

OPTIONS EVALUATION REPORT (OER)

Installation of Transfer Tripping Scheme at Cooma

OER-1459 Revision 0



Ellipse project no(s):

TRIM file: [TRIM No]

Project reason: Economic Efficiency - Network developments to achieve market benefits

Project category: Prescribed - NCIPAP

Approvals

| | | |
|------------------------------------|------------------|---|
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| Endorsed | Jahan Peiris | Network Modelling & Performance Manager |
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| Date submitted for approval | 6 December 2016 | |

1. NEED/OPPORTUNITY

The 132 kV network supplying Cooma, Bega and Munyang consist of two 132 kV lines 978 and 97D from Williamsdale and Cooma. During the outage of line 978 or 97D, and the trip of the other in-service line would island Cooma, Munyang and Bega loads, and Boco Rock windfarm. The islanded system may then operate in an unstable manner.

The installation of a transfer tripping scheme at Cooma could be used to disconnect generation at Boco Rock on the event of an islanded situation following a contingent trip of line 978 or 97D following the outage of the other. This would enable Boco Rock wind farm to continue to operate during the outage of line 978 or 97D providing market benefits.

For details, refer to the Need/Opportunity Statement (NOS-1459).

2. RELATED NEEDS/OPPORTUNITIES

- Nil

3. OPTIONS

Base case

The base case is to maintain the present supply arrangement to Boco Rock windfarm.

Option A — Install transfer tripping scheme at Cooma

This option is to install a transfer tripping scheme at Cooma to be used to disconnect generation at Boco Rock wind farm in the event of an islanded situation following a contingent trip of line 978 or 97D during the outage of the in-service line. The scheme would allow Boco Rock to continue operation during the outage of line 978 or 97D. This would provide market benefits.

This option has been assessed for feasibility in OFS-1459A. The estimated un-escalated capital cost of the option is \$0.13 M \pm 25% in 2016-17.

Market Benefit Calculation

The market benefit of implementing a transfer tripping scheme to allow the Boco Rock wind farm to generate during an outage of line 978 or 97D lines per year is assessed based on the following assumptions:

- Boco Rock maximum output capacity is 113 MW
- Boco Rock is on average outputting 33% of its maximum capacity¹
- Planned outage rate: 1 in every 2 years per line for 24 hours²
- Forced outage rate: 0.3 per year per line for 24 hours³
- Average generation cost of thermal generation compared to renewable generation⁴ = \$25/MWh

¹ Typical plant factor for Wind Farm generators in NSW

² Based on TransGrid historical outage schedules

³ Based on TransGrid historical reliability statistics – refer file Reliability Analysis - Final Summary.xlsx in PDGS; 132 kV line – 3.9 failures per 100 km per decade, length of 978 = 73.8 km, 97D = 79.4 km, Average length for 978 and 97D = 76.6 km,

⁴ Based on the NSW Black Coal variable costs of \$25 – refer page 61 of Jacobs report “Retail electricity price history and projections.pdf” filed in PDGS supporting documents. Typical bid price for renewable (wind/solar) generation is either \$0 or negative. Accordingly, Market impact = \$25 - \$0 = \$25.

$$\begin{aligned}
\text{Market Impact} &= [(\text{planned outage rate}) \times (\text{planned outage duration}) \times (\text{number of lines}) + (\text{forced outage rate}) \times (\text{forced outage duration}) \times (\text{number of lines})] \times (\text{generation cost}) \times (\text{generation max. output}) \times (\text{generation average output factor}) \\
&= [(0.5 \times 24 \times 2) + (0.3 \times 24 \times 2)] \times 25 \times 113 \times 0.33 \\
&= \$35,800 / \text{year}
\end{aligned}$$

Using the above assumptions and calculation, the market benefits is assessed to be \$0.036 million per year.

4. EVALUATION

A single option was identified and is evaluated below against the base case.

The economic evaluation of the technically feasible options is set out in Table 1.

Table 1 – Options Comparison

| Option | Description | Capex (\$m) [^] # | Opex (\$m) | Post project risk cost (\$m) | NPV (\$m) | Rank |
|------------------|---|----------------------------|------------|------------------------------|-----------|------|
| Base case | 'Do nothing' | Nil | | -\$0.036 | | 2 |
| A | Install transfer tripping scheme at Cooma | \$0.13* | \$0 | \$0 | \$0.11 | 1 |

[^] In 2016-17 dollars

[#] Expenditure in 2018-19 period

* Non-escalated cost

The commercial evaluation is based on:

- > a 10% discount, 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 | 0.18 |
| 13.00 | 0.07 |

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

There is no capital and operating expenditure trade-offs associated with this option.

Regulatory Investment Test

No RIT-T is required for this project as the total cost is less than \$6 million.

Risk Cost Benefits

Option A would realise a risk cost benefit of \$0.036 million per annum.

Net Present Value

The NPV of this option is \$0.11 million based on a standard discount rate of 10%.

The pay-back period is 3.61 years.

5. Recommendation

Based on the economic evaluation above, Option A is the preferred option to address the Need as it yields a yearly benefits of \$ 0.036 million.

It is therefore recommended that a NCIPAP project be initiated for the replacement of line Cooma transfer trip scheme over the 2018-23 regulatory period.

Appendix A- Financial and Economic Evaluation Reports

| Project_Option Name | | | Installation of Transfer Tripping Scheme at Cooma | | |
|---|---------|---------|---|-----------------------------------|-----------|
| 1. Financial Evaluation (excludes VCR benefits) | | | | | |
| NPV @ standard discount rate | 10.00% | \$0.11m | NPV / Capital (Ratio) | 0.87 | |
| NPV @ upper bound rate | 13.00% | \$0.07m | Pay Back Period (Yrs) | 0.23 Yrs | |
| NPV @ lower bound rate (WACC) | 6.75% | \$0.18m | IRR% | 22.88% | |
| 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% | \$0.11m | NPV / Capital (Ratio) | 0.87 | |
| NPV @ upper bound rate | 13.00% | \$0.07m | Pay Back Period (Yrs) | 3.61 Yrs | |
| NPV @ lower bound rate (WACC) | 6.75% | \$0.18m | IRR% | 22.88% | |
| Benefits | | | | | |
| Risk cost | As Is | To Be | Benefit | VCR Benefit | \$0.00m |
| Systems (reliability) | \$0.00m | \$0.00m | \$0.00m | ENS Penalty | \$0.00m |
| Financial | \$0.00m | \$0.00m | \$0.00m | All other risk benefits | \$0.00m |
| Operational/compliance | \$0.00m | \$0.00m | \$0.00m | Total Risk benefits | \$0.00m |
| People (safety) | \$0.00m | \$0.00m | \$0.00m | | |
| Environment | \$0.00m | \$0.00m | \$0.00m | Benefits in the financial NPV* | \$0.04m |
| Reputation | \$0.00m | \$0.00m | \$0.00m | *excludes VCR benefits | |
| Total Risk benefits | \$0.00m | \$0.00m | \$0.00m | | |
| Cost savings and other benefits | | | \$0.04m | Benefits in the economic NPV** | \$0.04m |
| Total Benefits | | | \$0.04m | **excludes ENS penalty | |
| Other Financial Drivers | | | | | |
| Incremental opex cost pa (no depreciation) | | | \$0.00m | Write-off cost | \$0.00m |
| Capital - initial \$m | | | -\$0.13m | Major Asset Life (Yrs) | 15.00 Yrs |
| Residual Value - initial investment | | | \$0.01m | Re-investment capital | \$0.00m |
| Capitalisation period | | | 2.00 Yrs | Start of the re-investment period | 2024-25 |

Attachment 2 – Summary of the Project

| Installation of Transfer Tripping Scheme at Cooma | |
|---|---|
| Transmission circuit / Injection point | Cooma 132/66 kV substation |
| Scope of works | Provide transfer tripping scheme at Cooma to disconnect generation at Boco Rock to prevent islanding following a contingent trip. |
| Reasons to undertake the project | Enable the full output from the Boko Rock generation during the outage of line 978 or 97D. |
| Current value of the limit | 0 MW during the outage of line 978 or 97D |
| Target limit | 113 MW (Boco Rock maximum output capacity) during the outage of line 978 or 97D |
| Capital cost | The total capital cost is \$0.13 million. |
| Operating cost | Nil |
| Market benefits | Market impact = \$36,000/year The NPV benefit = \$0.11 million, using 10% WACC |
| Pay-back period | Pay-back period = 3.61 years |
| Completion date | Within the regulatory period 2019-2023 |