

NEED/OPPORTUNITY STATEMENT (NOS)



Macarthur 66 kV Line Switchbay for Endeavour Energy
Connection of New Menangle Park Zone Substation

NOS- 000000001437 revision 4.0

Ellipse project description: Macarthur 66 kV Line Switchbay for Endeavour Energy Connection of New Menangle Park Zone Substation

TRIM file: [TRIM No]

Project reason: Reliability - To meet connection point reliability requirements

Project category: Prescribed - Connection

Approvals

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Reviewed	Charbel Lahoud	Engineer
Endorsed	Vincent Ong	Network and Connection Analysis Manager
	Azil Khan	Investment Analysis Manager
Approved	Nalin Pahalawaththa	M/PSA
Date submitted for approval	8 December 2016	

Change history

Revision	Date	Amendment
0	6/05/2016	Initial Issue
1	09/05/2016	Formatting changes
2	23/05/2016	Updated load at risk
3	27/10/2016	Formatting changes and updates to risk cost
4		Clarified all risk cost breakdowns

1. Background

TransGrid's Macarthur 330/132/66 kV Substation is supplied via two 330 kV lines from Kemps Creek and Avon. The substation supplies Endeavour Energy's (Endeavour's) 132 kV and 66 kV network. Macarthur Substation has one 330/132 kV transformer tail-ended to Endeavour's 9L1 Nepean feeder, and one 330/66 kV transformer connected to the 66 kV busbar supplying Endeavour's loads at Douglas Park, Ambarvale, Nepean and Campbelltown.

Figure 1 on page 5 shows the high voltage operating diagram (HVOD) of Macarthur Substation.

Through the joint planning (JP) process, Endeavour Energy has informed TransGrid that it plans to establish two new zone substations (ZSs) to meet the supply needs of the NSW Department of Planning and Infrastructure's (DPI's) proposed new developments under its [Greater Macarthur Land Release](#).

The precinct development plans are as follows:

- > Menangle Park, which is forecasted to take load of 1 MVA from Summer 2019/20, increasing to 4 MVA by 2023 and 10 MVA by 2026. This Need is covered in this NOS-1437.
- > Mt Gilead, which is forecasted to take load of 6 MVA from 2021, increasing to 8 MVA by 2023 and 14 MVA by 2026. This Need is covered in NOS-1444.

2. Need/opportunity

The expected Need date for Menangle Park ZS to take initial supply via a new line connection and new switchbay from Macarthur Substation is in 2019/20. The timing is to be confirmed with Endeavour Energy through the JP process.

2.1 Risks

The National Electricity Rules (NER) clause 5.14 – Joint Planning requires TransGrid (and Endeavour Energy) to jointly plan their regional electricity network. In this case, should TransGrid not participate with Endeavour Energy in addressing this Need, it would be violating this statutory obligation.

A further risk of not addressing this Need is a loss of load, that is, unserved energy (USE), at the new Menangle Park development due to electricity supply not being provided as required.

The load at risk which is being assessed here is the forecast peak load of 4 MVA in 2023 at Menangle Park¹, multiplied by a load factor of 0.8. As Menangle Park is a new development and there is no load data available yet, the 0.8 factor is used as a reasonable estimate of the likely average demand over summer 2022/23.²

Assuming a load power factor of 0.95 (minimum NER requirement under clause S5.3.5), this equates to $4 * 0.95 * 0.8 = 3.04$ MW.

The risk cost of not addressing this Need is therefore composed of the following components:

- > exposing customer load of 3.04 MW to risk of being unsupplied.
- > damage to TransGrid's reputation (negative media coverage).
- > litigation by customers/consumer groups.

The total cost of these risks has been calculated in TransGrid's Investment Risk Tool thus:

¹ Endeavour Energy, *Menangle Park – Update to Preliminary Business Case*, August 2016, [Endeavour Energy Letter](#) attachment 3. A snapshot of the load in 2023 is being used as this is the last year of the 2018/19-2022/23 revenue period.

² Load factor = average demand / maximum demand over the period assessed.

VCR Risk Cost (Unserviced Energy)

$VCR \text{ risk cost} = \text{load at risk} * \text{probability of Menangle Park going unsupplied for one day}^3 * VCR^4$

$\therefore VCR \text{ risk cost} = 3.04 \text{ MW} * 24 \text{ hrs} * \$38,350/\text{MWh}$

$\therefore VCR \text{ risk cost} = \$2.8 \text{ million per annum}$

Reliability Risk Cost

$Reliability \text{ risk cost} = VCR \text{ risk cost} + \text{litigation costs}$

$\therefore Reliability \text{ risk cost} = \$2.8\text{m} + \$0.01\text{m}^5 = \$2.81 \text{ million per annum}$

Financial Risk Cost

$Financial \text{ risk cost} = \text{internal investigation costs} = \$10,000^6$

Reputational Risk Cost

$Reputational \text{ risk cost} = \text{external consultations \& communications costs} = \$33,000^7$

Total Risk Cost

$Total \text{ risk cost} = Reliability \text{ risk cost} + Financial \text{ risk cost} + Reputational \text{ risk cost}$

$\therefore Total \text{ risk cost} = \$2.85 \text{ million per annum}$

A risk-cost summary extract from the Investment Risk Tool appears in Attachment 1.

3. Related needs/opportunities

The following Needs at Macarthur BSP have similar Need dates and consideration should be given to packaging all emerging works into a single project, if possible:

- > Need 1444 – Macarthur 66 kV Line Switchbay (Mt Gilead ZS) – Need Date 2021.

This switchbay will be needed to supply the proposed Mt Gilead ZS, which has been identified as another distribution supply point for the Greater Macarthur Land Release.

- > Need 1438 – Constraints in Endeavour Energy's 132 kV Network between Macarthur and Nepean – Need Date 2020.

The nature of the constraint is an overloading of Endeavour's two 120 MVA 132/66 kV transformers following a forced outage of TransGrid's single existing 330/66 kV transformer at Macarthur Substation. Options are being developed and evaluated jointly by TransGrid and Endeavour to determine the most cost-effective option to address the constraint.

³ This is a snapshot of the risk cost during a single day of summer 2022/23.

⁴ TransGrid's Investment Risk Tool bases the Value of Customer Reliability (VCR) on figures published by AEMO in its *Value of Customer Reliability Review - Final Report*, September 2014. In this case we use the mixed residential/industrial figure of \$38,350/MWh.

⁵ This component is an assumed litigation risk cost of this event.

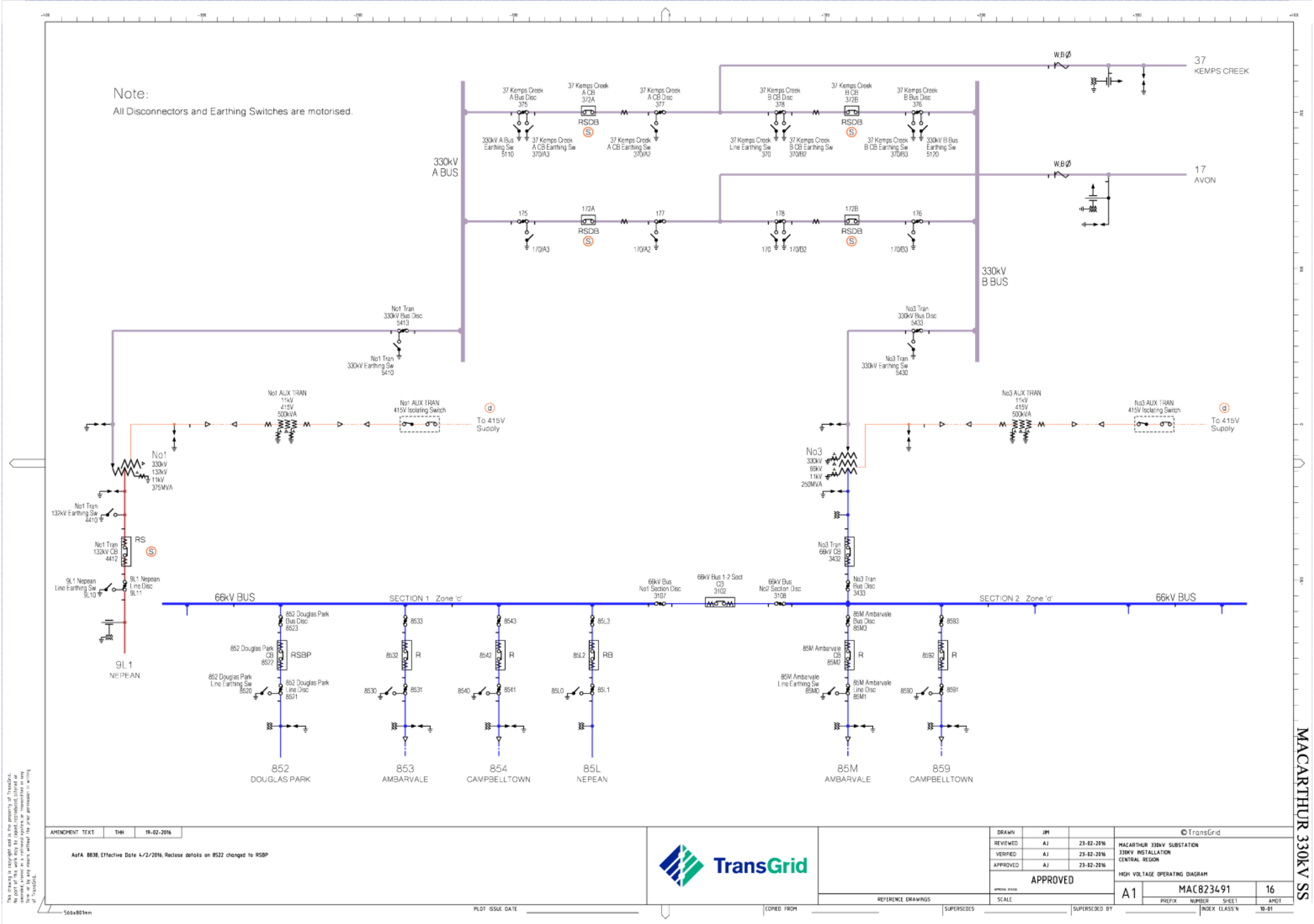
⁶ This component is an assumed financial risk cost of this event.

⁷ This component is an assumed reputational risk cost of this event.

4. Recommendation

It is recommended that options be considered to address the identified need by summer 2019/20.

Figure 1: Macarthur 330/132 kV Substation High Voltage Operating Diagram



Attachment 1 Risk Cost Summary

Current Option Assessment - Risk Summary

Project Name: Macarthur 66 kV Line Switchbay (Menangle Park ZS Connection)

Option Name: 1437 - Base Case

Option Assessment Name: 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)
Line switchbay	1	Electrical	Unplanned Outage - HV (Line switchbay)	\$2.85	Failure	\$2.85	100.00%	\$2.85	\$2.81		\$0.01			\$0.03
				\$2.85		\$2.85		\$2.85	\$2.81		\$0.01			\$0.03

Total VCR Risk: \$2.80

Total ENS Risk: \$0.00