

# NEED/OPPORTUNITY STATEMENT (NOS)



Deniliquin Secondary Systems Renewal

NOS- 00000001191 revision 2.0

**Ellipse project no.:** P0005261

**TRIM file:** [TRIM No]

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

**Project category:** Prescribed - Replacement

## Approvals

<b>Author</b>	Annie Welvaert	Secondary Systems Analyst
<b>Endorsed</b>	Mark Jones	Secondary Systems and Communications Asset Manager
	Azil Khan	Investment Analysis Manager
<b>Approved</b>	Lance Wee	M/Asset Strategy
<b>Date submitted for approval</b>	9 November 2016	

## Change history

Revision	Date	Amendment
0	27 June 2016	Initial issue
1	4 October 2016	Update to 2016/17 dollars
2	9 November 2016	Update to format

## 1. Background

Deniliquin 132/66kV Substation comprises of 2x 132kV feeders, 2x 132/66/11kV transformers, 5x 66kV feeders, and 3x 66kV capacitors. The site was established in 1970 and the secondary systems assets have install dates between 1970 and 2007.

Deniliquin Substation is a customer connection point supplying Essential Energy in the Deniliquin area which is mainly irrigation and rice farming. The site will remain a connection point to Essential Energy for 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<sup>1</sup> and Metering Systems<sup>2</sup>, Table 1 shows the assets at Deniliquin that have been identified for replacement by 2023.

**Table 1 – Identified asset replacements at Deniliquin 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	1	7% of all line/feeder protection relays 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 1380 – Schweitzer SELxxx Condition	1	7% of all line/feeder protection relays on site	<ul style="list-style-type: none"> <li>&gt; Component obsolescence resulting in a lack of spares and limited manufacturer support</li> </ul>
Need ID 1376 – Replacement of Alstom Pxxx Protection Relays	3	21% of all line/feeder protection relays 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; End of asset life</li> </ul>
Need ID 1356 – Replacement of OHx Protection Relays	1	7% of all line/feeder protection relays on site	<ul style="list-style-type: none"> <li>&gt; Component obsolescence resulting in lack of spares and no manufacturer support</li> <li>&gt; End of asset life</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 621 – Replacement of DB Series Protection Relays	4	100% of all transformer protection relays 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; Faulty harmonic bias circuitry due to component failure</li> <li>&gt; Internal wiring connection problems</li> </ul>
Need ID 1383 – Replacement of GE FV2 Protection Relays	6	100% of all busbar protection relays on site	<ul style="list-style-type: none"> <li>&gt; Degradation of plastic components causing mechanical failure of the pickup adjusting mechanism</li> <li>&gt; Component obsolescence resulting in a lack of spares and no manufacturer support</li> </ul>
Need ID 1387 – Replacement of Capacitor Protection Relays	6	100% of all capacitor protection relays on site	<ul style="list-style-type: none"> <li>&gt; Prone to excessive mechanical wear under certain situations, potentially causing a slow rest</li> <li>&gt; Component obsolescence resulting in a lack of spares and no manufacturer support</li> </ul>
Need ID 610 – Replacement of EDM I MK3 Energy Meters	4	100% of all market meters on site	<ul style="list-style-type: none"> <li>&gt; Microprocessor Energy Meters failing as they approach 15 years of life</li> <li>&gt; Component obsolescence resulting in a lack of spares and no manufacturer support</li> </ul>

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

The risk cost associated with all secondary systems at Deniliquin is \$3.35m per annum. The most significant element of concern is an unplanned outage of the HV system due to a fault on the LV AC system. There is a mixed customer load at the site with a forecast 41MW as the average of summer and winter loads in the Transmission Annual Planning Report and an estimated 8 hours to recover the site and the load after a hazardous incident. 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 consequences 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 Deniliquin (as listed

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

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

in the risk summary in Attachment 1). This opportunity is expected to 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. Related Needs/opportunities

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

- > Need ID 606 – Replacement of THR Protection Relays
- > Need ID 1380 – Schweitzer SELxxx Condition
- > Need ID 1376 – Replacement of Alstom Pxxx Protection Relays
- > Need ID 1356 – Replacement of OHx Protection Relays
- > Need ID 621 – Replacement of DB Series Protection Relays
- > Need ID 1383 – Replacement of GE FV2 Protection Relays
- > Need ID 1387 – Replacement of Capacitor Protection Relays
- > Need ID 610 – Replacement of EDMI MK3 Energy Meters

### 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: Deniliquin Secondary Systems Renewal

Option Name: 1191 - Base Case

Option Assessment Name: 1191 - 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)	\$0.53	Failure	\$1.05	9.20%	\$0.10	\$0.09	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Battery and Charger System	2	Battery	Unplanned Outage - HV (Battery and Charger System)	\$0.51	Failure	\$1.02	9.20%	\$0.09	\$0.09	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Battery and Charger System	2	Charger	Uncontrolled Electrical Contact / Discharge (Battery and Charger System)	\$0.53	Failure	\$1.05	9.20%	\$0.10	\$0.09	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Battery and Charger System	2	Charger	Unplanned Outage - HV (Battery and Charger System)	\$0.51	Failure	\$1.02	9.20%	\$0.09	\$0.09	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Controls	4	Bay Controller	Unplanned Outage - HV (Controls)	\$0.21	Failure	\$0.86	1.83%	\$0.02	\$0.01	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Controls	4	Control Cabling	Unplanned Outage - HV (Controls)	\$0.21	Failure	\$0.86	1.83%	\$0.02	\$0.01	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Low Voltage AC Supply	2	AC Low Voltage Board/Panel/Box	Uncontrolled Electrical Contact / Discharge (Low Voltage AC Supply)	\$0.77	Failure	\$1.54	31.00%	\$0.48	\$0.31	\$0.17	\$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)	\$1.77	Failure	\$3.54	31.00%	\$1.10	\$0.93	\$0.17	\$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)	\$0.77	Failure	\$1.54	3.20%	\$0.05	\$0.03	\$0.02	\$0.00	\$0.00	\$0.00	\$0.00
Low Voltage AC Supply	2	AC Low Voltage Cable	Unplanned Outage - HV (Low Voltage AC Supply)	\$1.77	Failure	\$3.54	3.20%	\$0.11	\$0.10	\$0.02	\$0.00	\$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)	\$0.51	Failure	\$1.02	2.00%	\$0.02	\$0.02	\$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)	\$0.51	Failure	\$1.02	2.00%	\$0.02	\$0.02	\$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)	\$0.51	Failure	\$1.02	2.00%	\$0.02	\$0.02	\$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)	\$0.51	Failure	\$1.02	2.00%	\$0.02	\$0.02	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
LV AC Cable Safety	1	AC Low Voltage Cable	Uncontrolled Electrical Contact / Discharge (LV AC Cable Safety)	\$3.00	Failure	\$3.00	30.00%	\$0.90	\$0.00	\$0.00	\$0.00	\$0.90	\$0.00	\$0.00
LV DC Cable Safety	1	DC Low Voltage Cable	Uncontrolled Electrical Contact / Discharge (LV DC Cable Safety)	\$0.18	Failure	\$0.18	30.00%	\$0.05	\$0.00	\$0.00	\$0.00	\$0.05	\$0.00	\$0.00
Metering	3	Meter	Failed Compliance Obligations (Metering)	\$0.11	Failure	\$0.34	4.40%	\$0.01	\$0.00	\$0.00	\$0.01	\$0.00	\$0.00	\$0.00
Protection <=132kV	15	Protection	Unplanned Outage - HV (Protection <=132kV)	\$0.23	Failure	\$3.47	2.43%	\$0.08	\$0.05	\$0.05	\$0.04	\$0.04	\$0.00	\$0.00
Protection <=132kV	15	Protection Relay	Explosive Failure of Asset (Protection <=132kV)	\$0.19	Failure	\$2.78	2.43%	\$0.07	\$0.05	\$0.05	\$0.01	\$0.00	\$0.00	\$0.00
				\$13.33		\$29.86		\$3.35	\$1.94	\$0.46	\$0.95	\$0.00	\$0.00	\$0.00
<b>Total VCR Risk:</b>				<b>\$1.93</b>			<b>Total ENS Risk:</b>	<b>\$0.00</b>						