

OPTIONS EVALUATION REPORT (OER)



NCIPAP – Finley 66 kV Full SCADA Capacity

OER-1463 Revision 1.0

Ellipse project no(s): P0008493

TRIM file: [TRIM No]

Project reason: Finley 66 kV Full SCADA Capacity

Project category: Prescribed - NCIPAP

Approvals

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Date submitted for approval	28 October 2016	

1. NEED/OPPORTUNITY

Finley substation is presently not equipped with full SCADA connectivity. Enabling full SCADA at the site would provide full control of all aspects of the substation and represents the most efficient and practical way to manage high voltage plant and equipment.

For details, refer to the Need/Opportunity Statement (NOS-1463).

2. RELATED NEEDS/OPPORTUNITIES

- > NOS-1499 Deniliquin 66 kV full SCADA capacity

3. OPTIONS

3.1 Base case

The base case is to maintain the present SCADA capacity at Finley substation.

The total risk cost is \$0.14 million per year. The risk cost summary is included in Attachment 2. The risk cost is primarily made up of the value of unserved energy.

Unserved Energy Cost Calculation

The unserved energy is estimated in the NOS to be \$124k per annum. This is based on:

- > Assumed 66 kV feeder failure rate of 3.9 / 100 km per decade (or 0.39 / 100 km per annum)¹
- > Average feeder length = Total feeder length²/No. of feeders = 55 km/3 = 18 km
- > Assuming 66 kV terminal equipment failure rate of 0.5 unit per decade (or 0.05 / unit per annum)³
- > Average Finley load of 8 MW⁴, therefore calculations are based on a busbar outage losing about 4 MW
- > Assuming manual load restoration time is 3 hours⁵
- > Value of customer reliability (VCR) of \$38.35/kWh⁶

$$\begin{aligned} \text{VCR Risk Cost} &= [(66 \text{ kV feeder failure rate}) \times (\text{no. of feeders}) \times (\text{average feeder load}) + (\text{term equip failure rate}) \times \\ &\quad (\text{average bus section load}) \times (\text{no. of busbars})] \times (\text{restoration time}) \times (\text{VCR}) \\ &= [(0.39 \times (18/100) \times 3 \times 3) + (0.05 \times 4 \times 2)] \times 3 \times 38.35 \times 1000 \\ &= (0.6318 + 0.4) \times (115050) \\ &= \$118,708 \end{aligned}$$

¹ Based on TransGrid historical outage statistics as at May 2016 – refer to the file “Reliability Analysis - Final Summary.xlsx” in PDGS Supporting Documents (132 kV feeder failure rate is assumed)

² TransGrid Electrical Database 2015

³ Historical outage statistics – refer to the file “Reliability Analysis - Final Summary.xlsx” in PDGS Supporting Documents

⁴ Based on historical Finley load data for 2015-16 - refer to the file “Finley Load 2015-16.xlsx” in PDGS Supporting Documents

⁵ Based on travel times to the substation from Wagga and standard times for restoration

⁶ AEMO, Value of Customer Reliability – Application Guide.

3.2 Option A – Install full SCADA capacity at Finley substation 66 kV

This option is to install full SCADA capacity to the 66 kV at Finley substation to provide full operating and monitoring capabilities.

This option has been assessed for feasibility in [OFS-1463A](#). The estimated un-escalated capital cost of the option is \$0.31 M ± 25% in 2016-17 AUD.

The post-project risk cost of Option A is assessed to be \$0.04 million per year. The risk cost summary is included in Attachment 3.

Option Risk Cost

The post-option risk cost is predominately made up of unserved energy and is calculated to be \$19,784 per annum. This is based on:

- > Assuming remote load restoration time is 30 minutes

$$\begin{aligned} \text{VCR Risk Cost} &= [(66 \text{ kV feeder failure rate}) \times (\text{no. of feeders}) \times (\text{average feeder load}) + (\text{term equip failure rate}) \times \\ &\quad (\text{average substation load}) \times (\text{no. of busbars})] \times (\text{VCR}) \times (\text{restoration time}) \\ &= [(0.39 \times (18/100) \times 3 \times 3) + (0.05 \times 4 \times 2)] \times 0.5 \times 38.35 \times 1000 \\ &= (0.6318 + 0.4) \times (19175) \\ &= \$19,784 \end{aligned}$$

4. EVALUATION

Commercial 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)	Yearly post project risk cost (\$m)	NPV (\$m)	Rank
Base case	'Do nothing'	Nil	-	0.14	-	2
A	Install full SCADA capacity at Finley substation 66 kV	0.31*	0	0.04	0.44	1

[^] In 2016-17 dollars

[#] Expenditure in 2018-19 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.

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

Discount Rate (%)	Economic NPV (\$m)
6.75	0.61
13.00	0.33

Preferred option

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 to Attachment 1).

A summary of the preferred option is included in Attachment 4.

ALARP Evaluation

An ALARP assessment is triggered by the following hazard with the associated disproportionate factor:

- > Unplanned outage of high voltage equipment – 3 times the safety risk reduction and taking 10% of the reliability risk reduction as applicable to safety.

However, as this will only produce 30% of the benefit derived in the commercial evaluation, a full ALARP evaluation will not produce an alternative preferred solution.

Capital and operating expenditure

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

Payback period

Expected payback period for Option A is approximately 3.13 years.

Regulatory Investment Test

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

5. Recommendation

It is recommended that SCADA system at Finley be expanded to provide full operating and monitoring capabilities on the 66 kV.

Attachment 1 – Financial and Economic Evaluation Reports

Project_Option Name

Finley 66 kV Full Scada Capacity

1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	-\$0.31m	NPV / Capital (Ratio)	-1.00
NPV @ upper bound rate	13.00%	-\$0.31m	Pay Back Period (Yrs)	Not measurable
NPV @ lower bound rate (WACC)	6.75%	-\$0.31m	IRR%	Not measurable

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%	\$0.44m	NPV / Capital (Ratio)	1.43
NPV @ upper bound rate	13.00%	\$0.33m	Pay Back Period (Yrs)	3.13 Yrs
NPV @ lower bound rate (WACC)	6.75%	\$0.61m	IRR%	31.47%

Benefits

Risk cost	As Is	To Be	Benefit		
<i>Systems (reliability)</i>	\$0.12m	\$0.02m	\$0.10m	VCR Benefit	\$0.10m
<i>Financial</i>	\$0.00m	\$0.00m	\$0.00m	ENS Penalty	\$0.00m
<i>Operational/compliance</i>	\$0.02m	\$0.02m	\$0.00m	All other risk benefits	\$0.00m
<i>People (safety)</i>	\$0.00m	\$0.00m	\$0.00m	Total Risk benefits	\$0.10m
<i>Environment</i>	\$0.00m	\$0.00m	\$0.00m	Benefits in the financial NPV*	\$0.00m
<i>Reputation</i>	\$0.00m	\$0.00m	\$0.00m	<i>*excludes VCR benefits</i>	
Total Risk benefits	\$0.14m	\$0.04m	\$0.10m	Benefits in the economic NPV**	\$0.10m
Cost savings and other benefits			\$0.00m	<i>**excludes ENS penalty</i>	
Total Benefits			\$0.10m		

Other Financial Drivers

Incremental opex cost pa (no depreciation)	\$0.00m	Write-off cost	\$0.00m
Capital - initial \$m	-\$0.31m	Major Asset Life (Yrs)	15.00 Yrs
Residual Value - initial investment	\$0.00m	Re-investment capital	\$0.00m
Capitalisation period	1.00 Yrs	Start of the re-investment period	2024-25

Attachment 2 – Base Case Risk Cost Summary

Current Option Assessment - Risk Summary

Project Name: Finley 66kV SCADA Capacity Augmentation

Option Name: 1463 - Base Case

Option Assessment Name: 1463 - 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)
Busbar Failure	2	Busbar	Unplanned Outage - HV (Busbar Failure)	\$0.53	Structural Failure	\$1.06	5.00%	\$0.05	\$0.05		\$0.00			\$0.00
Feeder Failure	3	Conductor (inc Joints)	Unplanned Outage - HV (Feeder Failure)	\$0.41	Break	\$1.23	7.02%	\$0.09	\$0.08		\$0.00			\$0.01
				\$0.94		\$2.29		\$0.14	\$0.12		\$0.00			\$0.01

Total VCR Risk: \$0.12

Total ENS Risk:

Attachment 3 – Option A Risk Cost Summary

Current Option Assessment - Risk Summary



Project Name: Finley 66kV SCADA Capacity Augmentation

Option Name: 1463 - Preferred Option

Option Assessment Name: 1463 - Preferred Option - 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)
Busbar Failure	2	Busbar	Unplanned Outage - HV (Busbar Failure)	\$0.15	Structural Failure	\$0.30	5.00%	\$0.01	\$0.01		\$0.00			\$0.00
Feeder Failure	3	Conductor (inc Joints)	Unplanned Outage - HV (Feeder Failure)	\$0.12	Break	\$0.37	7.02%	\$0.03	\$0.02		\$0.00			\$0.01
				\$0.27		\$0.66		\$0.04	\$0.03		\$0.00			\$0.01

Total VCR Risk: \$0.02

Total ENS Risk:

Attachment 4 – Summary of the Project

Finley 66 kV Full SCADA Capacity	
Transmission circuit / Injection point	Finley 132/66 kV substation
Scope of works	Provide full SCADA capacity to the Finley 66 kV
Reasons to undertake the project	Full SCADA control and monitoring improvements to significantly reduce the restoration time of the Finley 66 kV supplies.
Current value of the limit	0 MW for 3 hours
Target limit	8 MW average loads for 2.5 hours.
Capital cost	The total capital cost is \$310k (non-escalated)
Operating cost	Nil
Market benefits	Benefit = ENS with 3 hours restoration – ENS with 0.5 hours restoration = \$118,708 – \$19,784 = \$0.10 million / year
Pay-back period	3.13 years
Completion date	Within the regulatory period 2019-2023