

North West Transmission Development

**Early Works Independent Verification and
Assessment**

TasNetworks Pty Ltd

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→ The Power of Commitment



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Executive summary

Marinus Link is a proposed 1500 Mega Watt (MW) High Voltage Direct Current (HVDC) interconnector, crossing Bass Strait and connecting the states of Tasmania and Victoria. The Australian Energy Market Operator's (AEMO's) Final 2024 Integrated System Plan (ISP)¹ reconfirms the Actionable status of Project Marinus without decision rules. The 2024 ISP also details that the interconnect will be delivered as two 750MW cables with Stage 1 to be delivered by June 2030 and Stage 2 by June 2032² to align with AEMO's Optimum Development Path (ODP).

To resolve issues related to the pricing impact on customers, funding and the ownership structure, Marinus Link was split into two scopes with Marinus Link Pty Ltd (MLPL) to deliver the HVDC interconnectors and TasNetworks to deliver the associated High Voltage Alternating Current (HVAC) North West Transmission Development (NWTD) works. The ownership of MLPL was also changed in July 2021 which is now jointly owned by the Australian Government (49%), Tasmanian (17.7%) and Victorian governments (33.3%).

To match the proposed HVDC interconnector work phase, NWTD works will be undertaken in two separate stages:

- Stage 1³ – HVDC Cable 1 and the associated NWTD works, being upgrades to the Palmerston–Sheffield and Sheffield–Burnie 220 kV transmission lines, and construction of the Heybridge Spur East 220 kV transmission line, referred to as the 'coastal' route
- Stage 2 – HVDC Cable 2 and the associated NWTD works, being construction of the Staverton–Hampshire Hills and Burnie–Hampshire Hills 220 kV transmission lines, and upgrade of the Sheffield–Staverton 220 kV transmission line, referred to as the 'inland' route.

TasNetworks intends to submit a Contingent Project Application (CPA) to the Australian Energy Regulator (AER) in October 2024. This will cover NWTD early works and activities to progress through to the Final Investment Decision (FID). This CPA-1 will be followed by a CPA-2 submission planned for 2025 to cover the remaining costs to deliver the project.

GHD has been engaged by TasNetworks to conduct an Independent Verification and Assessment of the early works CPA-1. The assessment considers whether the costs and forecasts included in CPA-1 are prudent / efficient and are required to achieve project timeframes, reduce the final projects costs, and / or reduce schedule and cost risks.

The TasNetworks early works CPA-1 seeks \$167.3M (\$Real 2023-24) which is further detailed in section 5 of this report. Our assessment is detailed in the Table below.

In summary the costs included in CPA-1 represent actual from July 2021 to 30 June 2024 and forecast from July 2024 to February 2026 that relates to early works activities, required achieve project timeframes, reduce the final projects costs, and / or reduce schedule and cost risks. These costs align with the activities required to progress

¹ AEMO, Final 2024 Integrated system Plan (2024 ISP), June 2024 p.14

² AEMO, Final 2024 Integrated system Plan (2024 ISP), June 2024 p.62

³ AEMO, Final 2024 Integrated system Plan (2024 ISP), June 2024 p.63

Stage 1 of the project and other activities required to progress the project generally where it is prudent and efficiency to do so as part of the early works scope.

Table 1 GHD's independent and verification conclusions

Category	Commentary
Project management \$23.0M (\$Real 2023-24)	<p>Project Management Office (PMO) costs include internal resources required for establishing governance, managing the project plan, implementing project control and management systems, scheduling, risk, quality and information management. The costs also include contracted management services from [REDACTED] and other costs required to support the PMO.</p> <p>These costs are required to coordinate project delivery up to the FID and are considered prudent and efficient and would be incurred by a reasonable Transmission Network Service Providers (TNSPs).</p>
Project development \$92.7M (\$Real 2023-24)	<p>Project development costs include:</p> <ul style="list-style-type: none"> - The cost of procuring of Long Lead-time Equipment (LLE) required to reduce project risks - Design, preconstruction and LLE procurement activities - Early Contractor Involvement (ECI) support for the procurement process through the completion of studies, surveys and assessments to support the engineering design and technical and functional asset requirements that are included in the tender specifications - Internal team labour costs required to drive project development stream objectives - Support from [REDACTED] and [REDACTED] relating to engineering and procurement support. <p>GHD's analysis of LLE forecasts \$39.1M indicates that it is based upon a cumulative cash flow driven by items required to deliver the Stage 1 scope (consisting of switching station primary equipment, switching station secondary system equipment, and overhead transmission line items), unit price estimates and contract payment milestone assumptions based upon lead-time to site delivery.</p> <p>This approach is considered to be conservative noting the any over / under forecasting will be corrected in the CPA-2 submission.</p> <p>Based upon GHD's analysis all LLE items are considered prudent and efficient, required to achieve project milestones and to reduce supply chain delivery and cost escalation risks.</p> <p>The design, procurement, construction, pre-commissioning and commissioning activities to be delivered by [REDACTED] \$40.0M relates to Stage 1 are required to achieve the projects schedule and to reduce risk during delivery. As such this expenditure is considered prudent and efficient.</p>
Commercial and procurement \$12.0M (\$Real 2023-24)	<p>Costs associated with progressing activities related to ECI through to the final Request for Tender (RFT) are spread across several cost categories. These costs are required to develop a procurement strategy to identify a preferred contractor for delivery the project according to the ODP. The activities also represent a competitive process required to support the accuracy of the capex forecast for FID.</p> <p>Project management and delivery include costs related to studies, surveys and assessments to support the engineering design and technical and functional asset requirements that are included in the tender specifications. These activities support ECI and the RFT development to lower the risks associated with delivery and capex forecast accuracy.</p> <p>Commercial and procurement costs include activities related to procurement strategy development and execution, capex forecasting, ECI and tender preparation and evaluation activities.</p> <p>These actual and forecast costs are considered prudent and efficient to support project delivery within the required time frame and to lower the risks associated with the FID and program execution.</p>
Land and easement acquisition \$16.6M (\$Real 2023-24)	<p>Land and easement acquisition costs during early works is focused on securing voluntarily Licence and Easement Option Agreements (LEOAs) from the 142 landholders who collectively own 346 private land parcels which are impacted by the proposed Stage 1 transmission line easement.</p> <p>These activities and support from [REDACTED] are required to reduce project risk related to securing easements and are considered prudent and efficient.</p>

Category	Commentary
Planning and environment \$15.3M (\$Real 2023-24)	<p>These costs relates to an internal team leading planning and environmental approval activities with support from other parties to complete Development Approval (DA) / Environmental Impact Study (EIS) submissions. These approvals need to be completed before TasNetworks can commence construction and are being presently undertaken to minimise the risk of project delays.</p> <p>Based upon the TasNetworks Capex Forecasting Methodology, TasNetworks now expects to:</p> <ul style="list-style-type: none"> - Submit its DA/EIS for Crown and council consent to lodge Major Infrastructure Development Approvals Act 1999 (Tas) documentation with Tasmanian Planning Commission (TPC) in mid-January 2025 - Lodge the DA/EIS with the TPC in mid-February 2025 <p>These activities ideally need to be completed by FID to reduce the projects risk profile. As such the expenditure is considered prudent and efficient.</p>
Community and stakeholder engagement \$6.7M (\$Real 2023-24)	<p>Community and stakeholder engagement activities support the projects social licence. These activities are aligned with informing key parties and can support project risk mitigation. These are activities conducted on large transmission projects and have been claimed by other TNSPs as valid early works activities. As such this expenditure is considered prudent and efficient.</p>
Regulatory approvals and other support \$0.9M (\$Real 2023-24)	<p>These costs typically include all the costs-to-date related to the various phases of the Regulatory Investment Test for Transmission (RIT-T) process and the costs related to the regulatory activities related to CPA-1 submission. The total reflected is lower than would be typically expected as costs included to complete the RIT-T process between the 2019-20 and 2020-21 regulatory years were incurred as part of Project Marinus and forms a component considered in the sale price of MLPL.</p> <p>Costs relate to consulting advice related to the construction application for Stage 2 and the cost of this assessment. These costs are not considered material.</p>

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 the Report.

Glossary

AACE	Association for the Advancement of Cost Engineering
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
BoP	Basis of Preparation
CPA	Contingent Project Application
DA	Development Approval
ECI	Early Contractor Involvement
EIS	Environmental Impact Statement
ERP	Enterprise Resource Planning
EY	Ernst & Young
FID	Final Investment Decision
RFP	Request for Proposal
FTE	Full Time Equivalent
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
ISP	Integrated System Plan
LEOA	Licence and Easement Option Agreements
LLE	Long Lead-time Equipment
■	■
NEM	National Energy Market
MLPL	Marinus Link Pty Ltd
NWTD	North West Transmission Developments
MW	Megawatt
NPV	Net Present Value
PACR	Project Assessment Conclusions Report
PADR	Project Assessment Draft Report
PMO	Project Management Office
OPD	Optimum Development Path
RIT-T	Regulatory Investment Test for Transmission
RFP	Request for Proposal
RFT	Request for Tender
TCD	Transmission Cost Database
TNSP	Transmission Network Service Providers
TPC	Tasmanian Planning Commission

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1. Introduction

The 2024 ISP⁴ lists Project Marinus as a single actionable ISP project without decision rules. Project Marinus includes:

- MarinusLink representing the HVDC interconnector between Tasmania and Victoria to be delivered by MLPL
- The associated HVAC NWT D project to be delivered by TasNetworks.

The NWT D will include 240km of new and upgraded transmission lines and other associated infrastructure that will increase the capacity of Tasmania's electricity network and connect with the MarinusLink HVDC interconnect which will be delivered in two stages to align with AEMO's ODP. The 2024 ISP confirms that the timing of Stage 1 is by June 2030 and the timing of Stage 2 by June 2032.

TasNetworks published the MarinusLink Project Assessment Conclusions Report (PACR) in June 2021 followed by the Project Marinus Regulatory Investment Test for Transmission (RIT-T update) in April 2024. The PACR represents the final phase of the RIT-T process, and it is understood that:

- TasNetworks will submit a CPA-1 to the AER in August 2024. This will cover NWT D early works and activities to progress through to the FID. This CPA-1 will be followed by a CPA-2 submission planned for 2025 to cover the remaining costs to deliver the project
- MLPL will separately progress a revenue determination process with the AER for their scope of the project.

1.1 Purpose of this report

The purpose of this report is to provide an independent verification and assessment of the capital forecast to be included in TasNetworks NWT D Early Works CPA-1, which has been prepared for TasNetworks to support their submission to the AER.

1.2 Scope and limitations

TasNetworks has requested an independent verification and assessment of the NWT D Early Works CPA-1. The CPA -1 seeks to recover costs to date and the cost of the works necessary to develop a robust cost estimate for the project based on the preferred option, to complete early works for the project to ensure commissioning of Stage 1 by June 2030 and Stage 2 by June 2032 to match the MarinusLink HVDC interconnect ODP detailed in the 2024 ISP. This represents actual costs from July 2021 to 30 June 2024 and forecast costs from July 2024 to February 2026.

The NWT D independent verification and assessment:

- Provides independent assessment of the historical costs included in CPA-1
- Assesses the Basis of Preparation (BoP) used in forecasting detailed in TasNetwork's Capex Forecasting Methodology used to support forecasting accuracy

⁴ AEMO, 2024 Integrated System Plan, 26 June 2024, Version 1.0.

- Assesses whether the costs and forecasts included in CPA-1 are prudent / efficient and are required to achieve project timeframes, reduce the final projects costs, and / or reduce schedule and cost risks.

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

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

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

2. Background

Project Marinus was established by TasNetworks in December 2017. With funding support from the Australian Government via the Australian Renewable Energy Agency and the Tasmanian Government, Project Marinus was asked to undertake a detailed Feasibility and Business Case Assessment of a second Bass Strait electricity interconnector, known as MarinusLink.

The 2018 ISP details the justification required for an additional Bass Strait interconnector as follows:

“The economic justification behind an additional Bass Strait interconnector is expected to be driven primarily by the long-term need for energy storage across the NEM, and the projected replacement of energy produced by brown coal-fired generation in Victoria. Additional benefits would include accessing high-quality wind resources in Tasmania and improving hydro efficiencies by repurposing and refurbishing existing assets⁵”.

TasNetworks published the Project Specification Consultation Report in July 2018 which is the first step in the RIT-T process. This document describes the “identified need” and identifies several credible options that would maximise “the present value of net economic benefit to all those who produce, consume and transport electricity in the market.”⁶ This RIT-T document considered the following options:

- Option 1: A 600 MW monopole HVDC link, including associated HVAC transmission network augmentation, now referred to as the NWTD and connection assets
- Option 2: A 1,200 MW bipolar HVDC link, including associated HVAC transmission network augmentation and connection assets.

Subsequently, TasNetworks published the Project Assessment Draft Report (PADR) in May 2020. This report considered a cost-benefit analysis that examines whether and when the project should proceed with market modelling performed by Ernst & Young (EY). This analysis indicated the following as the optimal solution:

- Stage 1: An initial 750 MW HVDC link between Burnie in Tasmania and Hazelwood in Victoria with supporting network augmentations in Tasmania, should be commissioned in 2028
- Stage 2: The commissioning of a further 750 MW HVDC link in 2032.

The PADR confirms that the investment need remains unchanged but added additional credible options on the basis that subsequent work noted that a 750 MW increments of capacity would also be feasible and would provide higher power transfer capacity at a relatively small incremental cost.

The PADR therefore considered four credible options detailed in the table below.

⁵ AEMO 2018 ISP P 88

⁶ National Electricity Rules, clause 5.16.1(b)

Table 2 Four Marinus Link options considered in the PADR (\$M Real 2019)

Option	Description	Forecasted total cost (\$ million)	Weighted average NPV (\$ million)
A	<p>A 600 MW HVDC interconnector using voltage source converter technology and monopole configuration. Converter stations located in the Burnie area in Tasmania and the Hazelwood area in Victoria. HVDC transmission to use buried cable for the entire route.</p> <p>AC network augmentations in Tasmania comprise:</p> <ul style="list-style-type: none"> – Construction of a new 220 kV switching station in the Burnie area adjacent to the converter station – Construction of a new double-circuit 220 kV transmission line from Burnie to Sheffield and the decommissioning of the existing 220 kV single-circuit transmission line in this corridor – Construction of a new double-circuit 220 kV transmission line from Palmerston to Sheffield. <p>No AC augmentations are required in Victoria as there is sufficient transmission capacity to accommodate power flows to or from the interconnector. Limited 500 kV connection assets are required to connect the HVDC converter station to Hazelwood Substation.</p>	1,551	867
B	<p>Like Option A, with converter stations and HVDC cable rated to 750 MW. AC network augmentations are identical to Option A.</p>	1,640	1,066
C	<p>Like Option A, two parallel 600 MW HVDC interconnectors.</p> <p>AC network augmentations in Tasmania comprise:</p> <ul style="list-style-type: none"> – Construction of new 220 kV switching stations in the Burnie area adjacent to the converter stations – Construction of a new double-circuit 220 kV transmission line from Burnie to Sheffield and decommissioning of the existing 220 kV single-circuit transmission line in this corridor – Establishment of a new 220 kV switching station at Staverton – Construction of a new double-circuit 220 kV transmission lines from Staverton to Burnie via Hampshire – Construction of a new double-circuit 220 kV transmission line from Palmerston to Sheffield. <p>As noted for Option A, no AC augmentations are required in Victoria.</p>	2,603	1,274
D	<p>Like Option C, with converter stations and HVDC cable rated to 750 MW. AC network augmentations are identical to Option C.</p>	2,762	1,524

Source: PADR May 2020

The modelling detailed in the PADR outlines that the greatest benefits from options C and D could be extracted from completing the project in two phases in 2028 and 2032.

The PADR preferred option is detailed in table 2 below.

Table 3 PADR preferred Marinus Link option

Investment type	Description
Direct Current (DC) assets	<p>Two parallel 750 MW HVDC interconnectors using voltage source converter technology and monopole configuration.</p> <p>The first 750 MW interconnector is commissioned in 2028 and the second in 2032.</p> <p>Converter stations located in the Burnie area in Tasmania and the Hazelwood area in Victoria. HVDC transmission to use buried cable for the entire route.</p>
AC assets	HVAC network augmentations in Tasmania:

Investment type	Description
	<ul style="list-style-type: none"> – Construction of new 220 kV switching stations in the Burnie area adjacent to the converter stations – Construction of a new double-circuit 220 kV transmission line from Burnie to Sheffield and decommissioning of the existing 220 kV single-circuit transmission line in this corridor – Establishment of a new 220 kV switching station at Staverton – Construction of a new double-circuit 220 kV transmission lines from Staverton to Burnie via Hampshire – Construction of a new double-circuit 220 kV transmission line from Palmerston to Sheffield. <p>No AC augmentations are required in Victoria, as there is sufficient transmission capacity to accommodate power flows to or from the interconnector. Limited 500 kV connection assets are required to connect the HVDC converter station to Hazelwood Substation.</p>

The PACR was published in June 2021. At this point, the AEMO 2020 ISP described the Marinus Link project as “a multi-staged actionable ISP project to be completed from 2028-29, with early works recommended to start as soon as possible, and with further stages to proceed if their respective decision rules are satisfied.”⁷ This document recommended Option D as the preferred option which is a 1500 MW HVDC interconnector, comprising two 750 MW symmetrical monopole HVDC interconnectors, plus associated AC network upgrades. With earliest commissioning dates of 2027 for the first 750 MW stage and 2029 for the second 750 MW stage.

Across this period, the risk of the pricing impact on customers, funding and the ownership structure of the project remained as key risks to the project’s deliverability. To resolve this impasse, the ownership of MLPL was changed in July 2021. MLPL is now jointly owned by the Australian Government (49%), Tasmanian (17.7%) and Victorian governments (33.3%). Under this structure, MLPL would progress the HVDC link and TasNetworks the NWTD.

⁷ AEMO, 2020 Integrated System Plan, July 2020, page 82

3. Verification methodology

GHD Advisory has used several verification approaches to assess the reasonableness of costs included in CPA-1 and supported by TasNetwork's Capex Forecasting Methodology and to determine whether the expenditure is both prudent and efficient.

In considering the forecast, GHD relied upon a bottom-up assessment of forecast elements to determine the extent to which it is supported by appropriate evidence.

The bottom-up approach considered the reliability of evidence used to support forecast elements and the approach applied depended on the nature of the cost element and included a combination of:

- Reliance on the results of TasNetwork's competitive tendering processes supported by appropriate documentary evidence where appropriate
- Reliance upon supporting contracts and purchase orders, including variation requests
- Reliance upon third party reports covering more complex estimates. In these cases, GHD considered the reasonableness of the underpinning assumptions used and whether or not the forecast was based upon the best available information
- Recalculation and validation 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 NWTD and can be justified as early works
 - 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 of cost elements included in the AEMO Transmission Cost Database (TCD) model or other sources.
- Benchmarking – Where appropriate benchmarking references are available
- Whether internal labour costs can be considered prudent / efficient against the team structure, stream objectives, scheduled hours and position rates applied
- Comparison between the capex cost methodology, scope definition and cost forecasts supplied by TasNetworks to ensure that cost forecasts accurately reflect the scope and the assumptions outlined in the Capex Forecasting Methodology

Across this bottom up approach, GHD has considered whether the:

- Costs are prudent and would be incurred by other reasonable TNSPs
- Costs relate to activities required to achieve project timeframes, reduce the final projects costs, and / or reduce schedule and cost risks to assess prudence and efficiency.

4. Scope definition

The following subsections outline the proposed scope of the NWTD project and the early works activities required to support delivery.

4.1 Overall NWTD scope

Based upon the TasNetworks forecasting methodology and the 2024 ISP, the NWTD will be undertaken in two separate stages to support Cable 1 and Cable 2. This will require delivery in two stages:

- Stage 1 – HVDC Cable 1 and the associated NWTD works, being upgrades to the Palmerston–Sheffield and Sheffield–Burnie 220 kV transmission lines, and construction of the Heybridge Spur East 220 kV transmission line, referred to as the ‘coastal’ route
- Stage 2 – HVDC Cable 2 and the associated NWTD works, being construction of the Staverton–Hampshire Hills and Burnie–Hampshire Hills 220 kV transmission lines, and upgrade of the Sheffield–Staverton 220 kV transmission line, referred to as the ‘inland’ route.

The 2024 ISP confirms that the timing of Stage 1 is by June 2030 and the timing of Stage 2 by June 2032.

The two stages are detailed in the figure below.



Figure 1 NWTD Stage 1 (Cable 1) and Stage 2 (Cable 2)

4.2 Early works NWT D scope

To progress the project in an efficient manner to achieve the two staged timeframes detailed above and to conclude procurement processes to support the accuracy of capex estimates by FID, several interrelated activities need to be progressed. These include:

- Program and project management to coordinate and govern project delivery
- Finalisation of the proposed route
- Development of technical designs and functional specifications in conjunction with ECI during the procurement process
- Progression of environmental impact assessments and development approvals
- Delivery of landowner and community engagement programs
- The securing of land and easement acquisition related to the proposed route
- The execution of the procurement strategy based on a competitive Request for Proposal (RFP)
- Purchase of LLE.

Based upon the above, the early works capex for Stage 1 of the NWT D as outlined in TasNetworks Capex Forecasting Methodology includes:

Labour costs– for internal Full Time Equivalent (FTE) costs associated with a broad range of activities including project management, project development and corporate support for procurement, technical design and feasibility studies, land and environmental activities, stakeholder engagement and regulatory approvals.

Indirect capex – for a wide range of professional and consulting services, legal services as well as tender payments and associated facilities costs (e.g., data room)

Direct capex – for the preconstruction development activities that will be undertaken by the ECI Contractor as well as the costs of securing LLE.

5. Capex forecast

The table below details the actual costs to 30 June 2024 and the forecast to February 2026 included in the early works scope.

Across the following sections, those material cost elements claimed in the early works CPA-1 have been assessed according to the verification process detailed in section 3.

Table 4 NWTD actuals to 30 June 2024 and forecast to February 2026 for CPA-1 (\$M Real 2023-24)

Category	Section reference	Actual to 30 June 2024 \$M	Forecast to February 2026 \$M	Total \$M
Project development	Section 6	9.7	83.0	92.7
Project management	Section 7	12.8	10.2	23.0
Land and easement acquisition	Section 8	7.1	9.5	16.6
Planning and environment	Section 9	11.7	3.6	15.3
Commercial and procurement	Section 10	7.3	4.7	12.0
Community and stakeholder engagement	Section 11	4.4	2.3	6.7
Regulatory approvals and other support	Section 12	0.3	0.6	0.9
Rounding		0.1		0.1
Total		53.4	113.9	167.3

6. Project development

The project development stream supports the ECI procurement process through the completion of studies, surveys and assessments to support the engineering design and technical and functional asset requirements that are included in the tender specifications.

These activities are outlined in Section 6.2 of TasNetworks Capex Forecasting Methodology.

The costs summarised in the table below also includes additional work associated with the introduction of project staging discussed above. This required further engineering refinement of the Sheffield–Burnie 220 kV transmission line route. To this end the Project Development team in collaboration with Jacobs:

- Undertook further technical studies to assess transmission outage impact on the of the existing Sheffield–Burnie 220 kV transmission line
- Assessed the constructability challenges associated with the need to build the 220kV double-circuit transmission line on the same easement as the existing 220kV single-circuit transmission line.

This category also includes direct costs for the ECI phase being pre-construction activities and LLE.

The table below provides a summary of project development costs.

Table 5 Project development cost summary for CPA-1 (\$M Real 2023-24)

Category	Section reference	Actual to 30 June 2024 \$M	Forecast to February 2026 \$M	Total \$M
Long lead-time equipment	Section 6.1	-	39.1	39.1
Procurement	Section 6.2	-	40.0	40.0
Owners labour	Section 6.3	2.6	2.2	4.8
Indirect costs	Section 6.4	7.2	1.7	8.9
Rounding		(0.1)		(0.1)
Total		9.7	83.0	92.7

6.1 Long lead time equipment

LLE can represent a risk to project delivery due to extended delivery time frames, supply chain uncertainty and cost escalation. These items are typically secured as part of a projects early works scope as a risk mitigation activity.

TasNetworks Capex Forecasting Methodology summaries the LLE forecast as follows.

Table 6 LLE forecast included in TasNetworks Capex Forecasting Methodology (\$Real 2023-24)

LLE element	Payment milestone payments	\$M
Vendor drawings	10 per cent milestone payments	6.7
Purchase of raw materials	20 per cent milestone payments	11.3
Drawing approval and manufacture	30 per cent milestone payments	3.7
Freight-on-board milestone payments	-	16.0
Delivery	Based on receipt of equipment	1.4
Total		39.1

This summary is extracted from a cumulation cash flow estimate performed by the [REDACTED]. The cumulation cash flow estimate is based upon:

- An analysis of equipment performed by the [REDACTED]
- Estimated unit costs
- Phased payment milestones, with the phasing based upon the lead-time to site delivery for each LLE element.

When considering the prudence and efficiency of the LLE forecast, LLE should only be included as early works where it is required to deliver the projects schedule and where procurement commitment is required before the FID due to long lead times. This supports appropriate risk management.

The estimate also needs to be supported by a degree of accuracy that can be reasonably expected at this stage of the project's development.

The following sub-sections breakdown these elements to consider the accuracy of the LLE estimate and to determine whether LLE commitment is to reduce project risk.

6.1.1 LLE alignment with Stage 1 scope and unit cost assessment

The following table represents a breakdown of LLE elements by quantity and price based upon the spreadsheet provided from the [REDACTED]. These items represent the basis of the cumulative cash flow. For each LLE element, GHD has confirmed alignment with the Stage 1 scope and for individually material LLE elements we have considered the accuracy of the unit cost against building block in the TCD model where possible.

Note: Given that any costing error is likely to be corrected during the CPA-2 submission, and given that any estimate at this stage of the project and the TCD model itself is a Class 5a estimate a +/- range of 50% is considered acceptable.

Table 7 LLE elements unit cost and Stage 1 scope alignment

LLE elements	Unit rate \$K	Quantity	Total \$M	CPA-1 Total \$M	Aligned Stage 1 scope	Unit rate reasonableness
220kV Circuit Breaker	█	29	█	█	Aligned	37% lower than AEMO TCD estimate
220kV GIS	█	3	█	█	Aligned	Refer comments in section 6.1.3
110kV Circuit Breaker	█	1	-	-	Item not material	
220kV Current Transformer	█	67	█	█	Aligned with immaterial differences	13% lower than AEMO TCD estimate
110kV Current Transformer	█	3	-	-	Item not material	
220kV Capacity Voltage Transformer	█	52	█	█	Aligned with immaterial differences	41% higher than AEMO TCD estimate
220kV Inductive Voltage Transformer	█	6	█	█	Item not material	
220kV Power Voltage Transformer, 50kVA	█	1	█	█	Item not material	
220kV Disconnecter Switch (side-by-side)	█	34	█	█	Aligned	58% higher than AEMO TCD estimate
220kV Disconnecter Switch + 1ES (side-by-side)	█	26	█	█		62% higher than AEMO TCD estimate
220kV Disconnecter Switch + 1ES (end-to-end)	█	2	█	-	Item not material	
220kV Disconnecter Switch Pantograph	█	5	█	█	Item not material	
110kV Disconnecter Switch (end-to-end)	█	1	-	-	Item not material	
220kV Station Post Insulators	█	430	█	█	Item not material	
220kV Surge Arrester	█	18	█	█	Item not material	
220kV Protection Panel	█	37	█	█	Required	

LLE elements	Unit rate \$K	Quantity	Total \$M	CPA-1 Total \$M	Aligned Stage 1 scope	Unit rate reasonableness
Merging Unit	■	25	■	■		The TCD does not provide individual estimates of this component. Any over / under forecasting will be corrected in the CPA-2 submission.
Network Panel	■	3	■	■		
Station Panel	■	2	■	■	Item not material	
Steel Towers	■	7859T	■	■	Required	The TCD does not provide individual estimates of this component. Any over / under forecasting will be corrected in the CPA-2 submission
Glass Insulators	■	85861	■	■		
Rounding & non-material items				■		
Total				39.1		

6.1.2 LLE payment milestones assumptions

The [REDACTED] has also used different contract payment milestones for each LLE element to build the cumulative cash flow. The TasNetworks Capex Forecasting Methodology details that [REDACTED] plans to make deposits to book in manufacturing slots. Once booked, [REDACTED] will request the vendor to complete designs and specifications.

Example milestones include the following generally used across the estimate, with other items spreading out the commitment over a longer period.

Table 8 Example LLE milestone payment assumptions

Phase	Payment %
Vendor Drawings	10%
Purchase of Materials	20%
Drawing Approval	30%
FOB	20%
Delivery	20%

This approach is conservative and is considered appropriate for the accuracy required at this stage of the project's development.

6.1.3 LLE lead-times and project schedule requirements

GHD also analysed key LLE lead-times against the date that the equipment is required on site based upon the [REDACTED] cumulative spreadsheet. The spreadsheet assumes a range of delivery lead times summarised in the table below.

Table 9 LLE lead time assumptions

LLE element	Months
Glass insulators	11.5
Circuit breakers	9.25
220kV GIS	
Instrument transformers	
Switches	
Post insulators	
Surge Arrester	
Panels	7.25
Steel towers	6

Based upon analysis of the schedule LLE procurement and taking into account the potential of leveraging the complete Stage 1 volumes in procurement activities, all the LLE identified qualifies as early works apart from the 220kV GIS which could be potentially ordered and claimed in CPA-2. The current forecast only includes \$0.9M

related to 220kV GIS design costs only. This represents only 0.6% of total CPA-1 costs which is considered immaterial with GHD considering design progression as prudent.

6.1.4 LLE cumulative cash flows

GHD analysis of the cumulate cash flow, taking into account the above assumptions and found that it supports the estimate for LLE to be included in CPA-1.

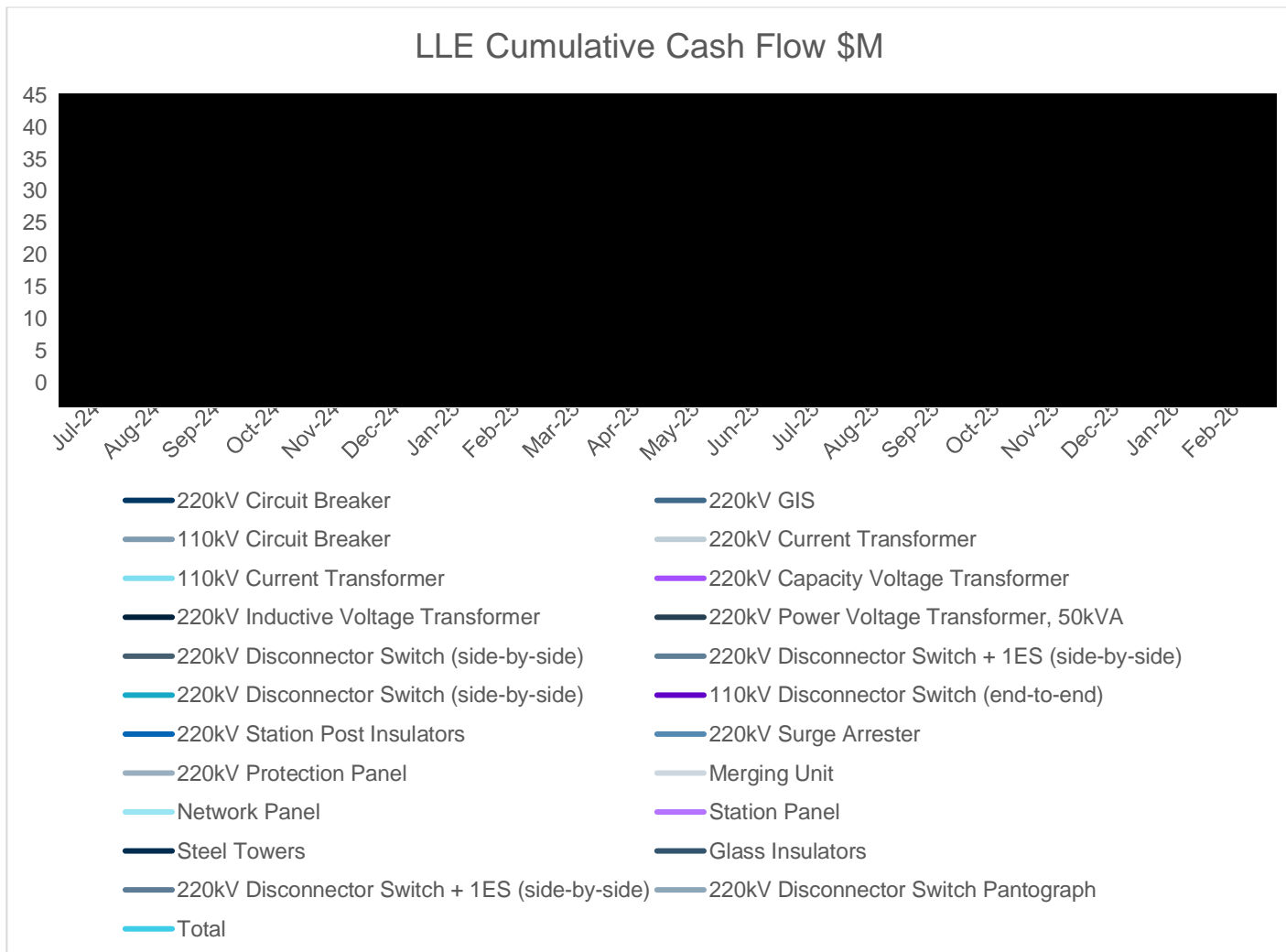


Figure 2 LLE cumulative cash flows

6.2 Procurement

Section 4.5 of TasNetworks Capex Forecasting Methodology outlines the ECI activities required to support tender processes including LLE and pre-construction development. In summary, this includes supporting project management activities, design, construction strategy and methodologies, key project management plans, construction program development, cost estimation and risk management.

Following a tender process [REDACTED]. Based upon their ECI Phased Management Plan – “[REDACTED] is responsible for all design, procurement, construction, pre-commissioning and commissioning (not including energisation), of the Project. It includes the following:

Transmission Line

- New 220kV Transmission Line to be designed only:
 - o TL542 Burnie to Hampshire Hill 30kms (new) – 62 towers
- Existing 110kV Transmission Line section to be designed and constructed and/or demolished:
 - o Realignment of sections along TL441 Sheffield to Burnie 4km and decommissioning/removal of old sections to facilitate construction of new TL538 47km – 107 new towers
- Design, supply, installation, testing and commissioning of primary and secondary systems for 22kV under crossings and augmentation works related to NWTB Project:
 - o NWTB Transmission Lines 22 kV Under crossings:
 - Palmerston – Sheffield (PM-SH) 220 kV transmission corridor TL535
 - Sheffield – Burnie (SH-BU) 220 kV transmission corridor TL538
 - Heybridge Spur East (HB Spur East) 220 kV transmission corridor TL543
 - Burnie – Hampshire Hills (BU-HH) 220 kV transmission corridor TL542 (design only)
 - o NWTB Burnie Area 22kV Augmentation
 - Burnie Substation to Three Mile Line Road – 4x distribution feeder underground augmentation
 - Burnie Substation to Mooreville Road – 3x distribution feeder underground augmentation (design only)
 - Three Mile Line Road to Massy Green Drive – 2x distribution feeder augmentation and demolition
 - Emu Bay Substation – 2x new distribution feeders for Marinus Link.

Switching Station / Substation

- New Hampshire Hills 220 kV AIS Switching Station to be designed only
- New Heybridge 220 kV GIS Switching Station
- Existing 220 kV Burnie, Sheffield and Palmerston Substations:
 - o Design, procure and construct 220 kV equipment and associated civil, structural, CCTV and security works
 - o Testing & Commissioning
 - o Demolition and disposal of redundant primary equipment & structures⁸

This contract includes transmission line design, realignment of sections along TL441, design, supply, installation, testing and commissioning of primary and secondary systems, Burnie area 22 kV augmentation and purchasing of LLE. All these activities are required to achieve the projects schedule and to reduce risk during delivery. As such

⁸ ██████████ Management Plan P5.

this expenditure is considered prudent and efficient. The forecast at \$40.0M is supported by ████████ ECI and LLE tender submission documentation.

6.3 Labour costs

6.3.1 Actual costs

TasNetworks actual project development labour costs for 1 July 2021 to 30 June 2024 are \$2.6M. These costs were based on transactions recorded in TasNetwork's Enterprise Resource Planning (ERP) system. These represent postings from the payroll system to cost centres based upon FTE allocation or based upon timesheet entries. These transactions were sighted and agreed to the supporting spreadsheet representing an extract from the ERP. These observations apply to all actual labour costs across this report.

6.3.2 Forecast costs

The forecast labour costs to February 2026 of \$2.2M relate to activities including facilitating the ECI process and overseeing and managing the day-to-day ECI contractor activities and deliverables.

The forecast project development labour costs are based on the:

- Project development team roles and associated salary band
- Forecast monthly FTE for each role.

The team currently comprises 3.0 FTEs and will increase to 6.0 FTEs by September 2024. The NWTD project development team currently comprises:

- Lead Engineering
- Project Engineer Transmission Lines
- Project Engineer Primary and Secondary Substation.

These costs represent the internal teams required to progress project development activities in conjunction with engineering support detailed above. The phased FTE profile is show below.

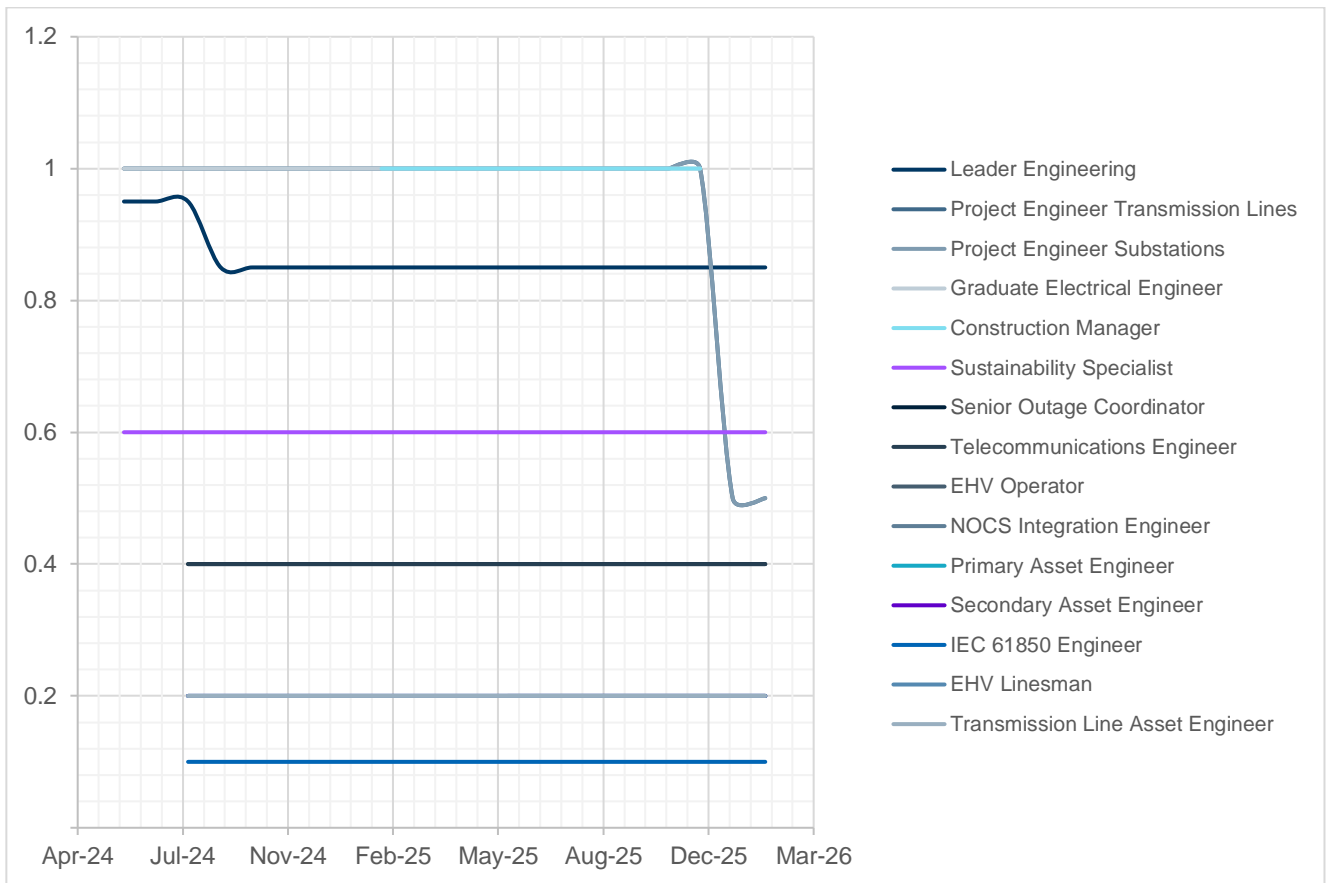


Figure 3 Project Development forecast FTE profile

6.4 Indirect costs

6.4.1 Actual costs

Actual project development indirect costs to 30 June 2024 includes expenditure related to engineering and procurement support.

These costs have been agreed to an extract provided by TasNetworks from SAP and further agreed to supporting documentation to confirm that the charges relate to NWT D early works activities.

Table 10 Project management actual costs to 30 June 2024

Description	GHD verification	\$M
Engineering support	<p>██████████ to undertake various activities including:</p> <ul style="list-style-type: none"> - Geotechnical site investigations - Transmission line geotechnical investigations - Transmission line design reports - Foundation and access track design reports - Landslide assessments - Transmission line support - Foundation design reports for the tender process - Engineering support. <p>Transactions reviewed and agreed to expenditure extract from ERP</p>	██
Procurement support	<p>██████████ to provide expert advice and support on the ECI process.</p> <p>Transactions reviewed and agreed to expenditure extract from ERP.</p>	██

Description	GHD verification	\$M
Geotechnical studies	██████████ to undertake geotechnical studies. Transactions reviewed and agreed to expenditure.	██
Other	Other costs individually <\$0.2M	██
Total		7.2

6.4.2 Forecast costs

Forecast project development costs to February 2026 includes expenditure related to engineering management, independent review of ECI and technical inputs into DA / EIS.

Table 11 Project management actual costs to 30 June 2024

Description	GHD verification	\$M
Specialist engineering contractors	██████████ to provide 7 secondees for specialist engineering support. Estimate is based the highest submitted cost estimates between two parties. The difference is not considered material and any under / over forecast will be corrected in CPA-2.	██
Project administration support	██████████ to provide project administration support for 20 months. Agreed to ██████████ calculation	██
Total		1.7

6.5 Project development conclusion

Project development costs include:

- The purchase of LLE required to reduce project risks
- Design, preconstruction and LLE procurement
- ECI support for the procurement process through the completion of studies, surveys and assessments to support the engineering design and technical and functional asset requirements that are included in the tender specifications
- Internal team labour costs required to drive project development stream objectives
- Support from ██████████ relating to engineering and procurement support.

GHD's analysis of LLE forecasts \$39.1M indicate that it is based upon a cumulative cash flow driven by items required to deliver the Stage 1 scope. Unit price estimates and contract payment milestone assumptions based upon lead-time to site delivery. This approach is conservative noting the any over / under forecasting will be corrected in the CPA-2 submission. All LLE items are considered prudent and efficient, required to achieve project milestones and to reduce delivery risks.

The design, procurement, construction, pre-commissioning and commissioning activities to be delivered by ██████████ \$40M relating to Stage 1 are required to achieve the projects schedule and to reduce risk during delivery. As such this expenditure is considered prudent and efficient.

7. Project management

The PMO is responsible for establishing governance, managing the project plan and schedule, implementing project control and management systems, scheduling, risk, quality and information management. The following table summarises PMO costs to 30 June 2024 and the forecast to February 2026.

Table 12 Project management cost summary for CPA-1 (\$M Real 2023-24)

Cost element	Section reference	Actual costs to 30 June 2024 \$M	Forecast to February 2026 \$M	Total \$M
Owners labour	Section 7.1	6.9	6.3	13.2
Indirect costs	Section 7.2	5.9	3.9	9.8
Total		12.8	10.2	23.0

7.1 Labour costs

7.1.1 Actual costs

TasNetworks' actual labour costs of \$6.9M relates to internal FTEs undertaking project management activities for the Project. The transactions were sighted and agreed to the supporting spreadsheet.

The PMO comprises 10 FTEs who are responsible for the set up and overall project management of Project. The PMO comprises which is considered typical for a PMO function:

- PMO Office Lead
- Integration and Delivery Manager
- Project Control Lead
- Information Management Lead
- Scheduling lead
- Estimating Lead
- Risk Specialists
- Reports and Systems Development Specialists
- Document and Drawing Controller
- Quality Assurance Lead.

7.1.2 Forecast costs

TasNetworks forecast labour costs of \$6.3M relate to internal FTEs undertaking project management activities for the Project. The team will increase to 12.4 FTEs with the addition of several new roles, including the Project Director commencing in October 2024, and reach a peak of 15.4 FTEs in January 2026.

The phased FTE profile is provided below.

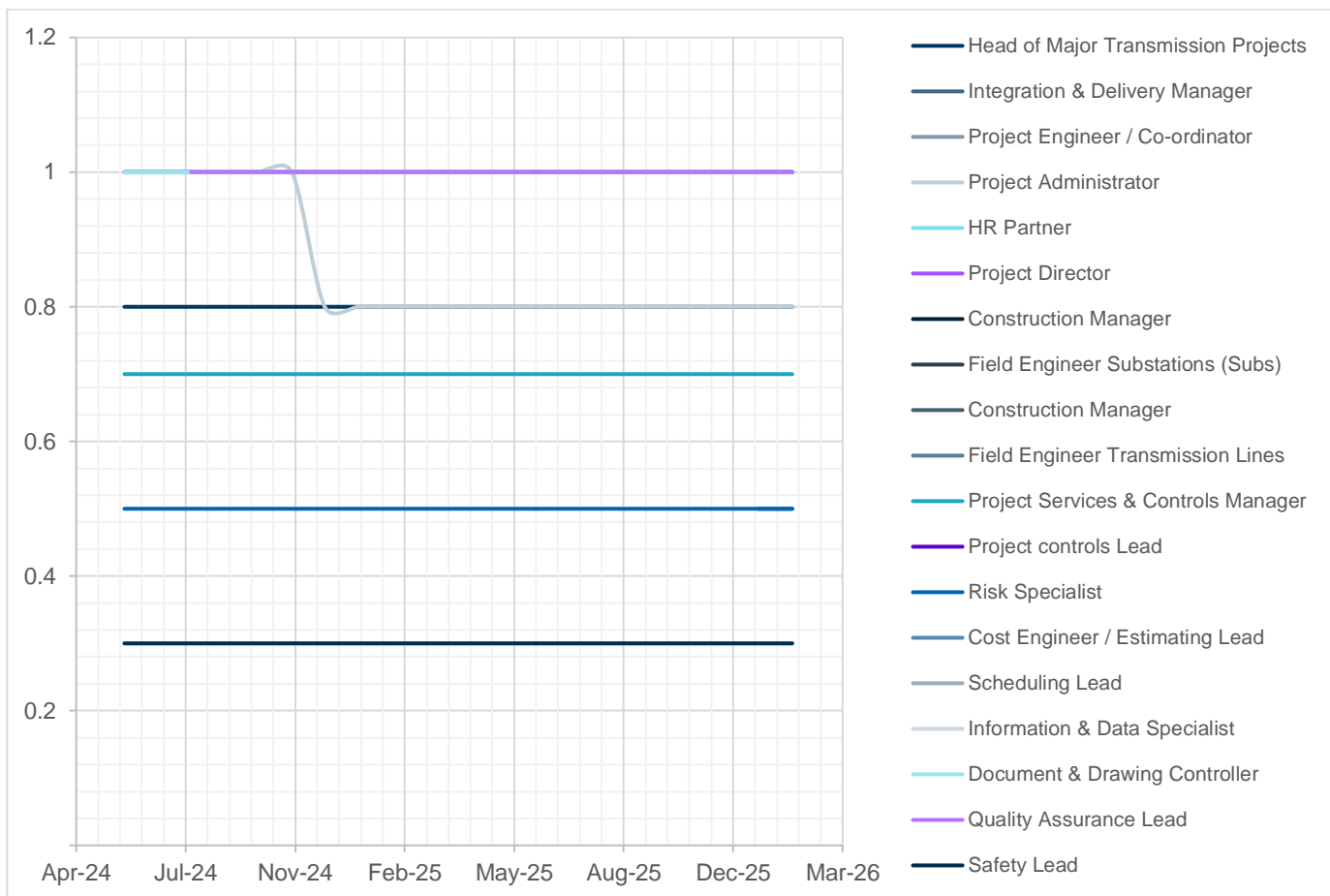


Figure 4 Project Management forecast FTE profile

7.2 Indirect costs

7.2.1 Actual costs

Actual project management consulting costs to 30 June 2024 includes expenditure related to the support provided by Jacobs and other consultant and professional fees to support the project management function summarised in the table below.

These costs have been agreed to an extract provided by TasNetworks from SAP and further agreed to supporting documentation to confirm that the charges relate to NWTD early works activities.

Table 13 Project management actual costs to 30 June 2024

Description	GHD verification	\$M
Jacobs project management support	<p>[REDACTED], including:</p> <ul style="list-style-type: none"> - Transmission line support - LiDAR surveys - EMF and noise studies - Concept design and capital estimating - Substation building fire risk assessment - Transmission line geotechnical site investigations - Network resilience and landslide studies - Foundation and track designs - Value engineering. 	[REDACTED]

Description	GHD verification	\$M
	SAP transactions reviewed and confirmed expenditure extract from ERP	
Overhead costs	<p>█████ for overhead costs, based on:</p> <ul style="list-style-type: none"> – an FTE calculation of ██████ for IT Services - hardware (Desktop/Laptop Computers), software (licences for SAP, Microsoft office etc), and IT infrastructure and Services (data storage and backup), and – a fixed fee of ██████ for transactional business services, payroll, public liability insurance & information management services. <p>SAP transactions reviewed and found expenditure totalling ██████ for PM overheads with the additional ██████ detailed in the table below.</p> <p>Given that actual and forecasted labour costs only include taxes without any general overhead loading these postings are considered appropriate noting that other TNSPs have included overhead loadings in their CPA submissions.</p>	█████
Travel provision	<p>█████ for project team travel for site visits.</p> <p>SAP transactions reviewed and confirmed expenditure extract from ERP</p>	█████
PMO depot rental	<p>█████ for two rental properties:</p> <ul style="list-style-type: none"> – Deloraine depot used by TasNetworks employees – Cradle Coast project hub used to host stakeholder activities and community sessions. <p>SAP transactions reviewed and confirmed expenditure extract from ERP</p>	█████
Other	<p>Individual costs considered immaterial, including:</p> <ul style="list-style-type: none"> – Software development – Infrastructure Sustainability Council – ISC specialist – Vehicle lease – Borealis software licence fee for 2023/24 – Catering – Corporate clothing – Printer/photocopier – Telstra hardware costs. <p>GHD considers these costs as required to support PMO objectives.</p>	█████
Total		5.9

7.2.2 Forecast costs

Forecast project management costs to February 2026 includes expenditure related to overhead costs and travel required for site visits.

Table 14 Project management forecast costs to February 2026 (\$Real 2023-24)

Description	GHD verification	\$M
Overhead costs	<p>█████ calculated as per actual costs, where:</p> <ul style="list-style-type: none"> – Corporate overheads are calculated based on: <ul style="list-style-type: none"> • A fixed monthly rate of ██████ × 20 months = ██████ • A monthly variable free of ██████ × FTE × 20 months = ██████ (based on an average variable monthly free of ██████) – Project overhead costs are fixed monthly rate of ██████ × 20 months = ██████ – Incremental cost reduction based on a fixed amount of ██████ per month × 20 months = ██████ M. <p>SAP transactions reviewed and found expenditure totalling ██████ for PM overheads with the additional ██████ detailed in the table above.</p>	█████

Description	GHD verification	\$M
	Given that actual and forecasted labour costs only include taxes without any general overhead loading these postings are considered appropriate noting that other TNSPs have included overhead loadings in their CPA submissions.	
Travel	<p>█████ for travel and accommodation for the Project. This has been calculated based on:</p> <ul style="list-style-type: none"> - Number and duration of intrastate trips - Number and duration of interstate trips - Number and duration of international trips - Estimates for meal and accommodation based on ATO guidelines - Estimates for travel costs based on historical costs and other benchmarks. <p>Estimate considered reasonable given that any over / under estimate will be corrected in CPA-2.</p>	█████
InEight development	<p>█████ for InEight development, based on supporting fee proposals from Jacobs and InEight:</p> <ul style="list-style-type: none"> - ██████ to undertake project management for InEight development - ██████ implementation - ██████ for licence fee 2024/25. <p>█████ in actual costs incurred to 30 June 2024 for ██████ 2023/24. Fee proposals reviewed and agreed to forecast costs.</p>	█████
Other	Other costs individually <\$0.2M which GHD confirms relates to PMO activities	█████
Total		3.9

7.3 Project management conclusion

PMO costs include internal resources required for establishing governance, managing the project plan and schedule, implementing project control and management systems, scheduling, risk, quality and information management. The costs also include contracted management services from Jacobs and other costs required to support the PMO.

These costs are required to coordinate project delivery up to the FID. These costs are considered prudent and efficient and would be incurred by other TNSPs.

8. Land and easement acquisition

TasNetworks Capex Forecasting Methodology details that Stage 1 will require the acquisition of easements for over 131 kilometres of transmission lines between the Palmerston and Burnie substations via the Sheffield substation and Heybridge spur. This will require access agreement and easement option agreements with 142 landholders who collectively own 346 private land parcels which are impacted by the proposed transmission line easement.

At this stage of the project TasNetworks is focusing upon option agreements rather than acquisition which is considered prudent given the current stage of project development.

Earlier in the project TasNetworks engaged ██████ to assist in securing land access for surveys and are targeting the following dates to voluntarily secure LEOAs:

- Sheffield-Palmerston 220 kV transmission line by December 2024
- Sheffield-Burnie, Heybridge Spur East and Heybridge Spur West 220 kV transmission lines by June 2025.

As detailed in TasNetworks Capex Forecasting Methodology, TasNetworks is targeting to voluntarily secure LEOAs. As such costs include █████ engagement with landholders and desktop valuations.

The table below details the land and easement acquisition costs claimed in CPA-1.

Table 15 Land and easement cost summary for CPA-1 (\$M Real 2023-24)

Category	Section reference	Actual to 30 June 2024 \$M	Forecast to February 2026 \$M	Total \$M
Labour	Section 8.1	2.4	2.1	4.5
Indirect	Section 8.2	4.7	7.5	12.2
Total		7.1	9.5	16.6

8.1 Labour costs

8.1.1 Actual costs

TasNetworks' actual labour costs of \$2.4M relates to internal FTEs needed to establish the necessary land access agreements and undertake land assessments. Valuations, and negotiations in collaboration with █████.

Following the decision in October 2022 to bring the █████ services in-house, the internal team now consists of 8 internal FTEs and 1 contract FTE:

- Leader Corporate Counsel Property and Commercial
- Corporate Counsel, Property and Commercial Specialist
- Landholder Engagement Specialist
- Regional Engagement Coordinators (two)
- GIS Analyst (two)
- Paralegal and Wayleaves Coordinator.

8.1.2 Forecast costs

The forecast labour costs for land and easement acquisition activities to February 2026 is \$2.1M. The team will decrease to 7.5 FTEs and then to 6.4 FTEs in July 2025. This is considered reasonable as the tasks of land acquisition and access rights will be required early in the Project.

The phased FTE profile is provided below.

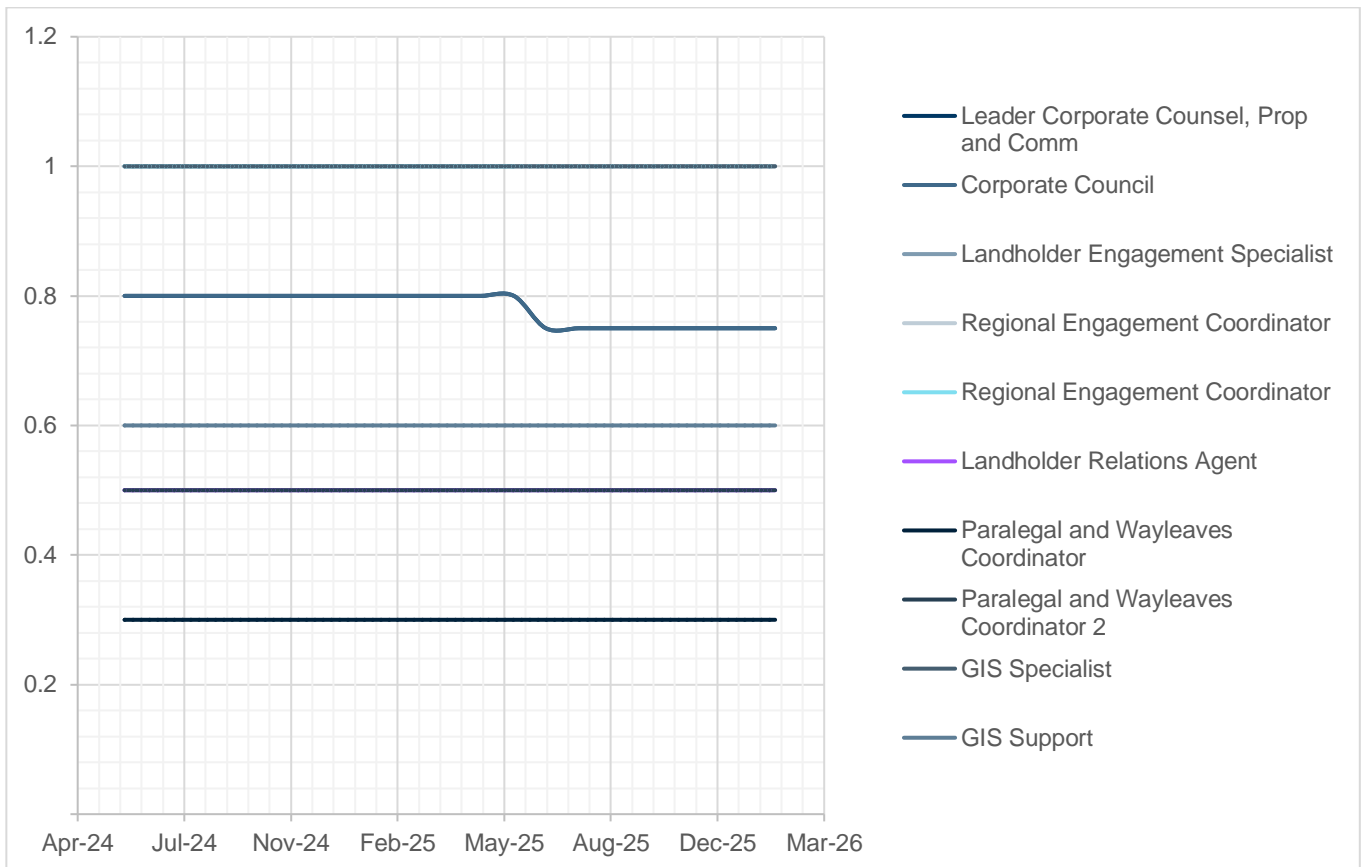


Figure 5 Land and easement forecast FTE profile

8.2 Indirect costs

8.2.1 Actual costs

Actual land and easement acquisition indirect costs to 30 June 2024 includes expenditure related to initial landholder engagement and land valuations.

These costs have been agreed to an extract provided by TasNetworks from SAP and further agreed to supporting documentation to confirm that the charges relate to NWTD early works activities.

Table 16 Land and easement actual costs to 30 June 2024

Description	GHD verification	\$M
Landholder engagement and valuations	<p>██████████ – this included:</p> <ul style="list-style-type: none"> Initial landholder engagement activities including face-to-face meetings, letter drops, land access negotiations, community engagement event attendance, and provision of landholder engagement advice Desktop valuation and on ground valuation assessments in accordance with the LAA Act. This involved property and market related research, due diligence, on ground inspections, meetings with landholders and TasNetworks along with producing property valuation reports. <p>Agreed to SAP transactions.</p>	████
Participation fees	<p>██████████ for participation fees of ██████████ paid to each landholder (90 landholders received fee) for engaging with TasNetworks and allowing access and valuation of their land.</p> <p>Participation fee agreed to recommendations included in ██████████</p> <p>██████████</p>	████

Description	GHD verification	\$M
Other	Other charges <0.5M with GHD review of details provided in the TasNetworks Capex Forecasting Methodology confirming land access and option fees and other activities related to securing land and easements considered to quality as early works.	■
Total		4.7

8.2.2 Forecast costs

The following table details forecasted land and easement acquisition costs to February 2026.

Table 17 Land and easement forecast costs to February 2026

Description	GHD verification	\$M
Landholder support	<p>■ for professional advice fees of to landholders – TasNetworks expect ■ greenfield (unsigned) at ■ each, ■ brownfield (unsigned) at ■ each, ■ commercial Forrest landholders at ■ and ■ public authority landholders a ■ each.</p> <p>Forecast capex of ■ is calculated as:</p> <ul style="list-style-type: none"> - ■ greenfield (unsigned) x ■ = ■ plus - ■ brownfield (unsigned) x ■ = ■ plus - ■ Commercial Forrest landholders x ■ = ■ plus - ■ Public Authority landholders x ■. <p>Professional support fees agreed to ■.</p>	■
Option fees	<p>■ for Option fees – TasNetworks has forecast ■ greenfield (unsigned) landholders will be paid an option fee of ■ and ■ Forrest landholders will be paid an Option fee of ■.</p> <p>Forecast capex of ■ calculated as:</p> <ul style="list-style-type: none"> - ■ greenfield (unsigned) landholders x ■ plus - ■ Forrest landholders x ■. <p>Greenfield option fees agreed to ■ the remaining forest landholders fee at ■ is considered immaterial.</p>	■
Property inspections, compensation assessments, valuation reports	<p>■ to undertake remaining property inspections and landholder meeting, finalise compensation assessments and certificates, prepare the valuation reports and attend valuer conferences.</p> <p>The total forecast capex of ■ is comprises:</p> <ul style="list-style-type: none"> - ■ for the period July 2024 to January 2025 is based on a ■ - ■ for the period February 2025 to February 2026 is based on the ■ for June 2024 to January 2025 period, adjusted to exclude the costs for valuer conferences, travel and accommodation. <p>GHD agreed to quotation provided by ■</p>	■
Access and easement options agreements	GHD agreed to quotation provided by ■	■
Other	Other forecast individually <\$0.1M with GHD review of details provided in the TasNetworks Capex Forecasting Methodology confirming land acquisition activities related to securing land and easements considered to quality as early works.	■
Total		7.5

8.3 Land and easement acquisition conclusion

Land and easement acquisition costs during early works is focused on securing voluntarily LEOAs from the 142 landholders who collectively own 346 private land parcels which are impacted by the proposed Stage 1 transmission line easement.

These activities and support from [REDACTED] are required to reduce project risk and are considered prudent and efficient.

9. Planning and environment

Leading the environmental, land use planning and heritage (Aboriginal and Historic) and social impact assessments and approvals across the State and Commonwealth levels that are needed to proceed to construction including the Development Approval DA and EIS.

The following table details the forecast land and environment forecasted costs included in Stage 1. These represent activities that need to be completed in Stage 1 to gain the necessary approvals to avoid risk to schedule delays and support Stage 2 forecasts.

Table 18 Planning and environment cost summary (\$Real 2023-24)

Category	Section reference	Actual to 30 June 2024 \$M	Forecast to February 2026 \$M	Total \$M
Labour	Section 9.1	1.1	1.0	2.1
Indirect costs	Section 9.2	10.6	2.6	13.2
Total		11.7	3.6	15.3

9.1 Labour costs

9.1.1 Actual costs

TasNetworks' actual labour costs of \$1.1M relates to internal FTEs undertaking planning and environmental approval activities. The transactions were sighted and agreed to the supporting spreadsheet.

The team consists of two FTEs:

- Environmental Project Manager
- Environmental Planning Specialist.

9.1.2 Forecast costs

The forecast labour costs for planning and environment activities to February 2026 is \$1.0M. The team will increase to 2.3 FTEs in July 2024 with the addition of a second Environmental Planning Specialist, peaking at 2.8 FTEs for November 2024 – April 2025.

The forecast cost has been determined based on the monthly FTE levels and role salary bands.

The phased FTE profile is provided below.

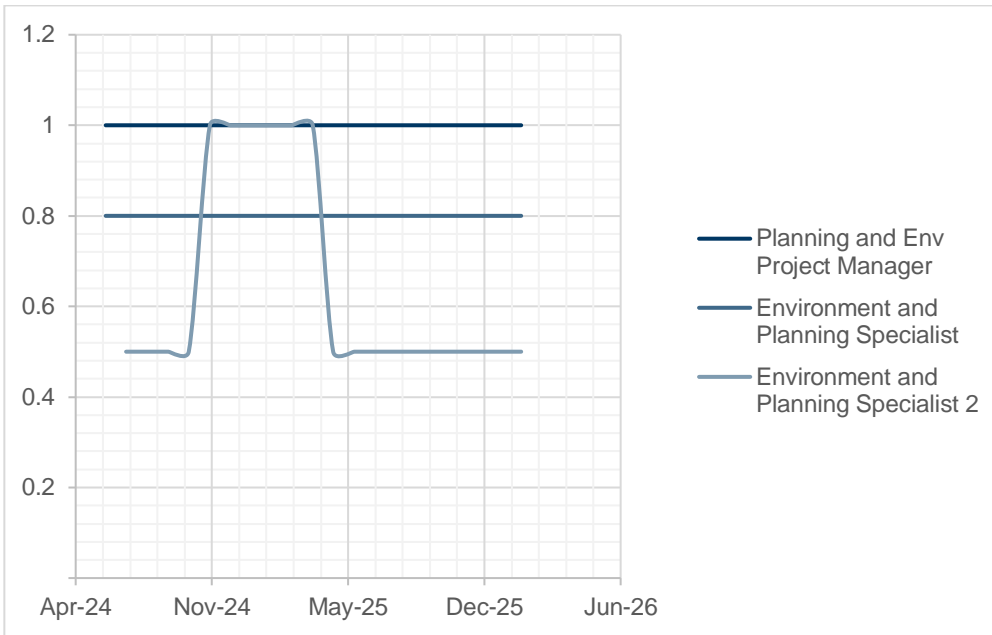


Figure 6 Planning and Environment forecast FTE profile

9.2 Indirect costs

9.2.1 Actual costs

Actual planning and environment indirect costs to 30 June 2024 includes expenditure related to the preparation of the DA / EIS.

These costs have been agreed to an extract provided by TasNetworks from SAP and further agreed to supporting documentation to confirm that the charges relate to NWT D early works activities.

Table 19 Planning and environment indirect cost actual costs to 30 June 2024

Description	GHD verification	\$M
DA/EIS Preparation	██████████ to prepare the DA EIS. SAP transactions include reallocation of \$0.3 million. SAP transactions reviewed and agreed to costs.	██
██████████ ██████████ eagle searches	██████████ to conduct helicopter-based eagle searches.	██
Landslip technical advice	██████████ to provide technical reports on to EMF and landslip to support the DA/EIS. GHD agreed with SAP transaction records.	██
Other	Individual charges <\$100K related to early works	██
Total		10.6

9.2.2 Forecast costs

The forecast indirect planning and environment costs over the period July 2024 to February 2026 are \$2.6M.

Table 20 Planning and environment indirect cost forecast to February 2026

Description	GHD verification	\$M
EIS development	Development of the revised DA / EIS. GHD Agreed to Contract Variation \$1.8M.	█
Annual eagle nest survey	GHD agreed the cost of two eagle nest surveys and helicopter fees to a service agreement from the █	█
EPBC fees	█ for payment of EPBC fees to the Australian Government based on its EPBC Act Cost Recovery Fee Schedule dated 19 July 2020, which requires the following payments: <ul style="list-style-type: none"> - █ for Part A and Part B base fee - █ for post approval fess – evaluation of the action plan - █ for contingent fees. GHD agreed to EPBC Act Cost Recovery – Fee Schedule.	█
Other	Other costs <\$0.1M that GHD confirms relates to planning and environment activities.	█
Total		2.6

9.3 Planning and environment conclusion

These costs relates to an internal team leading planning and environmental approval activities with support from other parties to complete DA / EIS submissions. These approvals need to be completed before TasNetworks can commence construction and are being undertaken now to minimise the risk of project delays.

Based upon the TasNetworks Capex Forecasting Methodology, TasNetworks now expects to:

- Submit its DA/EIS for Crown and council consent to lodge Major Infrastructure Development Approvals Act 1999 (Tas) documentation with TPC in mid-January 2025
- Lodge the DA/EIS with the TPC in mid-February 2025

These activities ideally need to be completed by FID to reduce the projects risk profile. As such the expenditure is considered prudent and efficient.

10. Commercial and procurement

As outlined in TasNetworks Capex Forecasting Methodology, a competitive procurement process is underway commencing with market sounding ECI in July 2022 through to a revised RFP March to May 2024 with the final evaluation expected to conclude December 2024.

These activities are required to support design finalisation and to improve the accuracy of the capex forecast based upon the outcome of the competitive tender process.

The table below summarises the costs incurred and forecast to conclude developing the procurement strategy and overseeing the competitive procurement process to identify the preferred Principal Contractor to deliver the project overseeing the ECI phase with the ECI contractor including pre-construction activities and securing LLE.

Table 21 Commercial and procurement cost summary for CPA-1 (\$M Real 2023-24)

Category	Section reference	Actual to 30 June 2024 \$M	Forecast to February 2026 \$M	Total \$M
Labour	Section 10.1	3.2	2.4	5.6
Indirect costs	Section 10.2	4.1	2.2	6.3
Rounding			0.1	0.1
Total		7.3	4.7	12.0

10.1 Labour costs

10.1.1 Actual costs

TasNetworks actual labour costs of \$3.2M relate to internal FTEs undertaking commercial and procurement activities for the Project. These costs were based on transactions recorded in TasNetwork's ERP system. The transactions were sighted and agreed to the supporting spreadsheet.

The NWTDC commercial and procurement team comprises 5.5 FTEs:

- Commercial Lead
- Finance Lead (0.25 FTE)
- Commercial Manager
- Financial Specialist
- Procurement / Contract Manager
- Senior Procurement Specialist
- Corporate Counsel (0.3 FTE).

10.1.2 Forecast costs

The forecast labour costs to February 2026 of \$2.4M relate to planned commercial and procurement activities such as finalising the RFP and preferred contractor selection process and contract development.

The team will increase to a maximum of 8.2 FTEs in September 2024, with the addition of one new role for a Finance Support Officer. The phased FTE profile is displayed below.

The supporting labour cost model spreadsheet was sighted and agreed to the forecasted cost. The forecast cost was calculated based on the monthly FTE level for each role and the corresponding role salary band, inclusive of overhead.

The teams size and mix of competencies is considered appropriate to deliver the tender by December 2024.

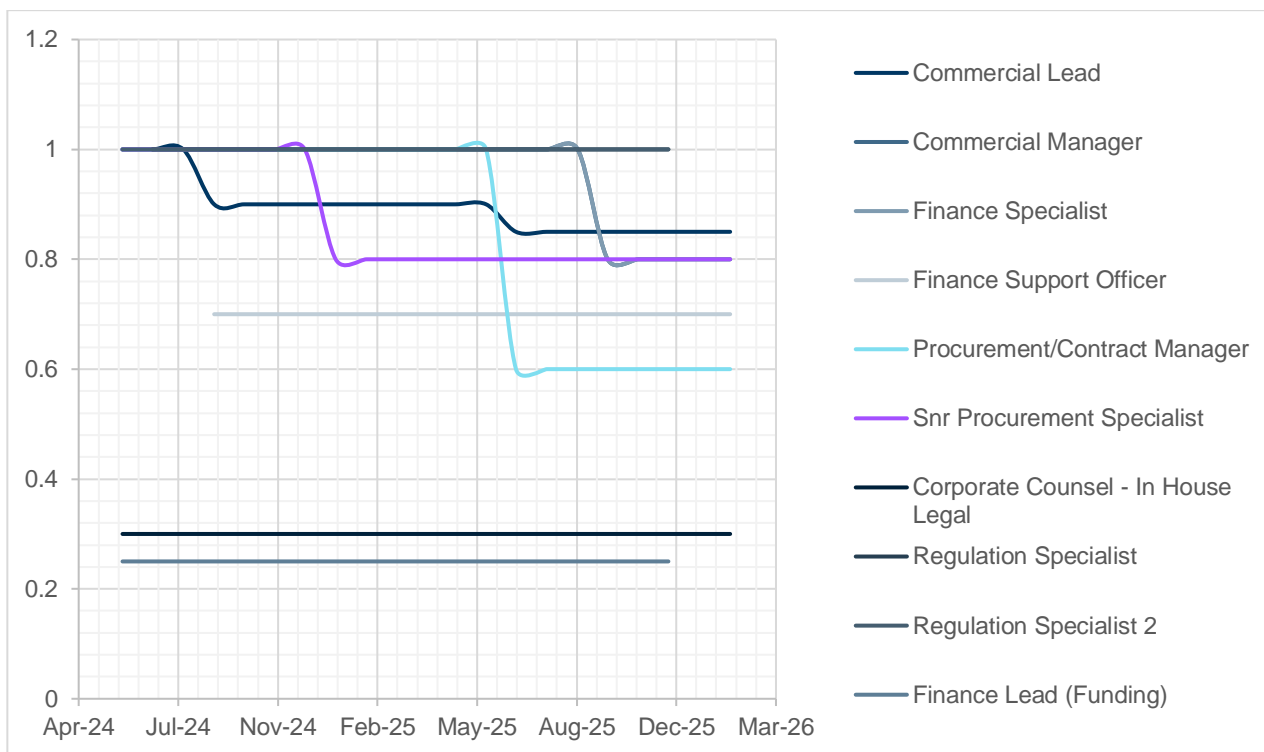


Figure 7 Commercial and procurement forecast FTE profile

10.2 Indirect costs

10.2.1 Actual costs

Actual commercial and procurement indirect costs to 30 June 2024 includes costs for external consulting advice and support related to undertaking a competitive RFP procurement process and other activities required during early works, summarised in the table below.

These costs have been agreed to an extract provided by TasNetworks from SAP and further agreed to supporting documentation to confirm that the charges relate to NWTD early works activities.

Table 22 Commercial and procurement indirect actual costs verification (\$M Real 2023-24)

Description	GHD verification	\$M
RFP Procurement Support	██████████ to support the internal team with the competitive RFP procurement process. SAP transactions reviewed and confirmed expenditure.	██
Reimbursable bid costs	██████████ to provide support on allowable reimbursable bid costs. SAP transactions reviewed and confirmed expenditure.	██
Legal advice	██████████ to provide specialist legal advice to support procurement process and the establishment of contracts. SAP transactions reviewed and confirmed expenditure.	██

Description	GHD verification	\$M
Engineering advice	██████████ to provide specialist engineering advice to inform the procurement process. SAP transactions reviewed and confirmed expenditure.	██
Landholder payment advice	██████████ to provide input on the options and criteria for strategic benefit payments to landholders. SAP transactions reviewed and confirmed expenditure.	██
Economic Development Strategy	██████████ to prepare, in collaboration with TasNetworks, an Economic Development Strategy. SAP transactions reviewed and confirmed expenditure.	██
Probity training	██████████ probity advisors. SAP transactions reviewed and confirmed expenditure.	██
Owners' estimator services	██████████ to provide owner estimator services. SAP transactions reviewed and confirmed expenditure.	██
Other	Other costs individually <\$0.1 million related to early works.	██
Total		4.1

10.2.2 Forecast costs

Forecast commercial and procurement indirect costs to February 2026 include further costs for legal and consulting advice regarding contract management, cost estimates and commercial strategy, summarised in the table below.

These costs have been agreed to fee proposals provided by TasNetworks.

Table 23 Commercial and procurement indirect forecast costs verification (\$M Real 2023-24)

Description	GHD verification	\$M
Legal services	██████████ to undertake services related to finance and construction. Total cost in ██████████ fee proposal is ██████████ sighted by GHD less actual costs incurred before 30 June 2024 and other costs captured under Marinus Link.	██
Owners estimator services	██████████ to undertake various tasks related to preparing an independent cost estimate. Total cost in ██████████ fee proposal is ██████████ actual costs incurred prior to 30 June 2024 detailed in the table above. SAP transactions reviewed and confirmed expenditure. GHD sighted fee proposal which agrees to forecast cost.	██
Project Execution Strategy	██████████ to provide a set of management plans that incorporate updates to the project and procurement strategy. GHD sighted fee proposal dated 14 June 2024 which agrees to forecast cost.	██
Quality systems	██████████ to assist with quality systems, including: <ul style="list-style-type: none"> – Quality systems development (not including InEight development) – QRA Monte Carlo analysis – Constructability workshops, registers and report. GHD sighted service contract cost estimate reviewed and agreed to forecast cost.	██
Reimbursable bid costs	██████████ for allowable reimbursable costs. Cost included within the TasNetworks Invitation to Request for Proposal (Revised Scope), dated 19 March 2024.	██
Total		2.2

10.3 Commercial and procurement conclusion

Costs associated with progressing activities related to ECI through to the final RFT are spread across several cost categories. These costs are required to develop a procurement strategy to identify a preferred contractor for delivery the project according to the ODP. The activities also represent a competitive process required to support the accuracy of the capex forecast for FID.

Project management and delivery include costs related to studies, surveys and assessments to support the engineering design and technical and functional asset requirements that are included in the tender specifications. These activities support ECI and the RFT development to lower the risks associated with delivery and capex forecast accuracy.

Commercial and procurement costs include activities related to procurement strategy development and execution, capex forecasting, ECI and tender preparation and evaluation activities.

These actual and forecast costs are considered prudent and efficient to support project delivery within the required time frame and to lower the risks associated with the FID and program execution.

11. Community and stakeholder engagement

Developing and implementing stakeholder and community engagement programs to build knowledge and support for the project, inform route alignment, gain and maintain a social licence, understand social and economic impacts arising from the Project, develop a community benefit sharing program and undertake First Nations engagement activities.

The following table summarises the community and stakeholder engagement costs included in CPA-1.

Table 24 Community and stakeholder engagement cost summary (\$Real 2023-24)

Category	Section reference	Actual to 30 June 2024 \$M	Forecast to February 2026 \$M	Total \$M
Labour	Section 11.1	2.4	1.2	3.6
Indirect costs	Section 11.2	2.0	1.1	3.1
Total		4.4	2.3	6.7

11.1 Labour costs

11.1.1 Actual costs

TasNetworks' actual labour costs of \$2.4M relate to 5 internal FTEs dedicated to the NWT D project including:

- Leader Major Projects Engagement
- Aboriginal Engagement Advisor (0.5 FTE)
- Media and Events Specialist (0.9 FTE)
- Major Projects Communications Specialist
- Major Projects Engagement Partners (two 0.8 FTE).

These costs were based on transactions recorded in SAP. The transactions were sighted and agreed to the supporting spreadsheet.

11.1.2 Forecast costs

The forecast labour costs to February 2026 of \$1.2M are for community and stakeholder engagement activities related to the economic development plan, easement use, and general engagement about early works.

The team will consist of the same 5 internal FTEs from July 2024 to February 2026. The FTE levels will progressively decrease from 4.9 to 4.5 as the project progresses and community and stakeholder engagement activities drop-off. The phased FTE profile is shown below.

The supporting labour cost model spreadsheet was sighted and agreed to the forecasted cost. The forecast cost was calculated based on the monthly FTE level for each role and the corresponding role salary band, inclusive of overhead.

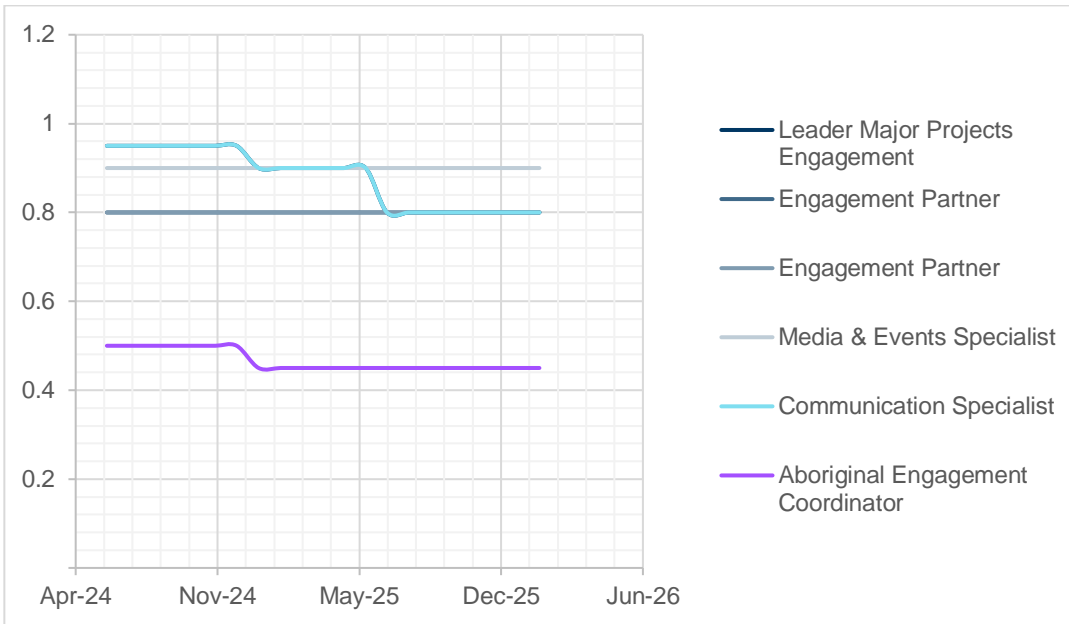


Figure 8 Community and stakeholder engagement forecast FTE profile

11.2 Indirect costs

11.2.1 Actual costs

Actual community and stakeholder engagement indirect costs to 30 June 2024 includes costs for ██████████ ██████████ to provide strategic advice, various community campaigns and sponsorships, summarised in the table below.

These costs have been agreed to an extract provided by TasNetworks from SAP and further agreed to supporting documentation to confirm that the charges relate to NWTD early works activities.

Table 25 Commercial and procurement indirect actual costs verification (\$M Real 2023-24)

Description	GHD verification	\$M
Strategic advice	██████████ to provide strategic advice and assistance with all aspects of community and stakeholder engagement. SAP transactions reviewed and confirmed expenditure.	████
Tasmanian Powered campaign	██████████ contribution to the Tasmanian Powered campaign. SAP transactions reviewed and confirmed expenditure.	████
Sponsorships	██████████ for sponsorships. SAP transactions reviewed and confirmed expenditure.	████
Other	Other costs <\$0.1 million related to early works.	████
Total		2.0

11.2.2 Forecast costs

Forecast community and stakeholder indirect costs to February 2026 include costs for community grants, sponsorships and further costs for RPS key deliverables and workshop facilitation, summarised in the table below.

These costs have been agreed to fee proposals provided by TasNetworks.

Table 26

Commercial and procurement indirect forecast costs verification (\$M Real 2023-24)

Description	GHD verification	\$M
Community grants, sponsorships and communication materials	<p>██████ for community grants, sponsorships, and communication materials including:</p> <ul style="list-style-type: none"> – Future Energy Hub Facilitator – Community investment opportunities – Community Benefits Sharing Program. <p>These costs have been estimated based on a combination of previous quotes/invoices and other sources (e.g. community investment board papers). The supporting sources were considered to provide sufficient supportability to the forecasted costs.</p>	██████
████████████████████	<p>██████████ to deliver:</p> <ul style="list-style-type: none"> – Construction Communications and Engagement Strategy – Community Benefits Sharing Program – CPA-2 documents (workshop facilitation and reporting) – Pre-EIS engagement support. <p>Costs agrees to fee proposal provided by TasNetworks for costs up to February 2026.</p>	██████
Total		1.1

11.3 Community and stakeholder engagement conclusion

Community and stakeholder engagement activities support the projects social licence. These activities are aligned with informing key parties and can support project risk mitigation. These are activities conducted on large transmission projects and have been claimed by other TNSPs as valid early works activities.

12. Regulatory approvals and other support

These costs typically include all the costs to-date related to the various phases of the RIT-T process and the costs related to the regulatory activities related to CPA-1 submission. The total reflected is lower than would be typically expected as costs included to complete the RIT-T process between the 2019-20 and 2020-21 regulatory years were incurred as part of Project Marinus and forms a component considered in the sale price of MLPL.

As such the actual costs detailed below relate to consulting advice related to the construction application for Stage 2 and the cost of this assessment.

These costs are not considered material.

Table 27

Summary of regulatory approvals and other costs (\$Real 2023-24)

Category	Section reference	Actual to 30 June 2024 \$M	Forecast to February 2026 \$M	Total \$M
Indirect costs	-	0.3	0.6	0.9
Total		0.3	0.6	0.9

13. Project timing and allocation of costs to CPA-1

TasNetworks intends to submit two CPAs to the AER in relation to the regulatory cost recovery for the project with:

- CPA-1 - seeking to recover costs to date and the costs to develop a robust cost estimate for the project and for procurement of necessary early works and property acquisitions
- CPA-2 will seek cost recovery for the implementation costs, including the construction cost of the project.

CPA-1 is intended to cover the costs to the 30th of June 2024 and the forecast to February 2026 and Stage 2 to cover the costs till the completion of the project. CPA-1 should also only include the necessary early works to provide a robust estimate for the implementation of the project in CPA-2 and to ensure the project can be commissioned in time to meet the earliest optimal development path required by AEMO.

This section reviews the reasonableness of the proposed project timing as well the justification for the necessity to include each of the cost elements in CPA-1 rather than in CPA-2.

13.1 Project timing review

As is detailed in section 4, the NWTD will be undertaken in two separate stages to support the Marinus Links HVDC interconnect Cable 1 and Cable 2. The 2024 ISP confirms that the timing of Stage 1 is by June 2030 and the timing of Stage 2 is by June 2032. Early works represent expenditure that will be necessarily incurred to deliver the project in line with AEMO’s ODP, support the accuracy of the final estimate for the FID and to reduce projects risks, whilst not committing to expenditure that can be delayed to after the FID.

A summary of the assessment of the reasonableness of the timeline is included in the following table.

Table 28 Assessment of project timeline activities

Cost category	Sub cost element	Commentary
Project management \$23.0M	Labour \$13.2	PMO team required to lead project delivery to FID. Structure and resources to FID considered prudent and efficient.
	Indirect costs \$9.8	PMO contracted support services required to deliver PMO objectives to FID and overhead costs that support TasNetwork internal team resources generally. Contracted support services are considered prudent and efficient and overhead costs have been included in other TNSP CPA submissions.
Project development \$92.7M	LLE \$39.1M	Based upon GHD’s analysis all LLE items are considered prudent and efficient, required to achieve project milestones and to reduce delivery risks.
	Procurement \$40.0M	The design, procurement, construction, pre-commissioning and commissioning activities to be delivered by █████ are required to achieve the projects schedule and to reduce risk during delivery. As such this expenditure is considered prudent and efficient.
	Labour \$4.8M	Project delivery team required to deliver project delivery activities to FID. Structure and resources to FID considered prudent and efficient.

Cost category	Sub cost element	Commentary
	Indirect costs \$8.9M	Project delivery support from [REDACTED] relating to engineering and procurement support required to achieve project objectives by FID. As such this expenditure is considered prudent and efficient.
Commercial and procurement \$12.0M	Labour \$5.6M	Internal ECI activities to progress to the RFT required to secure a delivery contractor and improve the accuracy of capex forecasts for FID. As such this expenditure is considered prudent and efficient.
	Indirect costs \$6.3M	Consulting and legal advice to support the above considered prudent and efficient.
Land and easement acquisition \$16.6M		Land and easement acquisition costs during early works is focused on securing voluntarily LEOAs from the 142 landholders who collectively own 346 private land parcels which are impacted by the proposed Stage 1 transmission line easement. These activities and support from [REDACTED] are required to reduce project risk and are considered prudent and efficient.
Planning and environment \$15.3M		These costs relates to an internal team leading planning and environmental approval activities with support from other parties to complete DA / EIS submissions. These approvals need to be completed before TasNetworks can commence construction and are being undertaken now to minimise the risk of project delays. Based upon the TasNetworks Capex Forecasting Methodology, TasNetworks now expects to: <ul style="list-style-type: none"> - Submit its DA/EIS for Crown and council consent to lodge Major Infrastructure Development Approvals Act 1999 (Tas) documentation with TPC in mid-January 2025 - Lodge the DA/EIS with the TPC in mid-February 2025 - Publish its DA/EIS for public exhibition in March/April 2023. These activities ideally need to be completed by FID to reduce the projects risk profile. As such the expenditure is considered prudent and efficient.
Community and stakeholder engagement \$6.7M		Community and stakeholder engagement activities support the projects social licence. These activities are aligned with informing key parties and can support project risk mitigation. These are activities conducted on large transmission projects and have been claimed by other TNSPs as valid early works activities.
Regulatory approvals and other support \$0.9M		Required to support the CPA-1 submission.

13.2 Project timeline and cost inclusions conclusion

Based upon GHD's assessment all of the above costs fall within the definition of early works.

Appendices

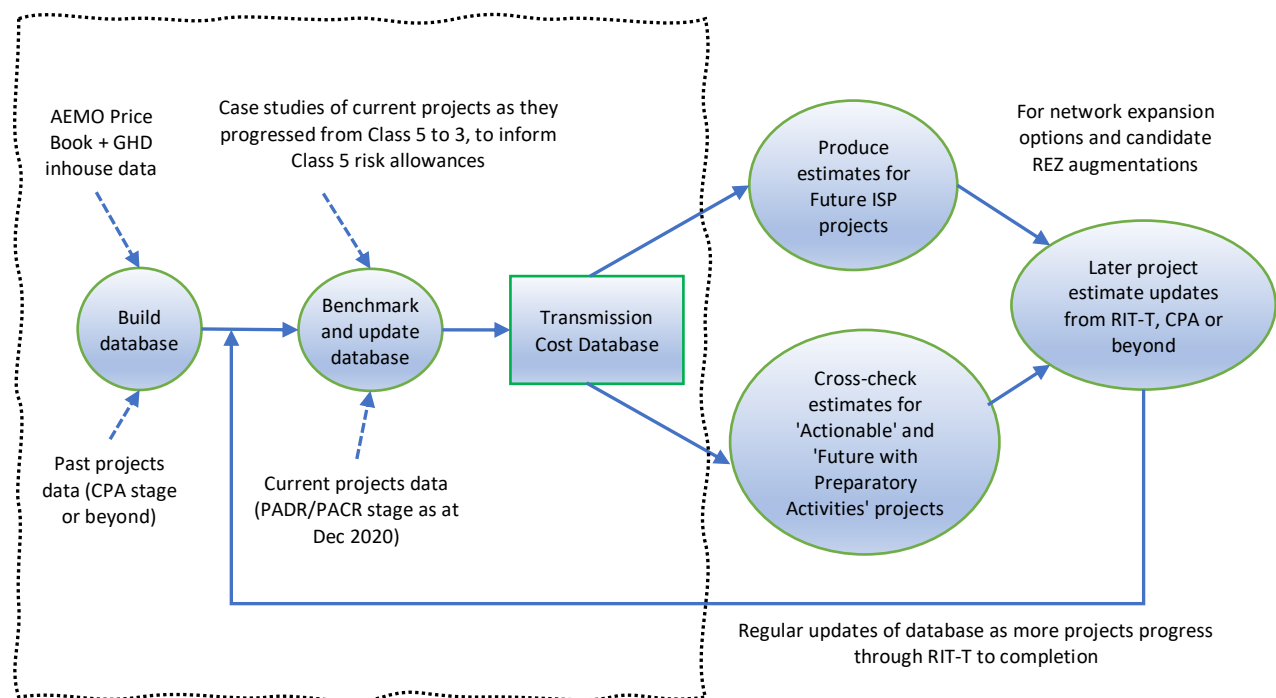
Appendix A Unit cost benchmarking methodology and tools

The TCD is used by AEMO to estimate the cost of candidate future ISP projects at early stages of development, and to cross-check TNSP estimates of 'Actionable' and 'Preparatory Activity' projects and is publicly available on AEMO's web site.

The TCD generates Class 5a/5b ($\pm 50\%$ & $\pm 30\%$) project cost estimates in a deterministic fashion, compiling various cost components that make up the total cost. The TCD does this by assembling varieties of required asset building blocks from a comprehensive database to match the given scope of work and adjusts their costs to reflect project specific attributes and risk exposures based on user inputs.

The Figures below illustrates the benchmarking data used to cost asset building blocks which includes allowances for indirect costs.

Figure 9 Transmission cost data base inputs / outputs



The breakdown structure of the building block is aligned to the AEMO's specification. In general, the unit rate estimates for these building blocks were derived from various sources and our experience as listed below:

- GHD's electricity network project bottom-up cost estimation model that uses various sources such as Rawlinson civil construction handbook, labour hours, contractor cost allocation and original equipment manufacture's material procurement quotes
- Publicly available cost estimate information for given scopes of work in the NEM during the revenue reset and RIT-T determination process
- Independent verification of various major transmission projects that GHD has recently undertaken in Australia enabling us to appreciate the build-up of costs including assets of various type, contractor costs, mobilisation costs and fixed cost structures
- Leveraging our multidisciplinary skill sets to understand the nuances of environmental regulatory requirements, associated offset costs and how it may impact in various NEM jurisdictions for different types of projects.

Indirect costs represent all not covered by the contractors or suppliers and within the model it is broken down into the following six cost components to match the various functions and cost centres within the owners' business.

- Project development (costs incurred to perform feasibility studies, option analysis, regulatory investment tests etc.)
- Works delivery (cost incurred to perform preliminary investigations, site inspections, survey, conceptual design work, site supervision, safety assurance, contract management, commissioning etc.)
- Land and environment (management and administration costs to procure easement right of way, land and environmental offsets)
- Stakeholder and community engagement (management and administration costs to liaise and engage with various project stakeholders and impacted communities)
- Procurement costs (management and administration costs to organise, tender, evaluate and award contracts)
- Insurance (costs incurred to obtain project insurance).

Indirect costs are applied after all the network elements of the project are estimated with their respective project attribute and risk factors. Indirect costs are applied to the total network element costs considering economies of scale and are dependent on the overall project attribute choices of green/brownfield nature, stakeholder engagement level and contract delivery model. As such the indirect costs are estimated using a 'top-down' percentage of project cost and are driven by these dependent variables.

The percentage for the indirect cost and its breakdown component factors is derived based on GHD's project owner cost model and benchmarked against recent transmission projects in the NEM. It is also based on our understanding on other infrastructure project owner costs, international experience and knowledge of how the business units and various functions within TNSPs in the NEM are generally structured and the nature of activities carried out to develop and deliver projects across the business.

It represents the owner internal costs to identify the need for the project, preliminary investigations, option analysis, project development, procurement, contract management, administration and insurance. The total indirect cost ranges from ~6.5% to 16% of the total network element cost and is broken down into six cost descriptions to match with the usual internal costs observed by TNSPs.

Where appropriate building block rates have been used to benchmark capital equipment costs where these have been used support forecast calculations. Indirect cost comparisons have not been used as within the TCD model they represent the total cost rather than the costs to be incurred in the D&A phase.

In 2023, a major update to the costs for equipment, materials, and services for each building block from the original estimates used for the 2020 Transmission Cost Database (2020) was performed. The updated model drew upon the original data from the 2020 Transmission Cost Database; international benchmarks; anonymised data from projects provided by AEMO and publicly available economic and transmission component cost data illustrated in the figure below.

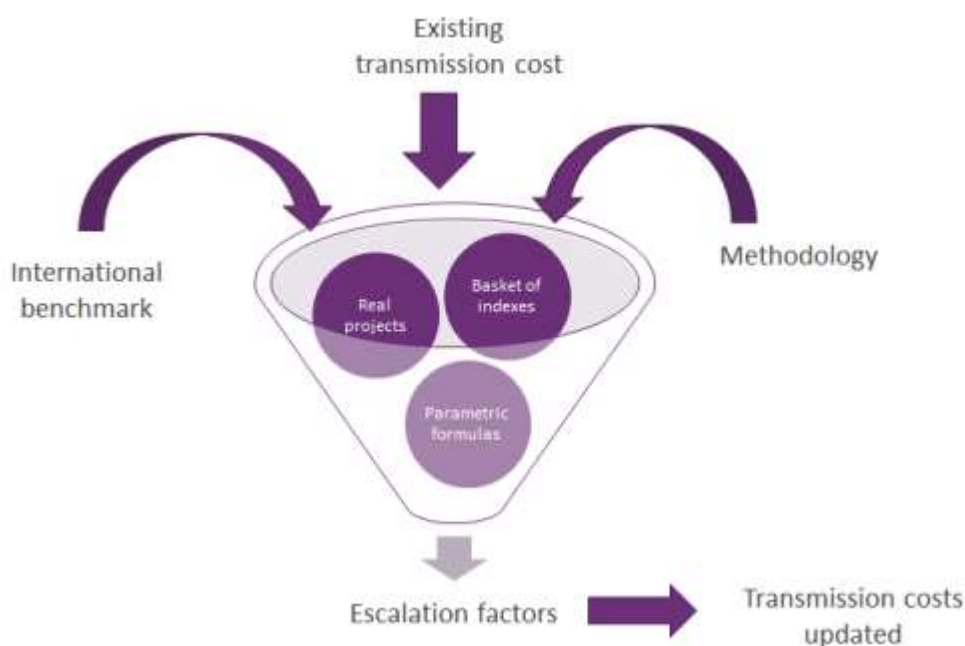


Figure 10 Updated transmission cost approach

A-1 Estimate class/accuracy level for assessment

In assessing forecasts included in CPA-1 that are based upon capital network components, consideration must be given to the level of accuracy that can be achieved in generating indicative cost estimates for the network augmentation work packages identified.

The Association for Advancement of Cost Engineering (AACE) International classification system is commonly used in many industries for defining the level of accuracy of a cost estimate, based on the amount of design work that has been done. This system defines a series of ‘classes’ of estimates, ranging from Class 5 (least accurate) to Class 1 (most accurate). The Table below shows the classification of estimates as defined in the AACE International Recommended Practice No. 96R-18: *Cost Estimate Classification System - As Applied in Engineering, Procurement, and Construction for the Power Transmission Line Infrastructure Industries*.

Table 29

AACE IRP No. 96R-18 Power Transmission Line Infrastructure Industries estimate classification matrix⁹

Estimate class	Primary characteristic	Secondary characteristic		
	Level of project definition Expressed as % of complete definition	End usage Typical purpose of estimate	Methodology Typical estimating method	Expected accuracy range Typical +/- range relative
Class 5	0% to 2%	Screening or Feasibility	Cost/length factors, parametric models, judgment	L: -30% to -50% H: +30% to +100%
Class 4	1% to 15%	Concept Study or Feasibility	Cost/length factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget, Authorisation or Control	Self-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 70%	Control or Bid/Tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

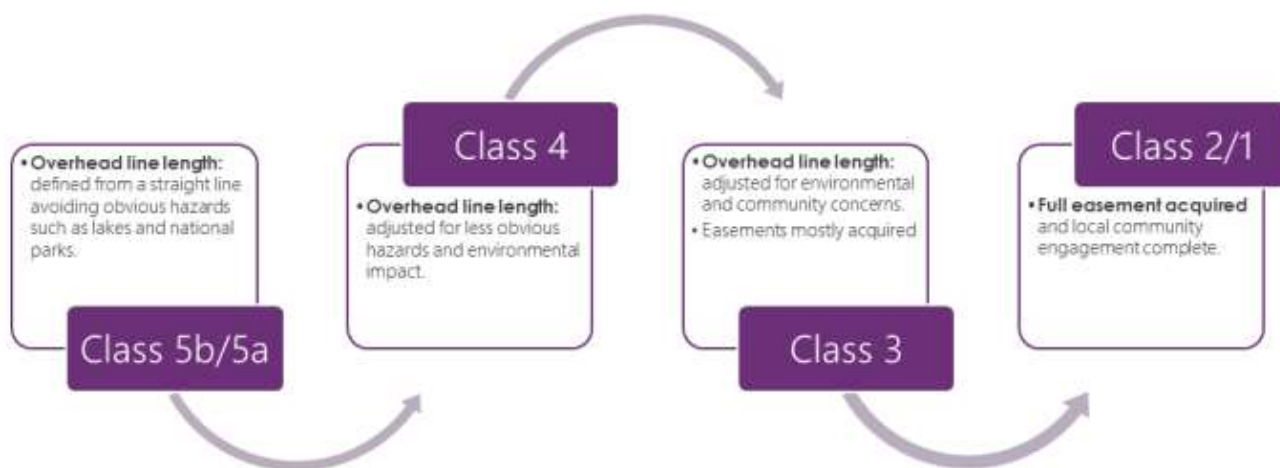
The Table above provides a summary of the characteristics of the five estimate classes and illustrates typical ranges of accuracy ranges that are associated with the power transmission line infrastructure industries. The +/- value represents typical percentage variation at an 80% confidence interval of actual costs from the cost estimate after application of contingency (typically to achieve a 50% probability of project cost underrun versus overrun) for given scope. Depending on the technical and project deliverables (and other variables) and risks associated with each estimate, the accuracy range for any particular estimate is expected to fall within the ranges identified

The AEMO TCD draws upon the framework of the AACE International guideline for its methodology to classify cost estimates, and defined sub-categories to reflect the range of estimates and accuracies that are available within the Australian regulated electricity sector¹⁰. The figure below illustrates how the definition of a single parameter within an estimate (using the example of transmission overhead line length) is progressed as a project matures from a Class 5b to Class 2 or 1 within the framework.

⁹ AACE International, *Recommended Practice No. 96R-18: Cost Estimate Classification System - As Applied in Engineering, Procurement, and Construction for the Power Transmission Line Infrastructure Industries*, 7 August 2020

¹⁰ AEMO 2023, *Transmission Expansion Options Report*, September 2023

Figure 11 Project maturity example



It is important to note that approach used in the TCD albeit drawing heavily on the AACE framework, does deviate slightly to suit the Australian sector:

- As shown in the figure above, the TCD splits class 5 into two categories. The AACE framework for power transmission line infrastructure sets out a range of accuracy bands for all estimate classes. Due to wide accuracy range Class 5 band in the AACE framework (Table 29), AEMO has decided to categorise estimates as Class 5a or Class 5b in the TCD as a succinct way to reflect whether the estimate is at the upper bound or lower bound of the accuracy range.
- The AACE framework reflects that cost estimates typically have an asymmetrical risk profile (Class 5 for instance has a -50% to +100% accuracy range). The AACE framework presents an approach for estimating costs but does not specify how the uncertainty range should be applied. For the TCD, AEMO uses the AACE framework to determine a point cost estimate with an asymmetrical uncertainty range for a cost estimate and then applies an unknown risk factor to uplift the point cost estimate while leaving the lower and upper ends of the accuracy range constant as visualised by the figure below. The result of this increase from a point cost to a mid-point cost is that the resulting uncertainty range is symmetric Through this approach, symmetric accuracy bands for the TCD are able to be calculated,

Figure 12 Addition of unknown risk to determine a mid-point cost estimate

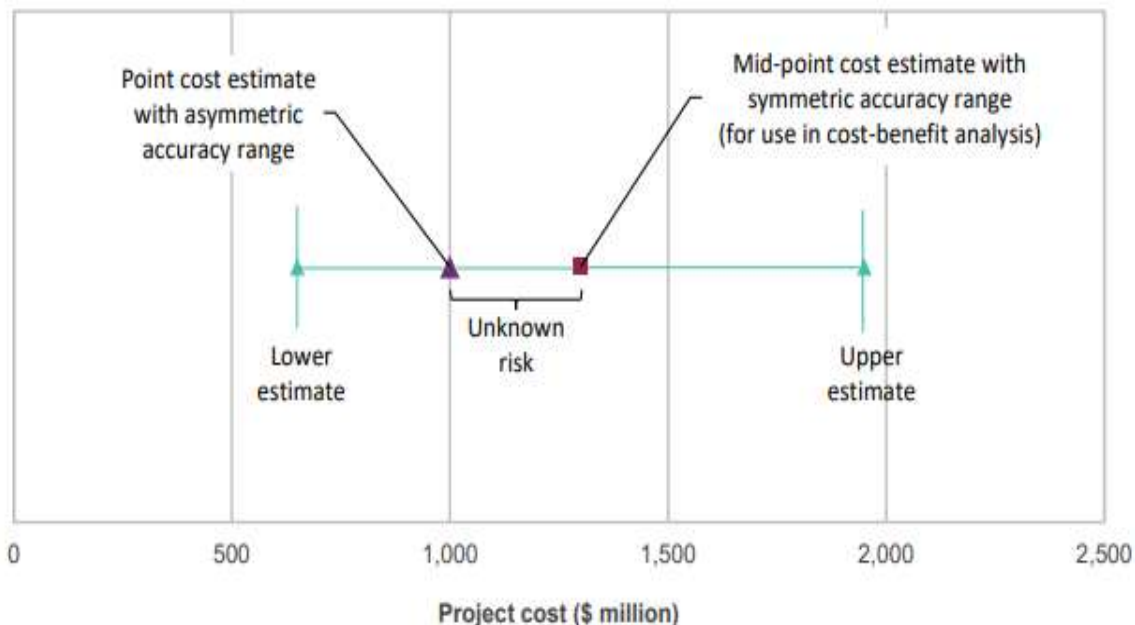


Figure 13 below showcases the cost accuracy range associated with each estimation class in the TCD. Known risk allowances, unknown risk allowances and indirect costs are added to the known costs to form the expected project cost. The known costs increasingly become a larger component of the total cost estimate, while risk allowances decrease as the design and estimate class progresses

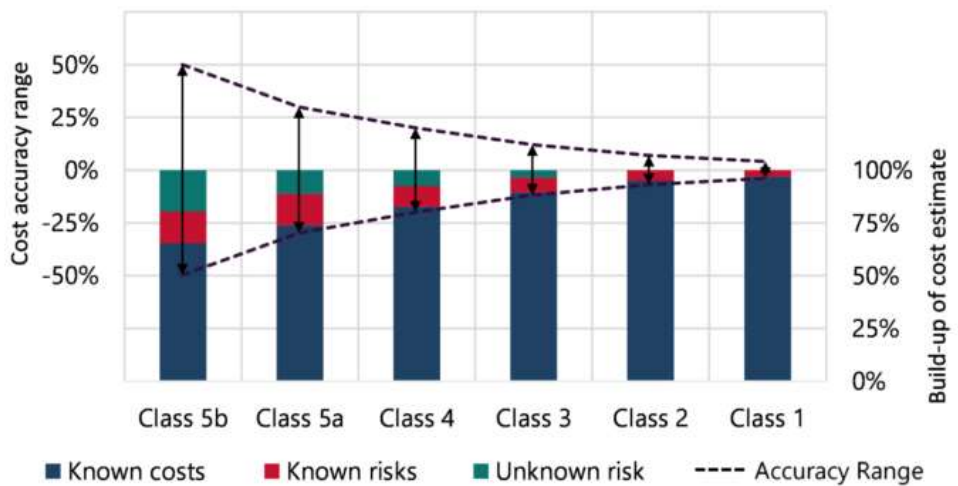


Figure 13 Cost estimate accuracy bands for the TCD

