OPTIONS EVALUATION REPORT (OER)

Transmission Line Asbestos Paint

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Approvals

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Change history

Revision	Date	Amendment
0	28 October 2016	Initial issue
1	8 December 2016	Update to format

1. Need/opportunity

Paint containing asbestos has been identified on steel towers across TransGrid transmission lines. The paint is generally limited to the lower part of the tower legs, however there are a few towers identified as having been completely painted with the asbestos paint. Both tension and suspension towers are affected. A typical tower identified with asbestos paint is shown in Figure 1.

Figure 1 – Typical transmission line structure containing asbestos paint

Testing of paint samples has been undertaken on a number of suspected transmission lines, namely Transmission Lines 8, 11, 16, 23, 27, 28 and 959/92Z. Following the initial testing, further ground inspections were undertaken and suspect paint was also found on Transmission Lines 76/77 and 39. The ground inspections identified a varied paint condition across all towers, with most towers reported in an average or poor condition. A proportion of paint samples analysed were found to contain non-friable asbestos, on the basis that the paint 'material' is not in a powder form and/or cannot be crumbled, pulverised or reduced to a powder by hand pressure when dry. As a result, a Subject Matter Expert has assessed that in its current condition and in the short term, it presents a 'low' health risk.

However, as the condition of the asbestos paint deteriorates with time (de-bonding from the steel and flaking), the safety risk it presents to TransGrid staff and the public will increase. The paint is not considered to be lead based paint. Transmission line maintenance work practices will be modified to allow work on unpainted areas of the affected structures; however routine and corrective maintenance cannot be performed on the portion of the structures coated in the paint without removal of the paint.

Addressing the treatment of the paint containing asbestos upholds the expenditure objectives in the National Electricity Rules (NER) Clause 6A.6.7(a), in particular to maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

2. Related Needs/opportunities

The transmission lines impacted may require tower life extension in the future which involves abrasive blasting of the towers prior to application of a zinc rich paint to effectively restore lost galvanising. The removal of asbestos on the towers must occur prior to this work. However, there may be an advantage in combining the work packages.

3. Options

All dollar values in this document are expressed in un-escalated 2016/17 dollars.

Base Case

To date, paint containing asbestos has been identified on transmission lines as listed in Table 1. It is not apparent as to why this paint containing asbestos was applied to the structures.

Table 1 – Transmission Lines with Asbestos Paint

Line	Towers on Line	Towers Sampled	Towers Positive
8 (Marulan – Dapto)	175	165	42
11 (Dapto – Sydney South)	154	110	25
16 (Marulan – Avon)	160	140	63
23 (Vales Point – Munmorah)	25	8	1[1]
27 (Sydney North – Sydney East)	58	57	57
28 (Sydney North – Sydney East)	55	49	45
76/77 (Wallerawang – Sydney South)	410	40	40
959/92Z (Sydney North – Sydney East)	58	45	49
Total To Date		**614**	**322**

The above towers identified to date as having asbestos paint have been added to TransGrid's Transmission Line Asbestos Register.

Analysis was undertaken on the identified towers to determine any common connection between their age, spatial locations, types of paint and historical uses for the paint. To date, little correlation has been identified, and as such, no effective method in predicting other transmission lines to target for further sampling other than a year of line construction prior to 1980 (1980 was selected as the most appropriate cut-off as the likelihood of containing paint asbestos still being used beyond this time would be low).

[1] On Transmission Line 23, it was initially thought that the asbestos paint had been removed. However, it was found that the asbestos paint was only painted over and encapsulated and therefore, the asbestos paint remains on the tower.

It is expected that additional structures and transmission lines across the TransGrid network not yet sampled will also be found to be coated with the paint containing asbestos. Based on the extrapolation of the percentages of asbestos paint found on existing lines and suspect paint found on ground inspections, it is estimated that the total number of towers with asbestos paint is 3,682 across the network. Further detail can be found in Need/Opportunity Statement (NOS) NS 1164.

Under a Base Case 'do nothing' option, the associated risk cost is $7.43m per annum. A breakdown of the Base Case risk cost by category is shown in Table 2.

Table 2 – Base Case risk cost by category ($ million)

Risk Category	Annual Risk Cost
Reliability (System)	0
Financial	0
Operational/Compliance	0
People (Safety)	7.34
Environment	0
Reputation	0.09
Total	**7.43**

It can be seen from Table 1 that the category with the highest risk cost is 'people (safety)', due to the consequences associated with exposure of persons to asbestos fibres. The other contributor to the overall risk cost is the 'reputation' category.

Option A — Removal of Asbestos Paint using Solvents [OFR 1164A, OFS 1164A]

This option covers removal of asbestos paint through the use of solvent based paint strippers. Of the estimated 3,682 towers with asbestos paint to be removed, it is expected that 3,648 towers require paint removal from the tower legs only and 34 towers require paint removal from the entire tower.

It is estimated that the capital expenditure associated with the refurbishment outlined in this option is $40.10m ±25%. Details of the cost estimate, including unit cost rates for both the removal of paint on tower legs only and on the entire tower, can be found in Section 6 of Option Feasibility Study (OFS) OFS 1164A.

Following the removal of asbestos paint under this option, the risk cost associated with the remediated line is zero. The total projected risk reduction as a result of implementing Option A is $7.43m per annum.

Option B — Removal of Asbestos Paint by Abrasive Blasting [OFR 1164B, OFS 1164B]

This option covers removal of asbestos paint through the use of abrasive blasting. As with Option A, of the estimated 3,682 towers with asbestos paint to be removed, 3,648 towers require paint removal from the tower legs only and 34 towers require paint removal from the entire tower.

It is estimated that the capital expenditure associated with the refurbishment outlined in this option is $262.83m ±25%. Details of the cost estimate, including unit cost rates for both the removal of paint on tower legs only and on the entire tower, can be found in Section 6 of OFS 1164B.

Following the removal of asbestos paint under this option, the risk cost associated with the remediated line is zero. The total projected risk reduction as a result of implementing Option B is $7.43m per annum.

All of the options mentioned in Section 3 are considered to be technically feasible[2].

4. Evaluation

4.1 Commercial evaluation

The commercial evaluation of the technically feasible options is set out in Table 3. Details of the Net Present Value (NPV) calculations for both Options A and B are provided in Attachment 1.

Table 3 — Commercial evaluation ($ million)

Option	Description	Total capex	Annual opex	Annual post project risk cost	Economic NPV @10%	Financial NPV @10%	Rank
Base Case	Do nothing	N/A	N/A	7.43	N/A	N/A	3
A	Removal of Asbestos Paint using Solvents	40.10	-	0	8.89	8.89	1
B	Removal of Asbestos Paint by Abrasive Blasting	262.83	-	0	(159.98)	(159.98)	2

The commercial evaluation is based on:

> a 10% discount rate

> a life of the investment of 20 years and a corresponding residual/terminal value

Discount rate sensitivities based on TransGrid's current AER-determined pre-tax real regulatory Weighted Average Cost of Capital (WACC) of 6.75% and 13% appear in Table 4.

Table 4 — Discount rate sensitivities ($ million)

Option	Description	Economic NPV @13%	Economic NPV @6.75%
A	Removal of Asbestos Paint using Solvents	0.13	24.82
B	Removal of Asbestos Paint by Abrasive Blasting	(156.56)	(159.06)

4.2 SFAIRP/ALARP evaluation

In the context of the Network Asset Risk Assessment Methodology, the SFAIRP (So Far As Is Reasonably Practicable)/ALARP (As Low As Reasonably Practical) principle is applicable to the following Key Hazardous Events:

> Asbestos exposure

[2] An option is technically feasible if TransGrid reasonably considers that there is a high likelihood that the option, if developed, will provide the relevant service while complying with all relevant laws.

Options to reduce the network safety risk as per the risk treatment hierarchy have been considered in other lifecycle stages of the asset, and it has been determined that no reasonably practicable options exist to reduce the risk further than those capital investment options listed in Table 5.

Evaluation of the proposed options has been completed against the SFAIRP (So Far As Is Reasonably Practicable)/ALARP (As Low As Reasonably Practical) obligation, as required by the Electricity Supply (Safety and Network Management) Regulation 2014 and the Work Health and Safety Act 2011. The Key Hazardous Events and the disproportionality multipliers considered in the evaluation are as follows:

- Asbestos exposure – 6 times the environment (bushfire) risk, 6 times the safety risk and 10% of the reliability risk (applicable to safety)

Table 5 – Feasible options ($ thousand)

Option	Description	CAPEX	Expected Life	Annualised CAPEX
Base	No nothing	N/A	N/A	N/A
A	Removal of Asbestos Paint using Solvents	40,100	20 years	2,005
B	Removal of Asbestos Paint by Abrasive Blasting	262,830	20 years	13,142

Table 6 – Annual risk calculations ($ thousand)

Option	Annual Residual Risk			Annual Risk Savings		
	Safety Risk	Reliability Risk	Bushfire Risk	Safety Risk	Reliability Risk	Bushfire Risk
Base	7,340	0	0	N/A	N/A	N/A
A	0	0	0	7,340	0	0
B	0	0	0	7,340	0	0

Table 7 – Reasonably practicable test ($ thousand)

Option	Network Safety Risk Reduction[3]	Annualised CAPEX	Reasonably practicable[4]?
A	44,039	2,005	Yes
B	44,039	13,142	Yes

From the above evaluation, it is considered that both Options A and B are reasonably practicable.

4.3 Preferred option

From the SFAIRP/ALARP evaluation, it is considered that both Options A and B are reasonably practicable and both options provide the same level of network safety risk reduction. In order to satisfy the organisation's SFAIRP/ALARP obligations, one of these options is required to be undertaken.

[3] The Network Safety Risk Reduction is calculated as 6 x Bushfire Risk Reduction + 6 x Safety Risk Reduction + 0.1 x Reliability Risk Reduction

[4] Reasonably practicable is defined as whether the annualised CAPEX is less than the Network Safety Risk Reduction

Since Option A is the only commercially viable of the two options (as per the commercial evaluation), it is preferred. It is proposed that Option A be scoped in further detail.

Capital and operating expenditure

The estimated capital expenditure associated with removal of asbestos paint using solvents outlined in Option A is $40.10m ±25%. This expenditure is proposed to be spread evenly across the 5 year regulatory period.

The estimated capital expenditure associated with removal of asbestos paint by abrasive blasting outlined in Option B is $262.83m ±25%. This expenditure is proposed to be spread evenly across the 5 year regulatory period.

Should the paint removal works under both Option A or B not occur by the Need date, an increase in risk exposure and corrective maintenance is expected as a result of increased asbestos exposure risk from paint degradation.

Regulatory Investment Test

No Regulatory Investment Test for Transmission (RIT-T) analysis is required as the works are condition based. The works are to address safety issues associated with existing assets.

5. Recommendation

From the above SFAIRP/ALARP evaluation in accordance with the regulatory requirements, and the commercial and technical evaluation of the available options, it is recommended that detailed scoping for the removal of asbestos paint using solvents as outlined under Option A is undertaken.

Attachment 1 – Commercial evaluation report

Option A NPV calculation

Project_Option Name	Tower Asbestos Option A - Asbestos Paint Removal Using Solve

1. Financial Evaluation (excludes VCR benefits)

NPV @ standard discount rate	10.00%	$8.89m	*NPV / Capital (Ratio)*	*0.22*
NPV @ upper bound rate	13.00%	$0.13m	*Pay Back Period (Yrs)*	*0.13 Yrs*
NPV @ lower bound rate (WACC)	6.75%	$24.82m	*IRR%*	*13.06%*

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%	$8.89m	*NPV / Capital (Ratio)*	*-1.78*
NPV @ upper bound rate	13.00%	$0.13m	*Pay Back Period (Yrs)*	*5.39 Yrs*
NPV @ lower bound rate (WACC)	6.75%	$24.82m	*IRR%*	*13.06%*

Benefits

Risk cost	As Is	To Be	Benefit		
Systems (reliability)	*$0.00m*	*$0.00m*	*$0.00m*	*VCR Benefit*	*$0.00m*
Financial	*$0.00m*	*$0.00m*	*$0.00m*	*ENS Penalty*	*$0.00m*
Operational/compliance	*$0.00m*	*$0.00m*	*$0.00m*	*All other risk benefits*	*$7.43m*
People (safety)	*$7.34m*	*$0.00m*	*$7.34m*	Total Risk benefits	$7.43m
Environment	*$0.00m*	*$0.00m*	*$0.00m*	Benefits in the financial NPV*	$7.43m
Reputation	*$0.09m*	*$0.00m*	*$0.09m*	**excludes VCR benefits*	
Total Risk benefits	$7.43m	$0.00m	$7.43m		
Cost savings and other benefits			$0.00m	Benefits in the economic NPV**	$7.43m
Total Benefits			$7.43m	***excludes ENS penalty*	

Other Financial Drivers

Incremental opex cost pa (no depreciation)	$0.00m	Write-off cost	$0.00m
Capital - initial $m	-$40.10m	Major Asset Life (Yrs)	20.00 Yrs
Residual Value - initial investment	$0.00m	Re-investment capital	$0.00m
Capitalisation period	5.00 Yrs	Start of the re-investment period	0.00 Yrs

Option B NPV calculation

Project_Option Name	Tower Asbestos Option B - Asbestos Paint Removal Using Abrasi

1. Financial Evaluation (excludes VCR benefits)				
NPV @ standard discount rate	10.00%	-$159.98m	*NPV / Capital (Ratio)*	*-0.61*
NPV @ upper bound rate	13.00%	-$156.56m	*Pay Back Period (Yrs)*	*-0.04 Yrs*
NPV @ lower bound rate (WACC)	6.75%	-$159.06m	*IRR%*	*-4.23%*

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%	-$159.98m	*NPV / Capital (Ratio)*	*32.00*
NPV @ upper bound rate	13.00%	-$156.56m	*Pay Back Period (Yrs)*	*Not measurable*
NPV @ lower bound rate (WACC)	6.75%	-$159.06m	*IRR%*	*-4.23%*

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*	*$7.43m*
Operational/compliance	*$0.00m*	*$0.00m*	*$0.00m*	Total Risk benefits	$7.43m
People (safety)	*$7.34m*	*$0.00m*	*$7.34m*		
Environment	*$0.00m*	*$0.00m*	*$0.00m*	Benefits in the financial NPV*	$7.43m
Reputation	*$0.09m*	*$0.00m*	*$0.09m*	**excludes VCR benefits*	
Total Risk benefits	$7.43m	$0.00m	$7.43m		
Cost savings and other benefits			$0.00m	Benefits in the economic NPV**	$7.43m
Total Benefits			$7.43m	***excludes ENS penalty*	

Other Financial Drivers			
Incremental opex cost pa (no depreciation)	$0.00m	Write-off cost	$0.00m
Capital - initial $m	-$262.83m	Major Asset Life (Yrs)	20.00 Yrs
Residual Value - initial investment	$0.00m	Re-investment capital	$0.00m
Capitalisation period	5.00 Yrs	Start of the re-investment period	0.00 Yrs