

NEED/OPPORTUNITY STATEMENT (NOS)



Protection - Schweitzer SELxxx Condition

NOS- 000000001380 revision 3.0

Ellipse project no.: P0008033

TRIM file: [TRIM No]

Project reason: Capability - Asset Replacement for end of life condition

Project category: Prescribed - Asset Renewal Strategies

Approvals

Author	Annie Welvaert	Secondary Systems Analyst
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	13 May 2016	Initial issue
1	17 October 2016	Update to 2016/17 dollars
2	17 November 2016	Update to format

1. Background

SEL 3xx-series protection relays are used throughout the NSW network to isolate both feeder faults and transformer faults in order to reduce their impacts on system security and network infrastructure. The relays under investigation are installed at 33kV, 66kV, 132kV, 220kV and 330kV voltage levels. There are currently approximately 41 installed units within TransGrid's asset base with install dates between 1998 and 2003.

All relays under investigation will have exceeded their estimated technical life by 2023. Manufacturer support for the majority of models is limited, meaning that repair and replacement facilities are expected to be unavailable by 2023. Spares currently held by TransGrid for this model are projected to be exhausted.

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
SEL321	Transmission Lines	38
SEL387	Transformers	3

The total risk cost associated with the relays is \$2.34m per annum, with 85% of this risk cost associated with the SEL321 relays used for feeder protection and 15% associated with SEL387 relays used for transformer protection. 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 assets connected to busbars supplying a mix of loads and are installed at network voltage levels ranging from 33kV through to 330kV. Relays installed at 330kV and above carry the 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 assessment¹. 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 - Schweitzer SELxxx Condition

Option Name: 1380 - Base Case

Option Assessment Name: 1380 - 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)
SEL321 >=330kV	13	Protection	Unplanned Outage - HV (SEL321 >=330kV)	\$0.11	Failure	\$1.37	2.40%	\$0.03	\$0.00	\$0.00	\$0.03	\$0.00	\$0.00	\$0.00
SEL321 >=330kV	13	Protection Relay	Explosive Failure of Asset (SEL321 >=330kV)	\$4.21	Failure	\$54.72	2.40%	\$1.31	\$1.28	\$0.00	\$0.03	\$0.00	\$0.01	\$0.00
SEL321 <=150MW	5	Protection	Unplanned Outage - HV (SEL321 <=150MW)	\$0.25	Failure	\$1.27	2.40%	\$0.03	\$0.02	\$0.00	\$0.01	\$0.00	\$0.00	\$0.00
SEL321 <=150MW	5	Protection Relay	Explosive Failure of Asset (SEL321 <=150MW)	\$0.22	Failure	\$1.08	2.40%	\$0.03	\$0.02	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
SEL387 <=150MW	2	Protection	Unplanned Outage - HV (SEL387 <=150MW)	\$0.14	Failure	\$0.28	33.00%	\$0.09	\$0.02	\$0.00	\$0.07	\$0.00	\$0.00	\$0.00
SEL387 <=150MW	2	Protection Relay	Explosive Failure of Asset (SEL387 <=150MW)	\$0.07	Failure	\$0.15	33.00%	\$0.05	\$0.02	\$0.00	\$0.02	\$0.00	\$0.00	\$0.00
SEL387 >=330kV	0	Protection	Unplanned Outage - HV (SEL387 >=330kV)	\$0.11	Failure	\$0.00	33.00%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
SEL387 >=330kV	0	Protection Relay	Explosive Failure of Asset (SEL387 >=330kV)	\$1.00	Failure	\$0.00	33.00%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
								\$1.54	\$1.36	\$0.00	\$0.17	\$0.00	\$0.01	\$0.00
								Total VCR Risk: \$1.36		Total ENS Risk: \$0.00				