NEED/OPPORTUNITY STATEMENT (NOS)

Cowra Secondary Systems Renewal

NOS- 000000001252 revision 2.0

Ellipse project no.: P0005325
TRIM file: [TRIM No]

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

Approvals

Author	Adam Hoare	Secondary Systems Senior Analyst
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	27 April 2016	Initial issue
1	11 October 2016	Update to 2016/17 dollars
2	10 November 2016	Update to format

1. Background

Cowra 132/66kV Substation comprises 3x 132kV feeders, 2x 132/66/11kV transformers and 5x 66kV feeders. The site was established in 1960, and the secondary systems assets have install dates between 1960 and 2010.

Cowra Substation is a customer connection point supplying Essential Energy's 66kV network. The site will remain a connection point to Essential Energy into the foreseeable future as outlined in the load forecasts of the 2015 Transmission Annual Planning Report.

2. Need/opportunity

In accordance with TransGrid's Renewal and Maintenance Strategies for Automation[1] and Metering Systems[2], Table 1 shows the following assets at Cowra Substation that have been identified for replacement by 2023.

Table 1 – Identified asset replacements at Cowra Substation from 2014-2023

Need Description	Quantity of Assets to be addressed	% of Services at Site	Need Driver
Need ID 1356 – Replacement of Reyrolle OHx Protection Relays	8	50% of all line/feeder protection relays on site	> Component obsolescence resulting in a lack of spares and no manufacturer support > End of asset life
Need ID 1376 – Replacement of Alstom Pxxx Protection Relays	8	50% of all line/feeder protection relays on site	> Component obsolescence resulting in a lack of spares and no manufacturer support > End of asset life
Need ID 1379 – Replacement of GE Multilin Protection Relays	2	50% of all transformer protection relays on site	> Increasing numbers of faults across the GE range. > Issues with the front facia failing and analogue module failures.
Need ID 1381 – Replacement of Siemens 7xx Protection Relays	2	50% of all capacitor protection relays on site	> Component obsolescence resulting in a lack of spares and no manufacturer support > End of asset life
Need ID 1383 – Replacement of GE FV2 Protection Relays	4	100% of all busbar protection relays on site	> Degradation of plastic components causing mechanical failure of the pickup adjusting mechanism. > Component obsolescence resulting in a lack of spares and no manufacturer support

[1] Refer SSA Strategy - Renewal and Maintenance - Automation Systems

[2] Refer SSA Strategy - Renewal and Maintenance - Metering Systems

Need Description	Quantity of Assets to be addressed	% of Services at Site	Need Driver
Need ID 1387 – Replacement of Capacitor Protection Relays	2	50% of all capacitor protection relays on site	> Prone to excessive mechanical wear under certain situations, potentially causing a slow reset. > Component obsolescence resulting in a lack of spares and no manufacturer support
Need ID 629 - Replacement of Remote Terminal Units (RTUs)	7	100% of all control RTUs onsite	> Component obsolescence resulting in a lack of spares and no manufacturer support
Need DCN539 – Cowra Auxiliary Supplies Upgrade			> Assets age and condition > Non-duplication of critical ac and dc systems

Additionally, condition assessments for all these individual asset types have been completed[3].

The low voltage DC system at Cowra is approaching end of life and is not currently duplicated.

The risk cost associated with all secondary systems at Cowra is $1.21m per annum. The most significant element of concern is an uncontrolled electrical contact/discharge outage on the DC system due to a fault. There is a mixed customer load at the site with a forecast 27MW as the average of the summer and winter loads in the Transmission Annual Planning Report and an estimated 16 hours to recover the DC system and load after hazardous event. The risk costs are based on 2015/16 probabilities of failure taken as a trend of existing defect rates of applicable asset types derived from the condition assessments. These probabilities are forecast to continue increasing over the coming years, with the consequence of failure also likely to escalate due to TransGrid's means of mitigating and repairing these failures being almost exhausted.

There is additional risk identified from market meters (which considers repair and potential litigation costs).

In accordance with TransGrid's Renewal and Maintenance Strategy for Secondary Systems Site Installations[4], an opportunity exists to address these risks by performing a full secondary system replacement at Cowra (as listed in the risk summary in Attachment 1). This opportunity is due to the high concentration of the secondary system assets required to be addressed. It is expected that this would provide additional benefits for the organisation including:

> Moving from a centralised Alarm and Control platform to a distributed control architecture that improves operational control and reliability while reducing the consequence of equipment failure

> Upgrading Auto Reclose facilities to allow better control, indication and fault analysis than what is currently available at the site

[3] Refer NACA-SSAP - Protection, NACA-SSAC - Control, NACA-SSAM - Metering

[4] Refer SSA Strategy - Renewal and Maintenance -Secondary Systems Site Installations

3. Related Needs/opportunities

The following related Needs contain works for Cowra that could be fulfilled by completing a Secondary Systems Renewal:

- Need ID 1356 – Replacement of Reyrolle OHx Protection Relays
- Need ID 1376 – Replacement of Alstom Pxxx Protection Relays
- Need ID 1379 – Replacement of GE Multilin Protection Relays
- Need ID 1381 – Replacement of Siemens 7xx Protection Relays
- Need ID 1383 – Replacement of GE FV2 Protection Relays
- Need ID 1387 – Replacement of Capacitor Protection Relays
- Need ID 629 - Replacement of Remote Terminal Units (RTUs)
- Need ID DCN539 – Cowra Auxiliary Supplies Upgrade

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: Cowra Secondary Systems Renewal

Option Name: 1252 - Base Case

Option Assessment Name: 1252 - 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)
Battery and Charger System	2	Battery	Uncontrolled Electrical Contact / Discharge (Battery and Charger System)	$0.14	Failure	$0.28	9.20%	$0.03	$0.02		$0.00	$0.00		$0.00
Battery and Charger System	2	Battery	Unplanned Outage - HV (Battery and Charger System)	$0.12	Failure	$0.24	9.20%	$0.02	$0.02		$0.00			$0.00
Battery and Charger System	2	Charger	Uncontrolled Electrical Contact / Discharge (Battery and Charger System)	$0.14	Failure	$0.28	9.20%	$0.03	$0.02		$0.00	$0.00		$0.00
Battery and Charger System	2	Charger	Unplanned Outage - HV (Battery and Charger System)	$0.12	Failure	$0.24	9.20%	$0.02	$0.02		$0.00			$0.00
Controls	7	Bay Controller	Unplanned Outage - HV (Controls)	$0.17	Failure	$1.20	4.39%	$0.05	$0.03		$0.02			$0.00
Controls	7	Control Cabling	Unplanned Outage - HV (Controls)	$0.17	Failure	$1.20	4.39%	$0.05	$0.03		$0.02			$0.00
Low Voltage AC Supply	2	AC Low Voltage Board/Panel/Box	Uncontrolled Electrical Contact / Discharge (Low Voltage AC Supply)	$0.42	Failure	$0.85	0.21%	$0.00	$0.00		$0.00	$0.00		$0.00
Low Voltage AC Supply	2	AC Low Voltage Board/Panel/Box	Unplanned Outage - HV (Low Voltage AC Supply)	$0.54	Failure	$1.09	0.21%	$0.00	$0.00		$0.00			$0.00
Low Voltage AC Supply	2	AC Low Voltage Cable	Uncontrolled Electrical Contact / Discharge (Low Voltage AC Supply)	$0.42	Failure	$0.85	0.21%	$0.00	$0.00		$0.00	$0.00		$0.00
Low Voltage AC Supply	2	AC Low Voltage Cable	Unplanned Outage - HV (Low Voltage AC Supply)	$0.54	Failure	$1.09	0.21%	$0.00	$0.00		$0.00			$0.00
Low Voltage DC Supply	1	DC Low Voltage Board/Panel/Box	Uncontrolled Electrical Contact / Discharge (Low Voltage DC Supply)	$9.23	Failure	$9.23	2.00%	$0.18	$0.18		$0.00	$0.00		$0.00
Low Voltage DC Supply	1	DC Low Voltage Board/Panel/Box	Unplanned Outage - HV (Low Voltage DC Supply)	$9.22	Failure	$9.22	2.00%	$0.18	$0.18		$0.00			$0.00
Low Voltage DC Supply	1	DC Low Voltage Cable	Uncontrolled Electrical Contact / Discharge (Low Voltage DC Supply)	$9.23	Failure	$9.23	2.00%	$0.18	$0.18		$0.00	$0.00		$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)
Low Voltage DC Supply	1	DC Low Voltage Cable	Unplanned Outage - HV (Low Voltage DC Supply)	$9.22	Failure	$9.22	2.00%	$0.18	$0.18		$0.00			$0.00
Metering	5	Meter	Failed Compliance Obligations (Metering)	$0.11	Failure	$0.56	3.32%	$0.02			$0.02			
Protection - 132kV	15	Protection	Unplanned Outage - HV (Protection - 132kV)	$0.21	Failure	$3.19	3.86%	$0.12	$0.06		$0.06			$0.00
Protection - 132kV	15	Protection Relay	Explosive Failure of Asset (Protection - 132kV)	$0.20	Failure	$3.04	3.86%	$0.12	$0.05		$0.02	$0.02	$0.01	$0.02
				$40.23		$50.99		$1.21	$0.99		$0.15	$0.02	$0.01	$0.03

Total VCR Risk: $0.86

Total ENS Risk: $0.08