

OPTIONS EVALUATION REPORT (OER)

Yanco Sub Low 33kV Busbar Clearance

OER 000000001606 revision 1.0



Ellipse project description:

TRIM file: [TRIM No]

Project reason: Compliance - Regulatory obligation

Project category: Prescribed - Security/Compliance

Approvals

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1. Need/opportunity

Yanco Substation is located at Yanco in the Riverina. The substation is connected to the 132 kV network through lines to Wagga, Darlington Point, Griffith and Uranquinty and supplies the surrounding area through five 33 kV connections.

The 33kV bus at Yanco Substation does not meet TransGrid Design Safety Clearances and does not meet clearances required under AS2067 at 33 kV busbar earthing stirrups (Refer to the need statement for details). This need should be addressed by 2020.

2. Related needs/opportunities

No related needs/opportunities have been identified.

3. Options

Base case

The base case is to do nothing and accept the risk associated with the reduced busbar clearance. The base case risk is \$14,540 per annum.

Option A — Administrative controls

In this option, the risks associated with the low busbar clearance are managed using administrative controls only. This is the lowest level of control in the hierarchy of controls and is hence the least preferred method for reducing the risk. In addition, this method may place restrictions on the work that can be performed on site.

It is noted that this option does not meet TransGrid's obligations to meet the design safety clearances of AS 2067. This option would therefore leave TransGrid liable under the NSW Work Health and Safety Regulation 2011 for not meeting safety in design requirements. As such, this option has been withdrawn.

Option B — Raising the existing busbar <OFR 1606B, OFS [1606B](#)>

In this option, the busbar would be raised by replacing the rigid busbar section with flexible conductors, including the following works:

- > Replacing the bus section 2-3 rigid busbar with flexible conductors
- > Lifting the busbar and attached insulators using cranes
- > Installing structure extensions at the top of structures, lowering busbars and insulators to complete installation
- > Replace all existing flexible connections due to new busbar height

This option is expected to require a total capital cost of \$553k, which has been estimated from a scope of work determined by a limited review of the project. This option is expected to eliminate the identified risks.

Option C — Installing a new modular switchboard <OFR 1606C>

In this option, a 33 kV modular indoor switchboard would be installed and existing services cabled to the new board. It is noted that secondary systems equipment is new on the 33 kV primary plant at Yanco.

This option is expected to require a total capital cost of approximately \$10m, which is a preliminary estimate based on a limited review of the option. As the capital cost of this option is nearly twenty times the cost of Option B, it has been withdrawn.

Option D — Removing low earth stirrups <OFR 1606D, OFS [1606D](#)>

This option is to remove the low earth stirrups and install earthing switches to provide the earthing function. This option would meet the design requirements of AS 2067 but would not meet internal design standards.

As the clearance violations are not only from the earth stirrup but also the disconnector insulator terminals, this option does not provide adequate clearance. This option has therefore been withdrawn as it is not technically feasible.

4. Evaluation

Option B, Option C and Option D have been found to be not feasible as per the above. The commercial evaluation of the technically feasible options is set out in Table 1.

Table 1

Option	Description	Capex (\$m)	Opex (\$m)	Post project risk cost (\$m)	NPV (\$m)	Rank
Base case	Do nothing	-	-	0.02	-	-
B	Raising the existing busbar	0.55	0.00	0.00	(0.36)	1

The commercial evaluation is based on a discount rate of 10%, discounted to June 2019. Table 2 below provides a sensitivity analysis based on TransGrid's current AER-determined pre-tax real regulatory WACC of 6.75% and an upper bound of 13%.

Table 2: Economic NPV Sensitivity Analysis

Option	Description	NPV with Discount Rate of 13% (16/17 \$m)	NPV with Discount Rate of 6.75% (16/17 \$m)
Base case	Do nothing	-	-
B	Raising the existing busbar	(0.36)	(0.34)

ALARP Evaluation

Options to reduce the network safety risk as per the risk treatment hierarchy have been considered in other lifecycle stages of the asset, and it has been determined that no reasonably practicable options exist to reduce the risk further than those capital investment options listed in **Error! Reference source not found..**

Evaluation of the proposed options has been completed against the SFAIRP (So Far As Is Reasonably Practicable)/ALARP (As Low As Reasonably Practical) obligation, as required by the Electricity Supply (Safety and Network Management) Regulation 2014 and the Work Health and Safety Act 2011. The Key Hazardous Events and the disproportionality multipliers considered in the evaluation are as follows:

- Catastrophic failure of asset/uncontrolled discharge or contact with electricity/ unauthorised access to site - 3 times the safety risk and 10% of the reliability risk (applicable to safety)
- Unplanned outage of HV equipment - 10% of the reliability risk (applicable to safety)

The results of this evaluation is summarised in the tables below:

Table 1: Feasible Options

Option	Description	CAPEX (\$k)	Expected Life (yr)	Annualised CAPEX (\$k)
Base	Do nothing	N/A	N/A	N/A
B	Raising the existing busbar	553k	25	22k

Table 4: Annual Risk Calculations

Options	Annual Residual Risk		Annual Risk Savings	
	Safety Risk (\$k)	Reliability Risk (\$k)	Safety Risk (\$k)	Reliability Risk (\$k)
Base Case	14.5	0	N/A	N/A
B	0	0	14.5	0

Table 5: Reasonably Practicable Test

Option	Description	Network Safety Risk Reduction ¹ (\$k)	Annualised CAPEX (\$k)	Reasonably practicable ²
B	Raising the existing busbar	43.6	22	Yes

Note 1: The Network Safety Risk Reduction is calculated as 3 x Safety Risk Reduction + 0.1 x Reliability Risk Reduction. No bushfire risk is applicable for the consequences considered

Note 2: Reasonably practicable is defined as whether the annualised CAPEX is less than the Network Safety Risk Reduction

Preferred Option

Although Option B's NPV is negative, this option passes the ALARP test and therefore, the preferred option is Option B.

Capital and operating expenditure

There are no other ongoing capital expenditure considerations beyond the initial project to raise the busbar height.

Regulatory Investment Test

A RIT-T is not required as this is an asset replacement project with no augmentation component.

5. Recommendation

Based on the ALARP test, it is recommended that Option B be scoped in detail to allow for implementation.