NEED/OPPORTUNITY STATEMENT (NOS)

Molong Reinforcement

NOS- 000000001696 revision 2.0

Ellipse project no(s): P0010128
TRIM file: [TRIM No]

Project reason: Reliability - To meet connection point reliability requirements
Project category: Prescribed - Augmentation

Approvals

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Date submitted for approval	[Publish Date]	

Change history

Revision	Date	Amendment
0	27/10/2016	Initial Issue
1	27/11/2016	Updated risk costs and clarified references to IPART reliability standard
2		Clarified all risk cost breakdowns

1.   Background

The Independent Pricing and Regulatory Tribunal (IPART) was asked to recommend a reliability planning standard for electricity transmission in NSW, and in doing so have recommended a new reliability standard based on levels of reliability redundancy and an annual unserved energy allowance.

IPART's optimisation model makes recommendations on the optimal value of expected unserved energy at each Bulk Supply Point (BSP) which the TNSP is expected to meet.

The new reliability standard is to be applied from 1 July 2018 for each BSP, should the NSW Minister for Infrastructure approve the *Electricity transmission reliability standards - Draft Report May 2016[a]* and the *Electricity transmission reliability standards - Supplementary Draft Report September 2015[b]*.

Based on the latter (supplementary) draft report, the expected unserved energy for Molong 66 kV is recommended as 46 minutes.

2.   Need/opportunity

Molong 132/66 kV Substation is presently equipped with one 132/66 kV transformer, and is connected to Wellington, Manildra and Orange North by Lines, 945, 94P and Line 94T, respectively. There is a back-up for the Molong area load available via Essential Energy's distribution network, supplied from the Orange area at 66 kV. This back-up requires Essential Energy to manually close these connections to allow temporary supply to the Molong area.

Essential Energy advised in their submission[c] to *IPART's Draft Reliability Standard Supplementary Report* that

"*Whilst informal back-up is available via Essential Energy's distribution network it cannot be permanently relied upon for an extended duration (catastrophic) single transformer outage.*"

TransGrid has assessed the present Molong 66 kV unserved energy (USE) minutes based on outage information and the current Essential Energy backup strategy to restore load to the Molong area.

Connection Point	Existing unserved energy minutes	IPART recommended unserved energy minutes
Molong 66 kV	108 minutes[A] 245 minutes[B]	46 minutes

[A] Assuming the Molong transformer failure rate and non-catastrophic restoration times are estimated using the site historical outage average (only 2 outage events have occurred since 2009, therefore the failure rate is 0.286/yrs. with 6.3hrs average restoration time). This is consistent with TransGrid's estimated annual expected unserved energy in minutes of the current network of around 100 minutes, published in IPART's Draft Reliability Standard Supplementary Report.

[B] Assuming the Molong transformer failure rate and non-catastrophic restoration time stipulated by IPART in its Supplementary Draft Report (failure rate of 0.17/yrs. with 24hrs restoration time).

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[a] *Electricity transmission reliability standards - An economic assessment Energy — Draft Report May 2016,* https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/investigation-section-12-publications-electricity-transmission-reliability-standards/draft_report_-_electricity_transmission_reliability_standards_-_may_2016.pdf, *retrieved on 2 December 2016.*

[b] *Electricity transmission reliability standards - Unserved energy allowances for Inner Sydney and Broken Hill, Molong, Mudgee, Munyang and Wellington Town Energy — Supplementary Draft Report September 2015,* https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/investigation-section-12-publications-electricity-transmission-reliability-standards/supplementary-draft-report-electricity-transmission-reliability-standards-september-2016.pdf, *retrieved on 2 December 2016.*

[c] *Essential Energy submission on Electricity Transmission Reliability Standards – Supplementary Draft Report* https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/investigation-section-12-submissions-electricity-transmission-reliability-standards-supplementary-draft-report/online-submission-essential-energy-b.-supple-28-oct-2016-161618220.pdf, *retrieved on 28 October 2016.*

The TransGrid calculated unserved energy minutes for Molong 66 kV presently exceeds the IPART recommended unserved energy minutes. There is an opportunity to increase the reliability of Molong BSP to reduce the present unserved energy minutes to 46 minutes.

2.1 Risks

Non-compliance with reliability standards

The primary risk for TransGrid not addressing the identified need is non-compliance with the *Draft Electricity Transmission Reliability Standards.*

The risk cost of not addressing this Need is therefore composed of the following components:

> exposing customer connections to an excess of unserved energy of 62 minutes[d] by using TransGrid's historical Molong transformer outage data, or 199 minutes[e] by using IPART's generic transformer outage data.[f]
> application of a fine similar to the civil penalty as defined in the National Electricity Law (1996).[g]
> damage to TransGrid's reputation (negative media coverage).
> litigation by customers/consumer groups.

VCR Risk Cost

$$VCR\ risk\ cost = Excess\ USE\ in\ MWh * VCR\text{[h]}$$

$$Excess\ USE\ in\ MWh = \frac{excess\ USE\ in\ "minutes"}{60} * \{estimated\ average\ annual\ demand\ at\ Molong\ in\ MW\}$$

$$Excess\ USE\ in\ MWh = \frac{62}{60}hrs * 2.4\ MW\text{[i]} = 2.48\ MWh$$

$$\therefore VCR\ risk\ cost\ = 2.48\ MWh/year * \$38,350/MWh = \$\textbf{95,108}\ \textbf{per annum}$$

Note that the VCR risk cost is expected to be the same every year of the 2018 – 2023 regulatory period, as the Molong load is forecast to be constant during the period.[j]

Reliability Risk Cost

$$Reliability\ risk\ cost = VCR\ risk\ cost + litigation\ cost\text{[k]}$$

$$\therefore Reliability\ risk\ cost = \$95,108 + \$110$$

$$\therefore \textbf{Reliability risk cost} = \$\textbf{95,218 per annum}$$

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[d] That is, the existing 108 minutes minus the allowable 46 minutes, using average restoration time of historical outages of the Molong transformer.

[e] That is, the existing 245 minutes minus the allowable 46 minutes, using IPART's stipulated failure rate and restoration time for transformers.

[f] According to IPART's Draft Electricity transmission reliability standards (May 2016):

> *"The allowance for expected unserved energy [USE] per annum is calculated by dividing the optimal expected unserved energy (in MWh) produced by [IPART's] optimisation model, by estimated average annual demand at that bulk supply point (in MW) and converting it to "minutes" (by multiplying it by 60). [IPART has] estimated annual demand at each bulk supply point using forecast maximum demand (in MVA [at unity power factor]) and an estimated load factor" (p.21).*

This can be expressed mathematically as follows:

$$USE\ in\ "minutes" = \frac{[optimal\ expected\ unserved\ energy\ in\ MWh]}{[estimated\ average\ annual\ demand\ in\ MW]} * 60$$

[g] As the standard has not been signed off by the Minister at time of writing, it is uncertain whether any fines may apply for non-compliance. However, we have assumed that a fine similar to that stipulated in the NEL clause 2AA is entirely within the realm of possibility.

[h] TransGrid's Investment Risk Tool bases the Value of Customer Reliability (VCR) on figures published by AEMO in its Value of Customer Reliability Review - Final Report, September 2014. In this case we use the mixed residential/industrial figure of $38,350/MWh.

[i] IPART's Supplementary Draft Report (September 2016) defines Average Demand as the total energy supplied during the year (MWh) divided by the number of hours in the year. TransGrid historical data in 2015 shows an average demand of 2.4 MW at Molong.

[j] TransGrid 2016, *Transmission Annual Planning Report*, 30 June 2016.

[k] This component is an assumed litigation risk cost for this event.

Financial Risk Cost

$Financial\ risk\ cost\ =\ civil\ penalty^{l}\ +\ investigation\ cost^{m}$

$\therefore Financial\ risk\ cost\ = \$806\ per\ annum$

Reputation Risk Cost

$Reputational\ risk\ cost\ =\ external\ consultations\ \&\ communications\ costs^{n}$

$\therefore Reputational\ risk\ cost\ = \$37\ per\ annum$

Total Risk Cost

$total\ risk\ cost = Reliability\ risk\ cost + financial\ risk\ cost$

$\therefore total\ risk\ cost = \$95{,}211 + \$793$

$\therefore\ total\ risk\ cost = \$96{,}061\ per\ annum$

A risk-cost summary extract from the Investment Risk Tool appears in Attachment 1. A full risk cost breakdown report is available on PDGS.

3. Related needs/opportunities

These Needs are related in that they are also addressing an excess of unserved minutes per IPART's draft reliability standard:[o]

> Need 1649 – Reliability of Supply to Broken Hill
> Need 1697 – Mudgee Reinforcement

4. Recommendation

It is recommended that network and non-network options be evaluated and a preferred option recommended by 1 July 2018 to meet the Molong reliability value (thereby reducing the number of unserved energy minutes) to meet the new Planning Reliability Standard.

The augmentation work will be completed during the 2018-2023 regulatory period.

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[l] As per NEL clause 2AA. Assuming the Need goes unaddressed for the duration of the five-year regulatory period.

[m] This component is an assumed financial risk cost.

[n] This component is an assumed reputational risk cost.

[o] See footnote a.

Attachment 1 – Risk Cost Summary

Current Option Assessment - Risk Summary

TransGrid

Project Name: Molong Reinforcement

Option Name: 1696 - Base Case

Option Assessment Name: 1696 - Base Case

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)
Single 132/66 kV transformer	1	Winding and Core	Unplanned Outage - HV (Single 132/66 kV transformer)	$467.00	Failure	$467.00	0.02%	$0.10	$0.10		$0.00			$0.00
				$467.00		$467.00		$0.10	$0.10		$0.00			$0.00

Total VCR Risk: $0.10   Total ENS Risk: $0.00

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