

# OPTIONS EVALUATION REPORT (OER)



## Making The Grid Smarter – Installation of North Western Area Transfer Tripping Scheme

OER 000000001477 revision 4.0

**Ellipse project description:** North Western Transfer Tripping Scheme  
**TRIM file:** [TRIM No]

**Project reason:** Reliability - To meet connection point reliability requirements

**Project category:** Prescribed - NCIPAP

### Approvals

Author	Son Nguyen	Power System Analyst
Reviewed / Endorsed	Jahan Peiris	Network Modelling & Performance Manager
	Hoang Tong	Operation Analysis Manager
	Garrie Chubb	Investment Support Manager
Approved	Andrew Kingsmill	Manager/Power System Analysis
Date submitted for approval	6 December 2016	

## 1. Need/opportunity

---

As detailed in NOS-1477, an outage of either of 330 kV lines 85 or 86 will require the north western 132 kV network ring to be split to avoid excessive loading and voltage stability issues in the event of a trip of the adjacent circuit.

This NCIPAP project proposes to implement a transfer tripping scheme in North Western area to split the 132 kV network during the outages of both 85 and 86 lines, this will allow the North Western area 132 kV network to operate in parallel and facilitate Moree Solar Farm generation during these 330 kV line outages realising benefits to the NEM.

## 2. Related needs/opportunities

---

Nil.

## 3. Options

---

### 3.1 Base Case

The base case under this Need is to “do nothing” and continue to constrain the Moree solar farm during the planned or forced outage of 85 or 86 lines.

### 3.2 Option A — Implementation of transfer tripping scheme in North West NSW

The north western area transfer tripping scheme to be implemented shall:

- > Be Armed/Disarmed using SCADA by the System Operator during an outage of Line 85 or Line 86 between Armidale and Tamworth
- > Monitor the remaining 330 kV line circuit breaker status
- > Send a transfer trip signal to Moree to trip 96M Narrabri – Moree 132 kV line circuit breaker in the event of a trip of the remaining 330 kV line between Armidale and Tamworth
- > The scheme to be operated and Line 96M circuit breaker to be opened at Moree in protection clearing time. This may require installation of communication fibre around the North Western 132 kV transmission network.
- > Ensure that appropriate system data will be fed to the TransGrid SCADA system so that Control Room staff can use this information for network operations.

This option has been assessed for feasibility in OFS-1477A. The estimated un-escalated capital cost of the option is \$0.12 M ± 25% in 2016-17 AUD.

### Market Benefit Calculation

The benefit of implementing a transfer tripping scheme to allow the generation from Moree solar farm during the planned or forced outage of 85 or 86 lines per year is assessed below:

Average generation cost of thermal generation compared to renewable generation<sup>1</sup> = \$25/MWh

---

<sup>1</sup> 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.

Market impact due to constraining Moree solar farm = Average Moree solar farm output<sup>2</sup> x Market impact per MWh x total outage hour (planned and unplanned outages of 85 or 86 lines<sup>3</sup>)

$$= 18.24 \text{ MW} \times \$25/\text{MWh} \times (30+167) = \$ 90 \text{ K/year}$$

Using the above assumptions and calculation, the market benefits is assessed to be \$0.09 million per year.

### 3.3 Non-network Solutions

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

## 4. Evaluation

Option A has been assessed to be technically feasible.

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

The full financial and economic evaluations are shown in Attachment 1.

**Table 1 – Options Evaluation**

Option	Description	Total Capex (\$m)	Ongoing Opex / yr (\$m)	Yearly benefit (\$m)	Economic NPV (\$m)	Rank
Base case	'Do nothing'	0	0	0	0	2
A	Implementation of transfer tripping scheme in North Western area	0.12	0.002	0.09	0.5	1

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 Attachment 1.

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

Discount Rate (%)	Economic NPV (2018/19 \$m)
6.75	0.65
13.00	0.39

### Preferred Option

The preferred option is Option A, as it has a positive NPV and yields the most benefits, as calculated using TransGrid's NPV Calculation Tool (refer to Attachment 1).

A summary of the preferred option can be found in Attachment 2.

<sup>2</sup> Based on historical average Moree solar farm generation – refer to file "1477 – Risk Assessment" in PDGS for details

<sup>3</sup> TransGrid historical asset performance assessment – as at May 2016

### Capital and operating expenditure

The capital cost of the option is estimated at \$0.12 M.

The yearly incremental operating expenditure is estimated to be 2% of the upfront capital cost of each option, which equates to \$2,400 escalated at a rate of 2.9% per annum.<sup>4</sup>

### 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.

## 5. Recommendation

---

Based on the economic evaluation above, Option A is the preferred option to address the Need as it has a positive NPV and yields yearly benefits of \$ 0.09 million.

It is therefore recommended that an RPS be completed for the implementation of transfer tripping scheme in north western area over the 2018/19-2022/23 period.

---

<sup>4</sup> TransGrid Success Database as at May 2016.

## Attachment 1 – Financial and Economic Evaluation Reports

Project\_Option Name

Need 1477 - Option A - North Western Transfer Tripping Scheme

1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	\$0.50m	NPV / Capital (Ratio)	4.13
NPV @ upper bound rate	13.00%	\$0.39m	Pay Back Period (Yrs)	0.73 Yrs
NPV @ lower bound rate (WACC)	6.75%	\$0.65m	IRR%	72.90%

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%	\$0.50m	NPV / Capital (Ratio)	4.13
NPV @ upper bound rate	13.00%	\$0.39m	Pay Back Period (Yrs)	1.37 Yrs
NPV @ lower bound rate (WACC)	6.75%	\$0.65m	IRR%	72.90%

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*	\$0.09m
Reputation	\$0.00m	\$0.00m	\$0.00m	*excludes VCR benefits	
Total Risk benefits	\$0.00m	\$0.00m	\$0.00m		
Cost savings and other benefits			\$0.09m	Benefits in the economic NPV**	\$0.09m
Total Benefits			\$0.09m	**excludes ENS penalty	

Other Financial Drivers

Incremental opex cost pa (no depreciation)	-\$0.00m	Write-off cost	\$0.00m
Capital - initial \$m	-\$0.12m	Major Asset Life (Yrs)	15.00 Yrs
Residual Value - initial investment	\$0.01m	Re-investment capital	\$0.00m
Capitalisation period	1.00 Yrs	Start of the re-investment period	0.00 Yrs

## Attachment 2 – Project Summary

<b>North Western area Transfer Tripping Scheme</b>	The transmission network to the north western area comprises of three 132 kV “rings”. The north western subsystem is backed by two 330 kV lines between Tamworth and Armidale (85 and 86). For the outage of the line 85 or 86, the trip of the remaining line will result in the north western 132 kV network experiencing excessive loading and voltage stability issues and the Moree Solar Farm generation will be constrained to 0 MW. The implementation of transfer tripping scheme in the north western area will facilitate Moree Solar Farm generation during these line outages realising benefits to the NEM.
Transmission Circuit / Injection Point	North Western 132 kV network ring (open point on line 96M)
Scope of works	Implement a control system to trip: 96M during outage combinations of 85 and 86 lines. The ability to arm/disarm the scheme using SCADA
Reasons to undertake the project	To improve the post-contingent limit on Moree Solar Farm generation during outages of line 85 and 86 realising benefits to the NEM.
Current value of the limit	0MW Moree Solar Farm generation capacity for about 197 hrs/year during Line 85 or 86 outages
Target limit	56 MW Moree Solar Farm generation capacity
Capital Cost	The total capital cost is \$0.12 millions
Operating Cost	\$2,400 per annum escalate at 2.9% per year
Market benefits	Market benefit = \$90,000 per annum The NPV benefit = \$0.5 million, using 10% WACC and 15-year term
Pay-back period	Pay-back period = 1.37 years
Completion date	Over the 2018/19-2022/23 period