NEED/OPPORTUNITY STATEMENT (NOS)

86 330kV Transmission Line Renewal

NOS- 000000001555 revision 4.0

Ellipse project description: P0009029
TRIM file: [TRIM No]

Project reason: Capability - Asset Replacement for end of life condition
Project category: Prescribed - Replacement

Approvals

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Date submitted for approval	15 December 2016	

Change history

Revision	Date	Amendment
0	15 July 2016	Initial issue
1	25 October 2016	Update to 2016/17 dollars
2	26 October 2016	Update of revision number
3	28 November 2016	Update to format
4	15 December 2016	Minor editorial changes

1. Background

Transmission Line 86 is a 330kV transmission line which runs between Tamworth and Armidale. The line is 111km in length and comprises 416 structures. The line was constructed in 1982 using mostly composite wood pole structures – a short section of the line outside Tamworth is constructed on steel towers. Wood rot beneath the composite pole joint sleeve is prevalent throughout the line, and 22 structures have been replaced with concrete poles since 2011 due to condition related issues.

Line 86 is the only 330kV line in TransGrid's network that was not constructed on steel towers. Due to its composite wood pole construction, Line 86 was designed and constructed to a lower set of criteria more comparable to other TransGrid wood pole lines than the criteria used on the 330kV steel towers and is considered to be less secure. As a result, its construction utilises shorter span lengths and a smaller lighter weight twin Lime ACSR conductor (compared to typical conductors used on TransGrid 330kV lines), which in turn reduces the rating of the line.

2. Need/opportunity

A defect analysis has been conducted on Line 86 and has consistently identified issues with wood decay beneath the composite pole joint sleeve. In 2011, 22 structures were identified to be defective and required replacement due to condition related issues, with another 14 identified as defective requiring remediation. Further, recent experience from Field Services has indicated an emerging issue with the crossarm bracing, with corrosion of the thimble leading to failures of the brace wiring and possible subsequent failure of the crossarm.

Given the high rate of defect issues, including required defect replacements, and past experience with composite wood pole structures and pressure impregnated type wood poles, it is likely that all the composite wood pole structures on the line exhibit various forms of decay, including some which may be significant. In addition, the deterioration in condition along the line is expected to worsen over time, with a corresponding increase in the structure defect rate. The benefit of addressing the composite wood pole defect issues on Line 86 is to continue providing the service at a lower risk of failure.

From the condition issues with composite wood pole structures on all of Line 86, the associated risk cost is $1.92m per annum (refer Attachment 1).

Line 86 is constructed with a relatively smaller twin Lime ACSR conductor with an original design temperature of 85°C. Due to its composite wood pole construction, it was designed and constructed to a lower set of criteria which is more comparable to other TransGrid wood pole lines than that used on the 330kV steel towers and is considered to be less secure. It has since been upgraded to a design temperature of 100°C, its maximum feasible capability and has no further capacity improvement available.

Current proposals indicate that there is 553MW of new renewable generation already committed in the northern NSW New England area (Moree Solar Farm, Sapphire Wind Farm and White Rock Wind Farm), with a potential of growing to over 1000MW. In addition, the proposed retirement of Liddell in 2022/2023 increases the likelihood of power flows in the direction from Queensland to NSW, placing a greater importance on securing supply to NSW.

The changing generation scenario sees a significant quantity of generation shifting from the Hunter Region to northern NSW in the form of new renewable generation. This places an increasing importance on the security both transmission lines between Armidale and Tamworth (Lines 85 and 86). Both line routes are located within a similar proximity geographically, and it is not inconceivable that one high wind event could adversely impact both lines. There has been one structure failure incident on Line 86 since its construction due to extreme weather conditions. In the event where both Lines 85 and 86 were out of service, Queensland and northern NSW (north of Tamworth) will operate as an island separated from mainland NEM.

Further, an increase in new northern NSW renewable generation, and in the circumstance where power is imported to NSW from Queensland, there is a higher likelihood of both Lines 85 and 86 being constrained. There is a proposal to upgrade Line 85 from a design temperature of 85°C to 100°C, which would leave Line 86 being the constraint in the event of trip of Line 85. With this likely future constraint, an opportunity exists to improve the rating of the line. An upgrade to the transmission network between Armidale and Tamworth would enable access to new wind/solar generation from northern NSW in the event of allowable market conditions and provide better security of supply to NSW.

3. Related needs/opportunities

> Need 1529 – Reinforcement of the Northern Network

4. Recommendation

It is recommended that options be considered to address the identified need/opportunity by 2023.

Attachment 1 - Risk costs summary

Summary of results is attached below. Refer to supporting document in PDGS for full risk assessment.

Current Option Assessment - Risk Summary

Project Name: Line 86

Option Name: 1555 - Base Case

Option Assessment Name: 1555 - 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)
Conductor	0	Conductor (inc Joints)	Conductor Drop (Conductor)	$4.77	Break	$0.00	0.00%	$0.00			$0.00	$0.00	$0.00	$0.00
Conductor	0	Conductor (inc Joints)	Unplanned Outage - HV (Conductor)	$1.37	Break	$0.00	0.00%	$0.00	$0.00		$0.00			$0.00
Conductor	1218	Fittings	Conductor Drop (Conductor)	$4.77	Fitting Failure	$5,806.20	0.00%	$0.06			$0.00	$0.01	$0.05	$0.00
Conductor	1218	Fittings	Unplanned Outage - HV (Conductor)	$1.37	Structural Failure	$1,673.08	0.00%	$0.02	$0.02		$0.00			$0.00
Conductor	1218	Insulators	Conductor Drop (Conductor)	$4.77	Insulator Failure	$5,806.20	0.00%	$0.06			$0.00	$0.01	$0.05	$0.00
Conductor	1218	Insulators	Unplanned Outage - HV (Conductor)	$1.37	Structural Failure	$1,673.08	0.00%	$0.02	$0.02		$0.00			$0.00
Earth Wire	0	Earth Wire (inc Joints)	Earth Wire Drop (Earth Wire)	$0.47	Break	$0.00	0.00%	$0.00			$0.00	$0.00	$0.00	$0.00
Earth Wire	0	Earth Wire (inc Joints)	Unplanned Outage - HV (Earth Wire)	$1.37	Break	$0.00	0.00%	$0.00	$0.00		$0.00			$0.00
Earth Wire	812	Fittings (inc Attachment)	Earth Wire Drop (Earth Wire)	$0.47	Fitting Failure	$379.77	0.00%	$0.00			$0.00	$0.00	$0.00	$0.00
Earth Wire	812	Fittings (inc Attachment)	Unplanned Outage - HV (Earth Wire)	$1.37	Structural Failure	$1,115.39	0.00%	$0.01	$0.01		$0.00			$0.00
Structure - 86	391	Wooden Poles	Conductor / Earth Wire / OPGW Drop (Structure - 86)	$4.77	Structural Failure	$1,863.90	0.06%	$1.11			$0.02	$0.10	$0.99	$0.00
Structure - 86	391	Wooden Poles	Unplanned Outage - HV (Structure - 86)	$2.75	Structural Failure	$1,074.16	0.06%	$0.64	$0.62		$0.02			$0.00
				$29.62		$19,391.77		$1.92	$0.66		$0.05	$0.11	$1.09	$0.00

Total VCR Risk: $0.66

Total ENS Risk: $0.00

Number of Components

The number of components used in the risk model has been derived as follows:

- Composite Wood Pole Structures: The number of composite wood pole structures remaining on the line proposed for replacement (391).
- Insulators: Associated insulators on the identified structures.
- Conductor/earthwire fittings: Associated fittings on the identified structures.

Probability of Failure

As per the Risk costs summary above.

Consequence of Failure

As per the Risk costs summary above.