

NEED/OPPORTUNITY STATEMENT (NOS)



Protection - Busbar Condition

NOS- 00000001389 revision 2.0

Ellipse project no.: P0008052

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	10 November 2016	

Change history

Revision	Date	Amendment
0	29 April 2016	Initial issue
1	17 October 2016	Update to 2016/17 dollars
2	10 November 2016	Update to format

1. Background

Busbar protection relays are used throughout the NSW network to isolate bus faults and their impacts on system stability and network infrastructure. The relays under investigation are installed purely on 330kV busbars located in sites connecting Snowy Hydro generation to the transmission network. There are 8 installed units under investigation with install dates between 1968 and 1985.

All of these relays were installed prior to 1973, and will have reached the end of their estimated life by 2023. Manufacturer support for all these models has ceased meaning no repair facilities are available and additionally, spares have been depleted. These relays lack any form of self-monitoring capabilities resulting in an unknown asset condition between maintenance activities. These relays form a small population of the busbar protection assets base that were inherited from Snowy Hydro and do not conform to TransGrid's design standards. Additionally, due to the small population of the assets, it is costly to manage and maintain continued maintenance capability.

The use of duplicated protection schemes across all busbars 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 relay models in Table 1 are covered by this Need.

Table 1 – Asset quantities

Relay Model	Primary Asset Protected	Quantity Installed
CAGx	330kV Busbars	2
DIFE3110	330kV Busbars	6

The risk cost associated with the 8 busbar protection relays is \$0.31m 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 relays protect busbars installed at Snowy Hydro generation sites. 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 assessment¹. These probabilities are forecast to continue increasing over the coming years as they move past their expected life.

3. Related Needs/opportunities

NIL

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 - Busbar Condition

Option Name: 1389 - Base Case

Option Assessment Name: 1389 - 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)	
Protection <=150MW	0	Protection	Unplanned Outage - HV (Protection <=150MW)	\$0.00	Failure	\$0.00	0.00%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
Protection <=150MW	0	Protection Relay	Explosive Failure of Asset (Protection <=150MW)	\$0.00	Failure	\$0.00	0.00%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
Protection >=330kV	4	Protection	Unplanned Outage - HV (Protection >=330kV)	\$0.11	Failure	\$0.42	25.00%	\$0.11	\$0.00	\$0.00	\$0.11	\$0.00	\$0.00	\$0.00	
Protection >=330kV	4	Protection Relay	Explosive Failure of Asset (Protection >=330kV)	\$0.20	Failure	\$0.81	25.00%	\$0.20	\$0.12	\$0.08	\$0.00	\$0.00	\$0.00	\$0.00	
Protection >150MW	0	Protection	Unplanned Outage - HV (Protection >150MW)	\$0.00	Failure	\$0.00	0.00%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
Protection >150MW	0	Protection Relay	Explosive Failure of Asset (Protection >150MW)	\$0.00	Failure	\$0.00	0.00%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
								\$0.31	\$0.12	\$0.19	\$0.00	\$0.00	\$0.00		
Total VCR Risk:								\$0.12	\$0.31	\$0.12	\$0.19	\$0.00	\$0.00	\$0.00	
Total ENS Risk:								\$0.00							