

NEED/OPPORTUNITY STATEMENT (NOS)



Protection - UFLS Condition

NOS- 000000001370 revision 3.0

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

Author	Hazem Khamis	Secondary Systems Strategist
Endorsed	Mark Jones	Secondary Systems and Communications Asset Manager
Approved	Lance Wee	M/Asset Strategy
Date submitted for approval	17 November 2016	

Change history

Revision	Date	Amendment
0	29 April 2016	Initial issue
1	17 October 2016	Update to 2016/17 dollars
2	17 November 2016	Update to format

1. Background

Under Frequency Load Shedding (UFLS) relays are strategically positioned within TransGrid's network to react to system emergency conditions by disconnecting strategically selected loads to remain within the network's nominal frequency band. Should the system frequency deviates significantly, the network could effectively collapse resulting in system brown out events as Generators automatically disconnect. There are currently 4 UFLS relays on the network with install dates between 1983 and 1986.

The assets investigated under this need are discrete component devices that have reached the end of their technical life resulting in a lack of manufacturer support and depleted spares. These relays are not duplicated and lack any form of self-monitoring capabilities resulting 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. Need/opportunity

The following relay models are covered by this need:

Relay Model	Primary Asset Protected	Quantity Installed
CFx	System Frequency	3
M2VFX12A	System Frequency	1

The risk cost associated with the 4 Under Frequency Load Shedding protection relays is \$1.24m per annum. The most significant element of concern 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. The relays protect the integrity of the network as a whole and are installed at several voltage levels including the 22kV, 66kV, 132kV and 220kV. It is estimated that 8 hours would be required to recover any loss of load after a frequency restoration failure. The risk costs are based on 2015/16 probabilities of failure derived from the condition assessment¹. These probabilities are forecast to continue increasing over the coming years as the assets continue past their expected life.

3. Related needs/opportunities

NIL

4. Recommendation

It is recommended that options be considered to address the identified need/opportunity.

¹ Refer NACA-SSAP - Protection

Attachment 1 – Risk costs summary

Summary of results is attached below. Refer to supporting document in PDGS for full risk assessment.

Current Option Assessment - Risk Summary

Project Name: Protection - UFLS Condition

Option Name: 1370 - Base Case

Option Assessment Name: 1370 - Base Case - Assessment 1

Rev Reset Period: Next (2018-23)



Major Component	No.	Minor Component	Sel. Hazardous Event	LoC x CoF (\$M)	Failure Mechanism	NoxLoC xCoF (\$M)	PoF (Yr-1)	Total Risk (\$M)	Risk (\$M) (Rel)	Risk (\$M) (Op)	Risk (\$M) (Fin)	Risk (\$M) (Peo)	Risk (\$M) (Env)	Risk (\$M) (Rep)
CFx Series <220kV	1	Protection	Unplanned Outage - HV (CFx Series <220kV)	\$0.89	Failure	\$0.89	25.00%	\$0.22	\$0.20	\$0.02	\$0.02	\$0.00	\$0.00	\$0.00
CFx Series <220kV	1	Protection Relay	Explosive Failure of Asset (CFx Series <220kV)	\$0.89	Failure	\$0.89	25.00%	\$0.22	\$0.20	\$0.02	\$0.02	\$0.00	\$0.00	\$0.00
CFx Series >=220kV	0	Protection	Unplanned Outage - HV (CFx Series >=220kV)	\$0.48	Failure	\$0.00	25.00%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
CFx Series >=220kV	0	Protection Relay	Explosive Failure of Asset (CFx Series >=220kV)	\$8.36	Failure	\$0.00	25.00%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
M2VFX12A <220kV	1	Protection	Unplanned Outage - HV (M2VFX12A <220kV)	\$0.40	Failure	\$0.40	100.00%	\$0.40	\$0.31	\$0.09	\$0.09	\$0.00	\$0.00	\$0.00
M2VFX12A <220kV	1	Protection Relay	Explosive Failure of Asset (M2VFX12A <220kV)	\$0.40	Failure	\$0.40	100.00%	\$0.40	\$0.31	\$0.09	\$0.09	\$0.00	\$0.00	\$0.00
								\$11.41	\$2.57	\$1.02	\$0.22	\$0.00	\$0.00	\$0.00

Total VCR Risk: \$1.02 Total ENS Risk: \$0.00