Yass Substation	20	Replace
ER0	Eraring 500/330kV Substation	21	Replace
BAY	Bayswater 500kV/330kV Substation	22	Replace
LD1	Liddell Substation	23	Replace
LSM	Lismore Substation	24	Replace
LT1	Lower Tumut (LTSS) Switching Station	25	Replace

Substation ID	Substation	Priority ranking	Replace/ New Installation
MTP	Mount Piper 500kV/330kV Substation	26	Replace
MN1	Munmorah 330kV Substation	27	Replace
MUR	Murray 330kV Substation	28	New Installation
UT1	Upper Tumut (UTSS) Switching Station	29	Replace
VP1	Vales Point Substation	30	Replace
WW1	Wallerawang 330	31	Replace
LP1	Liverpool Substation	32	Replace
TOM	Tomago 330	33	Replace
WL1	Wellington Substation	34	Replace
WOL	Wollar 500/330kV Substation	35	Replace
BKH	Broken Hill 220kV Substation	36	Replace
HLD	Holroyd	37	Replace
RWR	Rookwood Rd Substation	38	Replace
MAC	Macarthur 330kV Substation	39	Replace
JDA	Jindera Substation	40	Replace
MRN	Marulan Substation	41	Replace
RGV	Regentville Substation	42	Replace
TGH	Tuggerah Substation	43	Replace
ORG	Orange Substation	44	Replace
WG2	Wagga 132kV Substation	45	Replace
URQ	Uranquinty 132kV Switching Station	46	Replace
ONO	Orange North Switching Station	47	Replace
WGN	Wagga North 132kV Substation	48	Replace
AVS	Avon 330kV Switching Station	49	Replace
DNT	Darlington Point Substation	50	Replace
BRG	Buronga Switching Station	51	Replace
BRD	Balranald Substation	52	Replace
BUK	Burrinjuck 132kV Substation	53	New Installation
COF	Coffs Harbour Substation	54	Replace

Substation ID	Substation	Priority ranking	Replace/ New Installation
COA	Cooma 132kV (New) Substation	55	Replace
CW2	Cowra Substation	56	Replace
DN2	Deniliquin Substation	57	Replace
GRF	Griffith Substation	58	Replace
GN2	Gunnedah Substation	59	Replace
GTH	Guthega 132kV Substation	60	New Installation
HU2	Hume 132kV Substation	61	New Installation
INV	Inverell Substation	62	Replace
KVS	Kangaroo Valley Switching Station	63	Replace
KS2	Kempsey Substation	64	Replace
MPP	Mount Piper 132kV Substation	65	Replace
MNY	Munyang Substation	66	Replace
QBN	Queanbeyan Substation	67	Replace
TMW	Tamworth 132kV (New) Substation	68	Replace
TU2	Tumut Substation	69	Replace
ALB	Albury 132kV Substation	70	Replace
MRK	Muswellbrook	71	Replace
FNY	Finley Substation	72	Replace
GNS	Glen Innes Substation	73	Replace
MOL	Molong Substation	74	Replace
PMA	Panorama Substation	75	Replace
BER	Beryl Substation	76	Replace
PMQ	Port Macquarie Substation	77	Replace
WRH	Waratah West Substation	78	Replace
ANM	Australia News Print Substation	79	Replace
GAD	Gadara 132kV Substation	80	Replace
FB2	Forbes Substation	81	Replace
MRE	Moree Substation	82	Replace
PKS	Parkes Substation	83	Replace

Substation ID	Substation	Priority ranking	Replace/ New Installation
MAN	Manildra 132kV Substation	84	New Installation
TRE	Taree Substation	85	Replace
NB2	Narrabri Substation	86	Replace
NAM	Nambucca Substation	87	Replace
TTF	Tenterfield Substation	88	Replace
WWS	Wallerawang 132 (New)	89	Replace
KLK	Koolkhan 132kV Substation	90	Replace
MRU	Murrumburrah Substation	91	Replace
YA2	Yanco Substation	92	Replace
GUR	Gullen Range	93	Replace
C02	Capital Wind Farm Substation	94	Replace
CLY	Coleambally Substation	95	New Installation
TOM	Tomago 132	96	Replace
B0S	Boambee South 132kV Substation	97	New Installation
MVL	Macksville 132kV Substation	98	New Installation
RAL	Raleigh 132kV Substation	99	New Installation
BGE	Boggabri East Switching Station	100	Replace
BGN	Boggabri North Switching Station	101	Replace

Table 8 lists the priority of TransGrid depots from highest to lowest. Potential pairing of depot with the nearest TransGrid substation can improve the cost effectiveness of delivery. Following factors are considered for prioritisation of depots:

- Approximate number of TG staff
- Availability of data Centre
- Availability of control room
- Availability of store

Table 8 – Prioritisation of depots

Site	Approximate No of Staff	Data Centre	Control Room	Store	Priority ranking	Replace/New Installation
Metropolitan Regional Centre	119	Y	Y	Y	1	Replace
Newcastle Regional Centre	162	N	Y	Y	2	Replace

Site	Approximate No of Staff	Data Centre	Control Room	Store	Priority ranking	Replace/New Installation
Yass Area Centre	68	N	N	Y	3	Replace
Wagga Regional Centre	68	N	N	N	4	Replace
Orange Area centre	50	N	N	N	5	Replace
Tamworth Area centre	43	N	N	N	6	Replace

Attachment 2 – High level scope

List of key components of security system is shown in Table 9.

Table 9 – High level scope

Component	Quantity per System	No. of Systems	Total Quantity
Site main controller	1	112	112
Door controllers	6	112	672
Card readers	15	112	1680
Motorised sliding gate controller, drive etc.	1	70	70
Zone expander per site	3	112	336
Reed switch per site	25	112	2800
Back-up power supply	1	112	112
Fibre modems	6	112	672
Keypad	3	112	336
Software - All modules	1	1	1
Software - Clients	1	50	50
Software - Closed-circuit Television (CCTV) integration	16	107	1712
Software maintenance agreement	1	1	1

Attachment 3 – Commercial evaluation report

Option A NPV calculation

Project_Option Name	Access card and Intrusion Detection System Replacement (Op

1. Financial Evaluation (excludes VCR benefits)				
NPV @ standard discount rate	10.00%	-$0.39m	*NPV / Capital (Ratio)*	*-0.04*
NPV @ upper bound rate	13.00%	-$1.63m	*Pay Back Period (Yrs)*	*0.09 Yrs*
NPV @ lower bound rate (WACC)	6.75%	$1.74m	*IRR%*	*9.27%*

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%	$0.28m	*NPV / Capital (Ratio)*	*0.03*
NPV @ upper bound rate	13.00%	-$1.11m	*Pay Back Period (Yrs)*	*6.55 Yrs*
NPV @ lower bound rate (WACC)	6.75%	$2.66m	*IRR%*	*10.51%*

Benefits					
Risk cost	As Is	To Be	Benefit	*VCR Benefit*	*$0.13m*
Systems (reliability)	*$0.23m*	*$0.01m*	*$0.22m*	*ENS Penalty*	*$0.00m*
Financial	*$1.12m*	*$0.22m*	*$0.90m*	*All other risk benefits*	*$1.16m*
Operational/compliance	*$0.00m*	*$0.00m*	*$0.00m*	Total Risk benefits	$1.29m
People (safety)	*$0.18m*	*$0.01m*	*$0.17m*		
Environment	*$0.00m*	*$0.00m*	*$0.00m*	Benefits in the financial NPV*	$1.48m
Reputation	*$0.00m*	*$0.00m*	*$0.00m*	**excludes VCR benefits*	
Total Risk benefits	$1.53m	$0.23m	$1.30m		
Cost savings and other benefits			$0.32m	Benefits in the economic NPV**	$1.61m
Total Benefits			$1.61m	***excludes ENS penalty*	

Other Financial Drivers			
Incremental opex cost pa (no depreciation)	-$0.10m	Write-off cost	$0.00m
Capital - initial $m	-$10.04m	Major Asset Life (Yrs)	15.00 Yrs
Residual Value - initial investment	$0.00m	Re-investment capital	$0.00m
Capitalisation period	4.00 Yrs	Start of the re-investment period	0.00 Yrs