NEED/OPPORTUNITY STATEMENT (NOS)

Panorama Secondary Systems Renewal

NOS 000000001246 revision 0.0

Ellipse project no.: P0005233
TRIM file: [TRIM No]

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

Approvals

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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	11 January 2016	Initial issue
1	21 January 2016	Update to 2016/17 dollars
2	17 October 2016	Minor amendments
3	10 November 2016	Update to format

1. Background

Panorama 132/66kV Substation comprises 2x 132kV feeders, 2x 132/66/11kV transformers and 5x 66kV feeders. The site was established in 1979, and the secondary systems assets have install dates between 1977 and 2012.

Panorama Substation is a customer connection point supplying Essential Energy's 66kV network in the area inclusive of Bathurst which contains Bathurst Correctional Centre and Hospitals. The site will remain a connection point to Essential Energy into the foreseeable future as outlined in the load forecasts of the 2015 Annual Planning Report.

Note: This site is subject to a Connection Agreement with Essential Energy and as a result the information contained within this Need/Opportunity Statement may be subject to confidentiality.

2. Need/opportunity

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

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

Need Description	Quantity of Assets to be addressed	% of Services at Site	Need Driver
Need ID 606 – Replacement of THR Protection Relays	5	36% of all line/feeder protections on site	> Component obsolescence resulting in a lack of spares and no manufacturer support > Inaccurate measurement of fault angles due to deteriorated internal components
Need ID 622 – Replacement of Feeder OC and EF Protection Relays	4	28% of all line/feeder protections on site	> Spares are deteriorating for the equipment with many spares a result of cannibalisation of equally deteriorated equipment. > Designs of panels can lead to injury from accessing links and cables.
Need ID 629 – Replacement of Remote Terminal Replacement (RTUs)	Site Wide Replacement	100%	> 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 637 – Replacement of YTG Protection Relays	5	36% of all line/feeder protections on site	> Component obsolescence resulting in a lack of spares and no manufacturer support > Inaccurate measurement of fault angles due to deteriorated internal components
Need ID 610 – Replacement of EDMI MKIII Meters	6	38% of all market Meters on site	> Microprocessor Energy Meters failing as they approach 15 years of life > Component obsolescence resulting in a lack of spares and no manufacturer support
Need ID 1382 – Protection - GE FAC Condition	2	50% of all transformer protections on site	> Regular firmware updates required, increasing lifecycle costs > Numerous component failures leading to spurious trips and Circuit Breaker Failure operations

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

The risk cost associated with all secondary systems at Panorama is $2.4m 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. There is a mixed customer load at the site with a forecast 70MW as the average of the summer and winter loads in the Annual Report and an estimated 16 hours to recover the site and 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 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). Furthermore several issues have been identified with the condition of Low Voltage (LV) 415V AC systems at the site including lack of Residual Current Devices (RCD) or Earth Leakage Circuit Breaker (ELCB) devices on power, light and Heating, Ventilation and Air Conditioning (HVAC) circuits. These issues were identified as part of the recent LV safety survey[4].

In accordance with TransGrid's Renewal and Maintenance Strategy for Secondary Systems Site Installations[5], an opportunity exists to address these risks by performing a full secondary system replacement at Panorama. 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:

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

[4] Refer AM FS 0006 TWR 125 – Low Voltage Safety Survey

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

- 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
- Upgrading Transformer Control facilities to allow better control, indication and fault analysis than what is currently available at the site
- Optimising the current investment in TransGrid's High Capacity Telecommunications to the site by upgrading all ancillary systems to TransGrid's latest design standard which provides the greatest amount of real time operational and condition data to better support the planning, operation and maintenance of the Network

3. Related Needs/opportunities

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

- Need ID 606 – Replacement of THR Protection Relays
- Need ID 622 – Replacement of Feeder OC and EF Protection Relays
- Need ID 629 – Replacement of Remote Terminal Replacement (RTUs)
- Need ID 637 – Replacement of YTG Protection Relays
- Need ID 610 – Replacement of EDMI MKIII Meters
- Need ID 1382 – Protection - GE FAC Condition

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: Panorama Secondary Systems Renewal

Option Name: 1246 - Base Case

Option Assessment Name: 1246 - 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)	$0.26	Failure	$0.52	9.20%	$0.05	$0.04		$0.00	$0.00		$0.00
Battery and Charger System	2	Battery	Unplanned Outage - HV (Battery and Charger System)	$0.25	Failure	$0.50	9.20%	$0.05	$0.04		$0.00			$0.00
Battery and Charger System	2	Charger	Uncontrolled Electrical Contact / Discharge (Battery and Charger System)	$0.26	Failure	$0.52	9.20%	$0.05	$0.04		$0.00	$0.00		$0.00
Battery and Charger System	2	Charger	Unplanned Outage - HV (Battery and Charger System)	$0.25	Failure	$0.50	9.20%	$0.05	$0.04		$0.00			$0.00
Controls	12	Bay Controller	Unplanned Outage - HV (Controls)	$0.30	Failure	$3.64	6.50%	$0.24	$0.19		$0.05			$0.00
Controls	12	Control Cabling	Unplanned Outage - HV (Controls)	$0.30	Failure	$3.64	6.50%	$0.24	$0.19		$0.05			$0.00
Low Voltage AC Supply	2	AC Low Voltage Board/Panel/Box	Uncontrolled Electrical Contact / Discharge (Low Voltage AC Supply)	$0.53	Failure	$1.05	31.00%	$0.33	$0.15		$0.17	$0.01		$0.00
Low Voltage AC Supply	2	AC Low Voltage Board/Panel/Box	Unplanned Outage - HV (Low Voltage AC Supply)	$0.94	Failure	$1.88	31.00%	$0.58	$0.41		$0.17			$0.00
Low Voltage AC Supply	2	AC Low Voltage Cable	Uncontrolled Electrical Contact / Discharge (Low Voltage AC Supply)	$0.53	Failure	$1.05	3.20%	$0.03	$0.02		$0.02	$0.00		$0.00
Low Voltage AC Supply	2	AC Low Voltage Cable	Unplanned Outage - HV (Low Voltage AC Supply)	$0.94	Failure	$1.88	3.20%	$0.06	$0.04		$0.02			$0.00
Low Voltage DC Supply	2	DC Low Voltage Board/Panel/Box	Uncontrolled Electrical Contact / Discharge (Low Voltage DC Supply)	$0.27	Failure	$0.54	2.00%	$0.01	$0.01		$0.00	$0.00		$0.00
Low Voltage DC Supply	2	DC Low Voltage Board/Panel/Box	Unplanned Outage - HV (Low Voltage DC Supply)	$0.25	Failure	$0.50	2.00%	$0.01	$0.01		$0.00			$0.00
Low Voltage DC Supply	2	DC Low Voltage Cable	Uncontrolled Electrical Contact / Discharge (Low Voltage DC Supply)	$0.27	Failure	$0.54	2.00%	$0.01	$0.01		$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	2	DC Low Voltage Cable	Unplanned Outage - HV (Low Voltage DC Supply)	$0.25	Failure	$0.50	2.00%	$0.01	$0.01		$0.00			$0.00
Metering	8	Meter	Failed Compliance Obligations (Metering)	$0.11	Failure	$0.89	4.40%	$0.04			$0.04			
Protection	12	Protection	Unplanned Outage - HV (Protection)	$0.34	Failure	$4.13	5.51%	$0.23	$0.16		$0.07			$0.00
Protection	12	Protection Relay	Explosive Failure of Asset (Protection)	$0.65	Failure	$7.77	5.51%	$0.43	$0.22		$0.02	$0.00	$0.03	$0.15
				$6.70		$30.05		$2.40	$1.58		$0.61	$0.02	$0.03	$0.15

Total VCR Risk: $1.46 Total ENS Risk: $0.04