

OPTIONS EVALUATION REPORT (OER)

Substation Based PC Condition

OER 000000001375 revision 2.0



Ellipse project no.: P0008016

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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Approved	Lance Wee	M/Asset Strategy
Date submitted for approval	14 December 2016	

Change history

Revision	Date	Amendment
0	29 June 2016	Initial issue
1	31 October 2016	Update to 2016/17 dollars and SFAIRP/ALARP data
2	14 December 2016	Update to format

1. Need/opportunity

The assets raised within this Need have reached or exceeded their estimated technical life by 2023. Manufacturer support for the majority of models has ceased meaning no repair or replacement facilities exist and spares currently held by TransGrid for these models are projected to be exhausted. Additionally there are higher costs associated with managing and maintaining spares and the continuing maintenance capability required for obsolete models.

The use of substation based Personal Computers (PCs) provide core automation functions within a substation, including remote visibility capability, alarm monitoring and switchgear operability from the TransGrid Control Centre. As such these devices will be required into the foreseeable future.

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 run these assets to failure. This approach does not address the increasing failure rates or the risk cost associated with the Need. The risks are \$2.92m per annum and foreseen to increase as the probability of failure of the assets will also likely increase. Key drivers for this risk cost are:

- > Probability of asset failure is approximately 16.9% for substation PCs.
- > Increasing the maintenance for the assets cannot reduce the probability of failure in order to reduce the risk cost.

Option A — Replacement of Individual Assets [[OFR 1375A](#), [OFS 1375A](#)]

This option covers the replacement of assets in a “like for like” manner. This involves removing the existing substation PCs and replacing it with them with new substation PCs utilising the same features currently in use. This option doesn’t include any upgrade of systems to maximise the utilisation of available technology.

No operating costs have been estimated for this option based on current maintenance plan settings.

Due to the “like for like” nature of this option, no benefit has been calculated in accordance with TransGrid’s Renewal and Maintenance Strategy for Secondary Systems Site Installations¹.

The expected total capital cost to replace all 117 asset identified under this Need is \$2.42m. This costing is estimated using TransGrid’s “Success” estimating system.

The residual risk associated with this option upon completion of the project amounts to \$0.69m per annum (base case risk cost = \$2.92m). The risk reduction is realised through the reduction in the probability of failure for all assets.

The assets under investigation have been categorised into three broad categories:

¹ Refer SSA Strategy - Renewal and Maintenance -Secondary Systems Site Installations

Assets providing DCON (VmHost) services

This configuration covers only replacing the substation assets providing Data Concentrator (DCON) (VmHost) services.

The expected capital cost to replace this category of assets is \$0.50m. This costing was estimated using the unit costs provided under Option Feasibility Study (OFS) OFS 1375A and applying them to those assets that would be replaced. These costs are broken down in Table 1.

Table 1 – Expected costs for replacing assets providing DCON (VmHost) services (\$ thousand)

Item	Unit Cost, Including Labour	Quantity	Total Cost
DCON (VmHost)	21	24	500
Total estimated cost			500

The residual risk associated with this portion of assets upon completion of the project amounts to \$0.64m per annum (base case risk cost component = \$2.70m). The risk reduction is realised through the reduction in the probability of failure for the affected assets.

Assets providing HMI / Condition Monitoring / Other services

This configuration covers only replacing the substation assets providing HMI, condition monitoring and other miscellaneous services.

The expected capital cost to replace this category of assets is \$1.93m. This costing was estimated using the unit costs provided under OFS 1375A and applying them to those assets that would be replaced. These costs are broken down in Table 2.

Table 2 – Expected costs for replacing assets providing HMI / Condition Monitoring / Other services (\$ thousand)

Item	Unit Cost, Including Labour	Quantity	Total Cost
HMI/CM/Other	21	93	1,930
Total estimated cost			1,930

The residual risk associated with this portion of assets upon completion of the project amounts to \$0.05m per annum (base case risk cost component = \$0.22m). The risk reduction is realised through the reduction in the probability of failure for the affected assets.

Option A has been identified as the only technically viable option as refurbishment of the systems is not possible.

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 3.

Table 3 – 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	0	2.92	N/A	N/A	4
A	Replace Individual Assets	2.42	0	0.69	4.90	(1.18)	2
i)	Replace DCON (VmHost) Assets	0.50	0	0.64	5.86	(0.22)	1
ii)	Replace HMI/CM/Other Assets	1.93	0	0.05	(0.95)	(0.95)	3

The commercial evaluation is based on:

- > Economic life of the PCs is assumed 7 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 4.

Table 4 – Discount rate sensitivities (\$ million)

Option	Description	Economic NPV @13%	Economic NPV @6.75%
A	Replace Individual Assets	3.65	6.75
i)	Replace DCON (VmHost) Assets	4.60	7.68
ii)	Replace HMI/CM/Other Assets	(0.95)	(0.93)

4.2 SFAIRP/ALARP evaluation

There is no safety risk associated with these assets therefore an SFAIRP (So Far As Is Reasonably Practicable)/ALARP (As Low As Reasonably Practical) evaluation is not required.

4.3 Preferred option

The option to address the condition of the identified assets, Option A(i) – Replacement of DCON (VmHost) Assets, is the preferred option.

This option has been selected due to its technical viability and reduction in reliability risk. Although the replacement of DCON (VmHost) assets is below the ALARP value, TransGrid cannot reduce the safety risk of these assets further by spending more capital. Therefore this option reduces TransGrid's safety risk to as low as reasonably practicable.

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 the replacement of all 24 identified DCON (VmHost) assets in the categories identified above.

Attachment 1 – Commercial evaluation report

Option A NPV calculation

Project_Option Name	Need ID 1375 - Substation Based PC Condition - Option A Replacement
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1. Financial Evaluation (excludes VCR benefits)				
NPV @ standard discount rate	10.00%	-\$1.18m	NPV / Capital (Ratio)	-0.48
NPV @ upper bound rate	13.00%	-\$1.18m	Pay Back Period (Yrs)	-0.07 Yrs
NPV @ lower bound rate (WACC)	6.75%	-\$1.14m	IRR%	-7.26%

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%	\$4.90m	NPV / Capital (Ratio)	2.02
NPV @ upper bound rate	13.00%	\$3.65m	Pay Back Period (Yrs)	1.09 Yrs
NPV @ lower bound rate (WACC)	6.75%	\$6.75m	IRR%	38.71%

Benefits				
Risk cost	As Is	To Be	Benefit	VCR Benefit
Systems (reliability)	\$2.64m	\$0.62m	\$2.01m	ENS Penalty
Financial	\$0.29m	\$0.07m	\$0.22m	All other risk benefits
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits
People (safety)	\$0.00m	\$0.00m	\$0.00m	
Environment	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*
Reputation	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits
Total Risk benefits	\$2.92m	\$0.69m	\$2.23m	Benefits in the economic NPV**
Cost savings and other benefits			\$0.00m	**excludes ENS penalty
Total Benefits			\$2.23m	
Other Financial Drivers				
Incremental opex cost pa (no depreciation)			\$0.00m	Write-off cost
Capital - initial \$m			-\$2.42m	Major Asset Life (Yrs)
Residual Value - initial investment			\$0.00m	Re-investment capital
Capitalisation period			5.00 Yrs	Start of the re-investment period
				2028-29

Option A(i) NPV calculation

Project_Option Name

Need ID 1375 - Substation Based PC Condition - Option A Replacement

1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	-\$0.22m	NPV / Capital (Ratio)	-0.45
NPV @ upper bound rate	13.00%	-\$0.23m	Pay Back Period (Yrs)	-0.05 Yrs
NPV @ lower bound rate (WACC)	6.75%	-\$0.21m	IRR%	-5.26%

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%	\$5.86m	NPV / Capital (Ratio)	11.78
NPV @ upper bound rate	13.00%	\$4.60m	Pay Back Period (Yrs)	Not measurable
NPV @ lower bound rate (WACC)	6.75%	\$7.68m	IRR%	84.65%

Benefits

Risk cost	As Is	To Be	Benefit	VCR Benefit	\$2.01m
Systems (reliability)	\$2.64m	\$0.62m	\$2.01m	ENS Penalty	\$0.00m
Financial	\$0.07m	\$0.02m	\$0.05m	All other risk benefits	\$0.05m
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$2.06m
People (safety)	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$0.05m
Environment	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
Reputation	\$0.00m	\$0.00m	\$0.00m	Benefits in the economic NPV**	\$2.06m
				**excludes ENS penalty	
Total Risk benefits	\$2.70m	\$0.64m	\$2.06m		
Cost savings and other benefits			\$0.00m		
Total Benefits			\$2.06m		

Other Financial Drivers

Incremental opex cost pa (no depreciation)	\$0.00m	Write-off cost	\$0.00m
Capital - initial \$m	-\$0.50m	Major Asset Life (Yrs)	7.00 Yrs
Residual Value - initial investment	\$0.00m	Re-investment capital	\$0.00m
Capitalisation period	5.00 Yrs	Start of the re-investment period	2028-29

Option A(ii) NPV calculation

Project_Option Name

Need ID 1375 - Substation Based PC Condition - Option A Replacement

1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	-\$0.95m	NPV / Capital (Ratio)	-0.49
NPV @ upper bound rate	13.00%	-\$0.95m	Pay Back Period (Yrs)	-0.08 Yrs
NPV @ lower bound rate (WACC)	6.75%	-\$0.93m	IRR%	-7.79%

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%	-\$0.95m	NPV / Capital (Ratio)	-0.49
NPV @ upper bound rate	13.00%	-\$0.95m	Pay Back Period (Yrs)	Not measurable
NPV @ lower bound rate (WACC)	6.75%	-\$0.93m	IRR%	-7.79%

Benefits

Risk cost	As Is	To Be	Benefit	VCR Benefit	
Systems (reliability)	\$0.00m	\$0.00m	\$0.00m	ENS Penalty	\$0.00m
Financial	\$0.22m	\$0.05m	\$0.17m	All other risk benefits	\$0.17m
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$0.17m
People (safety)	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$0.17m
Environment	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
Reputation	\$0.00m	\$0.00m	\$0.00m	Benefits in the economic NPV**	\$0.17m
				**excludes ENS penalty	
Total Risk benefits	\$0.22m	\$0.05m	\$0.17m		
Cost savings and other benefits			\$0.00m		
Total Benefits			\$0.17m		

Other Financial Drivers

Incremental opex cost pa (no depreciation)	\$0.00m	Write-off cost	\$0.00m
Capital - initial \$m	-\$1.93m	Major Asset Life (Yrs)	7.00 Yrs
Residual Value - initial investment	\$0.00m	Re-investment capital	\$0.00m
Capitalisation period	5.00 Yrs	Start of the re-investment period	2028-29