OPTIONS EVALUATION REPORT (OER)

Installation of Fibre Networks - Phase 2

OER 000000001355 revision 1.0

Ellipse project no.: P0007978
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Project reason: Capability - Obsolescence/Manufacturer support withdrawn
Project category: Prescribed - Replacement

Approvals

Author	Mark Jones	Secondary Systems and Communications Asset Manager
Endorsed	Hazem Khamis	Secondary Systems Strategist
	Azil Khan	Investment Analysis Manager
Approved	Lance Wee	M/Asset Strategy
Date submitted for approval	16 November 2016	

Change history

Revision	Date	Amendment
0	08 November 2016	Initial issue
1	16 November 2016	Update to format

1. Need/opportunity

TransGrid's Telecommunications Infrastructure Renewal and Development Strategy[1] details the organisational requirement to roll out protected fibre rings as the new basis for the telecommunications network structure. The initial rollout of this strategy occurred under Need 669, and phase two covers the work to be completed across the entire High Voltage (HV) Network in the 5 to 10 year timeframe of the strategy.

2. Related Needs/opportunities

- Need 699 – Installation of Fibre Networks
- Need 1365 – Telecommunications SDH Network Condition

3. Options

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

Base Case – Status Quo

The Base Case for this Need is to maintain the existing microwave and Power Line Carrier (PLC) networks, undertaking like-for-like replacements when required. This approach does not address the limited bandwidth of these systems and will not achieve any of the benefits that access to larger bandwidth can provide.

The expected total capital cost for this Base Case is $5.03m with an additional $8.01m required over the life of the proposed investment. This costing is estimated using TransGrid's "Success" estimating system.

The Base Case also includes ongoing operational costs of $0.29m per annum to cover operational costs such as spectrum licences, Lease Fees and ongoing maintenance that TransGrid would not incur were Option A to be implemented.

Option A — Installation of Optical Ground Wire (OPGW) [OFR 1355A, OFS 1355A]

This option covers the retrofitting of OPGW on seven transmission lines. Terminal equipment at all sites will require minor upgrades.

The expected total capital cost to implement this option total $36.38m. This costing is estimated using TransGrid's "Success" estimating system.

The benefits calculated for these works are based on those identified as part of the Fibre rollout under Need 699 and equate to $1.21m per annum for the proposed program, as well as a one-off capital disposal benefit of $10.21m in 2024.

The proposed scope of works for the Phase 2 rollout is detailed below:

87 – Armidale to Coffs Harbour

The Armidale to Coffs Harbour scope of works includes the replacement of one earthwire with 48-core OPGW and installation of fibre optic cable in the substation to the telecommunication equipment. This will span the 136km 87 line (330kV) and will increase the security and decrease the latency on the Northern Loop.

[1] Refer SSA Asset Management – Strategy – Development and Renewal – Telecommunications Infrastructure

The expected capital costs for the link total $6.33m. This costing is estimated using TransGrid's "Success" estimating system

9U2 – Moree to Inverell

The Moree to Inverell scope of works includes the replacement of the earthwire with 48-core OPGW and the installation of fibre optic cable in the substation to the telecommunication equipment. This will span the 143km 92U line (132kV) and will complete the New England Ring.

The New England area is a weaker area of the transmission network that has experienced a significant increase in development recently, including Moree solar generation and mining loads around the Boggabri area.

Establishing secure, diverse communication paths into the area by constructing OPGW on 9U2 could enable special protection and control schemes to manage contingent scenarios and potentially delay further investment.

The expected capital costs for the link total $7.42m. This costing is estimated using TransGrid's "Success" estimating system.

35/36 – Marulan to Bannaby

The Marulan to Bannaby scope of works includes the replacement of one earthwire with 48-core OPGW and the installation of fibre optic cable in the substations to the telecommunications equipment. This will span the 20km 35/36 line and replace one of the duplicated microwave services between Marulan and Bannaby.

The expected capital costs for the link total $1.70m. This costing is estimated using TransGrid's "Success" estimating system.

63 – Wagga to Darlington Point

The Wagga to Darlington Point scope of works includes the replacement of one earthwire with 48-core OPGW and the installation of fibre optic cable in the substations to the telecommunications equipment. This will span the 152km 63 line and replace the duplicated microwave services between Darlington Point and Wagga and allow the retirement of Square Head and Coorawa Radio Repeater Sites.

The expected capital costs for the link total $7.27m. This costing is estimated using TransGrid's "Success" estimating system.

61 – Bannaby to Gullen Range

The Bannaby to Gullen Range scope of works includes the replacement of one earthwire with 48-core OPGW and the installation of fibre optic cable in the substations to the telecommunications equipment. This will span the 59km 61 line and assist in the retirement of microwave services into Marulan from Bannaby and Gullen Range.

The expected capital costs for the link total $3.52m. This costing is estimated using TransGrid's "Success" estimating system.

3J – Gullen Range to Yass

The Gullen Range to Yass scope of works includes the replacement of one earthwire with 48-core OPGW and the installation of fibre optic cable in the substations to the telecommunications equipment. This will span the 66km 3J line and in conjunction with works on 61 and 35/36 lines, will allow the retirement of towers at Marulan and Bannaby Substations and the retirement of Ellsmore, Mt Gray and Gullen Range Radio Repeater sites.

The expected capital costs for the link total $3.76m. This costing is estimated using TransGrid's "Success" estimating system

5A4 – Wollar RRS to Bayswater

The Wollar to Bayswater scope of works includes the replacement of one earthwire with 48-core OPGW and the installation of fibre optic cable in the substations to the telecommunications equipment. This will span the 115km

5A4 line and will allow the retirement of towers at Bayswater Substations and the retirement of Wollar, Merriwa and Mt Arthur Radio Repeater sites.

The expected capital costs for the link total $6.33m. This costing is estimated using TransGrid's "Success" estimating system

4. Evaluation

Evaluation of the proposed options has been completed using the ALARP (As Low as Reasonably Practicable) regulatory requirements and economic considerations. The results of this evaluation are outlined below.

4.1 Commercial Evaluation

The result of commercial evaluation for each of the options is summarised in the Table 1.

Table 1 – Commercial evaluation ($ million)

Option	Description	Total capex	Annual opex	Annual post project risk cost	Economic NPV @10%	Financial NPV @10%	Rank
Base Case	Status Quo	5.03[2]	0.29	NA	NA	NA	2
A	Installation of Optical Ground Wire (OPGW)	36.23	-	NA	(4.39)	(4.39)	1

The commercial evaluation is based on:

- Economic life of the assets is assumed 30 years, hence this assessment period has been applied
- Write-offs have not been estimated
- Capital cost is not escalated and it does not include capitalised interest
- Capital avoidance benefit (reinvestment in existing microwave and PLC systems) have been included in Option A evaluation

Sensitivities on economic NPV for all options with changing discount rates are shown in Table 2.

Table 2 – Discount rate sensitivities ($ million)

Option	Description	Economic NPV @13%	Economic NPV @6.75%
Base Case	Status Quo	(6.28)	(8.61)
A	Installation of Optical Ground Wire (OPGW)	(7.51)	2.32

[2] This is only the capital expenditure for the 2018/19 - 2022/23 regulatory period and does include the additional $8m of reinvestment required over the period of this investment.

4.2 SFAIRP/ALARP evaluation

Evaluation of the proposed options 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, cannot be performed as the options do not directly involve the reduction of risk.

4.3 Preferred Option

Option A - Installation of Optical Ground Wire is the preferred option over maintaining and renewing the existing microwave and PLC networks under the Status Quo option. This preference aligns with the Telecommunications Infrastructure Development Strategy.

Despite a negative Net Present Value (NPV) at a 10% discount rate, Option A provides a technically and economically superior option to the Base Case that will meet TransGrid's increasing telecommunications requirements into the foreseeable future. At 6.75% discount rate, Option A returns a positive NPV (see sensitivities above). By deploying Option A, a robust optical fibre backbone will be established to facilitate the withdrawal of microwave and power line carrier infrastructure from the network.

Capital and operating expenditure

There is significant difference in predicted ongoing operational expenditure between Option A and Status Quo case. This reduction is based around a decrease in site lease fees, spectrum licensing and ongoing maintenance and repair of Radio Repeater sites.

Implementing Option A will create a range of benefits including reduced callouts, increased efficiency of work completed on site and greater exchange of data enabling better management of assets. These have been captured as benefits for delivering the project.

Regulatory Investment Test

A Regulatory Investment Test for Transmission (RIT-T) is not required as this is an asset replacement project with no augmentation component.

5. Recommendation

It is recommended that Option A - Installation of Optical Ground Wire is scoped in greater detail.

Attachment 1 – Commercial evaluation report

Option A NPV calculation

Project_Option Name	Option A - OPGW Installation

1. Financial Evaluation (excludes VCR benefits)				
NPV @ standard discount rate	10.00%	-$4.39m	*NPV / Capital (Ratio)*	*-0.14*
NPV @ upper bound rate	13.00%	-$7.51m	*Pay Back Period (Yrs)*	*0.08 Yrs*
NPV @ lower bound rate (WACC)	6.75%	$2.32m	*IRR%*	*7.64%*

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%	-$4.39m	*NPV / Capital (Ratio)*	*-0.14*
NPV @ upper bound rate	13.00%	-$7.51m	*Pay Back Period (Yrs)*	*10.55 Yrs*
NPV @ lower bound rate (WACC)	6.75%	$2.32m	*IRR%*	*7.64%*

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*	$11.71m
Reputation	*$0.00m*	*$0.00m*	*$0.00m*	**excludes VCR benefits*	
Total Risk benefits	$0.00m	$0.00m	$0.00m		
Cost savings and other benefits			$11.71m	Benefits in the economic NPV**	$11.71m
Total Benefits			$11.71m	***excludes ENS penalty*	

Other Financial Drivers			
Incremental opex cost pa (no depreciation)	$0.00m	Write-off cost	$0.00m
Capital - initial $m	-$31.21m	Major Asset Life (Yrs)	30.00 Yrs
Residual Value - initial investment	$6.04m	Re-investment capital	$8.01m
Capitalisation period	5.00 Yrs	Start of the re-investment period	2033-34