NEED/OPPORTUNITY STATEMENT (NOS)

Protection - ABB Relays Condition

NOS- 000000001377 revision 3.0

Ellipse project no.: P0008020
TRIM file: [TRIM No]

Project reason: Capability - Obsolescence/Manufacturer support withdrawn
Project category: Prescribed - Asset Renewal Strategies

Approvals

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Approved	Lance Wee	Manager Asset Strategy
Date submitted for approval	17 October 2016	

Change history

Revision	Date	Amendment
0	28 June 2016	Initial issue
1	17 October 2016	Update to 2016/17 dollars
2	17 November 2016	Update to format

1. Background

There are 23 in-service relays in total of this type in TransGrid's network consisting of 16 for transformer protection, 6 for line protection and 1 for busbar protection. In recent years these relays have started to exhibit end of life characteristics. The fault rates for these relays are increasing and this behaviour is compounded by the fact that the majority of TransGrid staff who are experienced in the repair and maintenance of these relays have now retired. Only limited internal support is available for the ongoing repair and maintenance of this equipment using parts recovered from other removed relays. All spare parts are obtained from old equipment that is similarly worn and prone to failure, and therefore cannot be guaranteed to provide meaningful life extension.

2. Need/opportunity

The following relay models are covered by this need:

Relay Model	Primary Asset Protected	Quantity Installed
RADSB	Transformer	16
RADHL	Lines	6
RADHA	Busbar	1

RADSB relays are used in transformer protection schemes where the risk due to transformer oil is the predominant environmental concern. RADHL relays are used in line/feeder protection schemes where the risk due to bushfire is the predominant environmental concern. Lastly, RADHA relay used in busbar protection scheme where no environmental risk is anticipated, however reliability, financial and safety risks are still accounted for. Importantly, there are 16 relays protecting assets at 330kV level and above and therefore carries a significant risk of system black event in case of relay malfunction.

TransGrid's analysis of asset health score (which summarises the consideration for technological obsolesce of the in-service assets, spare availability and asset age) and asset criticality score (which summarises the consideration for load at risk, value of customer reliability, assumed restoration duration, consequence costs and the failure probability) indicates the need to replace these relays from the network with modern equivalent assets. Continuing to operate these relays will result in an unacceptable network risk post 2023.

The associated risk cost is $5.43m per annum. The most significant element of concern is the reliability consequence associated with a protection system failing to operate during a genuine fault due to the malfunction of the protection relays identified for replacement above. This hazard can result in a number of different outcomes including load shedding, explosive failure of associated primary assets, offloading generation or in the most extreme case, black start of the entire network. The risk costs are based on 2015/16 probabilities of failure taken as a trend of existing defect rates of the assessed assets derived from the condition assessment[1]. These probabilities are forecast to continue increasing over the coming years as they move past their expected life.

3. Related needs/opportunities

N/A

[1] Refer NACA-SSAP - Protection

4. Recommendation

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

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 - ABB Relays Condition

Option Name: 1377 - Base Case

Option Assessment Name: 1377 - 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)
RADHA <=150MW	0	Protection	Unplanned Outage - HV (RADHA <=150MW)	$0.11	Failure	$0.00	100.00%	$0.00	$0.00		$0.00			$0.00
RADHA <=150MW	0	Protection Relay	Explosive Failure of Asset (RADHA <=150MW)	$0.04	Failure	$0.00	100.00%	$0.00	$0.00		$0.00	$0.00	$0.00	$0.00
RADHL >=330kV	0	Protection	Unplanned Outage - HV (RADHL >=330kV)	$0.11	Failure	$0.00	16.70%	$0.00	$0.00		$0.00			$0.00
RADHL >=330kV	0	Protection Relay	Explosive Failure of Asset (RADHL >=330kV)	$4.21	Failure	$0.00	16.70%	$0.00	$0.00		$0.00	$0.00	$0.00	$0.00
RADSB - <=150MW	3	Protection	Unplanned Outage - HV (RADSB - <=150MW)	$0.16	Failure	$0.47	7.50%	$0.04	$0.01		$0.02			$0.00
RADSB - <=150MW	3	Protection Relay	Explosive Failure of Asset (RADSB - <=150MW)	$0.09	Failure	$0.27	7.50%	$0.02	$0.01		$0.01	$0.00	$0.00	$0.00
RADSB >=330kV	5	Protection	Unplanned Outage - HV (RADSB >=330kV)	$0.11	Failure	$0.53	7.50%	$0.04	$0.00		$0.04			$0.00
RADSB >=330kV	5	Protection Relay	Explosive Failure of Asset (RADSB >=330kV)	$1.00	Failure	$4.99	7.50%	$0.37	$0.34		$0.03	$0.00	$0.00	$0.00
				$5.81		$6.25		$0.47	$0.37		$0.10	$0.00	$0.00	$0.00

Total VCR Risk: $0.37

Total ENS Risk: $0.00