

# OPTIONS EVALUATION REPORT (OER)



Making The Grid More Resilient - Increase Ratings of TL 051

OER 00000001540 revision 2.0

**Ellipse project description: Increase Ratings of TL 051**  
**TRIM file: [TRIM No]**

**Project reason:** Economic Efficiency - Network developments to achieve market benefits  
**Project category:** Prescribed - NCIPAP

## Approvals

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<b>Reviewed / Endorsed</b>	Jahan Peiris	Network Modelling & Performance Manager
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<b>Approved</b>	Andrew Kingsmill	Manager/Power System Analysis
<b>Date submitted for approval</b>	4 November 2016	

## 1. Need/opportunity

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As detailed in NOS-1540, the 330 kV line O51, from Lower Tumut to Wagga, forms part of the Snowy – NSW – Victoria 330kV power transmission network. A network constraint and limitation of transfer capability can occur during system normal condition and outage of line 65 or line 66 in Snowy region due to line O51 ratings.

This NCIPAP project proposes to raise the CT ratio at Wagga 330 kV substation and replace the wave traps at Lower Tumut 330 kV substation to increase the ratings of line O51. This would realise the maximum benefit of transfer capability improvement, and minimise constraints and market costs.

## 2. Related needs/opportunities

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Nil.

## 3. Options

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### 3.1 Base Case

The base case under this Need is to “do nothing”.

#### Base Case Risk Cost

The base case risk is the constraining import from Victoria and cheap renewable generation from South Western NSW requiring thermal plant to meet the balance of generation. The higher cost of thermal generation increases the cost to the consumer and results in a negative market benefit.

### 3.2 Option A – Increase Rating of Line 051

This option required:

- > Replace the wave traps at Lower Tumut substation, and
- > Increase CT ratio at Wagga 330 kV substation.

This option has been assessed for feasibility in OFS-1540A. The estimated un-escalated capital cost of the option is \$0.3 million ± 25% in 2016-17 AUD.

#### Option Benefit

An option benefit can be estimated based on:

- > Increased capacity due to implementation of Option A = 228 MW of transfer capability<sup>1</sup>
- > Assumed 1 hour per month of constraint, and
- > Market impact due to NSW export limit binding<sup>2</sup> = \$15/MWh.

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<sup>1</sup> Based on the difference between present rating and the rating achieved if the Option A is implemented, line O51 rating to increase from 1143 MVA to 1371 MVA.

<sup>2</sup> Based on the difference between VIC Brown Coal variable costs and typical Renewable Generation bid price of \$0 (or less) – refer page 61 of Jacobs report “Retail electricity price history and projections.pdf” filed in PDGS supporting documents for VIC Brown Coal Price details. VIC price is expected to be at higher end following retirement of Hazelwood Coal Power Station. Hence, high -range Coal prices in VIC was used. Accordingly, Market impact = \$15 - \$0 = \$15.

$$\text{Benefit} = [(\text{additional transfer capability}) \times (\text{hours of constraint per month}) \times 12 \times (\text{price difference in generation})]$$

$$= \$228 \times 1 \times 12 \times 15 = \$41,040/\text{year}$$

### 3.3 Non-Network Option

No feasible non-network solutions have been identified to address this Need.

## 4. Evaluation

### Commercial Evaluation

Both the Base Case and Option A are technically feasible.

The commercial evaluation of the technically feasible options is summarised in Table 1.

The full financial and economic evaluations are shown in Appendix A.

**Table 1 – Options Comparison**

Option	Description	Capex (\$m) <sup>^#</sup>	Opex (\$m)	Yearly Post project risk cost (\$m)	NPV (\$m)	Rank
Base case	'Do nothing'	Nil	-	n/a	n/a	2
A	Remove secondary system and wave trap limitations on line O51	\$0.30*	\$0	-0.04	\$0.06	1

<sup>^</sup> In 2015-16 dollars

<sup>#</sup> Expenditure in 2019-21 period

\* Non-escalated cost

The commercial evaluation is based on:

- > A 10% discount rate, with sensitivities based on TransGrid's current AER-determined pre-tax real regulatory WACC of 6.75% for the lower bound and 13% for the upper bound provided in Appendix A.

The applied sensitivities on the discount rate give the following economic NPVs:

Discount Rate (%)	Economic NPV (2018/19 \$m)
6.75	0.19
13.00	-0.01

The preferred option is therefore Option A, as it improves TransGrid's risk exposure, and yields the most benefits, as calculated using TransGrid's NPV Calculation Tool and Risk Tool (refer Appendix A).

### Capital and operating expenditure

The yearly incremental operating expenditure is estimated to be \$0 as there is no change in operating cost between the base case and option A.

### **Regulatory Investment Test – Transmission (RIT-T)**

The preferred option is not subject to the RIT-T as it is below the \$6 million threshold required.

### **Net Present Value**

The NPV of this option is \$0.06 million on a standard discount rate of 10%.

The pay-back period is 7.31 years.

## **5. Recommendation**

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Based on the economic evaluation above, Option A is the preferred option to address the Need. It is therefore recommended that a NCIPAP project be initiated for the works to increase line 051 ratings over the 2018-23 period.

## Appendix A - Financial and Economic Evaluation Reports

Project\_Option Name

Increase Ratings of Line 051

### 1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	\$0.06m	NPV / Capital (Ratio)	0.20
NPV @ upper bound rate	13.00%	-\$0.01m	Pay Back Period (Yrs)	0.13 Yrs
NPV @ lower bound rate (WACC)	6.75%	\$0.19m	IRR%	12.53%

### 2. Economic Evaluation (includes VCR benefits but excludes tax benefits from non-cash transactions, ENS penalty and overall tax cost)

NPV @ standard discount rate	10.00%	\$0.06m	NPV / Capital (Ratio)	0.20
NPV @ upper bound rate	13.00%	-\$0.01m	Pay Back Period (Yrs)	7.31 Yrs
NPV @ lower bound rate (WACC)	6.75%	\$0.19m	IRR%	12.53%

### Benefits

	As Is	To Be	Benefit		
Risk cost				VCR Benefit	\$0.00m
Systems (reliability)	\$0.04m	\$0.00m	\$0.04m	ENS Penalty	\$0.00m
Financial	\$0.00m	\$0.00m	\$0.00m	All other risk benefits	\$0.04m
Operational/compliance	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$0.04m
People (safety)	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$0.04m
Environment	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
Reputation	\$0.00m	\$0.00m	\$0.00m	Benefits in the economic NPV**	\$0.04m
Total Risk benefits	\$0.04m	\$0.00m	\$0.04m	**excludes ENS penalty	
Cost savings and other benefits			\$0.00m		
Total Benefits			\$0.04m		

### Other Financial Drivers

Incremental opex cost pa (no depreciation)	\$0.00m	Write-off cost	\$0.00m
Capital - initial \$m	-\$0.30m	Major Asset Life (Yrs)	40.00 Yrs
Residual Value - initial investment	\$0.09m	Re-investment capital	\$0.00m
Capitalisation period	2.00 Yrs	Start of the re-investment period	0.00 Yrs

## Appendix B – Project Summary

Increase Ratings of Line 051	Replace Wave traps at Wagga substation and change CT ratio at Lower Tumut substation
Transmission Circuit / Injection Point	Wagga and Lower Tumut substations on Line 051
Scope of works	<p>The scope of works associated with this option includes the following:</p> <ul style="list-style-type: none"> <li>&gt; Replace the existing 2000 Amp wave trap at Lower Tumut substation with a wave trap rated 2400 Amp or higher</li> <li>&gt; Changing the respective CT core ratio for metering from 1600/1 to 2400/1 at Wagga 330 Substation</li> </ul>
Reasons to undertake the project	Increase ratings of line 051 to minimise constraints and market costs
Current value of the limit	Line wave trap limit to 1143 MVA (2000 amps)
Target limit	Replaced line wave trap improves the limit to 1371 MVA (2400 amps)
Capital Cost	<p>The total capital cost is \$0.30 million</p> <p>The NPV cost = \$0.06 million, using 10% WACC and 40<sup>3</sup>-year term</p>
Operating Cost	\$0 as there is no change in operating cost
Market benefits	Market benefit = \$0.041 million per year
Pay-back period	Pay-back period = 7.31 years
Completion date	Over the 2018-23 period

<sup>3</sup> Life of a wave-trap as advised by TransGrid/Project Services/Procurement/Equipment Technical Standards.