







# **Line 86 (Tamworth – Armidale) Capex Independent Assessment**

**2023-28 Revenue Proposal**

Transgrid

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**GHD Pty Ltd 39 008 488 373**

180 Lonsdale Street

Melbourne, Vic 3000, Australia

**T** +61-3-8687-8000 | **F** +61-3-8687- 6522 | **E** maelmail@ghd.com | **ghd.com**

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# Executive summary

The Option Evaluation Report (OER) 000000001555 - 2022 revision 4 details a project to replace 31 high risk wood poles displaying condition issues. The preferred Option "1C" has a capex forecast of \$11.4M (Real 2021-22) delivering a \$6.5M NPV over 19-years on a weighted basis.

Having considered replacing the line with steel towers in the Project Specification Consultation Report (PSCR), Transgrid has settled upon the lowest cost option representing a targeted replacement of the worst condition wood poles.

GHD has benchmarked the capex forecast against pole replacement costs actually incurred by Transgrid and against our own bottom up build of the estimate. Both benchmarking sources indicate that Option 1C's capital forecast is within the +/- 25% accuracy allowance which is considered suitable for the stage of the project's development and consistent with that which would be incurred by a prudent and efficient business.

# Glossary

AER	Australian Energy Regulator
OFS	Options Feasibility Study
NPV	Net Present Value
PACR	Project Assessment Conclusions Report
PADR	Project Assessment Draft Report
PSCR	Project Specification Consultation Report
RIT-T	Regulatory Investment Test for Transmission

# Contents

<b>1. Introduction</b>	<b>2</b>
1.1 Purpose of this report	2
1.2 Scope and limitations	2
<b>2. Background</b>	<b>3</b>
2.1 Investment need and options considered	3
2.2 Capex forecast	3
<b>3. Our approach</b>	<b>4</b>
<b>4. Benchmarking results</b>	<b>5</b>
4.1 Transgrid line 86 pole replacement actual costs	5
4.2 GHD cost estimate	5

# 1. Introduction

In December 2021, Transgrid published its PSCR titled “Managing Risk on Line 86 (Tamworth – Armidale)”. The PSCR identified several options, with the least cost option representing wood pole replacement program at \$95.7M (Real 2020-21) and a highest cost option representing a double circuit line rebuild at \$315.4M (Real 2020-21).

Transgrid’s January 2022 2023-28 Revenue Proposal included a project for the establishment of a new transmission line undergoing Regulatory Investment Test for Transmission (RIT-T) assessment for \$331.1M (Real 2022-23).

Subsequently, Transgrid further refined the options assessment through the following RIT-T publications:

- Project Assessment Draft Report (PADR) May 2022
- PACR 29 July 2022

Modelling of market benefits across the PADR and PACR narrowed the range of preferred options on the basis that replacement of all poles / rebuild of the line as a double circuit effectively delivered negative NPV results across a range of scenarios assessed.

Transgrid has engaged GHD to perform an independent assessment of the forecasted capex included in the OER.

## 1.1 Purpose of this report

This report outlines an independent assessment of the capex forecast included in OER 000000001555 - 2022 revision 4.

This report may be used to support Transgrid’s Revised Revenue Proposal to be submitted at the AER.

## 1.2 Scope and limitations

GHD has been engaged by Transgrid to perform an independent assessment of the capex forecast included in OER 000000001555 - 2022 revision 4.

This report has been prepared by GHD for Transgrid and may only be used and relied on by Transgrid for the purpose agreed between GHD and Transgrid as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Transgrid arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

## 2. Background

### 2.1 Investment need and options considered

As part of the RIT-T process, the investment need and options assessment have been progressed and the results published in the following reports:

- PSCR December 2021
- PADR May 2022
- PACR July 2022

As outlined in section 1, options related to the replacement of all poles or a rebuild of the line as a double circuit were progressively discounted on the basis that market modelling indicated negative NPV results.

The PADR and PACR identify the investment need as the requirement to mitigate the risks associated with composite wood pole asset condition where, the deteriorating condition of the wood poles increase exposure to bushfire risk and also results in higher expected costs associated with reactive maintenance.

The PADR and PACR consider the same options presented in the table below, with the PACR building upon the PADR with the following changes:

- Staged investment - The PACR truncates the assessment period so that it ends 2040-41, shortening the assessment period from 27 years to 19 years. This is permissible under the RIT-T process provided that the reduced assessment period is made transparent. Any future program would be subject to a subsequent RIT-T.
- Benefit modelling – Update to market modelling to fully align with the final Australian Energy Market Operator 2022 Integrated Systems Plan.

The OER builds upon previous work and the preferred option “1C” has an estimated cost of \$11.4M (Real 2021-22) it focuses upon the replacement of the highest risk wood poles (31) delivering a \$6.5M NPV over 19-years on a weighted basis.

The Options Feasibility Study (OFS) “OFS-000000001555-NOSA-A Rev 2 - 86 - Tamworth - Armidale WP Line Rebuild-86” details that line 86 is 111 km 330 kV line which was constructed in 1982 using mostly composite wood pole structures. Wood rot beneath the metal sleeve cylinder that holds the two wood pole sections together (referred to as a pole ‘joint sleeve’) is prevalent across the line and 10% of the structures to-date have been replaced / remediated.

Option 1C involves replacing the 31 highest risk wood poles between 2025-26 and 2027-28 like for like in-situ with concrete or steel poles, keeping the existing twin line conductor and single circuit configuration.

The 31 poles included for replacement between 2025-26 and 2027-28 were identified through a process of reviewing the updated data on both the condition and risk of each of the 400 poles on line 86 and comparing the expected risk reduction from replacing each pole with the associated cost.

### 2.2 Capex forecast

The following table details the capex forecast (2020-21) for the pole replacement program, noting that it represents a bottom-up build of 49-line items summarised in the table below. The bottom-up build has been based upon previous experience related to pole replacement with cost elements extracted from Transgrid’s MTWO® cost estimation database.

Table 1 Summary of line 86 pole replacement capex forecast

Cost element	\$M (Real 2020-21)
General and ancillary costs	2.6
Civil works	2.9
EPC costs	2.2
Electrical fitting, conduct, earthWire, OPGW	0.9
Transgrid labour	0.7
Access	0.5
Steelwork	0.5
Design costs	0.3
<b>Total</b>	<b>10.6</b>

The OFS-00000001555-NOSA-A Rev 2 - 86 - Tamworth - Armidale WP Line Rebuild-86 details the assumptions used in developing the cost estimates. These include:

- Assumption of outage works to be completed with three crews concurrently to minimise outage duration as per Asset Management’s direction in order to minimise market impact on Line 86.
- Additional mobilisation cost (x 2) has been allowed for in the basis for estimate to cater for this delivery approach. This will need to be confirmed and validated as part of the project development process.
- Exclusion of 26 composite wood poles previously replaced and steel structures 1B to 13B which is a shared double circuit route with TL968
- Alignment of 111km in length from Tamworth SS to Armidale.
- Reuse of existing Lime Conductor and existing OHEW – 111km.
- Access and Clearing allowance as per the below distributions:
  - Light Terrain – 36%
  - Medium Terrain – 37%
  - Heavy Terrain – 17%
  - Very Heavy Terrain – 10%
- The values used in the estimate were obtained using the MTWO Estimating System.
- The estimate has an uncertainty of +/- 25%.

### 3. Our approach

GHD has used two sources to benchmark the capex forecast. These include:

- Benchmarking against actual costs recorded by Transgrid on line 86 when conduction pole replacement
- GHD’s own cost estimate



## 4. Benchmarking results

### 4.1 Transgrid line 86 pole replacement actual costs

Transgrid has supplied to GHD the historical costs incurred on past line 86 pole replacements. Based upon an extract from Transgrid's Ellipse ERP system the average cost per pole replacement was \$371K (2021-22), scaled up for 31 poles is \$11.5M (2021-22) within the accuracy threshold set for the capex forecast.

### 4.2 GHD cost estimate

GHD developed its own cost estimate based upon concrete pole - 34 m 40 kN - two-piece pole. Our estimate was \$10.0M (2021-22) within the accuracy threshold +/- 25% set for the capex forecast.

The data sources used for the development of unit rates include:

- Contract and procurement costs available for recent projects completed by electricity utilities
- Material cost data that may be obtained from suppliers
- Market cost data available through recent operational and capital expenditure reviews for electricity transmission utilities
- Recent asset valuations by GHD
- Cost data available in the public domain, including standard labour costs.

Our standard estimating unit rates have been based on the following:

- Our standard transmission line configurations for overhead lines on steel support structures (towers and poles)
- All steel support structures considered to have normal or typical foundations.

The following adjustment factor has been applied to the unit rates in our estimates:

- Remote area working allowance of 5% for labour costs.

The following have been excluded from the estimates:

- No Goods and Services Tax (GST) allowance
- No consideration of construction difficulties with transmission line support structure foundations
- No separate consideration of any transmission line crossings

## A-1 Documentation considered

The following documentation was considered during our independent assessment:

- Australian Energy Regulator, "Industry practice application note, Asset replacement planning", January 2019
- OER-000000001555-2022 Rev 4 - 86 - Tamworth - Armidale WP Line Rebuild.pdf
- OFS-000000001555-NOSA-A Rev 2 - 86 - Tamworth - Armidale WP Line Rebuild-86.pdf
- transgrid-pacr\_managing-risk-on-line-86.pdf
- transgrid-padr\_managing-risk-on-line-86.pdf
- transgrid-pscr-for-line-86.pdf
- Copy of Option A Rev 2 -- Estimate (Option 1C - Stage 1)
- Copy of Line 86 Pole Replacement

## A-2 Estimate accuracy for assessment

Figure 1 indicates the levels of accuracy that can be expected for estimates prepared for capital works at various stages of a project development. Due to the different levels of engineering input, and completeness in the design, there are various levels of accuracy that can be reasonably expected.

Figure 1 Standard estimate accuracy levels

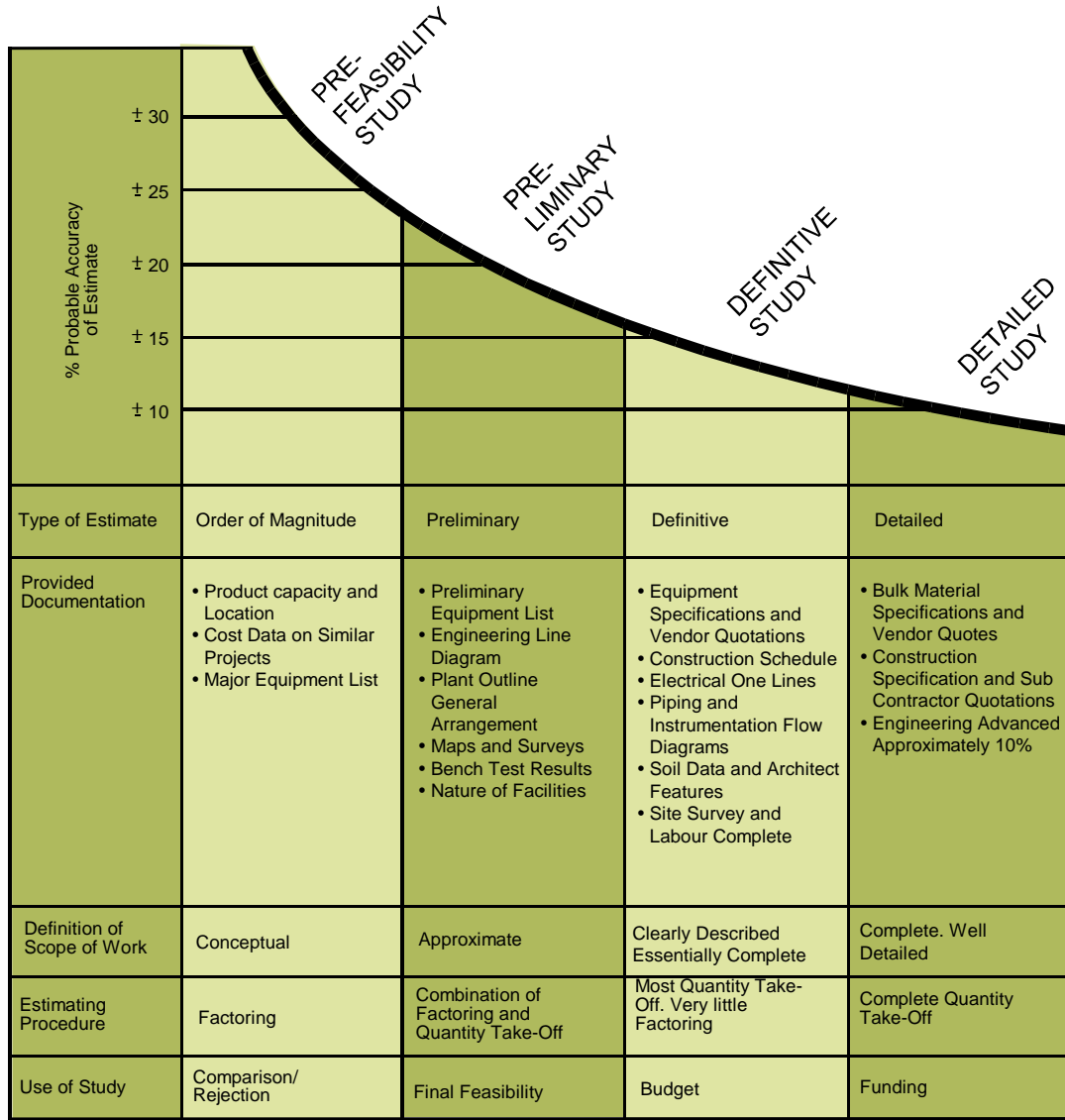


Table 2 shows the classification of estimates as defined in the AACE International *Recommended Practice No. 96R-18 Cost Estimating Classification System EPC Power Transmission Line Infrastructure Industries*.

**Table 2** Cost estimate classification matrix for the power transmission line industries

Estimate class	Primary characteristic	Secondary Characteristics		
	Maturity Level of project definition deliverables Expressed as % of complete definition	End usage Typical purpose of estimate	Methodology Typical estimating method	Expected accuracy range Typical variation in low and high ranges at an 80% confidence interval
Class 5	0% to 2%	Concept screening	Cost / length, factored or parametric models, judgement, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Cost / length, factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget, authorisation or control	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%



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