



Material Cost Escalation Factors

2023-28 Revenue Proposal

Transgrid

27 October 2022

→ **The Power of Commitment**



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Executive Summary

Transgrid has engaged GHD to perform an independent review and assessment of the methodologies used to update FY21 unit rates to FY22 held within their MTWO® cost estimation database.

As is indicated in the body of the report, unit rates represent one of the input sources required to develop capex forecasts included in Transgrid's Revenue Proposal.

In January 2022, Transgrid submitted to the Australian Energy Regulator (AER) its 2023-28 Revenue Proposal which included Capex forecasts that were based upon FY21 unit rates. According to the AER's regulatory timetable, Transgrid can submit a Revised Revenue Proposal in December 2022.

In preparation, Transgrid has revised its unit rates from a base year of FY21 to FY22. As part of this update GHD has reviewed the methodologies used to update unit rates.

Our assessment indicates that the process was consistent with the annual unit rate update process applied in previous years. Different methodologies have been used to leverage the best available sources to update unit rates to FY22. In summary the methodologies include:

- Assumption factor escalation such as its Enterprise Bargaining Agreement (EBA) or the Australian Bureau of Statistics (ABS) Consumer Price Index (CPI) increases
- Current rate reflection from FY22 tenders or contracts
- Prior year tender or contract results escalated to FY22
- Cost driver escalation

As detailed in the body of this report, GHD considers that the methodologies used by Transgrid to update FY21 unit rates to FY22:

- Are applied appropriately to leverage the best available sources of unit rates
- Are considered appropriate to the cost categories they have been applied
- Are based upon credible sources of escalation factors
- Represent a robust calculation approach.

GHD notes that Transgrid has devoted sufficient and appropriate resources to perform this update and notes that the overall process is based upon a significant amount of data obtained from different and appropriate sources including current and historical tender / contract outcomes, prudent assumptions and current rates based upon its finance system data.

GHD also notes that the update is driven largely by spreadsheets that are subject human factors. During our assessment we have considered data outliers and observed only immaterial results associated with this analysis.

Glossary

AER	Australian Energy Regulator
Augex	Augmentation expenditure
BISOE	BIS Oxford Economics
Capex	Capital expenditure
CPI	Consumer Price Index
EGWWS	New South Wales Electricity, Gas, Water and Waste Services
FY	Financial Year
Opex	Operational expenditure
PPI	Producer Price Index
Repex	Replacement expenditure
RIT-T	Regulatory Investment Test for Transmission

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1. Introduction

Transgrid submitted its 2023-28 Revenue Proposal to the AER in January 2022. According to the AER regulatory timetable, Transgrid can submit a Revised Revenue Proposal in December 2022.

In preparation, Transgrid has revised its unit rates underpinning its network Capex forecast from a base year of FY21 to FY22. These revised unit rates represent one of the inputs to developing a revised network (i.e. Repex and Augex) Capex forecast to be included in the Revised Revenue Proposal.

1.1 Purpose of this report

This report outlines GHD's independent verification and assessment of the process / methodologies used to update the unit rate base year from FY21 to FY22.

1.2 Scope and limitations

GHD has been engaged by Transgrid to perform an independent verification and assessment of the process / methodologies used to update the unit rate base year from FY21 to FY22.

This review is a limited assurance review as assessment has been based upon selection verification, walk through testing, statistical analysis and analytical review.

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

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

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

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

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

2. Background

Transgrid operates and manages the high voltage electricity transmission network in NSW and the ACT which connects generators, distributors, major end users and interstate transmission networks. Transgrid is required to submit to the AER its revenue proposal, including its forecast capital and operational expenditure (Capex and Opex), every 5 years with the next regulatory period being on 1 July 2023 and ending on 30 June 2028.

Capex forecasts included in the revenue proposal are based upon the forecasting method described in section 8.6 of Transgrid's 2023-28 Revenue Proposal. In summary the process includes:

- **Identify the need / opportunity** – identify investment needs and opportunities that efficiently support the continued delivery of a safe, reliable and secure power system
- **Options evaluation** – evaluate options to address each need and opportunity
- **Regulatory Investment Test for Transmission (RIT-T)** – for projects with a cost greater than \$7M apply the RIT-T to identify the credible option, including consulting for non-network options, that maximises the present value of net economic benefit to the market of our proposed investments
- **Top-down assessment** – test and challenge the Capex program (investment portfolio) using top-down assessments including predictive models and benchmarking
- **Network investment portfolio optimisation** – identify optimisation opportunities by considering the deliverability of the portfolio, appropriate scheduling and bundling of works.

Inputs into Transgrid's network Capex forecasts also include base year unit rates. The 2023-28 Revenue Proposal was based upon FY21 unit rates which have been revised to FY22 to support the development of the Revised Revenue Proposal.

Unit rates are discussed in the following section.

3. Unit rates

The Repex and Augex Capex forecasts included in Transgrid's revenue proposal are based upon several building blocks, including:

- Base year unit rates
- Escalated labour costs based upon BIS Oxford Economics (BISOE) NSW Gas, Water and Waste Services (EGWWS 'Utilities') sector forecasts
- CPI escalation.

Section 6.12 of Transgrid's Repex Overview Paper 2022 details the Repex forecasting methodology and section 7.6 of Transgrid's Augex Overview Paper details the Augex forecasting methodology used in developing its network Capex forecasts in the revenue proposal.

Based upon a review of these documents the network Capex forecast included in the Transgrid's 2023-28 Revenue Proposal comprised FY21 unit rates based upon:

- Unitised programs – these programs are forecast using standardised estimates
- Non-unitised projects – these are individually costed projects, which in some instances are also combined to form a larger program.

These cost elements were estimated using Transgrid's MTWO cost estimation system. These are then applied in the capex spreadsheet model to generate the Capex forecast.

Unitised costs included in the 2023-28 Revenue Proposal were based upon:

- Historical costs with movement in unit rates determined from most recent costs as recorded in the MTWO cost estimating system
- Contract unit rates from service providers.

Non-unitised project costs were based upon detailed scopes of works based upon Transgrid's experience of delivery similar projects from which the estimate is compiled using itemised cost elements sourced from the MTWO cost estimating system. This system utilises historical costs, updated with the most relevant recently completed projects of similar scope.

4. Unit rate base year update

The 2023-28 Revenue Proposal used FY21 unit rates in its base year. Since the FY21 unit rates underpinning the Capex forecast were established some cost drivers relevant to the sector (oil, steel, copper, aluminium, construction costs, external labour and freight etc) were observed to increase at a rate greater than the CPI assumptions used in the 2023-28 Revenue Proposal. To reflect these factors and to improve the accuracy of its Capex forecast, Transgrid has updated its unit rates to FY22.

On an annual basis Transgrid updates the unit rates included in its MTWO cost estimating system. The update of the base year to FY22 unit rates is important as it captures the impact of current infrastructure demand, Covid-19 and geopolitical impacts on the supply chain and an observed increase in the other heavy and civil construction Producer Price Index (PPI) of 9% over the 12-months to FY22¹:

As illustrated by the following graphs, BISOE notes that "aluminium, copper and oil – have all experienced significant recoveries from the Covid-induced lows of 2020 and are currently trading at near 10-year highs. Although they are expected to retreat from these highs over the period to FY28, the average prices in the five years to FY28 (the upcoming revenue period) will be considerably higher than the current revenue period (FY19 to FY23), indicating much higher cost pressures on operators of electricity distribution networks in the coming period²".

¹ ABS

² BIS Oxford Economics Electricity- Related Labour & Material Escalation Forecasts to 2027/28 P6

Figure 1 Copper prices

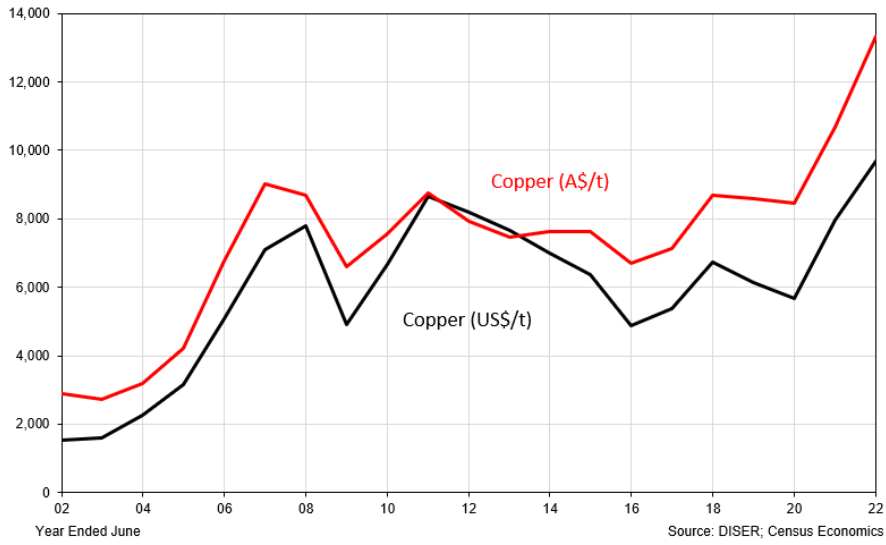


Figure 2 Oil prices

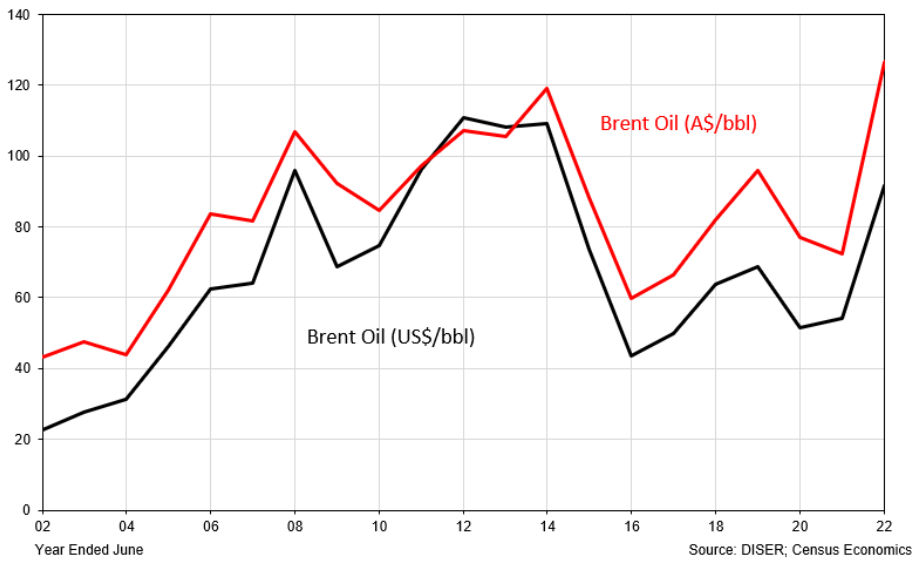


Figure 3 Aluminium prices

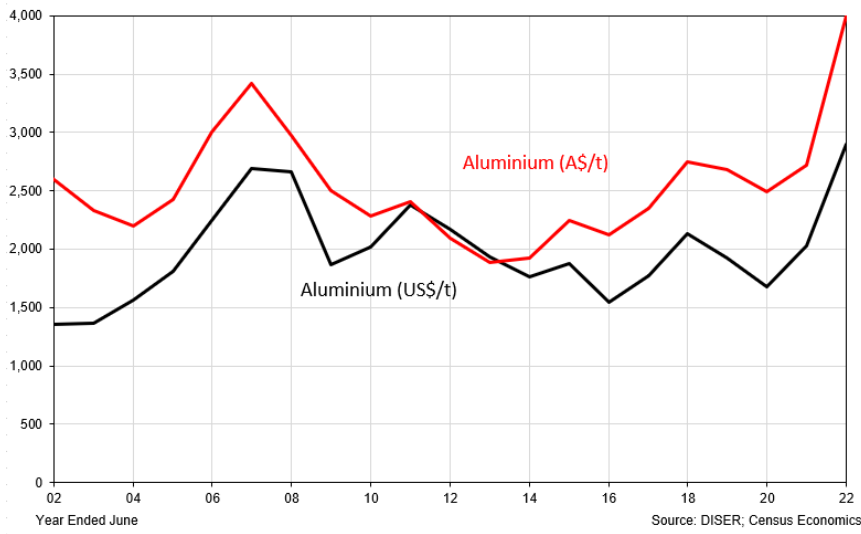
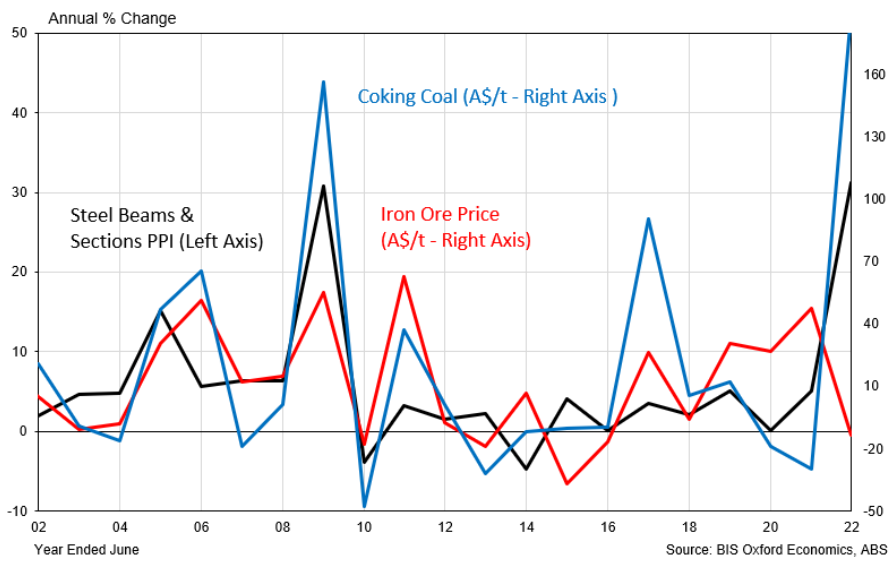


Figure 4 Steel beams PPI drivers



5. Unit rate up-date methodologies

As indicated above Transgrid updates the unit rates included in its MTWO cost estimating system on an annual basis. The methodology applied takes advantage of the most recent available information (e.g. tenders or contracts) or applies general escalation assumptions. In general, the methodologies include:

- Assumption factor escalation such as EBA or CPI increases
- Current rate reflection
- Tender or contract results escalated to FY22
- Cost driver escalation.

5.1 Assumption factor escalation

This methodology simply applies an escalation rate to FY21 unit rates to reflect FY22 costs.

This methodology has been used to update Transgrid's labour support and on-costs and other cost elements.

Transgrid's labour support and on-costs unit rates have all been increased by 3% based upon EBA outcomes.

Other cost elements have been increased by CPI, which is consistent with the approach used in previous years.

GHD considers that this methodology reflects a reasonable approach.

5.2 Current rate reflection

Current rate reflection is generally applied through two different methodologies detailed below.

Transgrid internal labour

In this instance, Transgrid's internal labour costs are updated based upon information provided by its finance function. The finance function regularly updates this information and places the data set within an internal portal that can be accessed by Transgrid staff for different purposes. The data identifies all staff through their job description category. By job description, category salaries are averaged and converted to an hourly rate. This provides the number of positions by job description category and its averaged hourly rate.

GHD considers that this methodology is appropriate for this cost category.

Other unit rate current cost reflection

In this instance, Transgrid applies the period agreement prices for equipment supplied by third parties and contract labour costs for the installation of this equipment. These are escalated by Rawlinsons construction handbook sourced drivers, using the same process as is described in section 5.3.

5.3 Tender or contract results escalated to FY22

Under this methodology actual tender or contract outcomes from the current base year (FY22) or previous years are used to update unit rates. Generally, the results of these tender or contract outcomes fall within the current or the last three years with the methodology applying the most recent outcomes. In some cases, depending upon history the outcomes may be sourced further back, but generally the methodology seeks the most current data.

Current or historical outcomes are escalated by factors detailed in Table 1 to reflect current base year costs. The average of which is reflected as the current FY unit rate.

The following table provides a summary of the escalation factors and their source. In terms of calculation accuracy, Appendix A1 includes the escalation matrix applied and this indicates that FY22 tender and contract outcomes are not escalated in determining the FY22 unit cost as they fall within the current year.

Prior year tender and contract outcomes are appropriately indexed by the factors detailed in Appendix A1.

GHD has confirmed the rates included in the table below back to their source and has considered the reasonableness of increases in labour support and on-costs based upon the EBA with the agreement allowing 3% from the first full pay period on or after 1 December 2022.

Table 1 Time based escalation factors and their source

Summary of all escalation factors	ABS Series Index	2018	2019	2020	2021	2022	Source
Aluminum	Chief Economist Table, Macromonitor - Aluminum	13.2%	-10.6%	-7.0%	8.8%	47.2%	Actuals to Jun 19 based on Chief Economist Tables provided by the Department of Industry, Science and Resources. FY20 and onwards based on BISOE actuals/forecasts
Copper	Chief Economist Table, Macromonitor - Electrical Cable and Wire	11.8%	-3.0%	-1.8%	26.3%	24.9%	
Crude oil	Chief Economist Table, Macromonitor - Diesel	49.4%	-5.6%	-20.2%	-4.9%	74.1%	
Steel	Chief Economist Table/ABS, Macromonitor - Iron and Steel Products	16.4%	4.9%	0.2%	5.1%	31.1%	
EBA wages	TG EBA/EGW AWOTE	4.0%	2.0%	2.0%	2.5%	3.0%	EBA
Wages - General	All Industrials/EGW AWOTE, Macromonitor - Avg Construction and EGWWS labour	1.7%	2.3%	1.6%	1.7%	2.3%	Actuals to Jun 19 based on Chief Economist Tables. FY20 and onwards based on Macromonitor actuals/forecasts

Summary of all escalation factors	ABS Series Index	2018	2019	2020	2021	2022	Source
Construction	ABS3109:3101 80:20	2.8%	1.1%	1.5%	2.4%	6.10%	Actuals to Jun 19 based on Chief Economist Tables. FY20 onwards based on CPI Based on Macromonitor actuals/forecasts
EPCM Labour	Macromonitor - EPCM Costs	4.2%	3.3%	2.5%	2.0%	5.7%	
Mobile Plant	Macromonitor - Equipment Rental	2.7%	1.5%	-0.1%	1.7%	1.8%	
Freight / Transport	Macromonitor - Avg Road and Ocean Freight	1.8%	4.0%	8.8%	16.6%	50.1%	
Concrete / Sand / Cement	Macromonitor - Ready mixed concrete	3.5%	2.5%	0.7%	-2.0%	-0.4%	
General Construction Materials	Macromonitor - Total Materials	4.6%	0.5%	0.1%	9.2%	15.0%	
Other	CPI (nominal) - From ABS Series	2.08%	1.59%	-0.35%	3.85%	6.10%	CPI

GHD concludes that the tender or contract results escalated to FY22 is based on a robust methodology, noting that the calculation is based upon spreadsheets that hold a large amount of data.

5.4 Cost driver escalation

Transgrid uses cost drivers to update its unit rates where they lack current contract rates for unit rate elements, e.g. because an item was not purchased in the preceding 12 months. Under this methodology the unit rate category item is broken down into cost driver proportions (totaling 100%) and escalation is applied to the respective cost driver based upon actual commodity movements provided by BISOE, Macromonitor May 2022 forecasts or CPI for FY22 using the same process as is described in section 5.3.

Cost drivers represent a breakdown of the elements that drive material price changes. These represent labour, commodity, freight, oil and other components that represent potential cost drivers.

Cost drivers have been derived from several sources based upon the credibility of the underlying information held. These include:

- Quantity surveyor – The splitting of substation and transmission line construction into their respective cost driver proportions detailed in section 5.4.1, these changes represent approximately 51% of the material unit rates.
- Procurement – Analysis performed by procurement with input from suppliers; these changes represent approximately 10% of the material components.

5.4.1 Quantity surveyor provided cost driver proportions

Transgrid engaged Vscope Services in May 2022 to breakdown substation and transmission line construction into its cost elements. Vscope used several past projects within the last 3 years, detailed below, to break up substation and transmission line construction into their respective cost drivers.

Interview results and Vscope's report indicate that the estimates were based upon bottom-up estimates from first principles using estimation software.

The estimates are made up of resources such as labour, material, plant and subcontract. The resources of each activity were extracted using simple commands and macros from the software.

The estimates recorded in a final spreadsheet consists of greenfield and brownfield substation (33kV to 330kV) and transmission line projects (330kV and 132kV) for various electrical utilities, transport infrastructure and renewable projects located in NSW, ACT, SA and QLD. Reference projects used:

- Project A: Large substation 330/220kV NSW
- Project B: Substation 330/33kV, Switching station and 330kV Transmission line NSW
- Project C: Substation 220/66/22 kV NSW
- Project D: Substation 33/132kV NSW
- Project E: Large substation 330/220/33kV NSW
- Project F: Substation 33/132kV NSW
- Project G: 330/33kV substation, Switching station and 330kV Transmission line NSW
- Project H: Substation 132/11kV, 132 Transmission line ACT
- Project I: Substation 33/132kV, 132kV Transmission line QLD
- Project J: 330 Transmission line NSW
- Project K: Substation 330/132kV NSW
- Project L: Substation 33/11 NSW

- Project M: 33kV Line NSW
- Project N: 132kv Transmission line demolition SA
- Project O: Not used
- Project P: 33/330kV Substation, 330kV line, NSW
- Project Q: 275kV Transmission line VIC

5.4.2 Cost driver escalation rates

For these unit cost elements, the FY21 unit rates in the MTWO have been escalated to FY22 through the use of specific cost drivers detailed above and the application of escalation rates to those cost drivers.

Table 1 details the cost drivers, the source used to derive the escalation rate and the rate used to update unit rates.

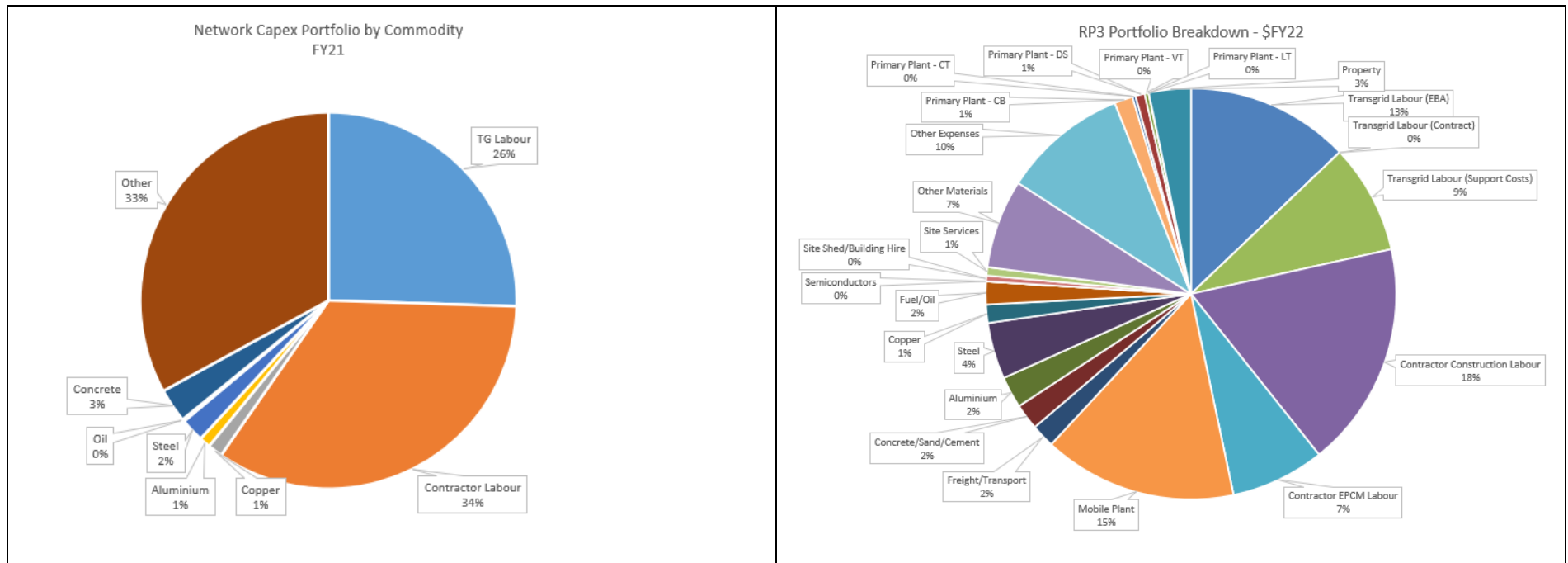
5.4.3 Cost driver methodology conclusion

Quantity surveyor and procurement sourced cost driver identification represents a reasonable approach to update unit rates where tender or contract rates are not readily available.

6. Unit rate escalation analysis

The methodology used by cost category has been detailed in Table 2, the figure below summarises the changes in cost categories between FY21 and FY22. As indicated, significant effort has been devoted to the identification of cost elements previously group into the “Other” category.

Figure 5 Cost category breakdown FY21 and FY22



The following table summarises cost categories by unit rate escalation methodology. This has been presented to indicate the respective prevalence of the different escalation methodologies. This is not intended to present a representation of total cost by category, as for example there are labour components included in cost driver and tender / contract escalation methodologies.

Total labour cost in the FY22 base year is \$689M (47% of the FY22 base year total), whereas the table below only details \$353M. This is because there are labour cost components in other escalation methodologies.

Table 2 Breakdown of unit rate escalation methodology

Category	Unit rate update methodology	Category total \$M	Section reference
Labour	Transgrid labour support costs have been updated by expected EBA outcomes	\$127	Section 7.1
	Transgrid labour on-costs have been updated by expected EBA outcomes	\$45	Section 7.2
	Transgrid labour cost driver escalation applied to historical rates	\$20	Section 7.2
	Transgrid labour has been updated to reflect current rates	\$125	Section 7.2
	Construction labour and EPC by current rates and the application of the cost driver escalation to historical rates	\$28	Section 7.3
	Construction labour and EPC set to current rates	\$7	
Construction activities, cables, materials, mobile plant hire, primary plant supply, secondary equipment and transformers.	Cost driver escalation	\$618	Section 8
Other costs	Increased by CPI	\$296	Section 9
Civil and electrical construction activities, earthing, low voltage cable and mobile plant hire	2021 tenders updated by cost driver escalation	\$66	Section 10
Construction - site establishment and running costs	2022 tenders updated by cost driver escalation	\$63	Section 11
Substation primary plant items	Current rates	\$48	Section 12
Various	Escalated by current rates	\$21	Considered immaterial
	Escalated by factors indicated by Rawlinsons	\$10	
Total		\$1,476	

Note: These numbers are preliminary estimates that have yet to be reflected in the capex model and final unit rates adopted may differ.

7. Labour rate updates

Labour unit rates categories that can be separately identified by category have been presented in the table below, detailing the escalation methodology used. As discussed above this excludes labour unit rates that represent a proportion of other cost categories that use the cost driver and tender / contract escalation methodologies.

Table 3 Base case FY21-22 labour escalators

Labour category	Labour sub-category	Labour sub-category total \$M	Labour category total \$M	FY21-22 escalation methodology	Verification section reference
Transgrid labour support costs	Labour support costs	\$127	\$127	EBA 3%	Section 7.1
Transgrid labour	Labour on-costs	\$51	\$190	EBA 3%	Section 7.1
	Transgrid labour	\$139		Current rate	
Construction labour	Contract labour	\$18	\$25	NEM applied to historical rates	Section 7.3
		\$7		Current rate	
EPC	EPC	\$11	\$11	NEM applied to historical rates	
Total		\$353	\$353		

7.1 Transgrid labour support and on-cost cost unit rate escalation

All Transgrid labour support cost components have been escalated from the FY21 base year to FY22 by 3% based upon the EBA.

Table 4 Transgrid labour support and on-cost cost verification

Assessment component	Details
MTWO resource description aligns with escalation factor applied	Only applied to labour support and on-costs
Calculation	Only 3% applied
Verification / selection methodology	Entire population calculation review
Data anomalies	None
Conclusion	Labour support and oncost escalation by 3% is considered reasonable.

7.2 Transgrid internal labour unit rate escalation

The following table breakdowns total Transgrid internal labour costs by the escalation methodology applied.

Table 5 Transgrid labour cost verification

Labour category	Escalation methodology	\$M
Labour on-costs	EBA 3%	\$45
Transgrid labour	Cost driver escalation applied to historical rates	\$20
Transgrid labour	Current rate	\$125
Total		\$190

Labour on-costs

Review of the RP3 New Escalation Model Rev 5.0 spreadsheet indicates that all labour on-costs categories were escalated by 3% based upon EBA outcomes.

Current rate

As indicated above, Transgrid's internal labour costs are updated based upon information provided by its finance function. The finance function regularly updates this information and places the data set within an internal portal that can be accessed by Transgrid staff for different purposes. The data identifies all staff through their job description category. By job description category salaries are averaged and converted to an hourly rate. This provides the number of positions by job description category and its averaged hourly rate.

The update of Transgrid's labour costs includes changes to the number positions for each role and the associated hourly rates. The overall increase in cost is 8.5%. This represents the combined result of position number and rate changes.

GHD consider that the methodology applied by Transgrid is appropriate for this cost category.

Table 6 Transgrid internal labour verification

Assessment component	Details
MTWO resource description aligns with escalation factor applied	Transgrid internal labour costs and on-costs
Calculation	<ul style="list-style-type: none"> Labour on-costs EBA – 3% Current rate – Update based upon finance provided data extracted for payroll systems.
Verification / selection methodology	<ul style="list-style-type: none"> Labour on-costs EBA – Entire population calculation review Current rate – Analytical review
Data anomalies	<ul style="list-style-type: none"> Labour on-costs EBA – None noted Current rate – As indicated above the percentage increase / decrease between FY21 to FY22 represents a

Assessment component	Details
	combination of movements in both position numbers and position description average unit rates. As such data anomalies are difficult to identify. To give an indication, percentage increases over 20% were considered and these total \$1.8M or only 1.4% of the methodologies population which is considered immaterial.
Conclusion	<ul style="list-style-type: none"> • Labour on-costs EBA – Methodology used is considered appropriate • Current rate - Methodology used is considered appropriate

7.3 Contract and EPC labour rate escalation

These unit rates have been updated to reflect current contract rates and/or application of the cost driver escalation method as detailed in the table below.

Table 7 Split of contractor & EPC escalation methodologies

Unit rate escalation methodology	\$m
Cost driver methodology	28
Set to current rate	7
Total	35

Table 8 Contract and EPC labour rate verification

Assessment component	Details
MTWO resource description aligns with escalation factor applied	Contractor and EPC labour rates
Calculation	<p>Two methods have been used to update these unit rates:</p> <ul style="list-style-type: none"> • Cost driver escalation - where unit rates are split into their key cost driver elements and escalated according to their observed price increases across FY22 • Current rates – where the current contract rate has been used.
Verification / selection methodology	<ul style="list-style-type: none"> • Cost driver escalation - Walk through review of methodology spreadsheet structure and formulas, verification of escalation factors back to source • Current rates – Walk through review of methodology spreadsheet structure and formulas, verification of escalation factors back to source

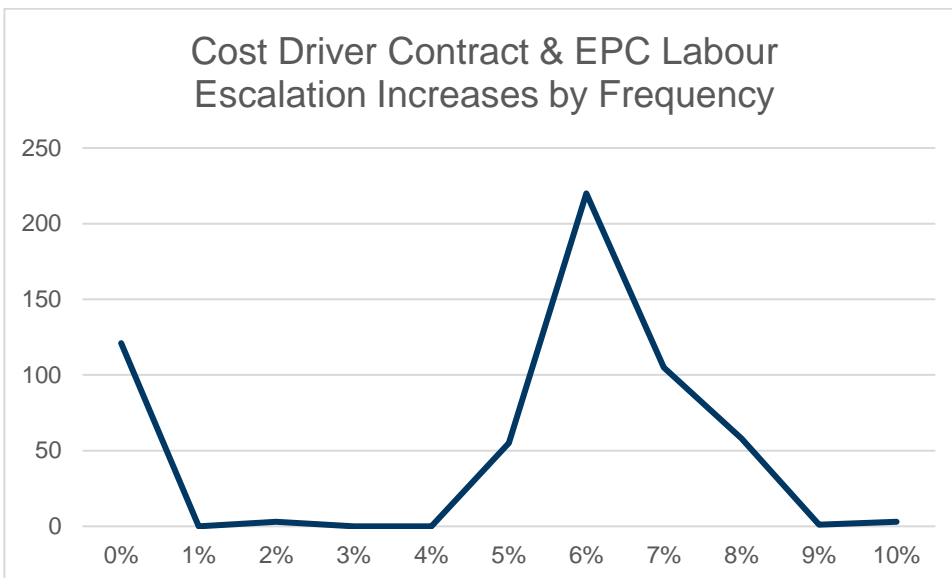
Assessment component	Details
Data anomalies	The data set includes some outliers with greater than 20% increases. These total \$695K (0.05% of total unit rates) which is considered immaterial.
Conclusion	Methodologies used are considered appropriate

Cost driver escalation assessment

Examining labour components that have been escalated using the cost driver escalation only, the increase in unit rates from FY21 to FY22 is 6.4%, close to CPI for the same period.

Examination of the frequency of rate increases across this population shows a peak around 6% with a skew to the right as illustrated in the table below.

Figure 6 Cost driver contract & EPC labour escalation increases by frequency



Current rate escalation assessment

Examining labour components that have been updated using current rate escalation only, the increase in unit rates from FY21 to FY22 is 42%. This is applied to \$7M which is only 0.5% of the unit rate total which is considered immaterial.

8. Construction and rated cost driver escalation

Transgrid uses cost drivers to update unit rates where they lack current rates for unit rate elements. Under this methodology the unit rate category item is broken down into cost driver proportions (totaling 100%) and escalation is applied to the respective cost driver based upon actual commodity movements provided by BISOE, Macromonitor May 2022 forecasts or CPI for FY22.

Table 9 Cost driver escalation verification

Assessment component	Details
MTWO resource description aligns with escalation factor applied	Cost driver escalation has been applied to construction activities, cables, materials, mobile plant hire, primary plant supply, secondary equipment and transformers where current base year rates were not available.
Calculation	Calculation methodology described at section 5.4. All cost driver component proportions add to 100%
Verification / selection methodology	Walk through of calculation methodology and verification of escalation factors back to source
Data anomalies	The population includes some items greater than the cost increases referenced in Table 1. Their total is immaterial.
Conclusion	Considered an appropriate escalation methodology

9. Other cost forecasting

In previous years the MTWO cost estimating system contained a category of “Other Costs” representing about 30% of total unit costs. In the past these “Other Cost” elements have been updated using CPI.

During the updates to unit rates additional efforts have been taken to specifically identify “Other Cost” elements. Where identification is possible, the above-described processes have been used to update the unit rates to FY22. The “Other Cost” element now represents 11% total unit costs, with CPI being applied to reflect the FY22 outcome.

As indicated above the MTWO has always contained an “Other” component. In past unit rate refresh processes these have been escalated at CPI and the same process has been used again in updating unit rates from FY21 to FY22.

Table 10 Other cost escalation verification

Assessment component	Details
MTWO resource description aligns with escalation factor applied	Review of the resource description indicates a mixture of: <ul style="list-style-type: none"> • General supply and installation works • Allowances (i.e. remote area allowances) • Miscellaneous materials • Property acquisitions • Secondary systems Transgrid supplied
Calculation	Only CPI at 6.1% applied
Verification / selection methodology	Entire population reviewed

Assessment component	Details
Data anomalies	None noted
Conclusion	The application of CPI to these unit rate cost elements is considered reasonable.

10. 2021 tenders and application of escalation model to historical rates

Table 11 2021 tenders and application of escalation model to historical rates verification

Assessment component	Details
MTWO resource description aligns with escalation factor applied	This category represents civil and electrical construction activities, earthing, low voltage cable and mobile plant hire for which 2021 tender results from the FY21 base year unit rates that have been updated to FY22 using the NEM.
Calculation	Described in section 5.3
Verification / selection methodology	Walk through of calculation methodology and verification of escalation factors back to source
Data anomalies	The total greater than 3 sigma is immaterial.
Conclusion	The methodology described in section 5.3 is considered appropriate.

11. New 2022 tenders and application of escalation model to historical rates

Table 12 2022 tenders and application of escalation model to historical rates verification

Assessment component	Details
MTWO resource description aligns with escalation factor applied	This category represents construction - site establishment and running costs for which 2022 tender results were available
Calculation	Described in section 5.3
Verification / selection methodology	Walk through of calculation methodology and verification of escalation factors back to source
Data anomalies	The total greater than 3 sigma is immaterial.
Conclusion	The methodology described in section 5.3 is considered appropriate.

12. Current rate (period agreement)

Table 13 Current rate escalation verification

Assessment component	Details
MTWO resource description aligns with escalation factor applied	<p>Transgrid have updated the pricing for a number of their substation primary plant items based on tender/contract rates for FY22. This includes:</p> <ul style="list-style-type: none"> • Dry type auxiliary transformers • 66kV circuit breakers, instrument transformers, disconnectors and earth switches • 132kV circuit breakers, instrument transformers, disconnectors and earth switches • 220kV dead tank circuit breakers • 330kV circuit breakers, instrument transformers, line traps, disconnectors and earth switches • 500kV instrument transformers
Calculation	Described in section 5.2
Verification / selection methodology	Walk through of calculation methodology and verification of escalation factors back to source
Data anomalies	None noted
Conclusion	Methodology considered appropriate.

13. GHD assessment

GHD considers that the methodologies used by Transgrid to update FY21 unit rates to FY22:

- Are applied appropriately to leverage the best available sources of unit rates
- Are considered appropriate to the cost categories they have been applied
- Are based upon credible sources of escalation factors
- Represent a robust calculation approach.

A-1 Escalation matrix

Cost description	2018	2019	2020	2021	2022	Cost category
ACSR Conductor Supply	0.706	0.678	0.656	0.716	1.000	ACSR Conductor Supply
Aluminum Conductor and Fitting Supply	0.688	0.660	0.626	0.684	1.000	Aluminum Conductor and Fitting Supply
Cable - LV AC/DC Power S&I >16mm2	0.713	0.712	0.716	0.833	1.000	Cable - LV AC/DC Power S&I >16mm2
Cable Control - Large S&I (>8C or >4mm2)	0.783	0.785	0.793	0.876	1.000	Cable Control - Large S&I (>8C or >4mm2)
Cable Control - Small S&I (<8C and <4mm2)	0.804	0.809	0.820	0.887	1.000	Cable Control - Small S&I (<8C and <4mm2)
Cable HV – S&I	0.745	0.741	0.738	0.851	1.000	Cable HV – S&I
Cable HV – Supply Only	0.722	0.707	0.701	0.829	1.000	Cable HV – Supply Only
Civil & Elec Construction	0.903	0.912	0.914	0.934	1.000	Civil & Elec Construction
Concrete Pole Supply	0.820	0.833	0.841	0.873	1.000	Concrete Pole Supply
Concrete Pole Supply and Install	0.907	0.918	0.930	0.947	1.000	Concrete Pole Supply and Install
Earthing	0.782	0.785	0.785	0.887	1.000	Earthing
Miscellaneous Materials	0.783	0.796	0.796	0.870	1.000	Miscellaneous Materials
Oil	0.802	0.757	0.604	0.574	1.000	Oil
Primary Plant Supply	0.848	0.860	0.851	0.891	1.000	Primary Plant Supply
Secondary Equipment Supply	0.896	0.911	0.908	0.943	1.000	Secondary Equipment Supply
Steel Substation & Found S&I	0.876	0.889	0.893	0.916	1.000	Steel Substation & Found S&I
Steel Substation Structure Only S&I	0.771	0.784	0.791	0.826	1.000	Steel Substation Structure Only S&I
Steel - Supply Only	0.682	0.703	0.711	0.755	1.000	Steel - Supply Only
Steel Tower & Found S&I	0.908	0.923	0.930	0.950	1.000	Steel Tower & Found S&I
Steel Tower Only S&I	0.801	0.817	0.825	0.858	1.000	Steel Tower Only S&I
Transformers Supply and Erect	0.765	0.775	0.773	0.834	1.000	Transformers Supply and Erect
TransGrid EBA Labour	0.910	0.929	0.947	0.971	1.000	TransGrid EBA Labour
Wages General	0.924	0.946	0.960	0.977	1.000	Wages General
Construction - Site Establishment and Running Costs	0.885	0.908	0.920	0.943	1.000	Construction - Site Establishment and Running Costs
Construction - Site preparation/resurfacing	0.904	0.916	0.912	0.931	1.000	Construction - Site preparation/resurfacing
Construction - Buildings and Site Services	0.793	0.807	0.810	0.863	1.000	Construction - Buildings and Site Services
Construction - Earthworks - Bulk Excavation	0.908	0.916	0.900	0.913	1.000	Construction - Earthworks - Bulk Excavation
Construction - Earthworks - Bulk Import and Filling	0.724	0.736	0.751	0.816	1.000	Construction - Earthworks - Bulk Import and Filling
Construction - Earthworks - Trenching	0.884	0.895	0.892	0.921	1.000	Construction - Earthworks - Trenching
Construction - Drainage	0.864	0.880	0.885	0.918	1.000	Construction - Drainage
Construction - Cable trenching and pits	0.871	0.891	0.896	0.918	1.000	Construction - Cable trenching and pits
Construction - Conduits	0.874	0.885	0.884	0.918	1.000	Construction - Conduits
Construction - Substation minor footings	0.868	0.889	0.893	0.916	1.000	Construction - Substation minor footings
Construction - Substation major footings and bunds	0.864	0.885	0.889	0.911	1.000	Construction - Substation major footings and bunds
Construction - Cable terminations	0.896	0.914	0.926	0.956	1.000	Construction - Cable terminations
Construction - TL Stringing and Clipping Works	0.912	0.925	0.919	0.934	1.000	Construction - TL Stringing and Clipping Works

Cost description	2018	2019	2020	2021	2022	Cost category
Construction - TL Refurbishment work	0.923	0.938	0.935	0.948	1.000	Construction - TL Refurbishment work
Construction - TL Concrete pole foundations	0.917	0.937	0.942	0.956	1.000	Construction - TL Concrete pole foundations
Construction - Substations Demolition and Disposal	0.920	0.937	0.941	0.956	1.000	Construction - Substations Demolition and Disposal
Construction - Lines Demolition and Disposal	0.916	0.930	0.927	0.942	1.000	Construction - Lines Demolition and Disposal
Construction - Access and Clearing Works	0.900	0.910	0.900	0.921	1.000	Construction - Access and Clearing Works
LV Cable - Supply and Install - Underground fibre optic - 48f	0.896	0.914	0.925	0.954	1.000	LV Cable - Supply and Install - Underground fibre optic - 48f
LV Cable - Supply Only - LV AC/DC power >16mm2	0.718	0.709	0.704	0.831	1.000	LV Cable - Supply Only - LV AC/DC power >16mm2
LV Cable - Supply Only - Control cables - large - >4mm2	0.718	0.710	0.705	0.830	1.000	LV Cable - Supply Only - Control cables - large - >4mm2
LV Cable - Supply Only - Control cables - small - <4mm2	0.719	0.715	0.715	0.829	1.000	LV Cable - Supply Only - Control cables - small - <4mm2
Primary Plant Supply - Circuit Breaker	0.861	0.873	0.869	0.905	1.000	Primary Plant Supply - Circuit Breaker
Primary Plant Supply - Current Transformer	0.840	0.834	0.815	0.861	1.000	Primary Plant Supply - Current Transformer
Primary Plant Supply - Disconnecter	0.818	0.823	0.814	0.858	1.000	Primary Plant Supply - Disconnecter
Primary Plant Supply - Earth Switch	0.896	0.911	0.908	0.943	1.000	Primary Plant Supply - Earth Switch
Primary Plant Supply - Voltage Transformer	0.840	0.834	0.815	0.861	1.000	Primary Plant Supply - Voltage Transformer
Primary Plant Supply - Line Trap	0.896	0.911	0.908	0.943	1.000	Primary Plant Supply - Line Trap
Primary Plant Supply - Capacitor Bank	0.729	0.714	0.688	0.729	1.000	Primary Plant Supply - Capacitor Bank
Contractor Design and Management Labour	0.877	0.906	0.928	0.946	1.000	Contractor Design and Management Labour
Mobile Plant Hire	0.952	0.967	0.966	0.982	1.000	Mobile Plant Hire
Other Expenses	0.896	0.911	0.908	0.943	1.000	Other Expenses



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