NEED/OPPORTUNITY STATEMENT (NOS)

Protection - Alstom Pxxx Condition

NOS- 000000001376 revision 3.0

Ellipse project no.: P0008018
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	17 November 2016	

Change history

Revision	Date	Amendment
0	3 May 2016	Initial issue
1	17 October 2016	Update to 2016/17 dollars
2	17 November 2016	Update to format

1. Background

Alstom P-series protection relays are used throughout the NSW network predominately to isolate feeder faults and their impacts on system stability and network infrastructure. The relays under investigation are installed at 22kV, 33kV, 66kV, 132kV, 220kV, and 330kV voltage levels. There are currently approximately 95 installed units within TransGrid's asset base with install dates between 2001 and 2008.

All relays under investigation will 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 duplicated protection schemes across all feeders greater than and equal to 66kV 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
P12x	<= 220kV Feeders & =>330kV Feeders	15
P14x	<= 220kV Feeders & =>330kV Feeders	5
P442	<= 220kV Feeders & =>330kV Feeders	66
P54x	<= 220kV Feeders & =>330kV Feeders	9

The risk cost associated with the Feeder protection relays is $4.31m per annum. The most significant element of concern is the reliability consequence associated with the explosive failure of a primary asset due to malfunction of the protection relays resulting in a failure to clear a fault. The relays protect assets connected to busbars supplying a mix of loads and are installed at network voltages levels ranging from 22kV through to 330kV, with those at the 330kV levels carrying a risk of a system black event. It is estimated that 8 hours would be required to recover any loss of load after a hazardous event. 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

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 - Alstom Pxxx Condition

Option Name: 1376 - Base Case

Option Assessment Name: 1376 - 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)
P12 P14 <=150MW	11	Protection	Unplanned Outage - HV (P12 P14 <=150MW)	$0.17	Failure	$1.86	3.80%	$0.07	$0.03		$0.04			$0.00
P12 P14 <=150MW	11	Protection Relay	Explosive Failure of Asset (P12 P14 <=150MW)	$0.13	Failure	$1.40	3.80%	$0.05	$0.03		$0.02	$0.00	$0.01	$0.00
P12 P14 >=330kV	0	Protection	Unplanned Outage - HV (P12 P14 >=330kV)	$0.11	Failure	$0.00	3.80%	$0.00	$0.00		$0.00			$0.00
P12 P14 >=330kV	0	Protection Relay	Explosive Failure of Asset (P12 P14 >=330kV)	$4.22	Failure	$0.00	3.80%	$0.00	$0.00		$0.00	$0.00	$0.00	$0.00
P12 P14 >150 MW	0	Protection	Unplanned Outage - HV (P12 P14 >150 MW)	$0.73	Failure	$0.00	3.80%	$0.00	$0.00		$0.00			$0.00
P12 P14 >150 MW	0	Protection Relay	Explosive Failure of Asset (P12 P14 >150 MW)	$0.69	Failure	$0.00	3.80%	$0.00	$0.00		$0.00	$0.00	$0.00	$0.00
P442 <=150MW	15	Protection	Unplanned Outage - HV (P442 <=150MW)	$0.21	Failure	$3.19	4.90%	$0.16	$0.08		$0.08			$0.00
P442 <=150MW	15	Protection Relay	Explosive Failure of Asset (P442 <=150MW)	$0.18	Failure	$2.63	4.90%	$0.13	$0.08		$0.03	$0.00	$0.02	$0.00
P442 >=330kV	0	Protection	Unplanned Outage - HV (P442 >=330kV)	$0.11	Failure	$0.00	4.90%	$0.00	$0.00		$0.00			$0.00
P442 >=330kV	0	Protection Relay	Explosive Failure of Asset (P442 >=330kV)	$4.21	Failure	$0.00	4.90%	$0.00	$0.00		$0.00	$0.00	$0.00	$0.00
P442 >150 MW	13	Protection	Unplanned Outage - HV (P442 >150 MW)	$1.73	Failure	$22.49	4.90%	$1.10	$1.03		$0.07			$0.00
P442 >150 MW	13	Protection Relay	Explosive Failure of Asset (P442 >150 MW)	$1.69	Failure	$21.99	4.90%	$1.08	$1.03		$0.02	$0.00	$0.02	$0.00
P54x <=150MW	1	Protection	Unplanned Outage - HV (P54x <=150MW)	$0.37	Failure	$0.37	5.00%	$0.02	$0.01		$0.01			$0.00
P54x <=150MW	1	Protection Relay	Explosive Failure of Asset (P54x <=150MW)	$0.34	Failure	$0.34	5.00%	$0.02	$0.01		$0.00	$0.00	$0.00	$0.00
P54x >150MW	5	Protection	Unplanned Outage - HV (P54x >150MW)	$1.76	Failure	$8.78	5.00%	$0.44	$0.41		$0.03			$0.00

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)
P54x >150MW	5	Protection Relay	Explosive Failure of Asset (P54x >150MW)	$1.72	Failure	$8.59	5.00%	$0.43	$0.41		$0.01	$0.00	$0.01	$0.00
				$18.36		$71.63		$3.49	$3.13		$0.30	$0.01	$0.06	$0.00

Total VCR Risk: $3.13

Total ENS Risk: $0.00