

# OPTIONS EVALUATION REPORT (OER)

Protection - UFLS Condition

OER 000000001370 revision 2.0



**Ellipse project no.:** P0008008

**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	23 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

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The assets raised within this Need have reached the end of their technical life resulting in a lack of manufacturer support and depleted spares. The relays are not duplicated and the lack of self-monitoring capabilities results in an unknown condition between maintenance activities. Due to the small population of the assets, it is costly to manage and maintain continued maintenance capability.

The use of under frequency load shedding schemes to maintain the network frequencies as outlined in the AEMC's Frequency Operating Standards are a continuing requirement of the Australian Energy Regulator (AER) as outlined in the National Electricity Rules (NER). These protection schemes are required into the foreseeable future.

## 2. Related Needs/opportunities

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Nil.

## 3. Options

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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. At \$1.24m per annum, the risks are significant and foreseen to increase as the probability of failure of the assets will also likely increase. The key driver for this risk cost is the reliability consequence associated with the failure of a network segment due to malfunction of the protection relays resulting in a failure to restore nominal system frequency.

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 1370A](#), [OFS 1370A](#)]

This option covers the replacement of assets in a “like for like” manner. This involves removing the panel and replacing it with a new relay panel 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 Installations<sup>1</sup>.

The expected total capital cost to replace every asset identified under this Need is \$406k. This costing is estimated using TransGrid's “Success” estimating system. This cost has been adjusted to \$190k for analysis in this OER to account for the reduction of 2 assets that will be replaced under Secondary Systems Renewal Needs or are utilised on negotiated services. This adjustment has been carried out using the unit costs provided in the Option Feasibility Study (OFS), shown in Table 1.

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<sup>1</sup> Refer SSA Strategy - Renewal and Maintenance -Secondary Systems Site Installations

**Table 1 – Asset quantities (\$ thousand)**

Item	Unit Cost, Including Labour	Quantity	Total Cost
CFx ≤132kV	94.50	1	0.10
M2VFX12A ≤ 132kV	94.00	1	0.09
<b>Total estimated cost</b>			<b>0.19</b>

The residual risk associated with this option upon completion of the project amounts to \$12.20k per annum (base case risk cost = \$1.24m). 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 practical) 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 2.

**Table 2 – Commercial evaluation (\$ million)**

Option	Description	Total capex	Annual opex	Annual post project risk cost	Economic NPV @10%	Financial NPV @10%	Rank
<b>Base case</b>	Run-to-fail	N/A	0	1.24	N/A	N/A	2
<b>A</b>	Replace Individual Assets	0.19	0	0.01	6.78	1.09	1

The commercial evaluation is based on:

- > Economic life of the assets is assumed 15 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 3.

**Table 3 – Discount rate sensitivities (\$ million)**

Option	Description	Economic NPV @13%	Economic NPV @6.75%
<b>A</b>	Replace Individual Assets	4.74	10.42

### 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

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 3.

The option to address the condition of the identified assets, Option A – Replacement of Individual Assets, 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 NPV while reducing the safety risk.

Refer to Attachment 1 for details of the assets to be replaced under this Need.

#### **Capital and operating expenditure**

There is negligible difference in predicted ongoing operational expenditure between the option and Base Case. Implementing Option A will reduce callouts to address defects and this benefit has been captured in the risk assessment. These have been captured as benefits for delivering the project.

#### **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

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It is recommended to proceed with the replacement of all 2 identified assets.

## Attachment 1 – Assets for replacement

EQUIP_NO	EQUIP_CLASS	PLANT_NO	ITEM_NAME_1	EQUIP_LOCATION
000000048951	PT	NTPKLKCRB254UFLS	KOOLKHAN 66KV UNDERFREQUENCY LOAD SHED	KLK
000000048895	PT	NTPINVCRC13UFLS	INVERELL 66KV UNDERFREQUENCY LOAD SHED	INV

## Attachment 2 – Commercial evaluation report

### Option A NPV calculation

Project_Option Name			Option A - Individual Asset Replacements - All Assets		
1. Financial Evaluation (excludes VCR benefits)					
NPV @ standard discount rate	10.00%	\$1.09m	NPV / Capital (Ratio)	5.77	
NPV @ upper bound rate	13.00%	\$0.72m	Pay Back Period (Yrs)	Not measurable	
NPV @ lower bound rate (WACC)	6.75%	\$1.74m	IRR%	37.78%	
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%	\$6.78m	NPV / Capital (Ratio)	35.97	
NPV @ upper bound rate	13.00%	\$4.74m	Pay Back Period (Yrs)	Not measurable	
NPV @ lower bound rate (WACC)	6.75%	\$10.42m	IRR%	80.03%	
Benefits					
Risk cost	As Is	To Be	Benefit	VCR Benefit	\$1.01m
Systems (reliability)	\$1.02m	\$0.01m	\$1.02m	ENS Penalty	\$0.00m
Financial	\$0.22m	\$0.00m	\$0.22m	All other risk benefits	\$0.22m
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$1.23m
People (safety)	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$0.22m
Environment	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
Reputation	\$0.00m	\$0.00m	\$0.00m	Benefits in the economic NPV**	\$1.23m
Total Risk benefits	\$1.24m	\$0.01m	\$1.23m	**excludes ENS penalty	
Cost savings and other benefits			\$0.00m		
Total Benefits			\$1.23m		
Other Financial Drivers					
Incremental opex cost pa (no depreciation)			-\$0.00m	Write-off cost	\$0.00m
Capital - initial \$m			-\$0.19m	Major Asset Life (Yrs)	35.00 Yrs
Residual Value - initial investment			\$0.05m	Re-investment capital	\$0.00m
Capitalisation period			5.00 Yrs	Start of the re-investment period	0.00 Yrs