

# NEED/OPPORTUNITY STATEMENT (NOS)

Regentville Secondary Systems Renewal

NOS 000000001258 revision 2.0



**Ellipse Project no.:** P0005381

**TRIM file:** [TRIM No]

**Project Reason:** Capability - Asset Replacement for end-of-life condition

**Project Category:** Prescribed - Replacement

## Approvals

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<b>Endorsed</b>	Mark Jones	Secondary Systems and Communications Asset Manager
<b>Approved</b>	Lance Wee	M/Asset Strategy
<b>Date submitted for approval</b>	30 November 2016	

## Change history

Revision	Date	Amendment
0	27 April 2016	Initial issue
1	11 October 2016	Update to 2016/17 dollars
2	30 November 2016	Update to format

## 1. Background

Regentville 330/132kV Substation comprises 2x 330kV feeders, 2x 330/132/11kV transformers, 5x 132kV feeders and 2x 132kV capacitor banks. The site was established in 1997, and the secondary systems assets have install dates between 1992 and 2014.

Regentville substation is a customer connection point supplying Endeavour Energy's 132kV network in an area which contains the Nepean Hospital and Richmond RAAF Air Base. The site will remain a connection point to Endeavour Energy into the foreseeable future as outlined in the load forecasts of the 2015 Annual Planning Report.

## 2. Need/opportunity

In accordance with TransGrid's Renewal and Maintenance Strategies for Automation<sup>1</sup> and Metering Systems<sup>2</sup>, **Error! Reference source not found.** shows the assets at Regentville Substation that have been identified for replacement by 2023.

**Table 1 - Identified Asset Replacements at Regentville Substation 2014-2023**

Need Description	Quantity of Assets to be addressed	% of services at Site	Need Driver
Need ID 605 - Replacement of Quadramho Protection Relays	4	29% of all line/feeder protections on site	<ul style="list-style-type: none"> <li>&gt; Component obsolescence resulting in a lack of spares and no manufacturer support</li> <li>&gt; Relay on occasion is stuck in a logic loop rendering it inoperative</li> </ul>
Need ID 607 - Replacement of 7SA513 Protection Relays	5	36% of all line/feeder protections on site	<ul style="list-style-type: none"> <li>&gt; Component obsolescence resulting in a lack of spares and no manufacturer support</li> </ul>
Need ID 608 - Replacement of 7SD511 Protection Relays	1	7% of all line/feeder protections on site	<ul style="list-style-type: none"> <li>&gt; Component obsolescence resulting in a lack of spares and no manufacturer support</li> <li>&gt; Relays experiencing regular communication signalling failures reducing their reliability</li> </ul>
Need ID 615 - Replacement of LFZP112 Protection Relays	2	14% of all line/feeder protections on site	<ul style="list-style-type: none"> <li>&gt; Component obsolescence resulting in a lack of spares and no manufacturer support</li> <li>&gt; Defect rate is increasing</li> </ul>

<sup>1</sup> Refer SSA Strategy - Renewal and Maintenance - Automation Systems

<sup>2</sup> Refer SSA Strategy - Renewal and Maintenance - Metering Systems

Need Description	Quantity of Assets to be addressed	% of services at Site	Need Driver
Need ID 602 - Replacement of RADSBS Protection Relays	2	50% of all transformer protections on site	<ul style="list-style-type: none"> <li>&gt; Component obsolescence resulting in a lack of spares and no manufacturer support</li> <li>&gt; Inaccurate measurement of fault angles due to deteriorated internal components</li> </ul>
Need ID 630 - Replacement of Siemens 7EC Meters	4	100% of all market Meters on site	<ul style="list-style-type: none"> <li>&gt; Component obsolescence resulting in a lack of spares and no manufacturer support</li> <li>&gt; Relays displaying accuracy drift issues</li> </ul>
Need ID 629 - Replacement of Remote Terminal Units (RTU)	Site wide Replacement	100%	<ul style="list-style-type: none"> <li>&gt; Component obsolescence resulting in a lack of spares and no manufacturer support</li> </ul>
Need ID 1386 – Protection - Transformer Diff Condition	2	50% of all transformer protections on site	<ul style="list-style-type: none"> <li>&gt; Component obsolescence resulting in a lack of spares and no manufacturer support</li> <li>&gt; Parts are cannibalised from equally aged relays</li> </ul>

Additionally, condition assessments for all these individual asset types have been completed<sup>3</sup>.

The risk cost associated with the secondary systems is \$5.18m 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 237MW 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. Regentville Substation forms part of the 330kV backbone and carries a risk of a system black 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<sup>4</sup>, an opportunity exists to address these risks by performing a full secondary system replacement at Regentville (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

<sup>3</sup> Refer NACA-SSAP - Protection, NACA-SSAM - Metering, NACA-SSAC - Control

<sup>4</sup> Refer SSA Strategy - Renewal and Maintenance - Secondary Systems Site Installations

- > Upgrading Transformer Control facilities to allow better control, indication and fault analysis than what is currently available at the site
- > Upgrading to modern design philosophies to reduce operational and maintenance requirements at the site

### 3. Related needs/opportunities

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The following related needs contained works for Regentville that could be fulfilled by completing a Secondary Systems Replacement:

- > Need ID 605 - Replacement of Quadramho (SHPM) Protection Relays
- > Need ID 607 - Replacement of 7SA513 Protection Relays
- > Need ID 608 - Replacement of 7SD511 Protection Relays
- > Need ID 615 - Replacement of LFZP112 Protection Relays
- > Need ID 602 - Replacement of RADS B Protection Relays
- > Need ID 630 - Replacement of Siemens 7EC Meters
- > Need ID 629 - Replacement of Remote Terminal Units (RTU)
- > Need ID 1386 – Protection - Transformer Diff Condition

### 4. Recommendation

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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: Regentville Secondary Systems Renewal

Option Name: 1258 - Base Case

Option Assessment Name: 1258 - Base Case - Assessment 1

Rev Reset Period: Next (2018-23)



Major Component	No.	Minor Component	Sel. Hazardous Event	LoC x CoF (\$M)	Failure Mechanism	NowLoC 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	1	Battery	Uncontrolled Electrical Contact / Discharge (Battery and Charger System)	\$0.76	Failure	\$0.76	9.00%	\$0.07	\$0.07	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Battery and Charger System	1	Battery	Unplanned Outage - HV (Battery and Charger System)	\$0.75	Failure	\$0.75	9.00%	\$0.07	\$0.07	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Battery and Charger System	1	Charger	Uncontrolled Electrical Contact / Discharge (Battery and Charger System)	\$0.76	Failure	\$0.76	9.00%	\$0.07	\$0.07	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Battery and Charger System	1	Charger	Unplanned Outage - HV (Battery and Charger System)	\$0.75	Failure	\$0.75	9.00%	\$0.07	\$0.07	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Controls	14	Bay Controller	Unplanned Outage - HV (Controls)	\$0.81	Failure	\$11.30	6.50%	\$0.73	\$0.68	\$0.06	\$0.06	\$0.06	\$0.06	\$0.00
Controls	14	Control Cabling	Unplanned Outage - HV (Controls)	\$0.81	Failure	\$11.30	6.50%	\$0.73	\$0.68	\$0.06	\$0.06	\$0.06	\$0.06	\$0.00
Low Voltage AC Supply	1	AC Low Voltage Board/Panel/Box	Uncontrolled Electrical Contact / Discharge (Low Voltage AC Supply)	\$1.10	Failure	\$1.10	31.00%	\$0.34	\$0.23	\$0.11	\$0.11	\$0.00	\$0.00	\$0.00
Low Voltage AC Supply	1	AC Low Voltage Board/Panel/Box	Unplanned Outage - HV (Low Voltage AC Supply)	\$2.54	Failure	\$2.54	31.00%	\$0.79	\$0.68	\$0.11	\$0.11	\$0.00	\$0.00	\$0.00
Low Voltage AC Supply	1	AC Low Voltage Cable	Uncontrolled Electrical Contact / Discharge (Low Voltage AC Supply)	\$1.10	Failure	\$1.10	3.00%	\$0.03	\$0.02	\$0.01	\$0.01	\$0.00	\$0.00	\$0.00
Low Voltage AC Supply	1	AC Low Voltage Cable	Unplanned Outage - HV (Low Voltage AC Supply)	\$2.54	Failure	\$2.54	3.00%	\$0.08	\$0.07	\$0.01	\$0.01	\$0.00	\$0.00	\$0.00
Low Voltage DC Supply	2	DC Low Voltage Board/Panel/Box	Uncontrolled Electrical Contact / Discharge (Low Voltage DC Supply)	\$0.76	Failure	\$1.52	2.00%	\$0.03	\$0.03	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Low Voltage DC Supply	2	DC Low Voltage Board/Panel/Box	Unplanned Outage - HV (Low Voltage DC Supply)	\$0.76	Failure	\$1.51	2.00%	\$0.03	\$0.03	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Low Voltage DC Supply	2	DC Low Voltage Cable	Uncontrolled Electrical Contact / Discharge (Low Voltage DC Supply)	\$0.76	Failure	\$1.52	2.00%	\$0.03	\$0.03	\$0.00	\$0.00	\$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)	\$0.76	Failure	\$1.51	2.00%	\$0.03	\$0.03	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
Metering	4	Meter	Failed Compliance Obligations (Metering)	\$0.11	Failure	\$0.45	2.80%	\$0.01	\$0.01	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
Protection	4	Protection	Unplanned Outage - HV (Protection)	\$0.85	Failure	\$3.39	3.35%	\$0.11	\$0.10	\$0.01	\$0.01	\$0.00	\$0.00	\$0.00	
Protection	4	Protection Relay	Explosive Failure of Asset (Protection)	\$11.48	Failure	\$45.90	3.35%	\$1.54	\$0.41	\$1.12	\$0.00	\$0.00	\$0.00	\$0.00	
Protection - 132kV	9	Protection	Unplanned Outage - HV (Protection - 132kV)	\$0.85	Failure	\$7.64	2.35%	\$0.18	\$0.16	\$0.02	\$0.00	\$0.00	\$0.00	\$0.00	
Protection - 132kV	9	Protection Relay	Explosive Failure of Asset (Protection - 132kV)	\$1.13	Failure	\$10.13	2.35%	\$0.24	\$0.20	\$0.03	\$0.00	\$0.00	\$0.00	\$0.00	
				\$29.38					\$5.18	\$3.60	\$1.56	\$0.01	\$0.00	\$0.01	\$0.01

Total VCR Risk: \$3.54      Total ENS Risk: \$0.00