GHD Advisory

Non-contestable CWO RNIP Revenue Submission

Independent verification and assessment

Transgrid

15 July 2025

→ The Power of Commitment

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Executive summary

The Central West Orana (CWO) Renewable Energy Zone (REZ) was formally declared by the Minister for Energy and Environment under section 19(1) of the Electricity Infrastructure Investment Act 2020 (the Act) and published in the NSW Gazette on 5 November 2021.

The CWO REZ Network Infrastructure Project (RNIP) will deliver new transmission network infrastructure, including transmission lines and energy hubs, which will transfer power generated by solar and wind farms to electricity consumers. The CWO RNIP will be delivered and operated by ACEREZ (Acciona Cobra Endeavour Consortium) as the selected Network Operator.

Transgrid's scope involves augmenting the existing Transgrid's transmission network to enable the connection of the newly built CWO RNIP to the National Electricity Market (NEM). This portion of the enabling work is the non-contestable scope of CWO RNIP and is the focus of this report.

Transgrid's sourcing strategy for delivering the non-contestable scope is based upon a tendered Design and Construct (D&C) agreement for the design and construction of new and upgraded transmission lines, substations and secondary systems. This is supplemented by free issue and direct procurement of High Voltage (HV) plant, equipment and secondary systems by Transgrid from its existing Original Equipment Manufacturer (OEM) panel agreements.

The capital expenditure (capex) forecast for the non-contestable scope is based upon competitively tendered results for D&C transmission lines, substations and secondary systems awarded to Zinfra. The D&C agreement represents approximately 89% of the total cost for these cost categories. The remainder is supported by quotations and other estimates that have robust Basis of Preparation (BoP).

At the time of the D&C tender, the overhead line conductor transposition works required detail network planning for the integration of the CWO RNIP into the existing Transgrid network. Due to these time constraints the transposition works were excluded from the Request for Tender (RFT) and later quoted by Zinfra.

As these costs represent only 7.5% of the total capex, reliance upon quotation should not materially impact efficiency assessment.

Based upon the support held for these cost elements, GHD views these as Class 2 estimates.

The remaining direct capital items are based upon the best available estimate at this stage of the project's development supported by independent views on land / easements and biodiversity offset costs. These costs represent a blend of Class 3 / 2 estimates.

Labour forecasts are based on phased roles that relate to the team composition required to deliver project stream objectives. Project stream team structures represent the roles required to deliver activities retained by Transgrid and required to deliver the overall project.

The total capex forecast for the non-contestable scope is $437.9M (Real 2025-26) and the forecast from 1 July 2026 to 30 June 2031 is $236.2M (Real 2025-26). The difference represents pre-period costs of $8.2M incurred by Transgrid that are not part of the Infrastructure Planner Fee (IPF) and the amount claimed as part of the IPF.

Because of the support held for the total cost and forecast from 1 July 2026 to 30 June 2031, GHD has decided not to benchmark costs against the AEMO's Transmission Cost Database as it produces a Class 5b and 5a estimates to provide a ±50% and ±30% range of accuracy respectively. This is less accurate than the current estimate held.

The result of our assessment is further detailed in the table below.

Table 1 Assessment summary total costs and forecast ($M, Real 2025-26)

Cost element and GHD's assessment summary	Section reference	Total $M	Forecast from 1 July 2026 $M
Transmission lines The transmission line works were competitively tendered and the forecast is 100% supported by the outcomes of this tender process. Based upon the project's scope and the support provided by the competitive tender process these costs are considered prudent and efficient.	Section 5.1		[redacted]
Conductor transposition The overhead line conductor transposition works are 100% supported by a quotation provided by Zinfra. The line transposition works were not included in the RFT as the timing did not align with the required detailed network planning that was needed and a time delay would have delayed contract award. Following the award of the contract, Transgrid requested Zinfra to price the scope of works to complete the required conductor transposition. As these costs only represent 7.5% of the total capex, reliance upon quotation should not materially impact the efficiency assessment.	Section 5.2		
Substations Substation estimates are 90% supported by market response schedules following a competitive tender process. The remaining estimates for the associated substation equipment estimates are based upon previous Purchase Orders (PO) indexed to 2025-26FY dollar. The costs reviewed are considered efficient and required to deliver the project scope or reduce risk.	Section 5.3		
Secondary systems The secondary system estimate is again based upon the results of competitive tender process. The tendered result represents 92% of the total secondary systems estimate. The remaining component is supported by Bills of Material (BoM) price using previous PO that access panel agreements indexed to 2025-26FY dollar and a detailed bottom-up build-up of communication component costs. The costs reviewed are considered efficient and required to deliver the project scope or reduce risk.	Section 5.4		
Land and easements Land and easement estimates are based upon on internal valuation desktop assessment that uses the assumptions provided by external valuers, with other associated costs supported by external fee estimates. This estimate is based upon the best available information at this stage of the project's development. The costs reviewed are considered efficient and required to deliver the project scope or reduce risk.	Section 5.5		

Cost element and GHD's assessment summary	Section reference	Total $M	Forecast from 1 July 2026 $M
Biodiversity offsets Transgrid engaged E3 Advisory to perform an independent verification of the cost estimate of the biodiversity offset cost component of their portion of CWO RNIP. Again, this estimate is based upon the best available information at this stage of the project's development.	Section 5.6	[redacted]	
Labour and indirect costs Historical labour costs have been extracted from Transgrid's Enterprise Resource Planning (ERP) system that records incurred costs. Because these costs are not part of the forecast from 1 July 2026, GHD has not validated these costs Labour forecast costs are based on a bottom-up estimate. This uses the projects schedule, applying phased roles that are required to deliver the activities required to achieve project stream objectives. The rates applied to these roles include base costs and appropriate on-cost and overhead loadings. These rates benchmark well with NSW Distribution Network Service Providers (DNSPs) Ancillary Network Services (ANS) rates analysed by CutlerMerz in July 2022 when considering the greater level of project management required on this project compared to typical ANS activities. Other material costs are supported by external evidence including cost estimates and proposals from third parties. Where available, benchmarking of labour categories are supportive of the estimate. The costs reviewed are considered efficient and required to deliver the project scope or reduce risk.	Section 6	182.0	61.9
Risk provision Transgrid has undertaken quantitative cost and schedule risk analysis to estimate cost and schedule risk impacts. These provisions are considered prudent.	Section 7	17.1	11.7
Labour escalation	-	0.3	0.3
Equity raising	-	1.6	1.6
Rounding	-	(0.1)	0.1
Total		**437.9**	**236.2**

Section 4 includes a table that reconciles these forecasts to Transgrid's revenue proposal documentation.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.2 and the assumptions and qualifications contained throughout this report.

Glossary

Table 2 Glossary

Acronym	Term
ACEREZ	Acciona Cobra Endeavour Consortium
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ANS	Ancillary Network Services
BCSS	Barigan Creek Switching Station
BoM	Bill of Material
BoP	Basis of Preparation
CAPEX	Capital Expenditure (i.e. capex)
CWO	Central West Orana
D&C	Design and Construct
DNSP	Distribution Network Service Providers
ECI	Early Contractor Involvement
EII Act	Electricity Infrastructure Investment Act 2020 (NSW)
EII Regulation	Electricity Infrastructure Investment Regulation (2021)
EIS	Environmental Impact Statement
EOI	Expression of Interest
FTE	Full Time Equivalent
HV	High Voltage
IP	Infrastructure Planner
IPF	Infrastructure Planner Fee
ISP	Integrated System Plan
OEM	Original Equipment Manufacturer
PO	Purchase Order
QCSRA	Quantitative Cost and Schedule Risk Analysis
REF	Review of Environmental Factors
REZ	Renewable Energy Zone
RFT	Request for Tender
RNIP	REZ Network Infrastructure Project
SME	Subject Matter Experts
SP	Separable Portions
TET	Transmission Efficiency Test
TNA	Transmission Network Augmentation
TNSP	Transmission Network Service Provider
WPI	Wage Price Index

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1. Introduction

The CWO REZ was formally declared by the Minister for Energy and Environment under section 19(1) of the Electricity Infrastructure Investment Act 2020 (the Act) and published in the NSW Gazette on 5 November 2021.

The REZ declaration was the first step in formalising the REZ under the Act and establishes EnergyCo as the Infrastructure Planner (IP) responsible for coordinating the development of the REZ.

Transgrid has been appointed to deliver the non-contestable scope of the CWO RNIP (i.e. the Enabling CWO REZ Network Infrastructure Project).

Transgrid has engaged GHD to perform an independent verification and assessment of the non-contestable scope of CWO RNIP revenue submission to support their submission to the AER.

1.1 Purpose of this report

This report details GHD's independent verification and assessment of the non-contestable scope of CWO RNIP revenue submission to support Transgrid's submission to the AER.

1.2 Scope and limitations

The AER is responsible for revenue determinations for Network Operators authorised or directed to carry out[1] network infrastructure projects[2] under the Act and Electricity Infrastructure Investment Regulation 2021 (NSW) (EII Regulation). For non-contestable projects the AER in their July 2024 Transmission Efficiency Test (TET) and Revenue Determination Guideline for Non-Contestable Network Infrastructure Projects indicates that revenue determination process would be based upon a modified version of Chapter 6A of the National Energy Rules defined as EII Chapter 6A within this guideline. Based upon this guidance GHD's scope of works is limited to independent verification and assessment of whether the:

- Scope of the non-contestable portion of the CWO RNIP is appropriate to meet the requirements set out in the Consumer Trustee Authorisation[3] and Project Deed.
- Basis of Preparation detailed in the capital forecasting methodology is reasonable.
- Capital forecast is within ± 20 per cent the level of accuracy expected at this project stage considering the BoP and the level of support held / developed for each capital forecast component. With the accuracy and supportability of the resulting capital forecast assessed using a range of assurance techniques. These include validation against tender results, benchmarking against comparative projects, selection testing, recalculation, and alignment with industry practice.

[1] EII Act, s. 38 and EII Regulation 47. Carrying out a network infrastructure project may include owning or leasing, constructing, financing, operating, and/or maintaining assets.
[2] Under the EII Act, network infrastructure projects can be REZ Network Infrastructure Projects or Priority Transmission Infrastructure Projects. In this guideline, where we refer to a 'project' or 'network infrastructure project' we are referring to either. Where the EII Act and EII Regulation specify differences in processes for these types of network infrastructure projects, these differences are noted in this Guideline. The key difference is that REZ Network Infrastructure Projects authorised by the Consumer Trustee, require the Consumer Trustee to calculate a maximum capital cost. This is not required for REZ Network Infrastructure Projects directed by the Minister, or for Priority Transmission Infrastructure Projects authorised or directed by the Minister.
[3] AEMO Services, Notice of Authorisation – Enabling CWO REZ Network Infrastructure Project, 4 June 2024.

- Capital costs for development and construction for the network infrastructure project are prudent, efficient, and reasonable.

The following is considered out of scope:

- As detailed by the TET, revenue determinations made under the EII Act will not consider the prudency of the authorised network option against other potential network options.
- Costs included in the IPF.

1.3 Verification process and materiality

1.3.1 Methodology

GHD used several verification approaches to assess whether the capex forecast is prudent, efficient and reasonable. The approach applied depends on the nature of the cost element and include a combination of:

- Reliance on the results of Transgrid's competitive tendering processes supported by appropriate documentary evidence.
- Review against supporting evidence supplied by third parties, including:
    - Verification of actual costs incurred and forecasted costs by reviewing supporting documentation on a selection basis to confirm the amount, period / scope covered and that the costs only relate to the non-contestable portion of CWO RNIP.
    - Verification of estimates based upon recalculation and verification of underlying assumptions to:
        - Regulatory charges, where relevant
        - Cost estimates provided by third parties
        - Cost estimates which can be verified through benchmarking.
- Labour costs have been assessed on a bottom-up basis considering the reasonableness of the team structure, scheduled hours and position rates applied.
- Comparison between the capex forecast methodology, scope definition and cost forecasts supplied by Transgrid to ensure that cost forecasts accurately reflect the scope, and the assumptions outlined by the non-contestable scope.

- Consideration of whether costs are prudent and would be incurred by other Transmission Network Service Providers (TNSPs) if they were to undertake same scope of work.
- Consideration of whether costs relate to activities required to achieve project timeframes.

1.3.2 Materiality

When considering individual cost elements, GHD considers any cost at or under $1M (0.2% of total forecast) as immaterial.

When considering cost elements that are supported by a large number of line items, GHD has made a selection of the most material elements. Where we have done so this is indicated in the body of the report.

2. Non-contestable scope

2.1 Overview

The CWO RNIP scope consists of contestable and non-contestable works:

- ACEREZ is delivering the contestable works which include the design, construction, and operation of the CWO RNIP upon successfully being selected and authorised as the Network Operator by the IP and Consumer Trustee (Out of scope).
- Transgrid is delivering the Transmission Network Augmentation (TNA) works under a Project Deed with EnergyCo, executed 31 January 2025, i.e., the non-contestable portion of work to enable CWO RNIP to connect with the NEM. This is the focus of this report.

TNA works breakdown

The TNA works are split into **TNA upgrade** and **TNA connection** projects under the Project Deed with EnergyCo.

The **TNA upgrade** project is split into three separable portions:

- TNA Separable Portion 1: Bayswater to Liddell Upgrade Works
- TNA Separable Portion 2: Mount Piper to Wallerawang Upgrade Works
- TNA Separable Portion 3: Transposition Works

The **TNA connection** project is also split into three separable portions (one with four sub-components):

- TNA Separable Portion 4: Cut in to Barigan Creek Switching Station (BCSS)
- TNA Separable Portion 5A: Commissioning of BCSS Stage 1
- TNA Separable Portion 5B: Commissioning of BCSS Stage 2
- TNA Separable Portion 5C: Merotherie Lines Connection
- TNA Separable Portion 5D: Commissioning of BCSS Stage 3
- TNA Separable Portion 6: Facilitation of TL79 over-crossing

These works include:

- A new 330kV single circuit transmission line between Bayswater and Liddell substations
- A new 330kV single circuit transmission line between Mt Piper and Wallerawang substations
- BCSS cut in works involving Lines 5A3 and 5A5 and connection to Wollar substation and including remote ends works at Bayswater, Mt Piper and Wollar substations
- Works to Transgrid's existing 330KV Line 79 to enable the overcrossing of 500kV transmission lines to be constructed from BCSS to Merotherie Energy Hub for the CWO RNIP
- Transposition scope detailed in section 5.2.

The **TNA upgrade** project is proposed to be delivered under a D&C contract by Zinfra and the **TNA connection** project is proposed to be delivered through a combination of Transgrid self-performed works and by Zinfra.

Further details on the scope and delivery methodology of the **TNA upgrade** and **TNA connection** projects can be seen in the table below.

Table 3 Project Deed scope by separable portion

Name of TNA separable portion	Description of TNA separable portion	Delivery approach
TNA upgrade project		
TNA Separable Portion 1: Bayswater to Liddell Upgrade Works	Establish an additional 330kV transmission line between Bayswater Substation (BAY) and Liddell Substation (LD1), involving line modification works to utilise an existing 330kV transmission line and asset replacements at substations.	Zinfra
TNA Separable Portion 2: Mount Piper to Wallerawang Upgrade Works	Establish a new 330kV transmission line between Transgrid's existing Mt. Piper 330kV substation (MTP) and existing Wallerawang 330kV substation (WW1) and augment substations to accommodate additional lines.	Zinfra
TNA Separable Portion 3: Transposition Works	Perform line transpositions for four lines: Mount Piper to Barigan Creek and Barigan Creek to Bayswater to enable transfer of generation from CWO REZ to the NSW Transmission Network.	Zinfra
TNA connection project		
TNA Separable Portion 4: Cut in to BCSS	Modify the existing 500kv line 5A3 (Mt. Piper – Wollar) and 5A5 (Mt. Piper – Bayswater) to loop-in-loop out of BCSS.	Zinfra
TNA Separable Portion 5A: Commissioning of BCSS Stage 1	Provision of loop-in-loop-out landing spans to the Barigan Creek Switching Station gantry structures for line 5A5. Connection of line 5A5 (Mt. Piper – Wollar) to Barigan Creek Switching Station. Perform asset acceptance, testing and commissioning to energise relevant parts of Barigan Creek Switching Station (see below) into the NSW Transmission Network in accordance with the RNI Interface Deed and the Project Deed.	Transgrid Self-Performed
TNA Separable Portion 5B: Commissioning of BCSS Stage 2	Commissioning and energisation of remaining Merotherie line bays in accordance with the RNI Interface Deed and the Project Deed.	Transgrid Self-Performed
TNA Separable Portion 5C: Merotherie Lines Connection	Commissioning and energisation of Merotherie lines 5M1, 5M2, 5M3 and 5M4 in accordance with the RNI Interface Deed and the Project Deed.	Transgrid Self-Performed
TNA Separable Portion 5D: Commissioning of BCSS Stage 3	Connection of line 5A3 (Mt. Piper – Bayswater) to Barigan Creek Switching Station. Perform asset acceptance, testing and commissioning to energise all remaining parts of Barigan Creek Switching Station into the NSW Transmission Network in accordance with the RNI Interface Deed and the Project Deed.	Transgrid Self-Performed
TNA Separable Portion 6: Facilitation of TL79 over-crossing	Facilitate management of Transgrid's TL79 assets including facilitating outages during construction by the RNI Network Operator of the new transmission line that crosses over TL79.	Transgrid Self-Performed

The following diagram illustrates Transgrid's scope of works.

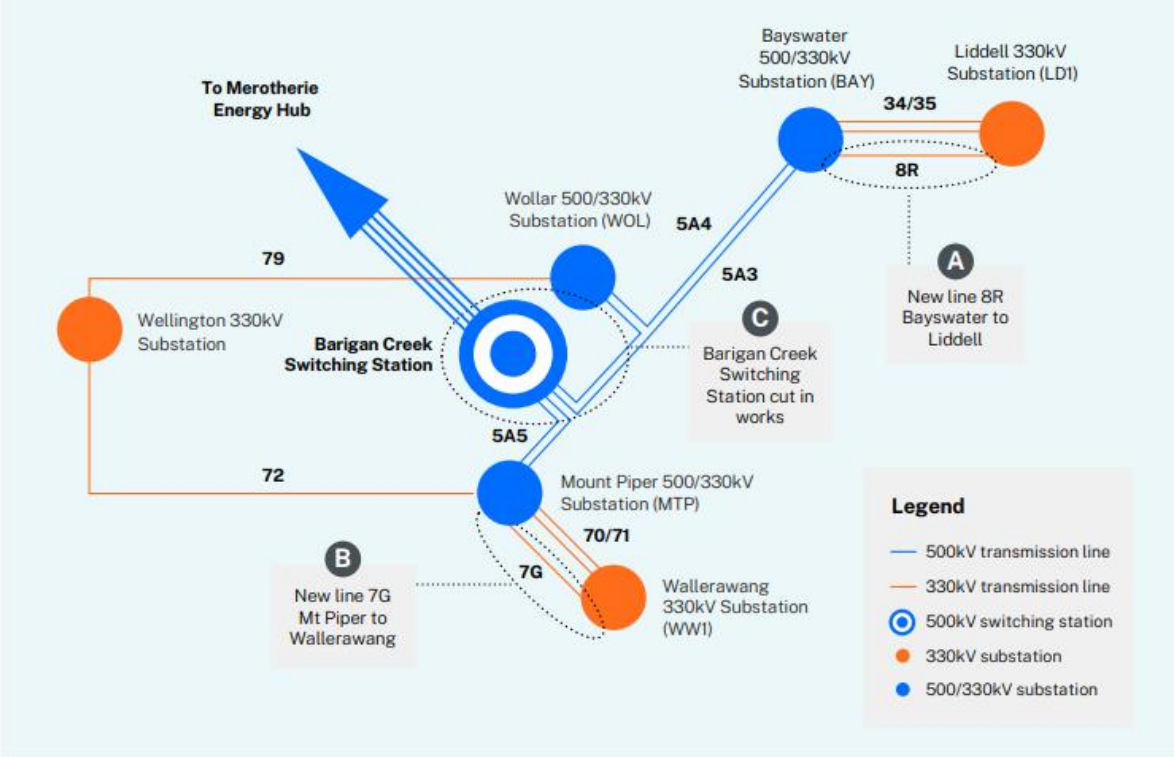


Figure 1 *Transgrid's 'Base' scope of works*

Contractor delivered works

For the purposes of downstream delivery by Zinfra, the four Separable Portions (SP) that Zinfra are delivering (consisting of SP1, SP2 and SP3 for TNA upgrade project and SP4 for TNA connection project) have been split into seven downstream SPs. The scope of the downstream SPs and the relationship to the upstream SP can be seen in the table below.

Table 4 *Contractor delivered works*

D&C contract separable portion	Downstream scope	Upstream separable portion
D&C SP 1 – Detailed design, and management plans	Design checks of Transgrid developed drawings. Design of new 330kV switching bays at Bayswater, Mt. Piper and Wallerawang – Design of foundations for new 330kV structures (Lattice Tower and Poles) between Bayswater to Liddell and Mt. Piper to Wallerawang. – Contract management plans – Geotechnical investigations – Other investigations.	TNA Separable Portions 1-4
D&C SP 2 - Barigan Creek 500kV Switching Station (BCSS) Cut-In	– Barigan Creek 500kV Switch Station (BCSS) cut-in works. – Remote End Works - 500kV Wollar. – Remote End Works - 500kV Bayswater. – Remote End Works - 500kV Mt. Piper.	TNA Separable Portion 4
D&C SP 3 - Transmission Line	– Removal of redundant TL73/74 timber poles and conductors in the vicinity of Bayswater to make way for line modifications and utilize existing switch bays.	TNA Separable Portion 1

D&C contract separable portion	Downstream scope	Upstream separable portion
Bayswater and Liddell	– Loop-in-loop-out (LILO) of the existing 330kV line 81, which runs between Liddell and Newcastle, in the vicinity of existing structure 81-688A at Bayswater Substation, to modify the network to become Line 81 between Newcastle and Bayswater. – The remaining section of Line 81 will be utilized to create the new 330kV transmission line between Bayswater and Liddell, to be called Line 8R. – Relocation of Line 33 and Line 34 to the spare Line 74 and Line 73 switch bays at Bayswater.	
D&C SP 4 - Substation Works Bayswater and Liddell	– Augment the existing Bayswater substation to accommodate the modified transmission line arrangement by replacing existing Line 74 and Line 73 landing poles within Bayswater Substation with new repositioned steel poles. – New secondary systems and panels for relocated Line 33 and Line 34 switch bays at Bayswater. – Replace and upgrade secondary system for existing Line 33 and Line 34 bays to Line 81 and Line 8R. – Secondary system (SS) remote end works at Bayswater and Liddell to address the network modifications.	TNA Separable Portion 1
D&C SP 5 - 330kV Transmission Line Mt Piper and Wallerawang	Construct 330kV single circuit line from Mt Piper to Wallerawang with twin olive conductors at 120°C design temperature.	TNA Separable Portion 2
D&C SP 6 - Substation Works Mt Piper and Wallerawang	Augment the existing Mt Piper and Wallerawang substations to accommodate additional lines by: – Adding additional feeder bays at both Mt Piper and Wallerawang and re-instate redundant generator feeder bay at Wallerawang. – Upgrading existing substation high voltage equipment to enable higher capacity where required at both substations. – Upgrading and updating protection, control, communications, and automation systems at both substations to accommodate for the network changes.	TNA Separable Portion 2
D&C SP 7 – Line Transpositions	– Design and construction of Transmission line foundations and new steel poles – The four transmission lines (5A4/5A3, 5P1/5P2) will be transposed at intervals corresponding to one-third and two-thirds of their lengths. At one end of these lines, the phases must be restored to align with the original phase sequence required at the substations. – The proposed technical solution is expected to be installed adjacent to an existing tension tower and will facilitate the transposition of the lines. – Phase rolls are assumed to be required at two substation locations. Tentatively understood to be Transgrid's Mount Piper and Barigan Creek. All temporary construction works will be managed in line with WHS Regulation requirements. Planning approvals to construct and operate are proposed to be obtained via a Review of Environmental Factors.	TNA Separable Portion 3

Transgrid delivered works

The scope of Transgrid's self-delivered works under the Project Deed can be seen in the table below.

Table 5 Transgrid delivered works

TNA separable portion	Transgrid delivered scope
TNA SP 5A: Commissioning of BCSS Stage 1	– Supply and installation of the 5A5 (Mt. Piper – Wollar) to loop-in-loop-out landing spans to the Barigan Creek Switching Station gantry structure. – Cut-in, commissioning and energisation of line 5A5 (Mt. Piper – Wollar) to a single busbar (Bus A) at Barigan Creek Switching Station, and energisation of one Merotherie line bay (up to the line disconnector) at Barigan Creek Switching Station from the same busbar (Bus A) through a coupler bay.
TNA SP 5B: Commissioning of BCSS Stage 2	– Commissioning and energisation of the remaining 3 Merotherie line bays (up to the line disconnectors) at Barigan Creek Switching Station to Bus B, and energisation of a second coupler bay on the same diameter as the line 5A5 (Mt. Piper – Wollar) cut-in. – Reasonable endeavours to undertake baseline harmonic voltage measurements for a minimum of 7 days based on the single Merotherie line bay energised in Commissioning of BCSS Stage 1, subject to coordination with the RNI Network Operator.
TNA SP 5C: Merotherie Lines Connection	– Connection of the droppers of each Merotherie line to the line bay referred to in Commissioning of BCSS Stage 2 and energisation of the four Merotherie lines sequentially. – Facilitation and support of the commissioning of the Merotherie line referred to above and relevant associated equipment at Merotherie Substation by the RNI Network Operator in accordance with the RNI Interface Deed.
TNA SP 5D: Commissioning of BCSS Stage 3	– Supply and installation of the 5A3 (Mt. Piper – Bayswater) to loop-in-loop out landing spans to the Barigan Creek Switching Station gantry structure. – Cut-in, commissioning and energisation of line 5A3 (Mt. Piper – Bayswater) to Bus A at Barigan Creek Switching Station. – Commissioning of remaining coupler bays and all remaining parts of Barigan Creek Switching Station. – Reasonable endeavours to undertake baseline harmonic voltage measurements for a minimum of 7 days following line 5A3 (Mt. Piper – Bayswater) cut-in and energisation, subject to coordination with the RNI Network Operator.
TNA SP 6: Facilitation of TL79 over-crossing	Outage facilitation includes: – Submitting outage request in line with ACEREZ outage plan. – Complete necessary outage coordination and operations on Transgrid's network to enable TL79 overcrossing works. – Supervision of works where ACEREZ works interface with TL79.

As detailed in Transgrid's Direct Capex Forecasting Methodology, the project's scope does not include the acquisition, energisation and operation of BCSS. The BCSS will be covered by Transgrid's Consumer Trustee Authorisation only after only after the Consumer Trustee has approved the transfer and the asset is formally transferred to Transgrid. As such, costs associated with the purchase, commissioning, operation and management of BCSS are excluded from the capex forecast.

2.2 Scope alignment

The New South Wales Ministerial Order number 580 - Electricity and Water, issued on Friday, 15 December 2023 (The Order), authorises Transgrid to deliver specified network infrastructure.

"The following network infrastructure is specified:

(a) Planned, new and existing network infrastructure in the specified geographical area.

(b) To the extent not specified in clause 1 (a) of this Schedule 2, planned and new network infrastructure operating at nominal voltages of 330kV or 500kV connecting:

(1) the existing network infrastructure operating at nominal voltages of 500kV connecting Bayswater 500kV substation, Wollar 500 kV substation and Mt Piper 500kV substation; and

(2) the existing network infrastructure operating at nominal voltages of 330kV connecting Wollar 500kV substation and Wellington 330kV substation.

(c) Planned and new augmentations to the existing Wollar substation.

(d) To the extent not specified in clause 1 (a) of this Schedule 2, existing network infrastructure operating at nominal voltages of 330kV connecting Wollar 500kV substation and Wellington 330kV substation"[4]*.*

Based upon the 4 June 2024 Notice of Authorisation – Enabling CWO RNIP from the Consumer Trustee, the works include -

"The authorised Enabling CWO REZ Network Infrastructure Project comprises:

(a) a new 330 kV single circuit transmission line between Bayswater and Liddell substations indicatively as shown in the Map and generally as described in the Diagram, in each case marked A

(b) a new 330 kV single circuit transmission line between Mt Piper and Wallerawang substations indicatively as shown in the Map and generally as described in the Diagram, in each case marked B

(c) Barigan Creek switching station cut in works involving Lines 5A3 and 5A5 and connection to Wollar substation indicatively as shown in the Map and generally as described in the Diagram and including remote ends works at Bayswater, Mt Piper and Wollar substations, in each case marked C

(d) works to the Network Operator's existing 330 kV Line 79 to enable the overcrossing of 500 kV transmission lines to be constructed from Barigan Creek switching station to Merotherie Energy Hub for the Central West Orana renewable energy zone generally as described in the Diagram

(e) all ancillary plant, equipment or other assets that will be connected to or used by the Network Operator for the purposes of controlling and operating the above network infrastructure; and

(f) any change, modification or addition to the above network infrastructure:

(1) required for the Network Operator to comply with its obligations under the National Electricity (NSW) Law or otherwise at law; or

(2) made in accordance with the Project Deed, provided that following the relevant change, modification or addition, the authorised Enabling CWO REZ Network Infrastructure Project will remain consistent with the description in sections 5(a) to 5(e) of this instrument.

The Enabling CWO REZ Network Infrastructure Project does not include any Dedicated Connection Assets."[5]

[4] Ministerial Order 580 Schedule 2
[5] 4 June 2024 Notice of Authorisation – Enabling CWO REZ Network Infrastructure Project from the Consumer Trustee AEMO Services

Based upon this information and the scope detailed in section 2.1 the scope of the project is appropriate to meet the requirements set out in the Consumer Trustee Authorisation and Project Deed.

3. Non-contestable scope CWO RNIP procurement

Transgrid's sourcing strategy was based upon:

- Design and construct contract for the design and construction of new and upgraded transmission lines and substations
- Direct procurement of HV plant, equipment and secondary systems from existing panel agreements, some of which will be free issued to the D&C contractor.

This strategy and the procurement process detailed below is consistent with other TNSP's and supports demonstration of efficiency.

Transgrid's Direct Capex Forecasting Methodology sets out the procurement process reproduced in the figure below.

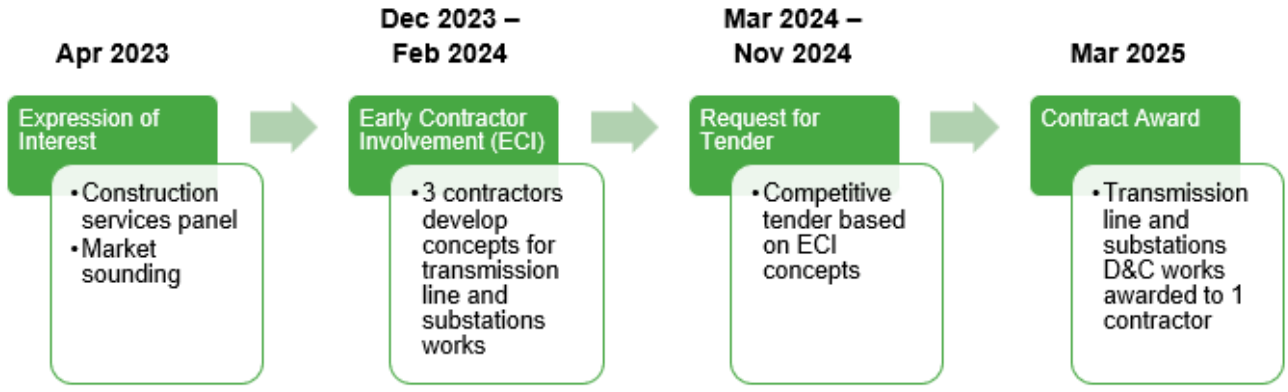


Figure 2 Transmission line and substations procurement process

The Expression of Interest (EOI) was issued to eight contractors with four responding. Subsequently the EOI was also issued to [redacted] to support competitive tension, taking the total responses to five.

The five EOI responses were evaluated, resulting in three selected to progress to the Early Contractor Involvement (ECI) phase. During this phase the design was progressed and key project risks evaluated.

These ECI participants and one other contractor were issued an RFT. Two contractors responded with the D&C contract awarded to Zinfra following tender evaluation. As part of this process, Transgrid engaged [redacted] to complete a value for money assessment of the tenderers' pricing. The assessment focused on three key areas:

- Review of the two tender submissions and associated tender clarifications and departures.
- Comparison of the two tender submissions against [redacted] previous estimate of the project, with a specific focus on activities where there was a large cost variance between [redacted] estimate and tender submissions.
- Recommendations to Transgrid to assist with ongoing tender clarifications.

The line transposition works detailed in section 5.2 were not included in the RFT as it required detailed network planning for the integration of the main CWO RNIP (contestable portion) into the existing Transgrid network.

Following the award of the contract, Transgrid asked Zinfra to price the scope of works to complete the required transmission line transpositions. The response from Zinfra forms the basis of Transgrid's forecast.

3.1 Non-contestable scope CWO RNIP procurement conclusion

Transgrid has significant experience developing procurement strategies for Integrated System Plan (ISP) projects. Across EOI, ECI and tender phases they have ensured that competitive tension is present which supports demonstration of efficiency.

4. Capital forecast

The capital forecast includes:

- Actual costs incurred across 2020-21 and 2021-22, referred to as pre-period costs
- Actual and expected costs incurred and provisioned for by EnergyCo, referred to as IPF
- Transgrid's forecast costs from 1 July 2026 to 30 June 2031.

The table below sets out a high-level summary of the forecast costs for the non-contestable scope of the CWO RNIP works.

Table 6 Total capex forecast capex for non-contestable CWO RNIP separating various capital elements ($M, Real 2025-26)

Capital element	Report reference	Total $M	Pre-period costs $M	IPF $M	Forecast from 1 July 2026 $M
Transmission lines	Section 5.1	[redacted]			
Conductor transposition	Section 5.2				
Substations	Section 5.3				
Secondary systems	Section 5.4				
Land and easements	Section 5.5				
Biodiversity offsets	Section 5.6				
Labour and indirect costs	Section 6	182.0	(8.2)	(111.9)	61.9
Risk provision	Section 7	17.1		(5.4)	11.7
Labour escalation	-	0.3			0.3
Equity raising costs	-	1.6			1.6
Rounding	-	(0.1)		0.2	0.1
Total		**437.9**	**(8.2)**	**(193.5)**	**236.2**
Total excluding labour and indirect costs and the risk provision		**238.8**			

The following table provides a reference point to the revenue submission materials. This table starts with total costs excluding labour / indirect and the risk provision. Adds these elements to the capital element categories and deducts IPF to produce a forecast from 1 July 2026.

Table 7 Total capex forecast capex for non-contestable CWO RNIP ($M, Real 2025-26)

Capital element	Total excluding labour and risk $M	Labour escalation $M	Risk provision $M	Labour and indirect costs $M	Pre-period costs $M	IPF $M	Forecast from 1 July 2026 $M	Per Capital Forecasting Methodology $M
Transmission lines	115.5	0.1	12.8	110.2	(4.9)	(103.9)	129.8	
Conductor transposition	32.7						32.7	
Total transmission lines	***148.2***	***0.1***	***12.8***	***110.2***	***(4.9)***	***(103.9)***	***162.5***	***162.5***
Substations	36.8	0.1	3.5	28.8	(1.4)	(31.6)	36.2	36.2
Secondary systems	16.3		0.3	11.9	(0.6)	(13.1)	14.8	14.8
Land and easements	[redacted]							
Biodiversity offsets								
Labour escalation	0.3	(0.3)						-
Equity	1.6						1.6	1.6
Rounding	(0.1)				0.1	0.2	(0.1)	(0.1)
Total	**238.8**	**-**	**17.1**	**182.3**	**(8.2)**	**(193.5)**	**236.2**	**236.2**

5. Direct non-labour costs

5.1 Transmission lines

Table 8 Breakdown of transmission costs ($M, Real 2025-26)

Forecast element	Report reference	Total $M
D&C contractor costs	Section 5.1.1	115.5
Total		**115.5**

5.1.1 Transmission D&C contract

As detailed in section 3, the D&C Contract - Transmission Line, Substations and Secondary System was awarded to Zinfra following an evaluation of competitive tenders.

The tender was split into SPs with the following files representing Zinfra's tender price schedules:

– CONS2_2025-03-20 Part 4.1 Pricing Schedule - SP1_Item1

– CONS3_2025-03-20 Part 4.1 Pricing Schedule - SP2 BCSS Cut-In_Item1

– CONS4_2025-03-20 Part 4.1 Pricing Schedule - SP3 Bayswater to Liddell_Item1

– CONS5_2025-03-20 Part 4.1 Pricing Schedule - SP4 Bayswater to Liddell_Item1

– CONS6_2025-03-20 Part 4.1 Pricing Schedule - SP5 MTP-WW1_Item1

– CONS7_2025-03-20 Part 4.1 Pricing Schedule - SP6 MTP-WW1_Item1.

The D&C contractor costs for transmission lines are outlined in the following table, which were verified to Zinfra tender price schedules and review of the contract execution page.

Table 9 Direct D&C contractor costs for transmission lines ($M, Nominal)

Component	Total $M
SP1	[redacted]
SP2	
SP3	
SP4	
SP5	
SP6	
Difference	
Total ($M Nominal)	**117.5**
Total ($M, Real 2025-26FY)	**115.5**

This direct D&C contractor cost information can also be reorganised in the following manner as shown in the table below.

Table 10 Breakdown of direct D&C contractor costs for transmission lines ($M, Nominal)

Component	Total $M
Transmission towers	45.2
Tower support structures	48.0
Conductors	24.3
Total ($M Nominal)	**117.5**
Total ($M, Real 2025-26FY)	**115.5**

5.1.2 Transmission lines conclusion

The transmission line works detailed in section 2.1 are required to deliver the project and the cost estimate is supported by tender price schedule following a competitive tender process.

Based upon the project's scope and the support provided by the competitive tender process these costs are considered prudent and efficient.

5.2 Conductor transposition costs

Transgrid's Direct Capex Forecasting Methodology details that under the Project Deed, conductor transpositions for four lines are also required to enable transfer of generation from CWO REZ to the NSW transmission network.

Transposition refers to the swapping of conductor positions along a transmission line at period intervals to reduce system imbalance.

Transgrid's Direct Capex Forecasting Methodology details that five key packages of works are required, illustrated in the following figure.

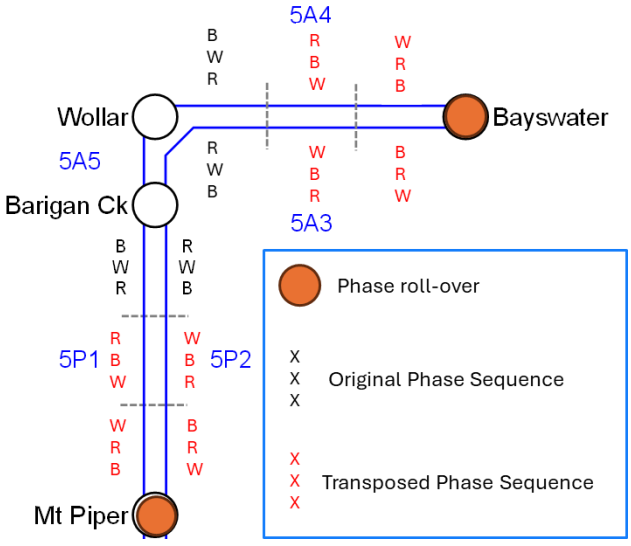


Figure 3 Transposition work packages

The line transposition works detailed in this section were not included in the RFT as the timing did not align with the detailed network planning that was needed and a time delay would have delayed contract award.

Following the award of the contract, Transgrid asked Zinfra to price the scope of works to complete the required transmission line transpositions. The response from Zinfra forms the basis of Transgrid's forecast.

Table 11 Transposition D&C costs ($M, Nominal)

Component	Total $M
Transmission line works	30.4*
Design	3.2*
Total ($M, Nominal)	**33.6**
Total ($M, Real 2025-26)	**32.7**

*Verified to Zinfra quotation price schedules.

5.2.1 Transposition conclusion

Overhead line conductor transposition costs are supported by a quotation from Zinfra and are required to complete the project's scope.

At the time of tender the transposition works required detail network planning for the integration of the main CWO RNIP into the existing Transgrid network. Due to these time constraints the transposition works were excluded from the RFP and later quoted by Zinfra.

As these costs represent only 7.5% of the total capex, reliance upon quotation should not materially impact efficiency.

5.3 Substations

The costs related to substations are presented in the following table.

Table 12 Substation capital forecast breakdown ($M, Real 2025-26)

Component	Report reference	Total $M
D&C contractor costs	Section 5.3.1	33.2
Equipment	Section 5.3.2	3.6
Total		**36.8**

5.3.1 D&C substations contractor costs

As detailed in section 3, the D&C Contract - Transmission Line, Substations and Secondary System was awarded to Zinfra following an evaluation of competitive tenders.

GHD verified the forecast costs to Zinfra tender price schedules and review of contract execution page.

Table 13 Breakdown of substations D&C forecast ($M, Nominal)

Component	Total $M
SP1	[redacted]
SP2	

Component	Total $M
SP3	[redacted]
SP4	
SP5	
SP6	
Rounding	(0.1)
Total ($M, Nominal)	**33.4**
Total ($M, Real 2025-26)	**33.2**

5.3.2 Substation equipment

The cost elements for substation equipment are presented in the following table. The equipment was procured through existing OEM panels.

These costs form part of the IPF and are considered outside the scope of the AER's review.

Table 14 Breakdown of substations equipment forecast ($M, Real 2025-26)

Component	Report reference	Total $M
Current transformers (CT)	Section 5.3.2.1	0.9
Disconnectors	Section 5.3.2.2	0.8
Line trap	Section 5.3.2.3	0.6
Circuit breakers	Section 5.3.2.4	0.6
Earth switch	Section 5.3.2.5	0.3
Voltage transformers (VT)	Section 5.3.2.6	0.3
Under $100K	Not material	0.1
Total		**3.6**

5.3.2.1 Current transformers (CT)

Table 15 Breakdown of CT forecast ($M, Real 2025-26)

Quantity	Associated switchbay	GHD assessment	Total $M
[redacted]	330kV Transmission Line Bayswater to Liddell	Quantity agreed to Bill of Material (BoM), price agreed to 2024 Purchase Order (PO) indexed to 30 June 2026	[redacted]
	330kV Transmission Line Mt Piper		
	330kV Transmission Line Wallerawang		
Total			**0.9**

5.3.2.2 Disconnectors

Table 16 Breakdown of disconnectors forecast ($M, Real 2025-26)

Quantity	Associated switchbay	GHD assessment	Total $M
[redacted]	330kV Transmission Line Bayswater to Liddell	Quantity agreed to BoM, price agreed to contract price schedule	[redacted]
	330kV Transmission Line Mt Piper		
	330kV Transmission Line Wallerawang		
Total			**0.8**

5.3.2.3 Line trap

Table 17 Breakdown of line trap forecast ($M, Real 2025-26)

Quantity	Associated switchbay	GHD assessment	Total $M
[redacted]	330kV Transmission Line Bayswater to Liddell	Quantity agreed to BoM, price agreed to 2024 PO indexed to 30 June 2026	[redacted]
	330kV Transmission Line Mt Piper		
	330kV Transmission Line Wallerawang		
Total			**0.6**

5.3.2.4 Circuit breakers

Table 18 Breakdown of circuit breakers forecast ($M, Real 2025-26)

Quantity	Associated switchbay	GHD assessment	Total $M
[redacted]	330kV Transmission Line Bayswater to Liddell	Quantity agreed to BoM, price agreed to 2024 PO indexed to 30 June 2026	[redacted]
	330kV Transmission Line Mt Piper		
	330kV Transmission Line Wallerawang		
Total			**0.6**

5.3.2.5 Earth switch

Table 19 Breakdown of earth switches forecast ($M, Real 2025-26)

Quantity	Associated switchbay	GHD assessment	Total $M
[redacted]	330kV Transmission Line Bayswater to Liddell	Quantity agreed to BoM, price agreed to 2024 PO indexed to 30 June 2026	[redacted]
	330kV Transmission Line Mt Piper		
	330kV Transmission Line Wallerawang		
Total			**0.6**

5.3.2.6 Voltage transformers (VT)

Table 20 Breakdown of VT forecast ($M, Real 2025-26)

Quantity	Associated switchbay	GHD assessment	Total $M
[redacted]	330kV Transmission Line Bayswater to Liddell	Quantity agreed to BoM, price agreed to 2024 PO indexed to 30 June 2026	[redacted]
	330kV Transmission Line Mt Piper		
	330kV Transmission Line Wallerawang		
Total			**0.3**

5.3.3 Substations conclusion

Substation estimates are supported by tender price schedule following a competitive tender process. The associated substation equipment estimates are based upon previous purchase orders (procured under established panel contracts) indexed to 2025-26FY.

The costs reviewed are considered efficient and required to deliver the project scope or reduce risk.

5.4 Secondary systems

As detailed in section 3, the D&C Contract - Transmission Line, Substations and Secondary System was awarded to Zinfra following an evaluation of competitive tenders. Other secondary systems cost elements were procured through existing panel arrangements.

The secondary systems costs are presented in the following table.

Table 21 Breakdown of secondary system forecast ($M, Real 2025-26)

Forecast and incurred costs	Reference	Total $M
D&C costs	Section 5.4.1	15.0
Protection relays	Section 5.4.2	0.4
Communications	Section 5.4.3	0.4
Other less than $200K	Not material	0.5
Total		**16.3**

5.4.1 Secondary systems D&C costs

As detailed in section 3, the D&C Contract - Transmission Line, Substations and Secondary System was awarded to Zinfra following an evaluation of competitive tenders.

GHD verified the costs to Zinfra tender price schedules and review of contract execution page.

Table 22 Secondary systems D&C costs ($M, Nominal)

Component	Total $M
SP1	[redacted]
SP2	
SP3	
SP4	

Component	Total $M
SP5	[redacted]
SP6	
Total ($M Nominal)	**15.3**
Total ($M, Real 2025-26)	**15.0**

5.4.2 Protection relays

The forecast cost for [redacted] protection relays for the Wollar, Bay-LD, Mt Piper and BCSS sites are outlined in the table below.

Table 23 Forecast protection relay cost ($M, Real 2025-26)

Site	Quantity	Purchase order amount $	Adjusted total cost (units multiplied by quoted amount) $	GHD assessment
Wollar	[redacted]	[redacted]	[redacted]	Quantity verified to BoM. Price verified to PO price adjusted to ($ Real 2025-26)
BAY-LD1				
Mt Piper - Wallerawang				
BCSS				
Estimated protection relay cost			**410,349**	

5.4.3 Communications

Estimated costs associated with the X TRAN and RAD communications systems are outlined in the table below.

Table 24 X TRAN and RAD communications systems costs ($M, Real 2025-26)

Site	Adjusted cost $ 2025-26	GHD assessment
XTRAN		
[redacted]		Not considered material but consists of a large spreadsheet that identifies a large number of lower cost components and licenses in Euros converted to AUD.
RAD		
[redacted]		Not considered material but consists of a large spreadsheet that identifies a large number of lower cost components.

Site	Adjusted cost $ 2025-26	GHD assessment
[redacted]		
Total	**377,883**	

5.4.4 Secondary systems conclusion

The secondary system cost is based upon the results of competitive tender process, previous purchase orders accessing panel agreements indexed to 2025-26 and detailed bottom up build up or communication component costs.

The costs reviewed are considered efficient and required to deliver the project scope or reduce risk.

5.5 Land and easements

Land and easement costs related to landholder compensation and compulsory acquisition costs for transmission line easements and transposition activities.

Costs supported by compensation assessment report by [redacted] and legal fee estimates by [redacted]

Table 25 Breakdown of land and easement costs ($M, Real 2025-26)

Forecast element	Reference	Total $M
Augmentation works	Section 5.5.1	[redacted]
Transposition works	Section 5.5.2	
Total		

5.5.1 Land acquisition

Land acquisition costs related to transmission augmentation works from [redacted] are presented in the following table.

Table 26 Land and easements transposition costs ($M, Real 2025-26)

Category	Total $M	GHD assessment
Compensation	[redacted]	The estimate is based on a Compensation Assessment Report prepared by [redacted] covering the proposed Acquisition of a Temporary Access Easement 10m wide and a Temporary Laydown Area over Lot 103 DP 1164619 for a period of 2.5 years and a variable width Transmission Line Easement in perpetuity over part Lot 5 DP 1087684 by Transgrid.
Legal fees		Supported by [redacted] legal fee estimate
Landholders disturbance costs		Supported by [redacted] egal fee estimate – selection from same estimate for legal fees
Option fees		Non-material [redacted] advice artefact
Valuation fees (landholder disturbance)		Non-material, advice artefact
Negotiation contingency		Refer section 7

Category	Total $M	GHD assessment
Total	[redacted]	-

5.5.2 Transposition land access and easement acquisition

The table below presents the assessment of land access and easement acquisition costs for transposition activities. The transposition works requires:

– Four permanent transmission line easement acquisitions
– Six access easements
– One temporary easement.

Table 27 Transposition land access and easement acquisition ($M, Real 2025-26)

Category	Total $M	GHD assessment
Compensation	[redacted]	Based upon compensation estimate using above assumptions. Includes [redacted] of negotiation contingency, described further in section 7.
Legal fees		Supported by [redacted] legal fee estimate
Landholders disturbance costs		Supported by [redacted] legal fee estimate
Option fees		Supported by [redacted] legal fee estimate
TG Valuation fees (landholder disturbance)		
Minor interests disturbance costs		
DCCEEW compulsory acquisition costs		Based upon [redacted] fee estimator screen shot
Total		-

5.5.3 Land and easements conclusion

Land and easement estimates are based upon on internal valuation desktop assessment that uses the assumptions provided by external valuers, with other associated costs supported by external fee estimates [redacted]

The costs reviewed are considered efficient and required to deliver the project scope or reduce risk.

5.6 Biodiversity costs

GHD prepared the biodiversity estimate for the CWO RNIP. To address conflicts of interest, Transgrid engaged E3 Advisory to perform an independent verification of the cost estimate of the biodiversity offset cost component of their CWO REZ Revenue Submission to the AER. Their report included in Appendix A.

The following table has been reproduced from the E3 Advisory report.

Table 28 E3 biodiversity cost independent verification finding summary

Review area	Finding description
Review the Land Area Requiring Offsets	The design envelope is considered reasonable. The envelope is consistent with a 60m wide 330kV transmission line easement and 6m width for access tracks. The design envelope also makes allowance for crane and Elevated Work Platform pads. More area may be disturbed with the creation of the access tracks (10m width may be necessary) then the 6m with allows however a contingency for additional disturbed land is included in the estimate.
Review Offset Unit Rates	The use of Biodiversity Credit Fund Credit Charge Report for biodiversity offset credit rates is considered a reasonable basis for determining the total biodiversity offset costs. The rate of change of these credit rates is relative stable for most ecosystem and species credit charges.
	Transgrid has provided justification for the 80/20% split between Biodiversity Stewardship Agreement / Credit Price costings in the Expected Case Scenario (based on past project experience and land prices in the west of NSW versus the east).
Cost Estimate Calculation Review	The calculation methods and sources used to develop the Transposition cost estimate is clearly stated and the relevant source material has been provided.
	Transgrid has selected the expected case scenario for the augmentation biodiversity offset costs. This is considered a reasonable approach given Transgrid is only able to recover costs that are considered prudent and efficient. Transgrid should consider inclusion of the difference in costs between the high case and expected case as a risk allowance in its overall cost estimate.
	The calculation methods and sources used to develop the Augmentation cost estimate is clearly stated and the relevant source material has been provided.
Detailed Calculation Check	Several minor inconsistencies were identified, however the calculations in the provided spreadsheets and tables produce the correct total cost estimate with minimal errors.
	For the augmentation works, the approach adopted to allocating credit prices was to select the closest matching OTG or species and closest subregion to the subject land and most recent BC Charge quote available.
Review Contingency and Escalation	Transgrid has included appropriate contingencies for additional impacted area, additional offset credits and credit price escalation the Augmentation works.
	Transgrid have not included contingencies for the Transposition works because of the conservative nature of the estimate and alternative approval pathway for the works.

Source – E3 Biodiversity offset cost estimate Independent Verification April 2025 P15

5.6.1 Biodiversity costs conclusion

The biodiversity cost estimate is based upon the best available information at this stage of the project's development.

6. Labour and indirect costs

Labour and indirect costs are a combination of pre-period costs incurred by Transgrid across 2020-21 and 2021-26and forecasted costs between 1 July 2026 to 30 June 2031.

The Forecasted labour components of the costs have been estimated based upon:

– The Full Time Equivalents (FTE) profile and numbers required to deliver each project objective to support delivery
– The month-by-month FTE requirements for each role type to meet the project schedule
– Hourly labour rates for each role type, including on-costs and support costs.

Across the following sections, those material cost elements have been assessed through:

– Verified the forecast to the supporting spreadsheets that have been used to generate labour and indirect cost forecasts
– Extracted and analysed the phased FTE profile to consider the appropriateness of roles and numbers required to deliver project stream objectives
– Considered the reasonableness of hourly rates applied by role in the forecast
– Performed a simple extension of the phased FTE profile by the hourly rates to confirm the material correctness of the forecast
– Where possible, performed a benchmarking assessment to similar projects to further assess reasonableness.

The following table shows labour and indirect cost forecasts from 1 July 2026 and pre-period costs. As the IPF are recoverable by Transgrid, these were not assessed.

Table 29 Labour and indirect costs summary ($M, Real 2025-26)

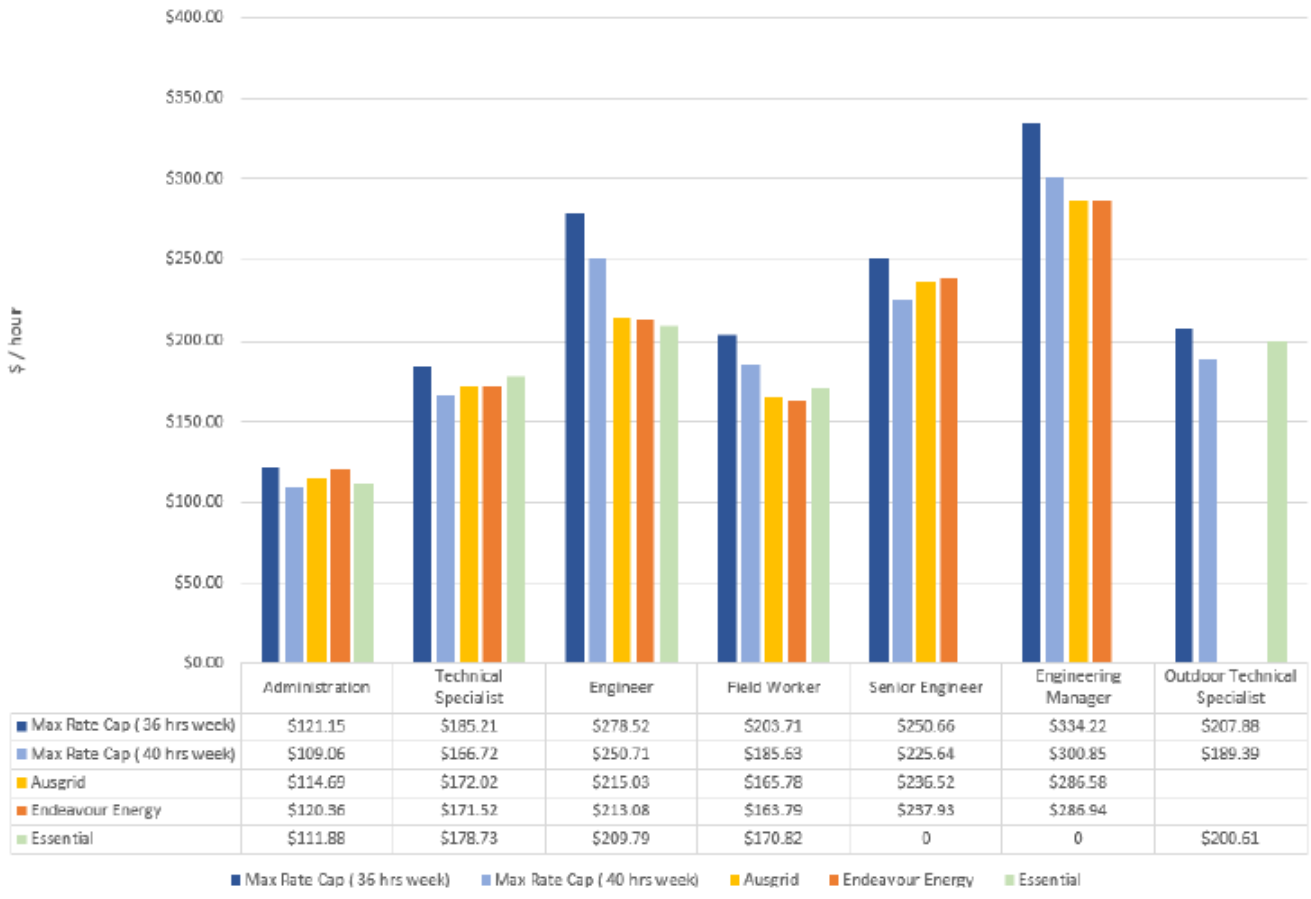
Category	Section reference	Total $M
Pre-period costs (2020-21 to 2021-22)	Section 6.3	8.2
Construction management (Forecast from 1 July 2026)	Section 6.4	19.3
Project management (Forecast from 1 July 2026)	Section 6.5	12.9
Commercial management (Forecast from 1 July 2026)	Section 6.6	10.9
Other support & corporate roles (Forecast from 1 July 2026)	Section 6.7	8.5
Land and environment (Forecast from 1 July 2026)	Section 6.8	5.4
Project controls (Forecast from 1 July 2026)	Section 6.9	3.1
Project development (Forecast from 1 July 2026)	Section 6.10	1.4
Community and stakeholder engagement (Forecast from 1 July 2026)	-	0.3
Total		**70.0**
Total (including IP costs of $111.9M)		**182.0**

6.1 Labour rates

In July 2022, CutlerMerz performed a benchmarking exercise of NSW DNSP ANS labour rates. The rates include:

- Basic hourly salary
- On-costs consisting of leave, superannuation, workers compensation, payroll tax, annual leave loading and long service leave loading
- Overheads.

The following figure provides an all-inclusive labour rate comparison of DNSP rates.



	Administration	Technical Specialist	Engineer	Field Worker	Senior Engineer	Engineering Manager	Outdoor Technical Specialist
Max Rate Cap (36 hrs week)	$121.15	$185.21	$278.52	$203.71	$250.66	$334.22	$207.88
Max Rate Cap (40 hrs week)	$109.06	$166.72	$250.71	$185.63	$225.64	$300.85	$189.39
Ausgrid	$114.69	$172.02	$215.03	$165.78	$236.52	$286.58	
Endeavour Energy	$120.36	$171.52	$213.08	$163.79	$237.93	$286.94	
Essential	$111.88	$178.73	$209.79	$170.82	0	0	$200.61

Figure 4 All-inclusive labour rates cap comparison ($2022/23)

Source - July 2022, CutlerMerz benchmarking exercise of NSW DNSP ANS labour rates

Ancillary Network Services include activities that require less senior supervision than a project of this nature (i.e. public lighting and metering services). Transgrid's labour classification system also does not align with the classification system used by CutlerMerz, as a result GHD has considered averages across all CWO RNIP project roles, including on-costs and overhead allocations.

A comparison of these rates updated by Wage Price Index (WPI) 3.2% to end of December 2024 compared to the rates used in the forecast is presented in the following figure. This comparison shows that the average labour rate applied across all roles by Transgrid falls under the AER Max Rate Cap (36-hour week) average. The average is above the DNSP ANS average as expected as these activities don't require the degree of supervision or senior project management as would be required on a project of this nature.

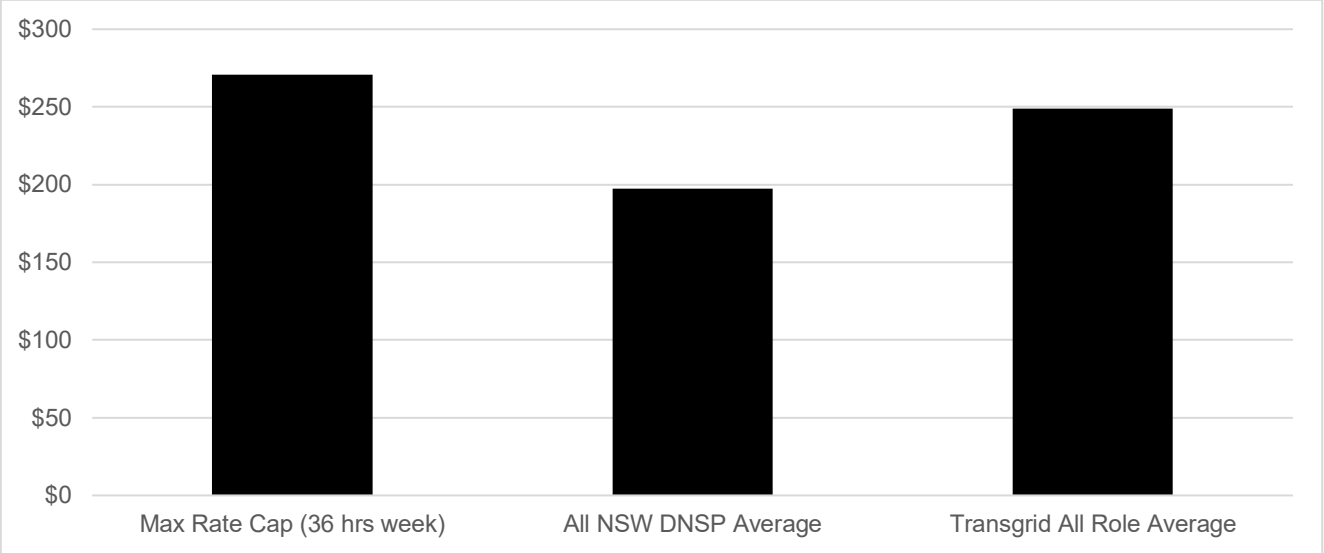


Figure 5 Comparison of CutlerMerz NSW DNSP ANS labour rates to labour rates used by Transgrid in labour cost estimates

6.2 Labour related costs

Forecasted labour related costs across all forecasted elements are based upon a set of standard assumptions detailed in the following table.

These have been verified to the labour cost estimation spreadsheet.

On-costs assumptions embedded within the spreadsheet are 30% which is materially consistent with other Transgrid ISP projects such as VNI West and HumeLink that applied 30.3%.

Table 30 Labour overhead assumptions

Overhead element	Basis of estimate	Cost basis of estimate
Training	Per FTE	$1,750.00 pa
Recruitment	Based upon salary costs	Recruitment fees as 15% of annual salary 25% of FTEs considered 'new'
IT hardware	Per FTE	$3,337.00 pa
Travel	Number of trips taken in each year of the modelling period	Cost per trip $1,351.00 based upon ATO rates

6.3 Pre-period costs

Pre-period costs refer to actual costs incurred by Transgrid across 2020-21 and 2021-22 related to identifying and considering technical options for the CWO REZ transmission infrastructure, including community and stakeholder engagement. The costs only include those that have not been recovered via other mechanisms (i.e., the IPF).

As these costs do not form part of the forecast from 1 July 2026, they have not been assessed by GHD.

The pre-period costs are outlined in the following table.

Table 31 Pre-period costs ($M, Real 2025-56)

Category	Total $M
Labour costs (internal and contracted)	4.9

Category	Total $M
Labour related costs	0.1
Indirect costs	11.9
IPF	(8.7)
Total	**8.2**

6.4 Construction management

The forecasted construction management costs encompass the expenses associated with oversight and coordination of the D&C contractor's site-based construction activities. This includes facilitating and reviewing on-site investigations, conducting ongoing constructability reviews, finalising construction related management plans, and coordinating contractor safety inductions.

Table 32 Construction management labour and indirect costs ($M, Real 2025-26)

Category	Section reference	From 1 July 2026 Total $M
Internal labour costs	Section 6.4.1	15.3
Labour overhead costs	N/A	4.0
Total		**19.3**

6.4.1 Internal labour costs

The figure below details the month-by-month internal construction management FTE numbers required to deliver the construction management activities. The construction management team consists of 60 roles reflecting an average of approximately 15 FTEs, based upon examination of the supporting spreadsheet to the forecast.

The following figure details the monthly total FTEs forecasted for the above roles given the construction management requirements.

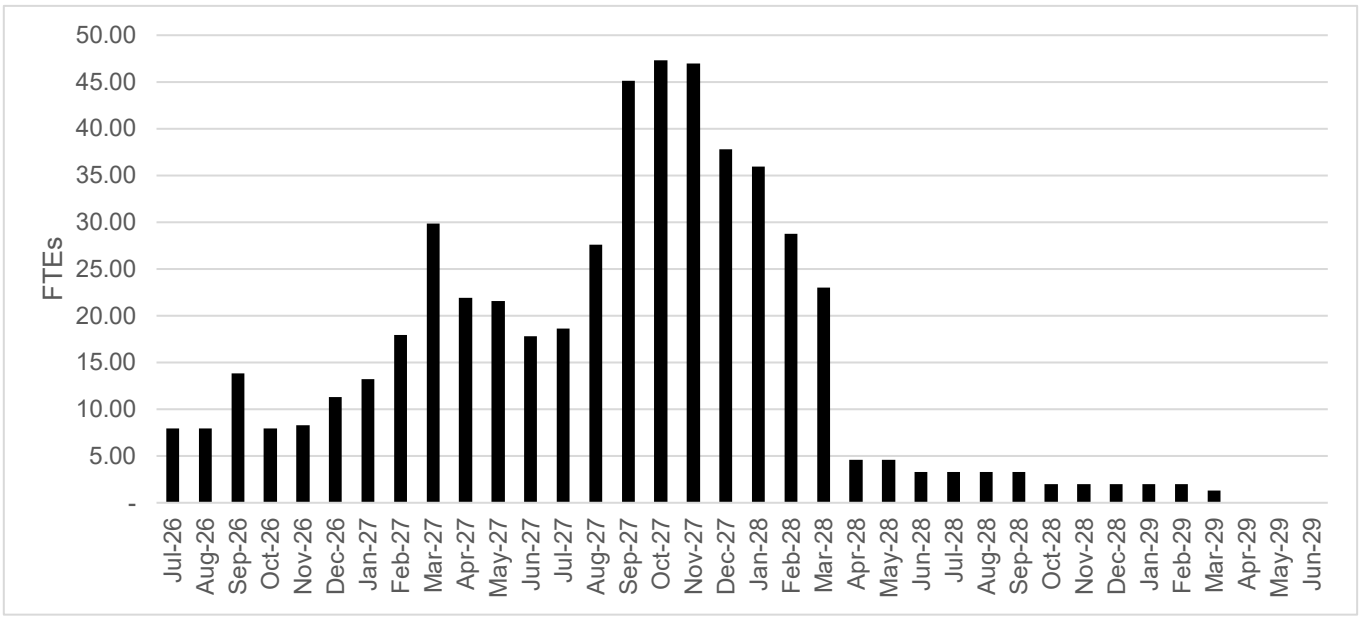


Figure 6 *Construction management phased FTE profile forecast*

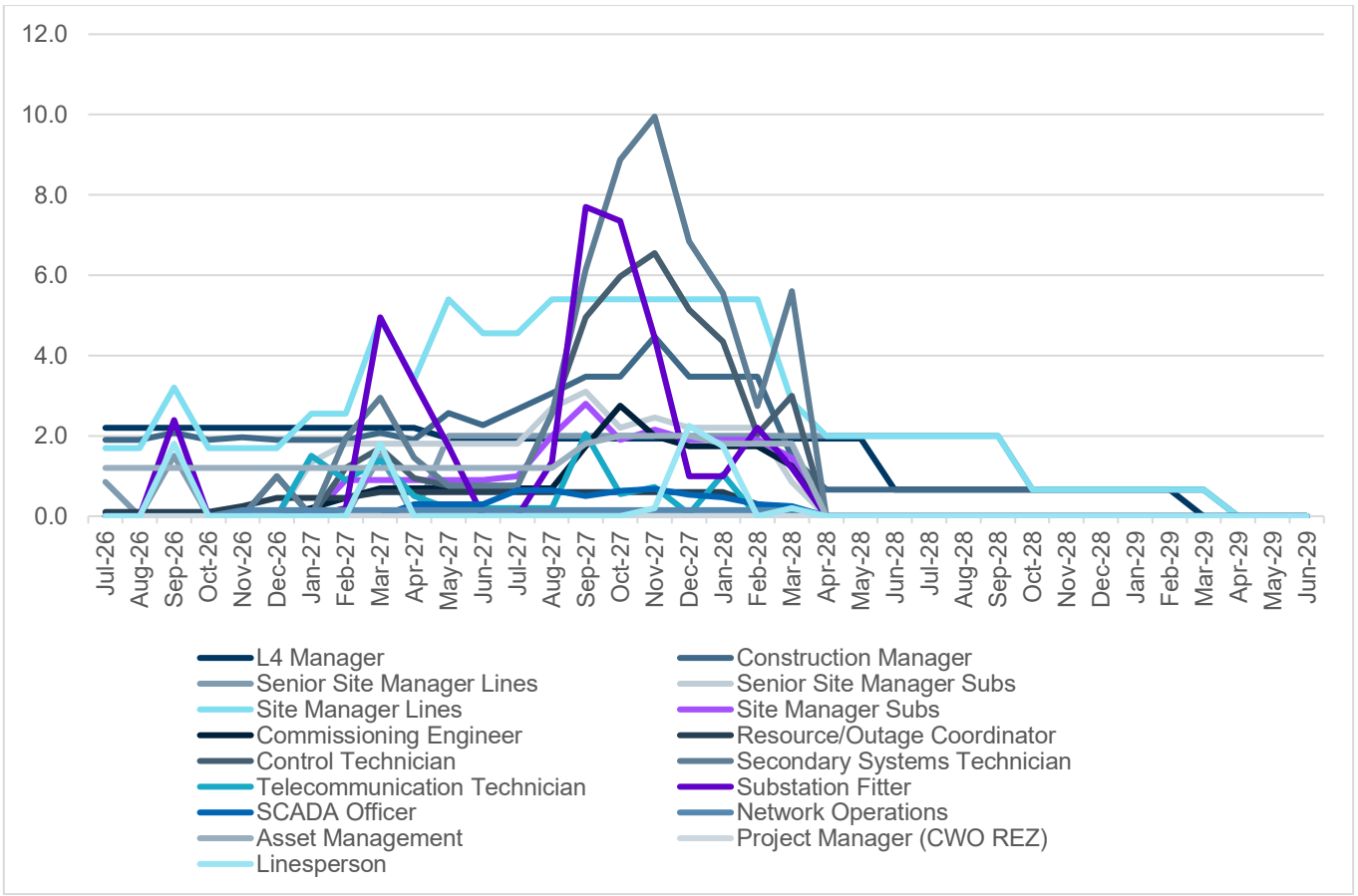


Figure 7 *Construction management roles forecast*

6.4.2 Construction management benchmarking

The following table provides some construction cost benchmarking data.

Generally, the larger the project, the smaller the project development and management owner costs will be as a percentage of the total. Hence smaller projects will result in a relatively higher percentage due to a proportion of fixed overhead costs. Additionally, the sourcing strategy will also affect the level of resources required at the interface point with contracted development and construction services. For example, this project has one primary contractor. VNI project is based on supply from three separate contractors. the overhead in the QNI project involved managing access and outages on the transmission lines for the uprating works. As such, not all projects are directly comparable.

Additionally, construction management costs include commissioning activities for the substations packages, cut in work at BCSS whose cost is not included in the capital forecast and resourcing to support the ACE overcrossing of Transgrid lines.

Table 33 Construction management cost benchmarking

Project	Capital forecast at Contingent Project Application or Revenue Proposal submission $M	Construction management costs $M	Percentage of capital forecast %
VNI	45.0	3.4	7.5%
QNI	222.8	17.9	8.0%
CWO RNIP (Transgrid's scope)	437.9	19.3	4.4%
Project EnergyConnect	1,894.6	19.9	1.0%
HumeLink	4,889.1	66.8	1.4%

Based upon the scale below that shows construction management costs as a percentage of total project costs using data from the above, 4.4% is on the diminishing scale to 1% for very large projects.

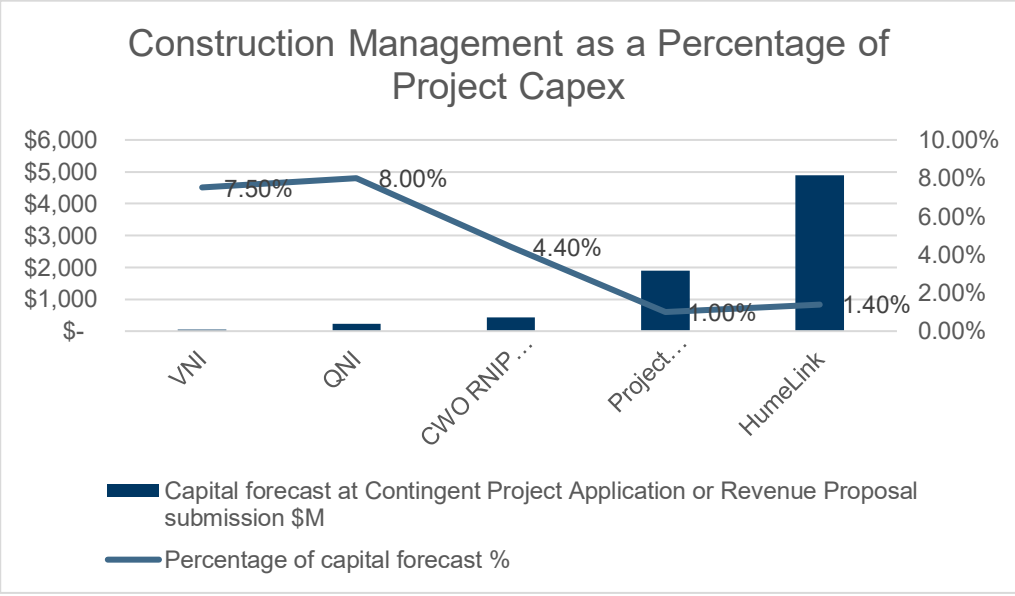


Figure 8 Construction management percentage by project cost

6.5 Project management

The forecasted project management costs encompass the expenses associated with the oversight and coordination required to manage the project and ensure it meets objectives within time, budget and resource constraints. To manage these challenges, Transgrid have established a dedicated CWO RNIP Project Team.

Table 34 Project management labour and indirect costs ($M, Real 2025-26)

Category	Section reference	From 1 July 2026 Total $M
Internal labour costs	Section 6.5.1	10.0
Non-labour costs	Section 6.5.2	1.6
Labour overhead	N/A	1.3
Total		**12.9**

6.5.1 Internal labour costs

The figure below details the month-by-month internal project management FTE numbers required to deliver the project management activities. The project management team consists of 20 roles reflecting an average of approximately 10 FTEs, based upon examination of the supporting spreadsheet to the forecast.

The following figure details the monthly total FTEs forecasted for the above roles given the project management requirements.

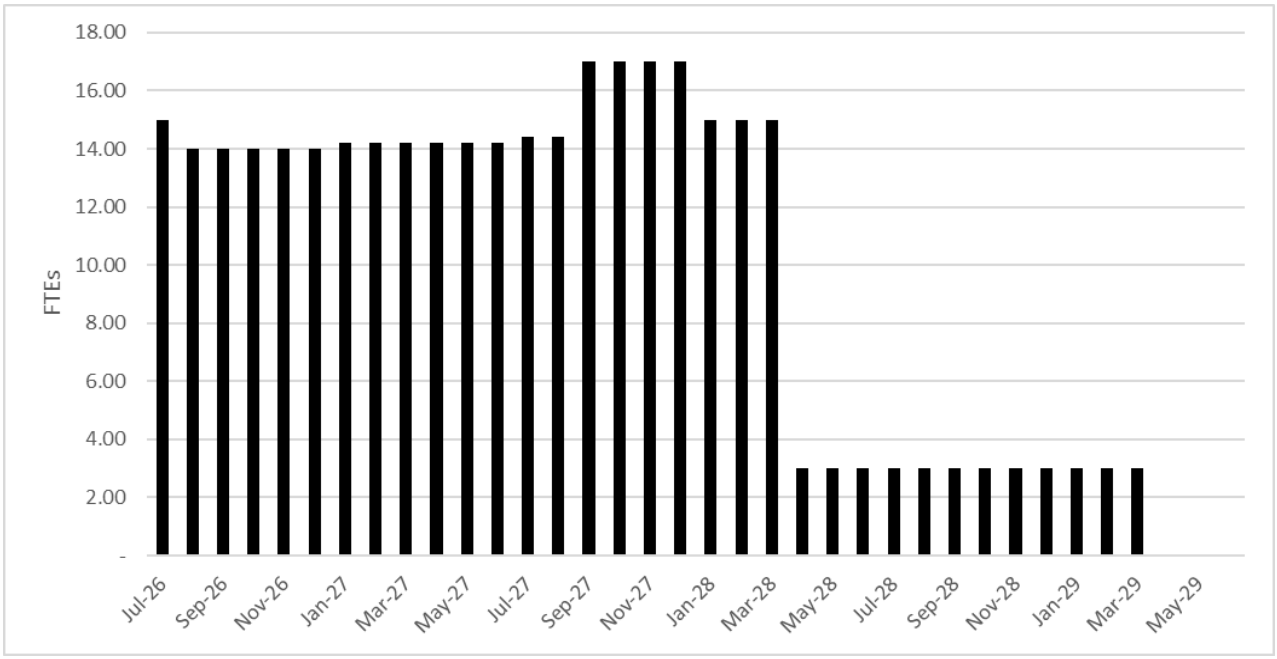


Figure 9 Project management phased FTE profile forecast

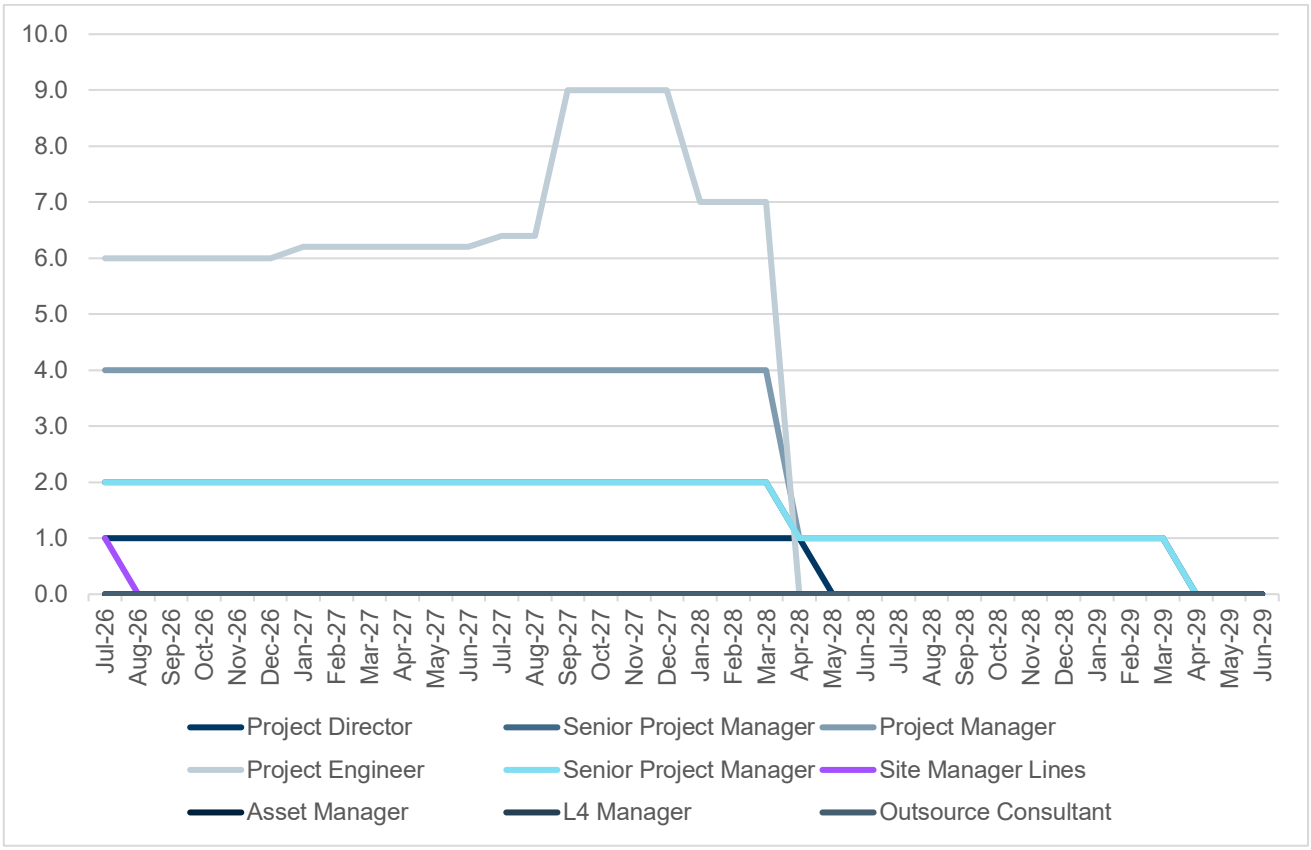


Figure 10 Project management roles forecast

6.5.2 Non-labour costs

The project management non-labour costs and associated GHD assessment are presented in the following table.

Table 35 Project management non-labour costs ($M, Real 2025-26)

Category	Total $M	GHD Assessment
Prescribed Works Insurance	1.4	Verified to Insurability and Insurance Premium Estimate Report by Lockton Companies Australia Pty Ltd
Other items < 0.1M	0.2	Not material
Total	**1.6**	-

6.5.3 Project management cost benchmarking

The following table provides some benchmarking content on project management costs.

Again, the larger the project, the smaller the project management costs will be as a percentage of the total. VNI is a small project and a possible outlier because of its size. The QNI project management fees are high as it requires managing access and outages on the transmission lines for the uprating works. Transgrid's CWO RNIP scope is in line with the curve of project management costs as a percentage of total costs shown in the figure below.

CWO RNIP also has a large number of works being completed concurrently at different locations limiting the ability to share project and construction management resources.

Table 36 Project management cost benchmarking

Project	Capital forecast at Contingent Project Application or Revenue Proposal submission $M	Project management and control costs $M	Percentage of capital forecast %
VNI	45.0	3.4	7.5%
QNI	222.8	5.9	2.6%
CWO RNIP (Transgrid's scope)	437.9	16.0	2.9%
Project EnergyConnect	1,894.6	22.1	1.2%
HumeLink	4,889.1	26.5	0.5%

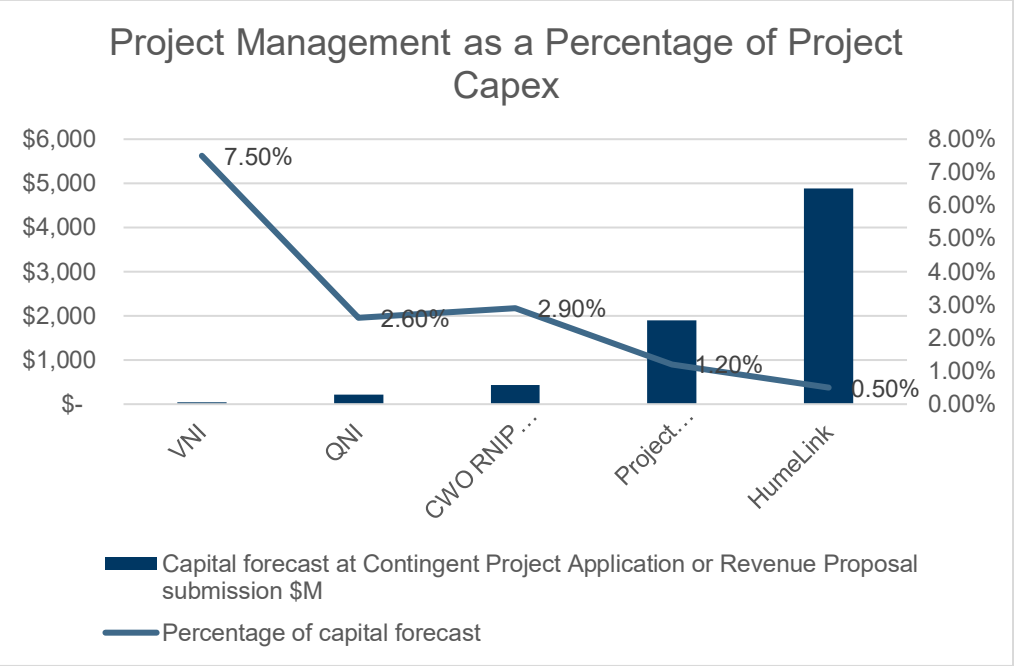


Figure 11 Project management percentage by project cost

6.6 Commercial management

The forecasted commercial management costs encompass the expenses associated with managing, administering, and coordinating the suite of commercial arrangements required to deliver the project. This includes upstream agreements with EnergyCo and ACEREZ and downstream delivery contracts with the D&C contractor and equipment suppliers.

Table 37 Construction management labour and indirect costs ($M, Real 2025-26)

Category	Section reference	From 1 July 2026 Total $M
Internal labour costs	Section 6.6.1	10.9
Labour overhead costs	N/A	<0.1
Total		**10.9**

6.6.1 Internal labour costs

The figure below details the month-by-month internal commercial management FTE numbers required to deliver the commercial management activities. The commercial management team consists of 7 roles reflecting an average of approximately 8.5 FTEs, based upon examination of the supporting spreadsheet to the forecast.

The following figure details the monthly total FTEs forecasted for the above roles given the commercial management requirements.

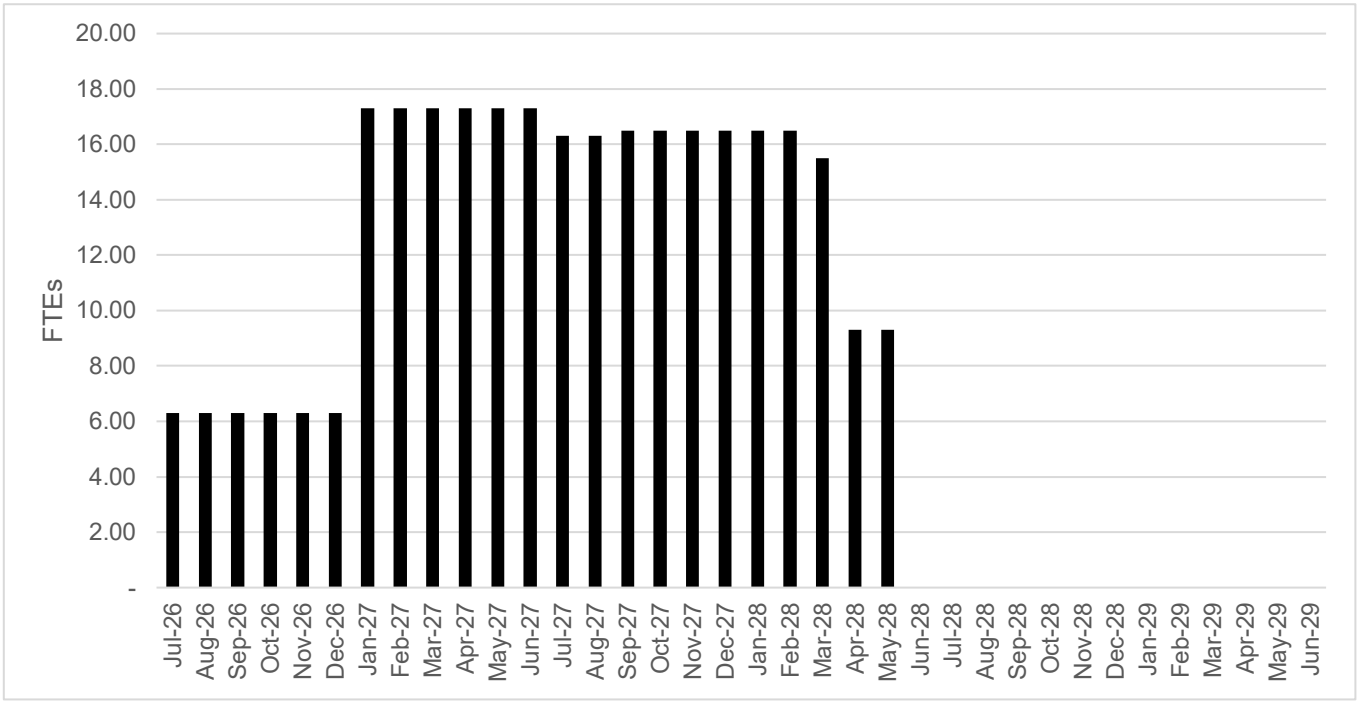


Figure 12 Commercial management phased FTE profile forecast

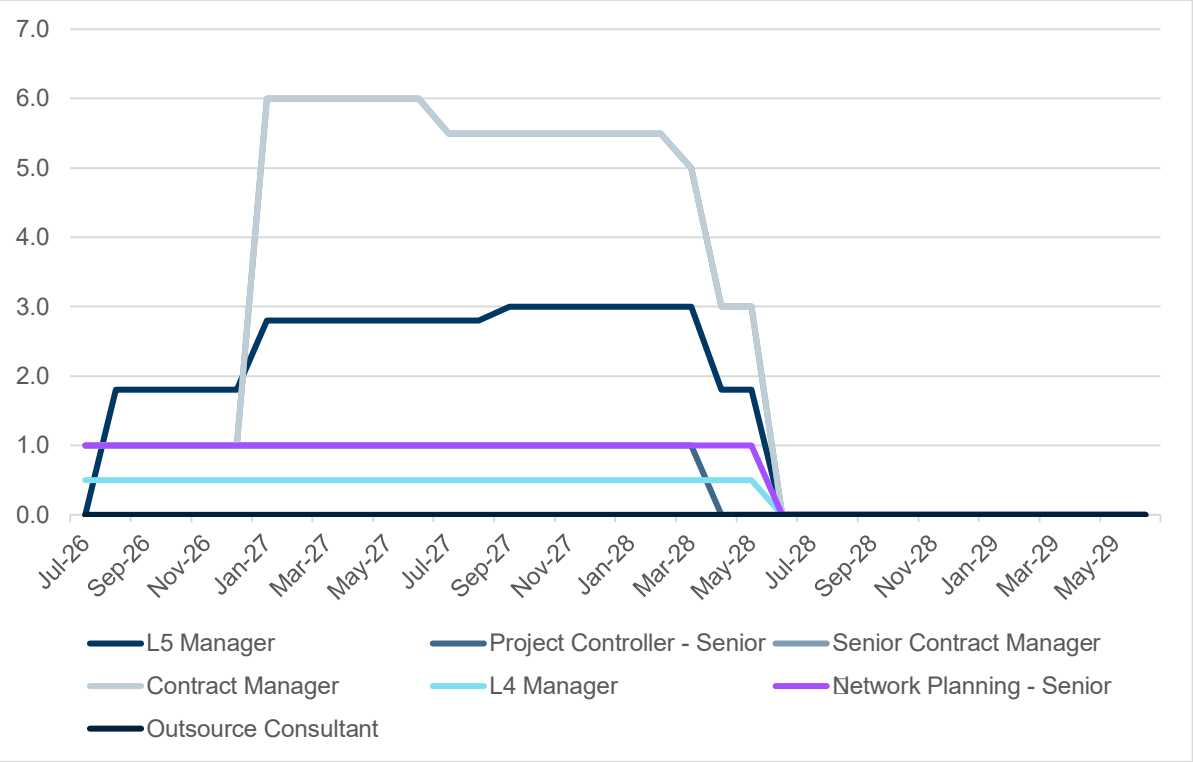


Figure 13 Commercial management roles forecast

6.6.2 Commercial management cost benchmarking

There are few available benchmarks for commercial management costs. This costs in this case are higher due to the interfaces with EnergyCo and ACEREZ.

Note: This project has 5 upstream deeds with Enco and Ace alongside downstream agreements. Humelink does not have this level of complexity.

Table 38 Commercial management cost benchmarking

Project	Capital forecast at Contingent Project Application or Revenue Proposal submission $M	Commercial management costs $M	Percentage of capital forecast %
CWO RNIP (Transgrid's scope)	437.9	10.9	2.5%
HumeLink	4,889.1	19.4	0.4%

6.7 Other support & corporate roles

The forecasted costs for other support and corporate roles relate to resources required for ongoing safety, regulatory, procurement and legal support throughout the delivery phase of the project.

Table 39 Other support & corporate roles labour and indirect costs ($M, Real 2025-26)

Category	Section reference	From 1 July 2026 Total $M
Internal labour costs	Section 6.7.1	8.1

Category	Section reference	From 1 July 2026 Total $M
Non-labour costs	Not material	0.2
Labour overhead costs	N/A	0.2
Total		**8.5**

6.7.1 Internal labour costs

The figure below details the month-by-month internal other support & corporate roles FTE numbers required to deliver the other support & corporate roles activities. The team consists of 14 roles reflecting an average of approximately 6 FTEs, based upon examination of the supporting spreadsheet to the forecast.

The following figure details the monthly total FTEs forecasted for the above roles given the project requirements.

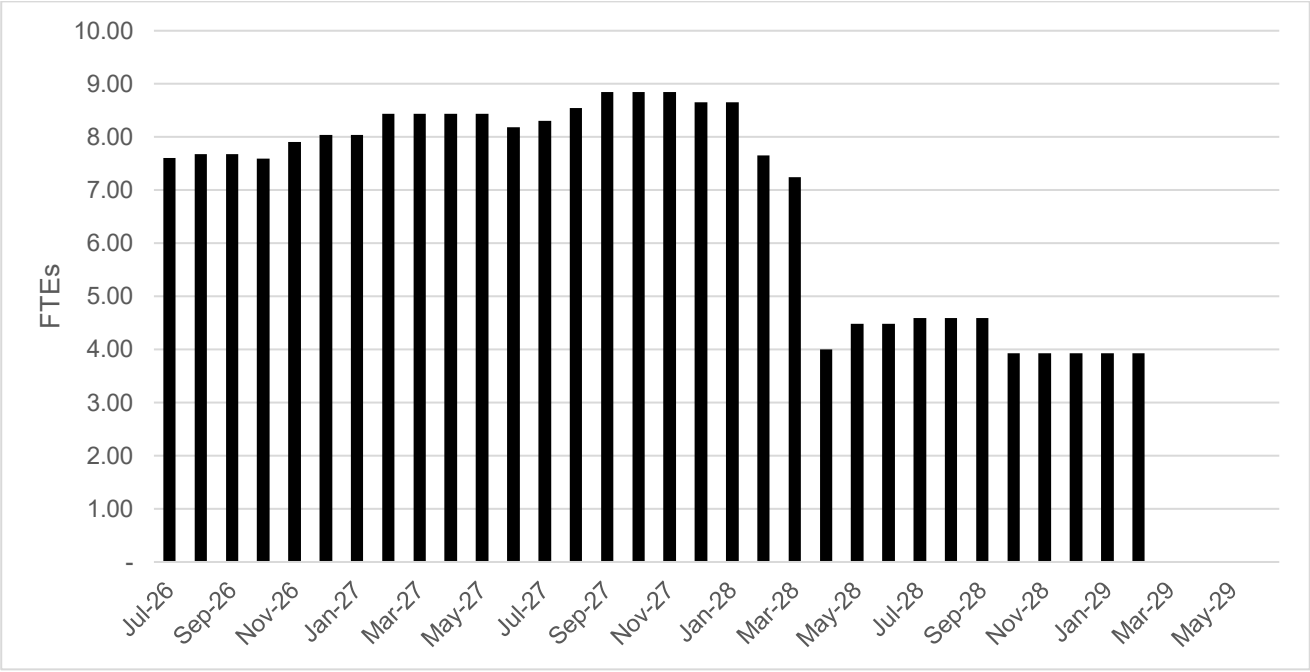


Figure 14 Other support & corporate roles phased FTE profile forecast

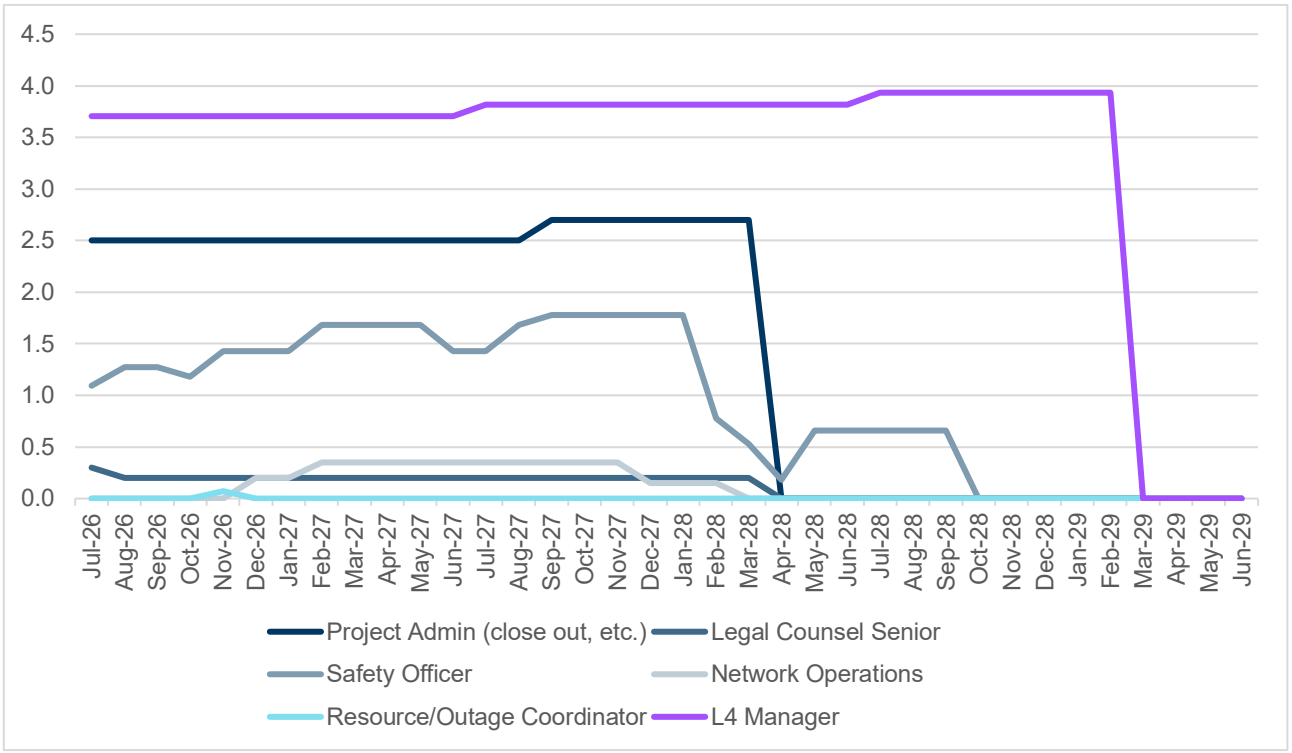


Figure 15 Other support & corporate roles forecast

6.7.2 Other support and corporate roles cost benchmarking

This forecast includes:

- Safety supervision of the construction works performed by the D&C contractor
- Regulatory support during the delivery phase
- Procurement support to assist with the engagement and management of contractors and consultants other than the D&C contractor
- Internal legal support to assist with the management of legal issues that may arise under upstream agreements with EnergyCo, downstream agreements with the D&C contractor, or in relation to third-party landholders.

These cost elements across ISP project benchmarking sources are recorded differently reducing the value of benchmarking. These cost forecasts however are considered prudent to include within the estimate.

6.8 Land and environment

The forecast costs for land and environment works include the internal labour and indirect costs associated with the acquisition of easements from landholders for the transmission line augmentation and conductor transposition works.

Table 40 Other support & corporate roles labour and indirect costs ($M, Real 2025-26)

Category	Section reference	From 1 July 2026 Total $M
Internal labour costs	Section 6.8.1	3.0
Contracted labour	Non-material	0.2
Non-labour costs	Section 6.8.2	1.4
Labour overhead costs	N/A	0.8
Total		**5.4**

6.8.1 Internal labour costs

The figure below details the month-by-month internal land and environment FTE numbers required to deliver the land and environment activities. The land and environment team consists of 31 roles reflecting an average of approximately 3 FTEs, based upon examination of the supporting spreadsheet to the forecast.

The following figure details the monthly total FTEs forecasted for the above roles given the land and environment requirements.

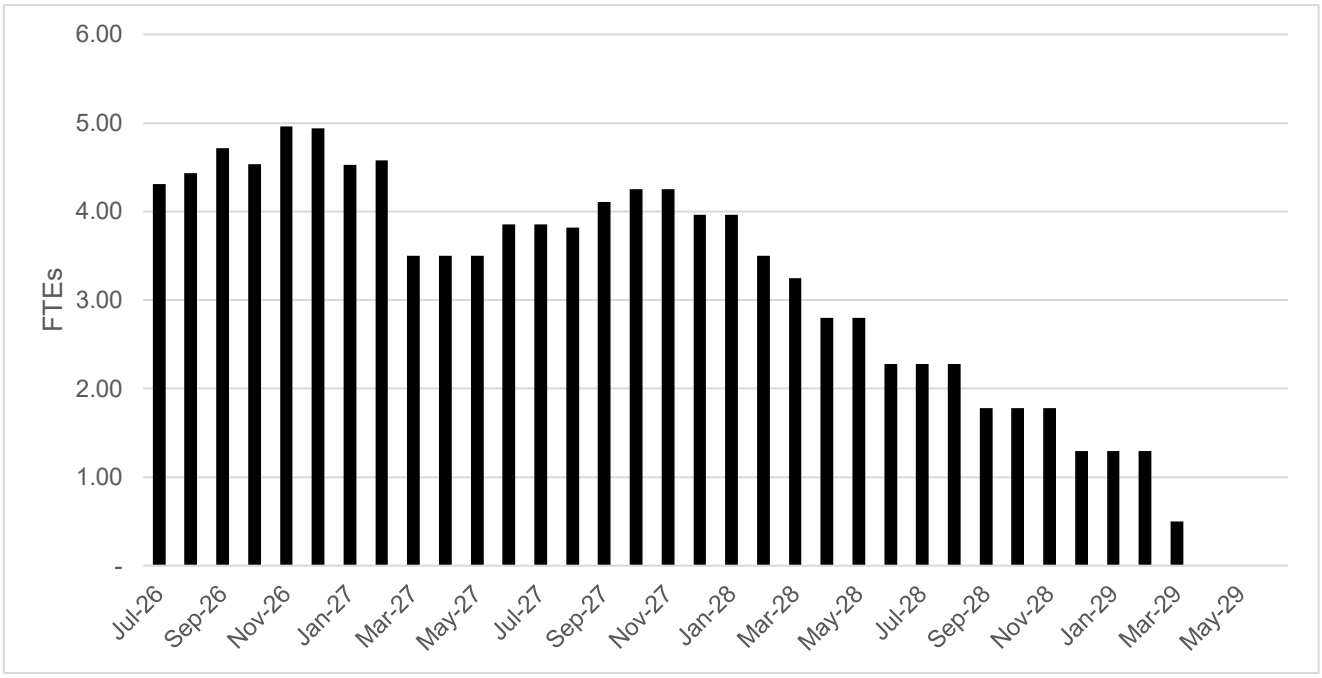


Figure 16 Land and environment phased FTE profile forecast

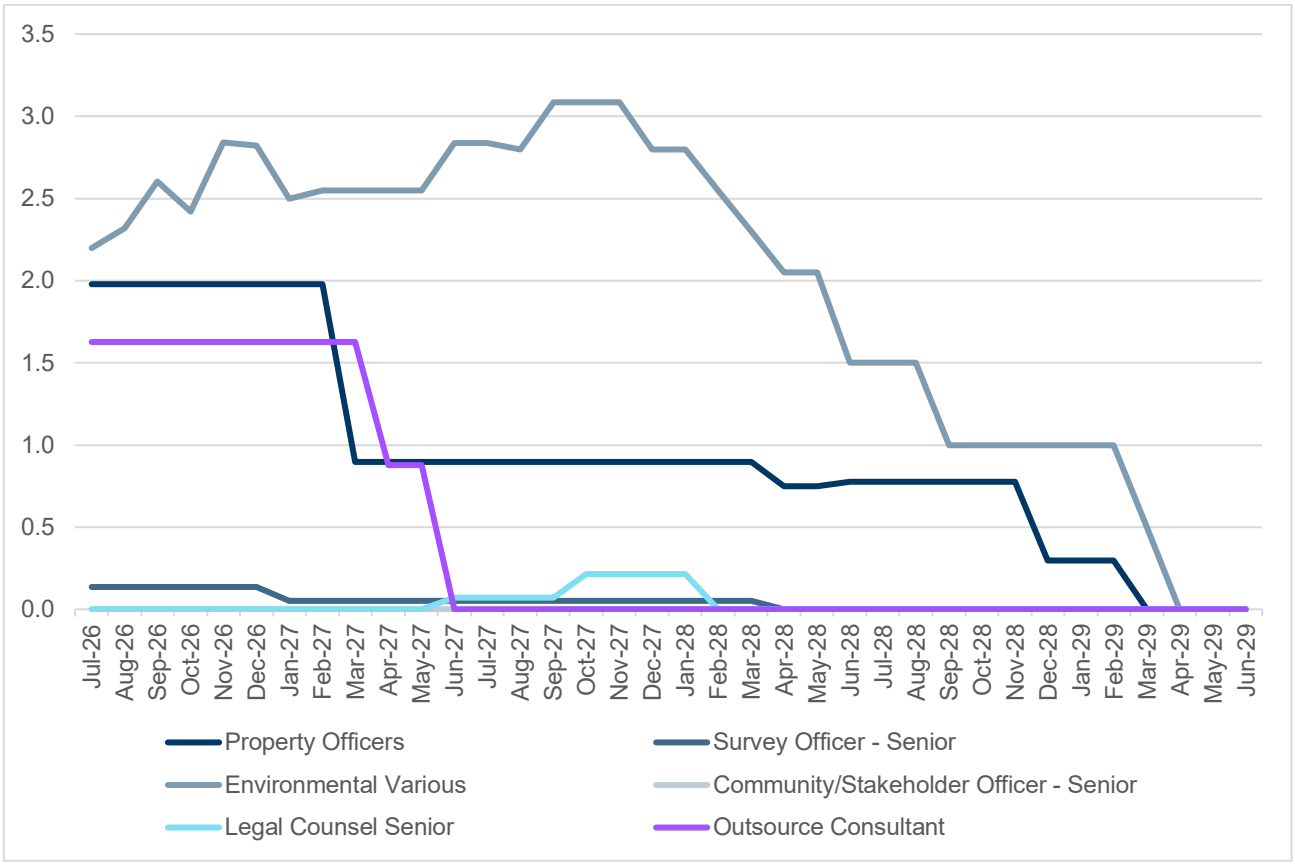


Figure 17 Land and environment roles forecast

6.8.2 Non-labour costs

The land and environment non-labour costs and associated GHD assessment are presented in the following table.

Table 41 Land and environment non-labour costs ($M, Real 2025-26)

Category	Total $M	GHD Assessment
[redacted]		
Other items <$1M	1.0	-
Total	**1.4**	-

6.9 Project controls

The forecasted project controls costs encompass the expenses associated with gathering, managing, and analysing project data to keep the project on track in terms of time, cost, quality and risk.

Table 42 Project controls labour and indirect costs ($M, Real 2025-26)

Category	Section reference	From 1 July 2026 Total $M
Internal labour costs	Section 6.9.1	3.0
Labour overhead costs	N/A	<0.1
Total		**3.1**

6.9.1 Internal labour costs

The figure below details the month-by-month internal project controls FTE numbers required to deliver the project control activities. The project controls team consists of 8 roles reflecting an average of approximately 3 FTEs, based upon examination of the supporting spreadsheet to the forecast.

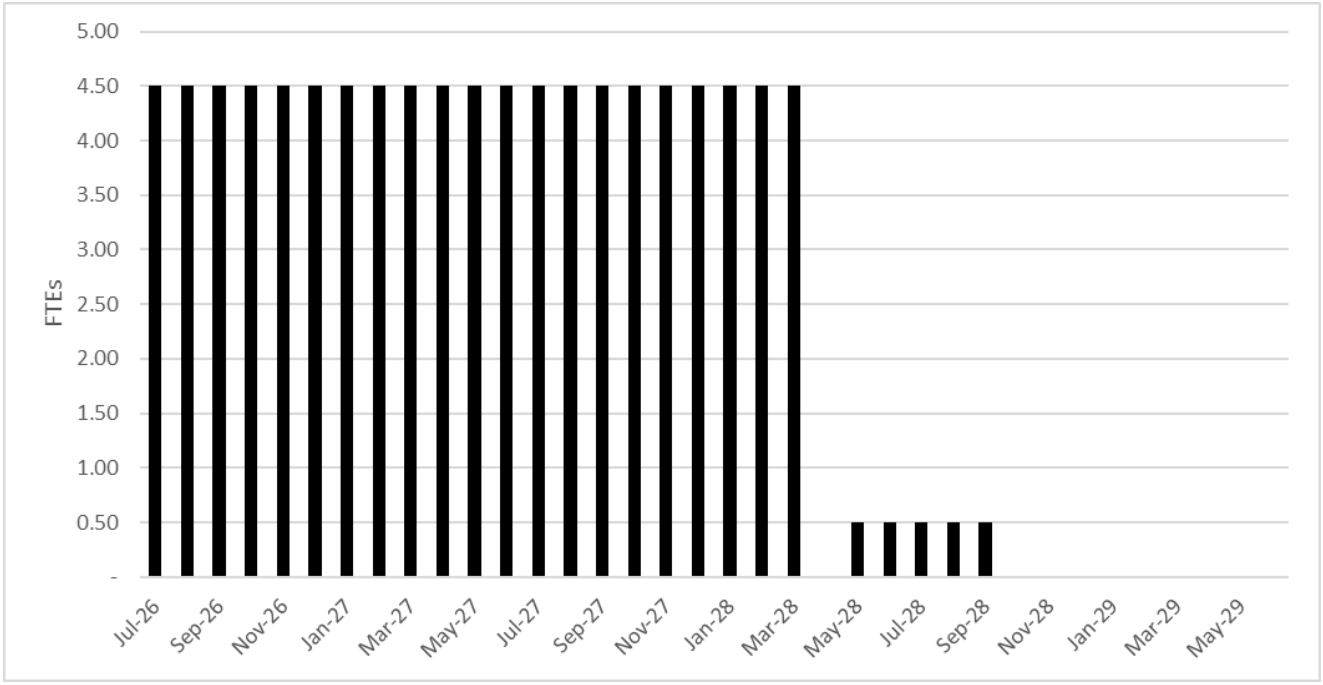


Figure 18 *Project controls phased FTE profile forecast*

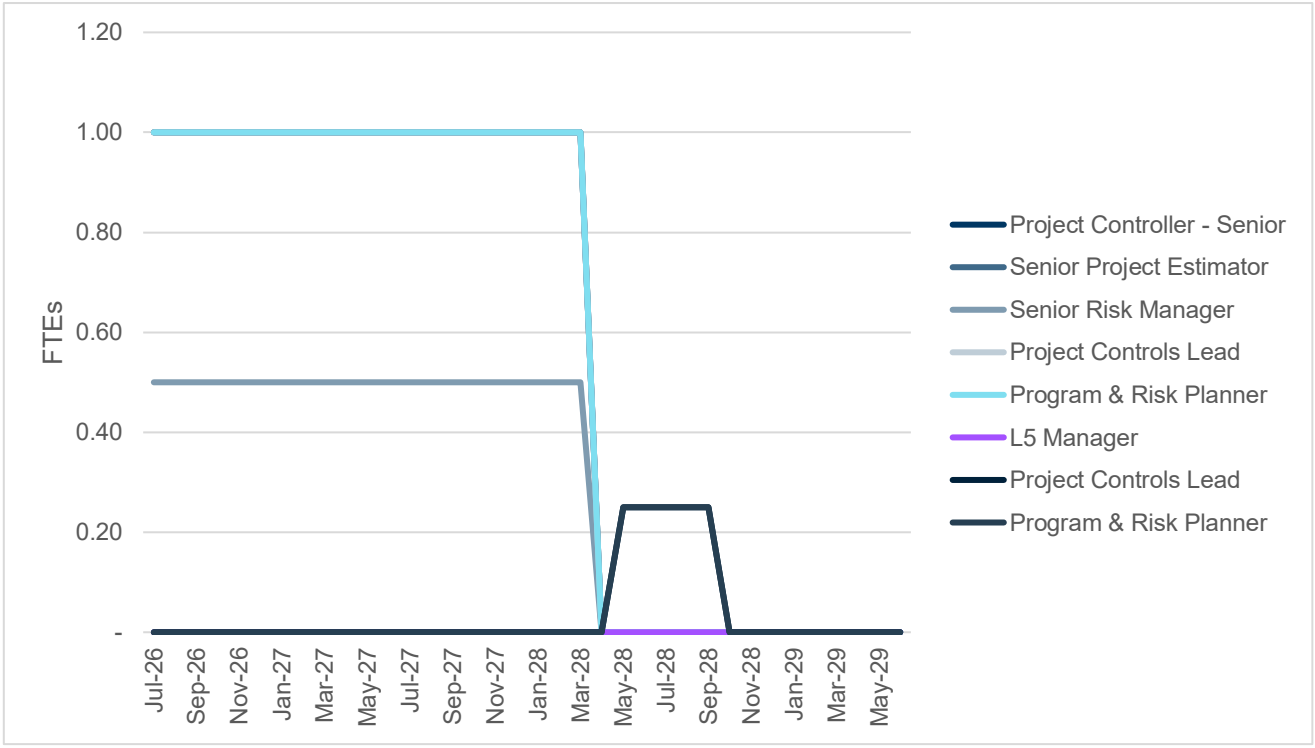


Figure 19 *Project controls roles forecast*

6.10 Project development

The forecasted project development costs encompass the expenses necessary for initial engineering and design development, including both concept and detailed design phases in certain areas. This also includes scoping work with EnergyCo to finalise project scope requirements.

Table 43 Project development labour and indirect costs ($M, Real 2025-26)

Category	Section reference	From 1 July 2026 Total $M
Internal labour costs	Section 6.10.1	1.3
Non-labour costs	Not material	0.1
Labour overhead costs	N/A	<0.1
Total		**1.4**

6.10.1 Internal labour costs

The figure below details the month-by-month internal project development FTE numbers required to deliver the project development activities. The project development team consists of 56 roles reflecting an average of approximately 2 FTEs, based upon examination of the supporting spreadsheet to the forecast.

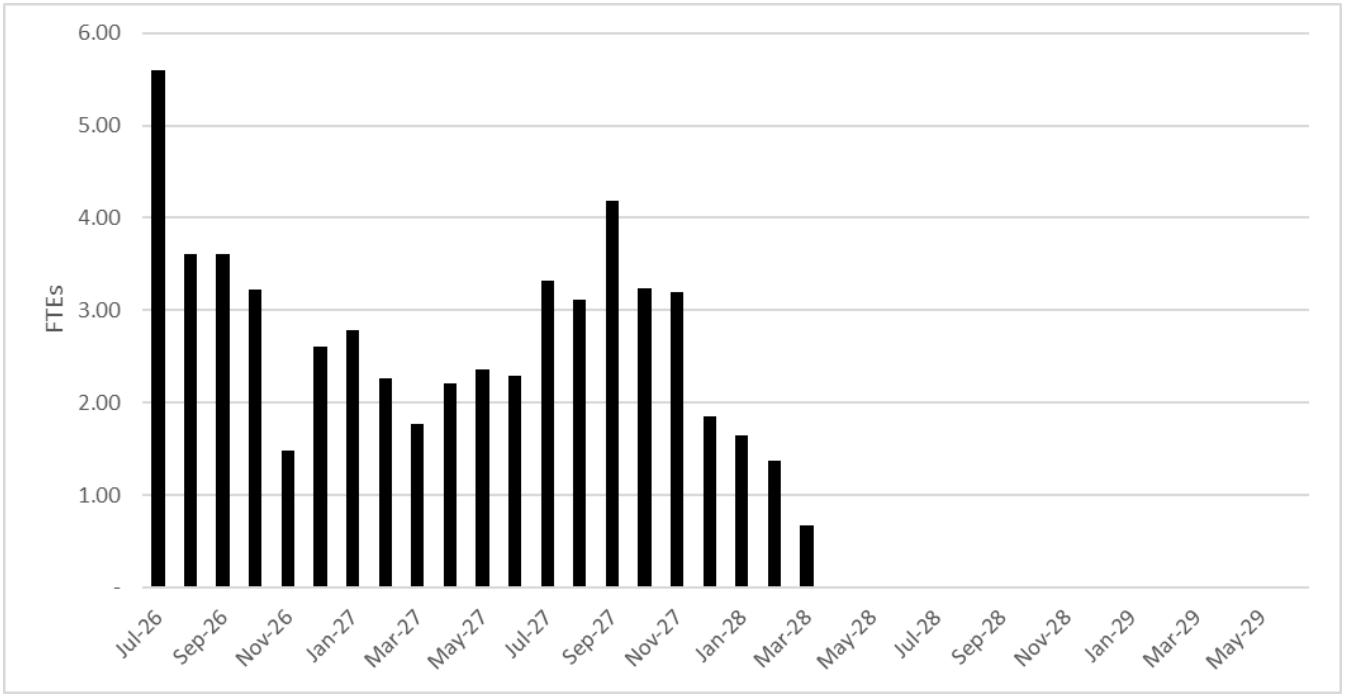


Figure 20 Project development phased FTE profile forecast

6.11 Labour and indirect costs conclusion

Labour forecast costs are based on a bottom-up estimate. This uses the project's schedule, applying phased roles that are required to deliver the activities required to achieve project stream objectives.

The rates applied to these roles include base costs and appropriate on-cost and overhead loadings. These benchmarks correlate well with ANS rate benchmarking performed by CutlerMerz in July 2022 when considering the greater level of project management required on this project compared to typical ANS activities.

Other material costs are supported by external evidence including cost estimates and proposals from third parties.

Where available, benchmarking of labour categories are supportive of the estimate.

The costs reviewed are considered efficient and required to deliver the project scope or reduce risk.

7. Risk provision

Different categories of project risks are present during project phases and the ability to manage the outcomes diminishes over time. Under a D&C contract, the contractor is responsible for risk management, and they will include risk provisions within their tendered prices. Reliance is placed upon competitive tendering process to help ensure that this provisioning is reasonable (efficient).

The CWO RNIP capital forecast from 1 July 2026 includes a risk provision of $11.7M which represents 5.9% of the capital forecast from 1 July 2026.

Based upon the Transgrid's Other Construction Cost Forecasting Methodology provided to GHD, risk provision was based upon:

– Transgrid the potential risk events that could arise by characterising inherent market complexity (e.g. adjacent project interfaces, latent conditions, force majeure events, social license), complexities specific to CWO REZ RNIP (e.g. intertwined agreements, network integration, commercial interfaces) and the impact of the D&C contract model.
– Transgrid developed a project risk register through identifying a list of potential risks that could impact the project's delivery or schedule based upon the established risk context. This involved engaging with various contractors, internal and independent Subject Matter Experts (SMEs), and risk specialists.
– Risk workshops conducted with internal and independent SMEs and risk specialists from project-related disciplines to characterise and assess identified project risks. This involved qualitatively assessing each risk to determine potential causes, consequences, mitigatory controls, treatments and residual risk ratings.
– Probabilistic Quantitative Cost and Schedule Risk Analysis (QCSRA) to estimate both time and cost risk consequences of identified, using a hybrid combination of the 'top-down' Risk Factor and First Principles Risk Analysis techniques. This project involved data collection, risk analysis workshops, schedule and cost risk modelling, and integration of results to produce probabilistic histograms of completion dates and risk costs. Outputs were validated through internal and external reviews, to ensure a transparent and robust basis for the project's cost estimate.

  This technique uses monte-carlo simulation using @Risk to consider the impact upon cost and schedule based upon assumptions that GHD has detailed in the following table.

The table below summarises risk provisions.

Table 44 Risk provisions ($M, Nominal)

Risk ID	Description	Basis	Total $M	GHD consideration
1	**Planning and environmental process approval uncertainty** – Increased efforts to deliver Environmental Impact Statement (EIS) and manage approvals process – Additional complexity in environmental approvals process for transposition works, requiring a more comprehensive EIS process rather than a Review of Environmental Factors (REF)	Forecast capex contingency allowance associated with this risk is $3.71M, determined by QCSRA inputs Contingent cost risk [redacted] contribution) – [redacted] probability of needing to produce out-of-scope EIS reports and additional fieldwork • Potential costs for each deliverable range from [redacted] (based on historical consultant and project fieldwork costs incurred to date) [redacted] – Requirement to undertake EIS for transposition scope instead of current REF • Estimated based on benchmarked costs from current EIS • [redacted] Inherent cost uncertainty [redacted] – Variability in estimated consultant hours and associated fees required to manage process – Based on historical data and recent project experiences, with uncertainty ranges applied to the base cost estimates – [redacted] Prolongation [redacted] – Variability in the estimated time to complete the EIS process (excluding delays by authorities) resulting in delivery delays at Wallerawang and Mt Piper. – [redacted]	3.7	Transgrid are currently relying upon REF assessments to determine if EIS are required for specific scope activities. Should these assessments identify a need for EIS a provision has been made for the additional costs. Interviews with Transgrid indicates that these specific scope activities related to the transposition scope of works are on the critical path and any extended EIS timeframe activities could impact the overall project time frames. Transgrid has proposed to address a delay to the EIS due to the departments as an adjustment event.
2	**Supplier delays** Delay of Transgrid's supplied HV and secondary systems equipment, due to overseas manufacturing and shipping timeframes	Relates primarily to the costs associated with manufacture and delivery time frames based upon QCSRA outputs. [redacted]	3.2	Considered prudent.

Risk ID	Description	Basis	Total $M	GHD consideration
3	**Extended inclement weather** D&C contractor exceeding the inclement weather allowance under the contract	The D&C contractor's inclement weather allowance is calculated with reference to the average inclement weather days, as reported by the Bureau of Meteorology. QCSRA inputs model impacts outside this range.	2.1	Considered prudent.
4	**Property valuation uncertainty** Uncertainty in property valuations and landowner negotiations resulting in the final compensation being higher than the current estimates.	Forecast capex contingency allowance associated with this risk is [redacted], determined by QCSRA inputs. [redacted]	[redacted]	Considered prudent given the uncertainty of estimation
Other risk provisions under $1M			[redacted]	Immaterial
Total ($M Nominal)			**12.8**	
Total ($M, Real 2025-26)			**11.7**	

7.1 Additional risk provisions

The following details other risk provisions included within specific forecasts that are considered prudent given the uncertainty of the base estimate.

Table 45 Risk provisioning already included in capital forecast ($M Nominal)

Capital element	Report reference	Total $M
Land and easement - Negotiation contingency	Section 5.5.1	[redacted]
Transposition land and easements - Negotiation contingency	Section 5.5.2	[redacted]
Total ($M Nominal)		[redacted]

7.2 Risk conclusion

The AER's guidance note on the regulation of actionable ISP projects states that it can accept a project risk allowance for a contingent project where[6]:

- Residual risks have been identified
- The associated cost estimates of the residual risk are efficient i.e., the consequential cost adjusted to reflect the likelihood of occurrence.

To inform its assessment, the AER requires a comprehensive and transparent explanation of how the risks have been identified and costed, including[7]:

- Risk identification, i.e., clearly identifying the risk events
- Risk cost assessment, i.e., estimating the potential cost impacts, the likelihood of occurrence, the consequential costs, and any mitigation/management strategies.

GHD believes that sufficient information has been presented in Transgrid's Direct Capex Forecasting Methodology for a provision that represents 3.9% of the total capital forecast fee.

The information presented by GHD in Table 44 supplements the information presented in Transgrid's Direct Capex Forecasting Methodology

Risk provisioning relates to specific areas where Transgrid has either contractual exposures, areas where they are responsible for management or areas where the forecast has potential variability. Risks associated with EIS causing delays to the project related to the transposition scope of works are potentially on the projects critical path Transgrid are currently relying upon REF assessments to determine if EIS are required for specific scope activities. Should these assessments identify a need for EIS Transgrid are proposing to address a delay as an adjustment event.

Interviews with Transgrid indicates that these specific scope activities related to the transposition scope of works are on the critical path and any extended EIS timeframe activities could impact the overall project time frames. Transgrid has proposed to address a delay to the EIS due to the departments as an adjustment event.

[6] AER, Guidance Note, Regulation of actionable ISP project, March 2021
[7] AER, *Regulation of actionable ISP projects,* Guidance note, March 2021, p 17

The costs reviewed are considered prudent and required to reduce risk.

Appendix A

E3 Advisory CWO biodiversity cost review

Central West Orana REZ Revenue Submission Non-contestable works

Biodiversity offset cost estimate

Independent Verification

E3 Advisory

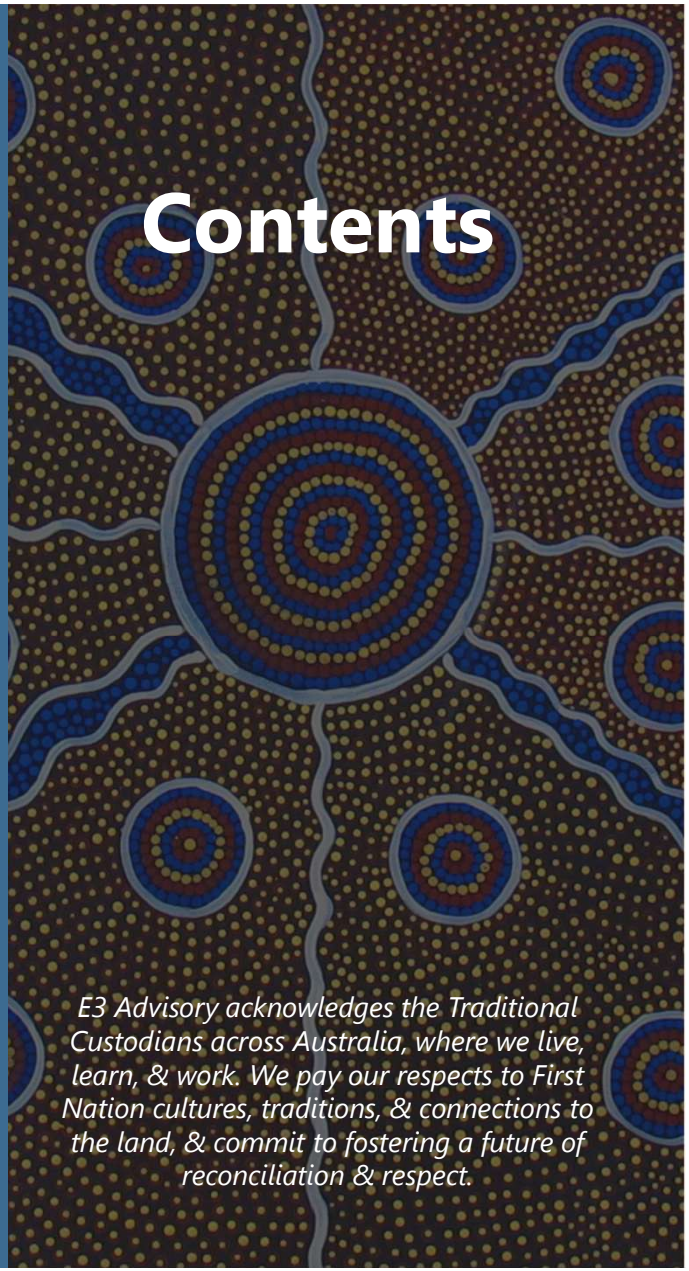
Transgrid

16 April 2025

Disclaimer

The details presented and findings contained within this report are based on current information, assumptions, and available data, made available to E3 Advisory at the time of preparation. They are intended to be used as an Independent Verification of the cost estimate of the biodiversity offset cost component of their CWO RRZ Revenue Submission to the Australian Energy Regulator (AER). Actual costs may vary due to changes in market conditions, project scope, design modifications, unforeseen site conditions, regulatory changes, and other factors.

Contents



E3 Advisory acknowledges the Traditional Custodians across Australia, where we live, learn, & work. We pay our respects to First Nation cultures, traditions, & connections to the land, & commit to fostering a future of reconciliation & respect.

Executive Summary

Project Overview

The Central-West Orana (CWO) Renewable Energy Zone (REZ) transmission project involves the construction of new transmission lines, energy hubs, switching stations and related infrastructure. The new REZ network infrastructure will enable renewable energy from solar, wind and storage projects to be distributed to energy consumers across the State via the existing NSW transmission network.

Transgrid has been appointed to deliver the non-contestable scope of the CWO REZ. Non-contestable projects fall under the Transmission Efficiency Test (TET) issued by the AER in April 2023.

The Scope of the Services

Transgrid has engaged E3 Advisory to perform an Independent Verification of the cost estimate of the biodiversity offset cost component of their CWO RRZ Revenue Submission to the Australian Energy Regulator (AER). The objective is to assess:

- The approach and processes used by Transgrid in developing the cost estimate,
- Provide comments regarding the cost estimate reasonableness and any limitations.

Transgrid Cost Estimate Summary

[redacted]

Review Findings

The Augmentation cost estimate is based on a more mature design with site investigations, while the Transposition estimate relies solely on a desktop survey. This distinction is considered in the review.

The design envelope used to determine the area of disturbed land that may require biodiversity offsets is considered appropriate for the construction activities, however for access tracks 10m width may be more suitable than the designated 6m to accommodate plant access.

The cost estimation methods are generally well-documented, and selecting the expected case scenario for Augmentation biodiversity offset costs is reasonable given Transgrid's requirement to recover only prudent and efficient costs. The approach adopted to allocating credit prices was to select the closest matching OTG or species and closest subregion to the subject land and most recent BC Charge quote available.

The RFI process has substantiated the [redacted] between BSA and Credit Price costings in the Expected Case Scenario, with justifications based on offset BSA land requirements, past project experience, and regional land price variations. While minor inconsistencies were identified, the calculation values in the spreadsheets and tables produce an accurate total cost estimate with minimal errors.

Transgrid has included appropriate contingencies for additional impacted area, additional offset credits and credit price escalation the Augmentation works. Transgrid have not included contingencies for the Transposition works because of the conservative nature of the estimate and alternative approval pathway for the works.

1 | Project Overview

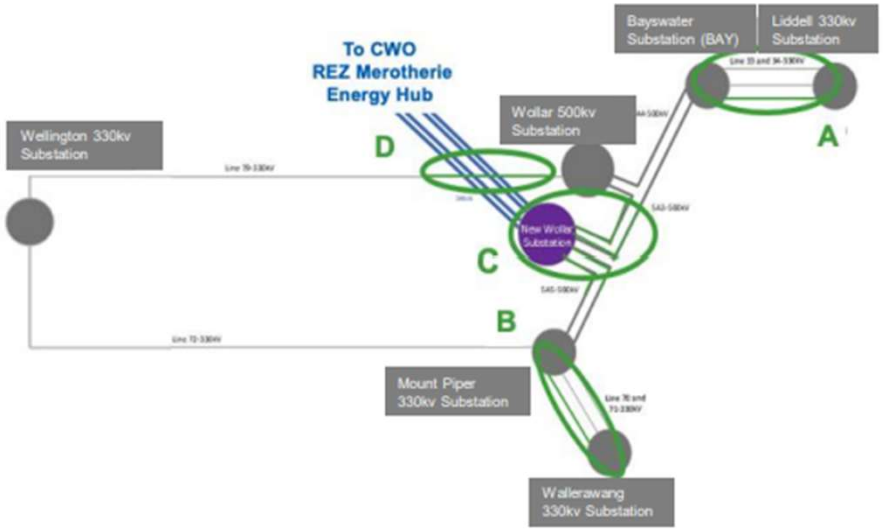
Part 1: Project Overview

Introduction and Project Scope Details

The Central-West Orana (CWO) Renewable Energy Zone (REZ) transmission project involves the construction of new transmission lines, energy hubs, switching stations and related infrastructure. The new REZ network infrastructure will enable renewable energy from solar, wind and storage projects to be distributed to energy consumers across the State via the existing NSW transmission network.

The CWO REZ was formally declared by the Minister for Energy and Environment under section 19(1) of the Electricity Infrastructure Investment Act 2020 (the Act) and published in the NSW Gazette on 5 November 2021. The REZ declaration was the first step in formalising the REZ under the Act and establishes EnergyCo as the Infrastructure Planner responsible for coordinating the development of the REZ. Transgrid has been appointed to deliver the non-contestable scope of the CWO REZ. Non-contestable projects fall under the Transmission Efficiency Test (TET) issued by the AER in April 2023.

Transgrid has engaged E3 Advisory to perform an Independent Verification of the cost estimate of the biodiversity offset cost component of their CWO RRZ Revenue Submission to the Australian Energy Regulator (AER).



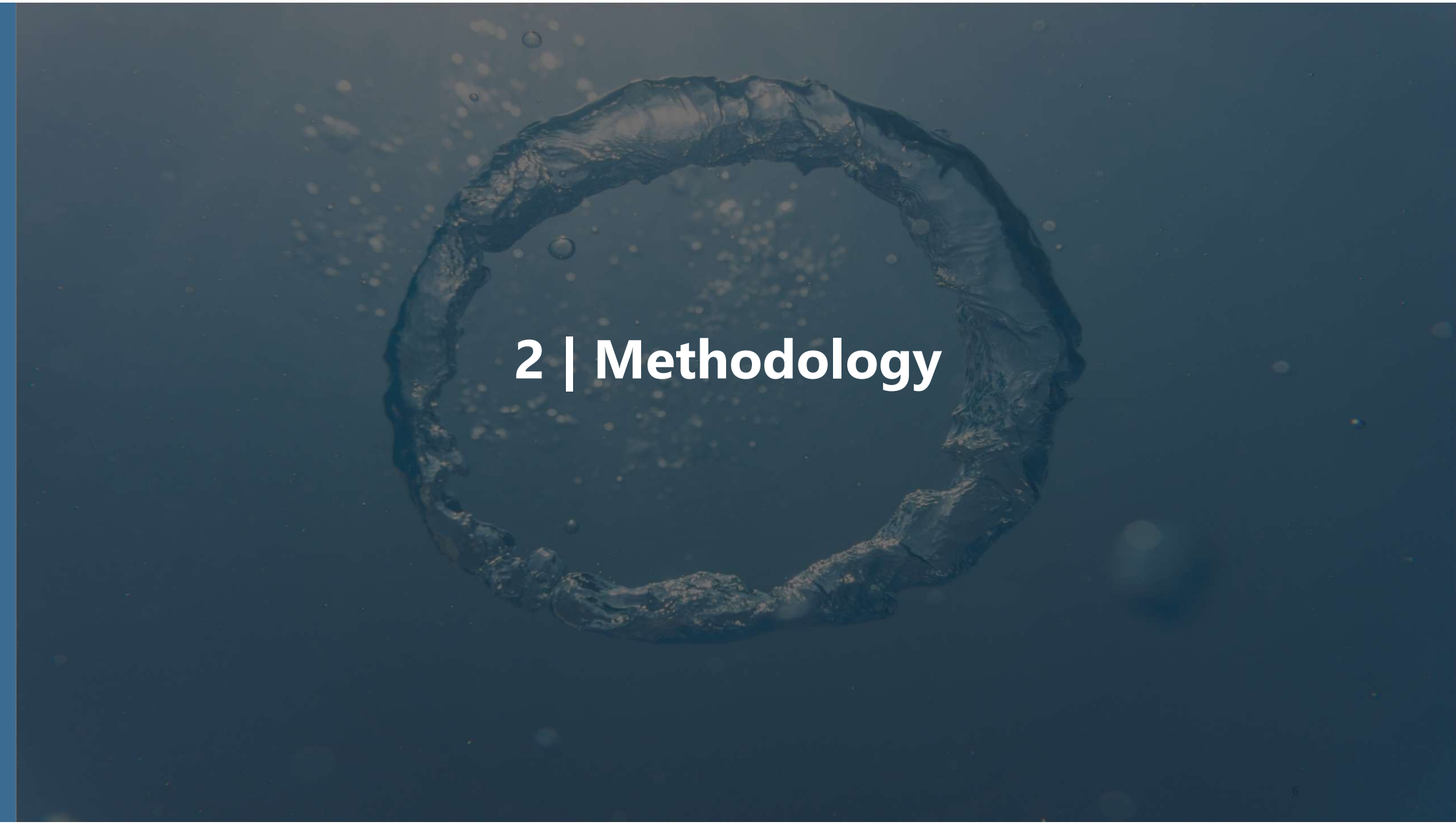
The Non – Contestable works is defined as:

A. 330kV Transmission Line arrangement works from Transgrid's existing Bayswater Substation to Transgrid's existing Liddell Substation, consisting of modifications to existing transmission lines and new assets at the substation.

B. 330kV Transmission line from Transgrid's existing Mt Piper Substation to Transgrid's existing Wallerawang Substation, consisting of a new transmission line and augmentations at the substations.

C. Wollar Cut In Works, including modifications to existing 500kV transmission line as well as remote ends works at Bayswater, Mt Piper and Wollar 500/330kV substations

D. Facilitation of construction outages for TL79 overcrossings (no construction works by Transgrid as part of this scope)



2 | Methodology

Part 2: Methodology

The Scope of the Services

Transgrid engaged E3 Advisory to carry out an independent verification of the biodiversity offset costs for the CWO REZ Project.

The objective of the review is to assess:

- The approach and processes used by Transgrid in developing the cost estimate
- Provide comments regarding the cost estimate reasonableness and any limitations

The review does not include an assessment of whether the biodiversity offsets proposed comply with the applicable legislation and guidelines.

Cost Review Approach

E3 Advisory used a systematic approach comprising the following key steps:

1. **Review Project Documentation:** Gather and review all relevant project documentation, including cost estimate, reports, project plans and specifications.
2. **Review the Land Area Requiring Offsets:** Check that the area needed for biodiversity offsets is the land area needed for both the final installed infrastructure and construction activities.
3. **Review Offset Unit Rates:** Check the basis for the unit rates for both ecosystem and species credits.
4. **Cost Estimate Calculation Review:** Check the basis for the cost estimate calculations.
5. **Review Contingency and Escalation:** Evaluate the reasonableness of contingency and any proposed escalation factors.
6. **Document Findings:** Document the findings of the cost review, including any discrepancies or areas of concern.

Source Data used in E3 Advisory's review

The source data provided by Transgrid containing the cost inputs used in E3 Advisory's review are summarised in table below.

Document / filename	Description of data
BIO1_12612502-REP-0_Mt Piper AER Biodiversity offset cost estimate_Item1	Augmentation biodiversity offset cost report for Mount Piper to Wallerawang transmission network project
BIO2_Rapid Desktop Assessment ARM Trial Biodiversity_20250304_Item1	Transposition biodiversity offset cost desktop study-CWOREZ ARM trial works & Access Tracks
BIO5_Rapid Desktop Assessment_Str169_Biodiversity_20250304_Item1	Transposition biodiversity offset cost desktop study-CWOREZ 5A3/5A4 Structure 169 & Access Tracks
BIO7_Rapid Desktop Assessment_Str356_Biodiversity_20250304_Item1	Transposition biodiversity offset cost desktop study-CWOREZ Line 5A3/5A5 Structure 356 & Access Tracks
BIO8_Rapid Desktop Assessment_Str432_Biodiversity_20250304 final_Item1	Transposition biodiversity offset cost desktop study-CWOREZ Line 5A3/5A5 Structure 432 & Access Tracks
BIO9_Rapid Desktop Assessment_Str82_Biodiversity_20250304_final_Item1	Transposition biodiversity offset cost desktop study-CWOREZ Line 5A3/5A4 Structure 82 & Access Track
BIO10_Rapid Desktop Assessment_WOL_Biodiversity_20250303_Item1	Transposition biodiversity offset cost desktop study-CWOREZ "WOL, Line 5A4/5A5 Structure 263A & Access Track
Mt Piper_Offset cost estimate_V2.4	Augmentation cost basis of estimate calculation sheet
web-report-bcf-charge-quotes-to-march-2025	BCF Charge Report V8-March 2025 used to extract credit costs
Attachment 1-Direct Non-Labour Model-Biodiversity	Summary for Augmentation and Transposition costs with relevant indexation multipliers applied (24-26 or 25-26)
CWOREZ_BCF_evidence_20250326	Transposition BCF Credit Cost mapping quote IDs to the BCF Charge Report
CWOREZ_V2.1_20250213-for Biodiversity Offset Calculation	GIS file highlighting the relevant Transposition envelope areas basis of estimate
ProjectFootprint_20250228	GIS file highlighting the relevant Augmentation envelope areas basis of estimate
SubjectLand_202410	GIS file highlighting the relevant Augmentation envelope areas basis of estimate

3 | Cost Estimate Review

Part 3: Cost Estimate Review

Project Description

The project scope for review is divided into two main categories: Augmentation and Transposition.

The Augmentation works involve significant upgrades to the transmission line network between Mount Piper and Wallerawang substations, which include the construction of a new 330kV transmission line and the installation of double-circuit transmission structures. These upgrades increase the capacity and reliability of the transmission system, requiring substantial planning and environmental assessments, including the calculation of biodiversity offset costs to mitigate any environmental impact caused by the construction activities.

Additionally, the Transposition works involve the relocation and modification of transmission infrastructure across six separate locations. The biodiversity offsets for these works are distributed across these locations, each requiring specific environmental management and mitigation measures to address the impact on local ecosystems. These offsets are a critical part of ensuring that the project complies with environmental regulations and minimizes ecological disturbances.

The Augmentation cost estimate was developed by GHD, with detailed summary costs provided in the report titled **"BIO1_12612502-REPO-0_Mt Piper AER Biodiversity Offset Cost Estimate_Item1,"** dated 17th December 2024. The underlying basis for these calculations is provided in the accompanying spreadsheet, **"Mt Piper_Offset Cost Estimate_V2.4."** This document outlines the assumptions, methodologies, and data sources used to calculate the biodiversity offset costs for the Augmentation works.

For the Transposition works, the cost estimate was completed through a Desktop Survey conducted by TransGrid, covering the nine separate locations identified in the reports **BIO2** through **BIO10**. The mapping of Biodiversity Credit Fund (BCF) credit charges associated with the biodiversity offset costs is further explained in the spreadsheet titled **"CWOREZ_BCF_Evidence_20250326."** This spreadsheet details the data and assumptions used in the estimation of the biodiversity offset costs for the Transposition works, including the relevant environmental factors specific to each of the locations.

Part 3: Cost Estimate Review

Cost Estimate Summary (Indexation for 2026)

Description	Estimate $ (2026 dollars)	% of Total cost
[redacted]		

Description of main cost elements

The Augmentation cost estimate accounts for ecosystem and species credit costs and includes several contingencies: [redacted] impact contingency applied to the subtotal of ecosystem and species credits, a [redacted] assessment contingency compounded on the combined total of ecosystem credits, species credits, and the impact contingency. Additionally, [redacted] indexation is applied to the BCF portion of credits to reflect increases in the BCF charge rate.

The Augmentation estimated biodiversity offset costs for the expected case scenario in 2024[redacted], Transgrid have applied [redacted] conversion to provide a 2026 estimate [redacted]

The Transposition cost estimate consists of a number of desktop studies which include ecosystem & species credit costs and involves no contingency.

The Transposition estimated biodiversity offset costs in 2025 [redacted] Transgrid have applied a [redacted] conversion to provide a 2026 estimate [redacted]

Augmentation Cost Estimate Summary

Description	Estimate $2024	% of Total cost
[redacted]		

Transposition Cost Estimate Summary

Description	Estimate $2025	% of Total cost
[redacted]		

Part 3: Cost Estimate Review

Review the Land Area Requiring Offsets

The design envelope area refers to the physical area of the CWO Transgrid works (for both the Augmentation and Transposition) where biodiversity offsets may be required to compensate for species and ecosystems impacted by land disturbance and removal. To reflect the total cost of the biodiversity offsets the envelope needs to include the spatial footprint of not only the installed transmission infrastructure (towers, access tracks and easements) but also the spatial footprint of construction activities and any temporary works.

The design envelope areas for both Augmentation and Transposition are contained within the following KMZ files-CWOREZ_V2.1_20250213-for Biodiversity Offset **Calculation,** ProjectFootprint_20250228**, and** SubjectLand_202410.

The design envelope areas were individually verified using the "polygon" and "path" measuring functions in ArcGIS to ensure accuracy in the basis of estimate. This validation process involved cross-checking the reported areas against geospatial data to confirm consistency with the design specifications. During independent validation, the measured Transposition areas were found to be within a [redacted] tolerance of the values stated in the reports, and the Augmentation areas differed by [redacted] which is considered an acceptable margin of error for this analysis.

The design envelope areas include offset land envelopes and access tracks, with each design envelope referenced against the State Vegetation Type Map (SVTM) prepared by the Department of Planning and Environment under Part 5A of the Local Land Services (LLS) Act. The SVTM's categorisation of each land parcel, as referenced within each BIO report, is clearly stated in the build-up of the ecosystem credit basis of estimates.

Finding/s:

1. The design envelope is considered reasonable. The envelope is consistent with a 60m wide 330kV transmission line easement and 6m width for access tracks. The design envelope also makes allowance for crane and EWP pads. More area may be disturbed with the creation of the access tracks (10m width may be necessary) then the 6m with allows however a contingency for additional disturbed land is included in the estimate.

Part 3: Cost Estimate Review

Review Offset Unit Rates

The cost estimate is built up with biodiversity credits for ecosystems and species with the unit rates from the BCF (Biodiversity Conversation Fund) Credit Charge Report. The Report contains all Biodiversity Conservation Fund (BCF) charge quotes provided to applicants during the period of the report (every quarter). Therefore, it represents the most accurate estimated unit cost for each credit type for a proponent such as Transgrid.

The BCF Charge Report prices do not include a risk premium or delivery fee. The BCT applies a risk premium of between 9% and 18% to most credit types, intended to cover the potential risk of not being able to deliver credits at the predicted charge. Additionally, the BCT charges a delivery fee of 5% or $120, whichever is greater, to help cover its delivery costs. To account for this, both GHD and Transgrid have applied [redacted] premium to each raw credit price.

Transposition

For the Transposition works, [redacted] of the credit costs were allocated to purchasing credits, which is considered a conservative approach [redacted] Additionally, for the Transposition works, an Offset Trading Group (OTG) credit price average was applied by TransGrid due to the absence of a specific credit price for the IBRA sub-region in which the Mt Piper project is located in the BCF charge report.

Augmentation

For the Augmentation works, there is a high case estimate [redacted], and an expected case scenario [redacted] Transgrid has clarified that the high case scenario is designed to provide a worst-case scenario, offering a framework for assessing biodiversity offset delivery risks. In contrast, the expected case scenario aims to provide a realistic, best point-in-time estimate of likely offset delivery costs, while identifying the approach and constraints necessary for prudent and efficient offset delivery. The expected case scenario was used for the Transgrid overall cost estimate. It is anticipated that Transgrid would include the difference between the high case and expected case scenario as a risk allowance.

High Case Scenario

The high case scenario assumes that [redacted]. An evaluation of the land has been conducted, and the affected ecosystem and species credits have been matched with the corresponding BCF Charge Report prices [redacted], alongside estimated envelopes to determine the final subtotal biodiversity offset cost. Impact, Assessment, and Credit Price indexation contingencies are then applied to this subtotal..

Part 3: Cost Estimate Review

Review Offset Unit Rates

Expected Case Scenario

The expected case scenario aims to [redacted]

TransGrid explained that the [redacted] was determined based on several key assumptions. Major linear projects like the Mt Piper project typically affect various landscapes and ecosystems, making it challenging to fully offset liabilities with land-based offsets alone. [redacted].

Finding/s:

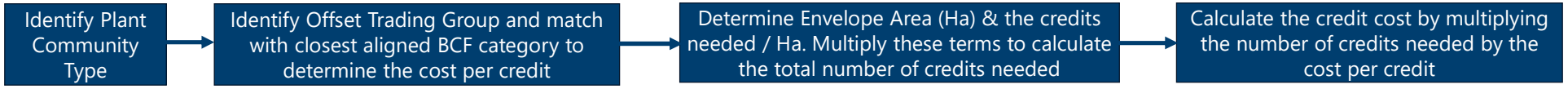
1. The use of BCF Credit Charge Report for biodiversity offset credit rates is considered a reasonable basis for determining the total biodiversity offset costs. The rate of change of these credit rates is relatively stable for most ecosystem and species credit charges.
2. Transgrid has provided justification for th[redacted] split between BSA/Credit Price costings in the Expected Case Scenario (based on past project experience and land prices in the west of NSW versus the east).

Part 3: Cost Estimate Review

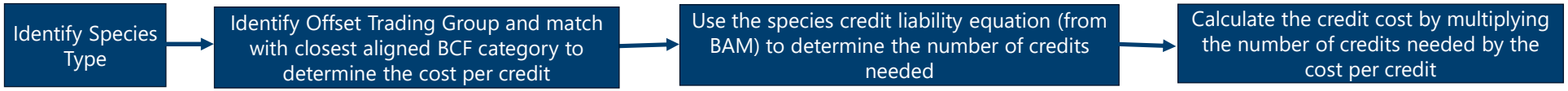
Cost Estimate Calculation Review - Transposition

Transgrid have used the following parameters to calculate the offset credits for ecosystem and species.

Ecosystem Credit Costs



Species Credit Costs



The following sources were used by Transgrid to determine the values for these parameters:

- **Envelope Area:** Based on the design envelope drawings supplied. In each Transgrid report the distinct area in Ha is given.
- **Plant Community Types:** Based on State Vegetation Type Maps (SVTM) which allows classification of offset ecosystem credits per hectare.
- **Credit unit rates:** Based on the BCF Charge Report
- **Species Credit Liability Equation:** The Biodiversity Assessment Method (BAM) is used for envelopes with an identified species.

  The Species Credit Liability equation is: $SCL = \sum_i^n HC_i \times HL_i \times BRW_i \times C$

  Hci = Habitat Condition Score; HLi Habitat Loss Score, BRWi – biodiversity Restoration Work Factor, C = Species Threat Factor
- **Assumptions and clarifications for ecosystem credits:** Based on the Biodiversity Conservation Act 2016 and the Biodiversity Conservation Act 1999

Finding/s:

1. The calculation methods and sources used to develop the Transposition cost estimate is clearly stated and the relevant source material has been provided.

Part 3: Cost Estimate Review

Cost Estimate Calculation Review - Augmentation

Sources

The sources for these Augmentation calculations align with those used for the Transposition calculations in the preceding slide, except for a few referenced in **Mt_Piper_Offset_cost_estimate_V2.4: "Industry advice about price for species credits"** and **"GHD Client BC Fund quote"**.

Cost Component Methodology-High Case Scenario

The High Case Scenario adopts the same methodology as the Transposition calculations in the previous slide, where both ecosystem and species credit costs are determined using a [redacted] The High Case Scenario is considered the more conservative option, as it accounts for potential cost escalations and uncertainties associated with biodiversity credit markets, with additional contingency applied, as explained in the subsequent slides.

Cost Component Methodology-Expected Case Scenario

The Expected Case Scenario adopts a blended approach to the cost estimation, combining elements from both the High Case and BSA models. In this scenario, [redacted] of the credits are allocated using the High Case Scenario methodology, which incorporates the conservative assumptions and cost component breakdowns of the BCF credit charges. This ensures that a portion of the land is accounted for with higher cost considerations, reflecting the potential for escalations and market uncertainties. [redacted] By blending these two approaches, the Expected Case Scenario seeks to offer a balanced and realistic estimate that reflects both the potential for higher costs in some areas and the stability offered by the BSA model.

Finding/s

1. Transgrid has selected the expected case scenario for the augmentation biodiversity offset costs. This is considered a reasonable approach given Transgrid is only able to recover costs that are considered prudent and efficient. Transgrid should consider inclusion of the difference in costs between the high case and expected case as a risk allowance in its overall cost estimate.
2. The calculation methods and sources used to develop the Augmentation cost estimate is clearly stated and the relevant source material has been provided.

Part 3: Cost Estimate Review

Detailed Calculation Review-Augmentation & Transposition

Detailed Calculation Checks

The following minor discrepancies in calculations has been identified from a detailed review of the documents as highlighted below:

-BIO3_Rapid Desktop Assessment_MTP_Biodiversity_20250304_Item1: There is an omission of the [redacted] risk premium applied to the base rate for the species credit **Eucalyptus cannonii / Capertee Stringybark.** This approach is inconsistent with the methodology applied to the other transposition BCF credit cost rates.

-Attachment 1-Direct Non-Labour Model-Biodiversity: The equation in **Cell H39** of the **Summary Tab** should read **sum (H36:H38)** to provide an accurate subtotal of transposition species credit costs.

CWOREZ_V2.1_20250213-for Biodiversity Offset Calculation: It is recommended that the substantiation be reviewed to confirm that the BCSS Winch Site Area, encompassing five zones as delineated in the GIS data, is unequivocally located outside the designated envelope area within the Wollar-Disturbance Area **(BIO10).**

Finding/s:

1. Several minor inconsistencies were identified, however the calculations in the provided spreadsheets and tables produce the correct total cost estimate with minimal errors.
2. For the augmentation works, the approach adopted to allocating credit prices was to select the closest matching OTG or species and closest subregion to the subject land and most recent BC Charge quote available if there were multiple matching quotes over time as listed in the BCF Charge Report V5 - July 2024.

Part 3: Cost Estimate Review

Review Contingency and Escalation

Augmentation

The following contingencies have been applied by GHD in report **BIO1_12612502-REP-0_Mt Piper AER Biodiversity offset cost estimate_Item1**:

- [redacted] for additional credits for indirect **impacts**, prescribed impacts or impacts on key fish habitat (as required under the NSW Fisheries Management Act 1994). **(This [redacted] is applied to the subtotal of the ecosystem and species credit costs)**.
- [redacted] for changes to vegetation zone or species polygon mapping, threatened species listings, survey and **assessment** guidelines or associated BAM calculator metrics that increase the credit obligation. **(This [redacted] is compounded on the subtotal of the ecosystem and species credit costs, and the [redacted]**
- [redacted] based upon the BCT's published rate to pay into the BCF via a BCF Charge Quote. A Charge Quote will be sought from the BCT prior to project approval in order to inform calculation of the bank guarantee required to secure two-year deferral of the offset liability. Accordingly, a total of two year's indexation has been applied to the High Case estimate. Transgrid has justified the [redacted] Annual Index by referencing the BCT guidance, attributing it to a combination of Management Cost Index of [redacted] (based on ABS indices over the 10 years to March 2024) and a Land Value Index o[redacted] (derived from Rural Bank's 20-year data on rural property values in NSW).

Transposition

Transgrid have not applied any contingencies for the Transposition works providing the following justification:

- Transposition works are subject to an alternate approval pathway to the augmentation works, whereby Transgrid self-approve the project as an Authorised Network Operator (ANO) under the Electricity Network Assets (Authorised Transactions) Act 2015. Clause 3(3) and Schedule 1(4) of the EP&A Regulation prescribes ANOs to be Part 5 determining authorities for development for the purposes of an electricity transmission or distribution network. This means Transgrid can self-assess and self-determine activities that are not likely to significantly affect the environment and are conducted by or on behalf of the ANO for the purpose of electricity transmission or distribution.
- Transposition contingencies would thus only be required if the works are likely to significantly affect biodiversity values (and thus required to be assessed under the NSW Biodiversity Offset Scheme). The likelihood of a significant impact upon any entity because of the proposed Transposition works is highly unlikely. However, as no field assessment has been conducted, the chance of a significant impact can not be ruled out entirely. Subsequently, we have provided high-level (desktop) assessment of likely worst-case biodiversity offset cost scenarios for the Transposition works to cover this risk. Given the low likelihood of the risk occurring at any single location (let alone all locations), the proposed biodiversity offset budget is considered as sufficient to cover any cost-escalation should the project be pushed into the NSW Biodiversity Offset Scheme.

Finding/s

1. Transgrid has included appropriate contingencies for additional impacted area, additional offset credits and credit price escalation the Augmentation works.
2. Transgrid have not included contingencies for the Transposition works because of the conservative nature of the estimate and alternative approval pathway for the works.

Part 3: Cost Estimate Review

Review Findings

A summary of the findings and recommendations for the CWO REZ biodiversity cost estimate is presented in the table below

Review Area	Finding Description
Review the Land Area Requiring Offsets	The design envelope is considered reasonable. The envelope is consistent with a 60m wide 330kV transmission line easement and 6m width for access tracks. The design envelope also makes allowance for crane and EWP pads. More area may be disturbed with the creation of the access tracks (10m width may be necessary) then the 6m with allows however a contingency for additional disturbed land is included in the estimate.
Review Offset Unit Rates	The use of BCF Credit Charge Report for biodiversity offset credit rates is considered a reasonable basis for determining the total biodiversity offset costs. The rate of change of these credit rates is relative stable for most ecosystem and species credit charges.
	Transgrid has provided justification for the [redacted] split between BSA/Credit Price costings in the Expected Case Scenario (based on past project experience and land prices in the west of NSW versus the east).
Cost Estimate Calculation Review	The calculation methods and sources used to develop the Transposition cost estimate is clearly stated and the relevant source material has been provided.
	Transgrid has selected the expected case scenario for the augmentation biodiversity offset costs. This is considered a reasonable approach given Transgrid is only able to recover costs that are considered prudent and efficient. Transgrid should consider inclusion of the difference in costs between the high case and expected case as a risk allowance in its overall cost estimate.
	The calculation methods and sources used to develop the Augmentation cost estimate is clearly stated and the relevant source material has been provided.
Detailed Calculation Check	Several minor inconsistencies were identified, however the calculations in the provided spreadsheets and tables produce the correct total cost estimate with minimal errors.
	For the augmentation works, the approach adopted to allocating credit prices was to select the closest matching OTG or species and closest subregion to the subject land and most recent BC Charge quote available.
Review Contingency and Escalation	Transgrid has included appropriate contingencies for additional impacted area, additional offset credits and credit price escalation the Augmentation works.
	Transgrid have not included contingencies for the Transposition works because of the conservative nature of the estimate and alternative approval pathway for the works.

Appendices

Appendix A – Transgrid Easement Areas

Appendix A: Cost Estimate Review

TransGrid-Easement Guidelines-Living and working with electricity transmission guidelines

Figure 1 Represents the easement widths for varying voltage levels and tower types.

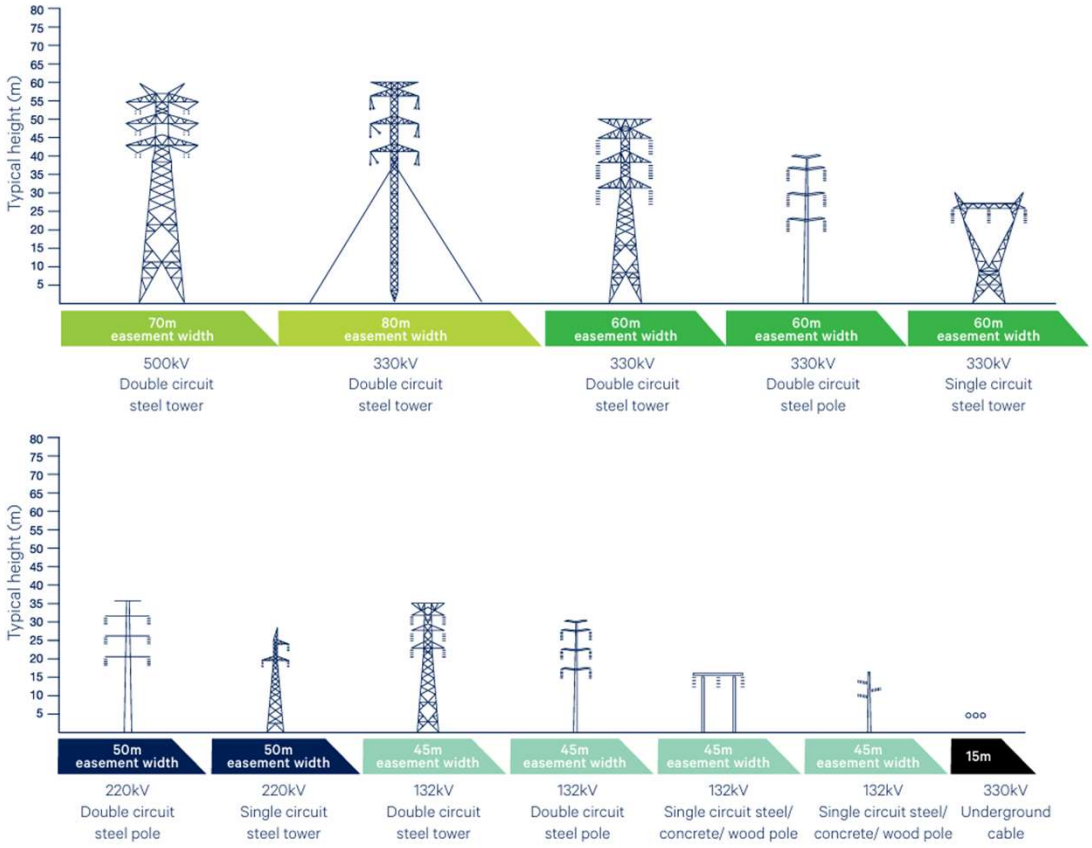


Figure 1: Figure not to scale. Typical easement widths only, may vary on a case-by-case basis. Typical height to be considered in the graph, actual size of tower can vary based on topography, location and conditions. It is best practice to engage a solicitor to check your land title for the exact location of an easement on your property.

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