2018-22
POWERLINK QUEENSLAND REVENUE PROPOSAL

APPENDIX 7.03

Jacobs
Cost Escalation Factors (materials) for Powerlink
2016 to 2022

Powerlink
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Cost Escalation Factors (materials) for Powerlink – 2016 to 2022

Powerlink

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Cost Escalation Factors (materials) for Powerlink (2016 to 2022)

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Project manager:	Jeff Butler
Author:	Hiresh Devaser and Angus MacDonald

Jacobs Australia Pty Limited
32 Cordelia Street
PO Box 3848
South Brisbane QLD 4101 Australia

T +61 7 3026 7100
F +61 7 3026 7300
www.jacobs.com

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1.1	16 September 2015	Updated Final Report	Hiresh Devaser	Jeff Butler	Angus MacDonald

Contents

Appendix A. References

Appendix B. Response to AER position regarding cost escalation

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Important notes about your report

Limitations Statement

Forecasts are inherently uncertain.

The forecasts in this report represent Jacobs' (our) opinion on what is reasonable, at the time of writing, based on the information that we have presented. We have used a number of publicly available sources, other forecasts we believe to be credible, and our own judgement as the basis for developing our estimates.

Actual outcomes will depend on complex interactions of policy, technology, international markets, and the behaviour of multiple suppliers and end users, all of which are subject to uncertainty and are beyond our control. Hence, we cannot warrant that the projections contained in this report will turn out to be correct.

Executive Summary

Powerlink engaged Jacobs (us) to estimate materials-related cost escalation rates for its upcoming revenue proposal to the Australian Energy Regulator (AER). Our report provides escalation rates from financial year (FY) 2015-16 (2016) to 2021-22 (2022) for Powerlink's transmission assets.

The cost escalation factors adopted over the next regulatory period will impact Powerlink's annual revenue requirement. Appropriate cost escalation forecasts aim to protect Powerlink from input-price increases that can erode its revenue, and customers from over-estimates of cost increases.

At Powerlink's request, this report only provides escalation rates for commodities and other key cost drivers only; it does not provide escalation rates for Powerlink's asset classes.

Our forecasts, which are transparently developed with integrity, improve revenue adequacy and can also allow customers to experience real price decreases (all other factors being equal) where real cost decreases occur in relation to Powerlink's input costs.

In producing this report, we note the AER's recent position on forecasting cost changes, that it is appropriate to apply the consumer price index (CPI) or real cost escalation of zero. The AER's reasons for its view include:

- the degree of potential inaccuracy of commodities forecasts

- limited evidence to support how accurately [the entity's] materials escalation model forecasts reasonably reflect changes in prices paid by [the entity] for physical assets in the past and by which [the AER] can assess the reliability and accuracy of its materials model forecasts

- insufficient evidence to show that [the entity] has considered whether there may be some material exogenous factors that impact on the cost of physical inputs (Final Determination on ActewAGL, Attachment 6, pp. 90-91).

The Australian Bureau of Statistics (ABS 2015) states that CPI is a measure of changes in retail prices of a basket of goods and services consumed by households in Australian capital cities. The basket includes food, alcohol and tobacco, clothing and footwear, housing, household contents and services, health, transportation, communication, recreation, education and financial and insurance services.

We consider that CPI is not sufficiently relevant to the inputs for constructing and maintaining electricity network assets (unless there is no alternative). We accept that CPI can be used as a proxy for cost escalation where no other appropriate method exists. Over the years, however, we have developed a more appropriate method.

For estimating network cost escalation, rather than CPI, we recommend using commodity cost drivers and asset classes, which we have for ten years refined to forecast cost changes in transmission and distribution networks.

Powerlink has asked us to provide nominal and real forecasts on a year-on-year basis (and not in cumulative terms). This executive summary presents only our proposed *nominal* cost escalation rates (on a year-on-year basis) as these are better understood by most readers. Our detailed report (below) presents nominal and real year-on-year forecasts spanning FY2016-2022. We assume CPI is 2.5% per annum (pa) over that period.

Our base year is 2015. We present nominal escalation rates for Powerlink's cost drivers in the following table.

Powerlink cost escalation (year-on-year nominal)

Cost Category	2016	2017	2018	2019	2020	2021	2022	Simple Average	'+' or '-' CPI
Aluminium	3.9%	6.3%	4.7%	6.1%	6.1%	5.3%	4.7%	5.3%	+
Copper	-1.5%	2.9%	2.3%	5.8%	6.0%	5.3%	4.6%	3.6%	+
Steel	-5.9%	9.5%	10.0%	7.3%	5.6%	5.7%	5.0%	5.3%	+
Oil	-0.5%	16.8%	8.3%	5.3%	3.9%	2.8%	4.9%	5.9%	+
Construction costs	-7.0%	-1.4%	1.8%	5.9%	4.4%	5.7%	4.5%	2.0%	-
TWI	-3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.4%	-
CPI	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	-

We expect aluminium, copper, steel and oil prices to increase, in simple average terms, by more than forecast CPI increases. Oil prices will have the largest average increase (5.9% pa), which is driven by price spikes anticipated in 2017 and 2018 (16.8% and 8.3% respectively). However, construction costs will (on average) escalate at a rate lower (i.e. 2.0% pa) than forecast CPI increases.

1. Introduction

Powerlink engaged Jacobs (us) to estimate materials-related cost escalation rates for its upcoming revenue proposal to the Australian Energy Regulator (AER). Our report provides escalation rates from financial year (FY) 2015-16 (2016) to 2021-22 (2022) for Powerlink's transmission assets.

The cost escalation factors adopted over the next regulatory period will impact Powerlink's annual revenue requirement. Appropriate cost escalation forecasts aim to protect Powerlink from input-price increases that can erode its revenue, and customers from over-estimates of cost increases.

Our forecasts, which are transparently developed with integrity, improve revenue adequacy and can also allow customers to experience real price decreases (all other factors being equal) where real cost decreases occur in relation to Powerlink's input costs.

If the price of distribution lines and general construction costs, for example, are anticipated to increase faster than the consumer price index (CPI), having positive real cost escalation factors will avoid inefficient cost signals and revenue inadequacy from impacting network service providers.

At the same time, robust and well-founded cost escalation factors provide confidence to downstream customers (i.e. small businesses and households) that Powerlink has proposed its revenue allowances in a reasonable, principled manner. For example, where we anticipate that transformer and switchgear costs will increase less than CPI, customers should benefit from real cost decreases.

Powerlink has sought our advice on three areas, namely:

- (nominal and) real annual material cost escalation rates and, if there is any difference across States, the real annual material cost escalation factors applicable to the relevant network service provider's State jurisdiction

- forecast details on any material exogenous factors that may impact on the reliability of material input costs with relevance to the network service providers' relevant State jurisdiction

- evidence of the historic correlation of manufactured network materials and equipment with the raw material input costs.

In producing this report, we note the AER's recent position on forecasting cost changes is to apply the consumer price index (CPI) or real cost escalation of zero. The AER's reasons for its view include:

- the degree of potential inaccuracy of commodities forecasts

- limited evidence to support how accurately [the entity's] materials escalation model forecasts reasonably reflect changes in prices paid by [the entity] for physical assets in the past and by which [the AER] can assess the reliability and accuracy of its materials model forecasts

- insufficient evidence to show that [the entity] has considered whether there may be some material exogenous factors that impact on the cost of physical inputs (Final Determination on ActewAGL, Attachment 6, pp. 90-91).

The Australian Bureau of Statistics (ABS 2015) states that CPI is a measure of changes in retail prices of a basket of goods and services consumed by households in Australian capital cities. The basket includes food, alcohol and tobacco, clothing and footwear, housing, household contents and services, health, transportation, communication, recreation, education and financial and insurance services.

We do not consider CPI to be especially relevant to the inputs for constructing and maintaining electricity network assets. We accept that CPI can be used as a proxy for cost escalation where no other appropriate method exists. Over the years, however, we have developed a more appropriate method.

Specifically, for estimating network cost escalation, rather than CPI, we recommend using commodity cost drivers and asset classes, which we have for ten years refined to forecast cost changes in transmission and distribution networks.

Powerlink asked us to provide nominal and real forecasts on a year-on-year basis (and not in cumulative terms). Our report (below) presents nominal and real year-on-year forecasts spanning FY2016-2022. We assume CPI is 2.5% per annum (pa) over that period.

Our report is structured as follows:

- Executive Summary

- Section 1: Introduction

- Section 2: Forecasts of input costs – sets out our recommended cost escalation factors for cost drivers underpinning Powerlink's physical assets, including commodities and other relevant indices.

2.   Forecasts of input costs

This section describes our forecasting approach for the key input costs or cost drivers underlying Powerlink's physical assets. The cost drivers we consider are:

- exchange rates

- aluminium

- copper

- steel

- crude oil

- construction costs

- CPI.

This section also covers our conversion of the cost drivers from nominal to real terms. In summary, we do this by multiplying a current nominal price by the ratio of the base year's CPI to current CPI (see Section 2.7). At the section's conclusion, we summarise the nominal (Section 2.8) and real (Section 2.9) cost escalation rates for the key cost drivers.

2.1   Exchange rates

We open this section with our approach to estimating future exchange rates as prices for commodities are usually quoted in United States Dollars (USD) and we need to convert them to Australian dollars (AUD) for our analysis. As part of this, we consider Australia's trade-weighted index.

2.1.1   USD

As aluminium, copper, steel and oil are four of Powerlink's key cost drivers, we must consider how the AUD will vary against the USD to estimate cost escalation for those commodities.

We have relied primarily on the CME Group's exchange rate futures-contracts information, which is supplied quarterly and covers September 2015 to September 2020. A foreign exchange futures contract is a contract to exchange one currency for another at a specified date in the future at a price (exchange rate) that is fixed on the purchase (or strike) date. Such contracts are binding and often deliverable (i.e. the money ultimately exchanges hands electronically at the execution date). Given these contracts reflect commercial decisions parties actually make, using futures contract information is robust and realistic way to forecast future exchange rates.

 Our approach for estimating the forecast USD/AUD exchange rates:

- We first identify the most recent monthly average USD/AUD exchange rate from the Reserve Bank of Australia (RBA) record (i.e. July 2015).

- For the period September 2015 to September 2020, we adopt the CME Group futures' quarterly data[1].

- For the end of the regulatory period (i.e. June 2022), we adopt the September 2020 futures' data point.

- We then linearly interpolate between the above data points to form a monthly time series, and then take the average of 12 months' data within each financial year to be the 'data point' for that financial year.

Using this approach, we developed the following forecast average annual exchange rates. The approach forecasts the USD/AUD exchange rate will fall (representing a weakening AUD) from 2015 to 2020, and practically remain flat till 2022 (see Table 2.1).

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[1] As at 14 August 2015.

Table 2.1: Forecast USD/AUD exchange rates from 2015 to 2022

FY	2015	2016	2017	2018	2019	2020	2021	2022
Average USD/AUD exchange rate[2] ($)	0.837	0.735	0.722	0.715	0.709	0.703	0.700	0.700

In our analysis, we connect our forecast monthly exchange rates with our forecast monthly price points for each of the relevant cost drivers (i.e. the imported commodities), resulting in an exchange-rate-adjusted forecast price for each of the relevant input cost drivers expressed in AUD. As our model uses monthly exchange rates, Table 2.1 (which adopts annual exchange rates) is provided only as a summary and guide to the reader on the monthly USD/AUD exchange rates underpinning our analysis.

We recognise there is uncertainty in this forecast, as with all forecasts.

2.1.2   Trade Weighted Index

While Powerlink's asset prices are linked to commodity-price movements, some of the asset-price changes will depend on other factors (e.g. changes in overseas manufacturing costs). The USD is not the only currency that will have a bearing on those outcomes. Since Powerlink imports a large share of its assets from other countries (e.g. China, Japan, Thailand), capturing the effect of other exchange rates is also important to ensure the robustness and accuracy of our cost escalation forecasts for imported cost inputs.

Using an exchange-rate index that reflects electricity network service providers' choice of trading partner countries, from which to import, would be ideal to account for that effect. However, we are not aware of any such specific index in existence. Accordingly, we must rely on an alternative approach and, to that end, have adopted the RBA's Trade Weighted Index (TWI).

The TWI is a weighted average of exchange rates between the AUD and currencies of Australia's main trading partners (from both export[3] and import perspectives). It accounts for 90% of Australia's trade with the rest of the world. Our review of Powerlink's procurement contracts reveals that countries from which it purchases assets are strongly represented among the TWI nations. Hence, using the TWI is a reasonable proxy for our analysis. Our approach for forecasting the TWI is as follows:

- We identify the most recent/actual historical monthly average Australian TWI data (i.e. July 2015)

- We assume this monthly average persists from July 2015 onwards to 2022.

Our rationale for adopting the position captured in the second dot point above is set out below. Using the RBA's historical data[4], we estimated the average TWI between 1 August 2010 and 31 July 2015:

- five-year average – 72.8

- four-year average – 72.3

- three-year average – 71.1

- two-year average – 68.5

- one-year average – 66.3.

Our analysis reveals a downward trend in the TWI, suggesting it might be lower in future years. We thus consider it reasonable to use the July 2015 TWI average, which is 62.1 (i.e. the AUD buys 62.1 units of the TWI's currency basket).

While we could have linearly interpolated between the one- and five-year averages to estimate exchange rates between 2015 and 2022, we considered it was too big of a leap to make that assumption. For our USD/AUD

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[2] The amount of USD required for purchasing one AUD.
[3] Ideally, for our analysis, a TWI reflecting Australia's imports only would be more suitable than an index capturing the sum of exports and imports. However, the RBA does not publish such an index.
[4] See RBA's F11 Exchange Rate publications, available at: http://www.rba.gov.au/statistics/historical-data.html#exchange-rates

exchange-rate analysis (subsection 2.1.1), we had the benefit of both historical and futures contract information to inform our proposed long-term USD/AUD average. However, we do not have futures contract information for the TWI (a 20-currency basket), which means our proposed long-term TWI average would have relied on historical information only. In light of this, we consider it reasonable to assume the July 2015 TWI average of 62.1 is the long-term average.

We combine information from TWI and the Australian CPI (see Section 2.6) to track the manufacturing costs of physical assets made overseas.

2.2   Aluminium and Copper

Aluminium is the core material for making for transmission and distribution line conductors, and copper is used in circuit breakers.

Our data source for forecast aluminium and copper prices is from the London Metals Exchange (LME) and Consensus Economics (2015). To capture data points for each year in the regulatory period, we use the average of 12 months' worth of forecast (monthly) spot prices.

The LME publishes daily official and settlement price data, which are based on prices that buyers and sellers have sought on the exchange. Because these prices reflect actual commercial positions, we consider them to be more reliable than price forecasts. Accordingly, we give these data first preference as an input to our method. However, as the LME supplies these data up to December 2017 only, we rely on price forecasts from Consensus Economics thereafter. In particular, we use Consensus Economics' long-term forecast (published in June 2015), which is a single price for the next 5-10 years.

Specifically, we use the following approach for forecasting aluminium and copper prices:

- We adopt the LME forecast Primary Aluminium and Copper futures prices based on 12-month averages for price points as at July 2015, October 2015, December 2015, December 2016 and December 2017. The price points used are the mean of the LME's buyers' and sellers' offers.

- We use the Consensus Economics forecast by assuming it applies to the midpoint (7.5 years). Starting at publication in June 2015, this results in our (derived) long-term forecast price for aluminium and copper as at December 2022 (the approximate end of the regulatory period).

- We apply an exchange-rate adjustment, prior to our linear-interpolation step (below), to convert the USD prices to AUD.

- We then use linear interpolation to connect LME's December 2017 data point with the Consensus Economics December 2022 data point. Refer to Table 2.2 for our method's results.

Table 2.2: Forecast aluminium and copper prices from 2015 to 2022

FY	2015	2016	2017	2018	2019	2020	2021	2022
Aluminium Price (AUD)	2,252	2,340	2,487	2,604	2,763	2,931	3,086	3,229
Nominal growth rate - aluminium	-	3.9%	6.3%	4.7%	6.1%	6.1%	5.3%	4.7%
Copper Price (AUD)	7,613	7,501	7,719	7,899	8,355	8,859	9,326	9,758
Nominal growth rate - copper	-	-1.5%	2.9%	2.3%	5.8%	6.0%	5.3%	4.6%

To summarise, we combined futures' pricing data from LME (up to December 2017) and forecast price data from Consensus Economics (as at December 2022), and used linear interpolation for the period between December 2017 to June 2022.

2.3   Steel

Steel is used in numerous plant and equipment supporting transmission and distribution assets. Unlike the approach we adopted for aluminium and copper, we have not relied on the LME's futures information. While the LME produces futures prices for steel, we consider that market to be insufficiently liquid to be a robust source of price prediction. In this regard, steel traded on that exchange amounted to less than 0.1 million tonnes[5] in calendar year 2014, compared with 1,640 million tonnes of global steel production[6].

As an alternative, our data source for forecast hot rolled coil (HRC) steel prices is from Consensus Economics.

Our traditional approach (i.e. submitted to the AER previously) for forecasting HRC steel prices is as follows:

- We adopt Consensus Economics' short- and long-term nominal forecasts for steel, specifically the mid-point of HRC in the USA and European steel markets.
- We use linear interpolation to connect these forecasts (using the annual data points in Table 2.3) to generate monthly steel prices for application within our model.

Table 2.3: Forecast steel prices from 2015 to 2022 based on USA and European HRC steel markets

FY	2015	2016	2017	2018	2019	2020	2021	2022
Price (AUD)	662	716	760	803	825	850	881	909
Nominal growth rate	-	8.3%	6.2%	5.6%	2.7%	3.1%	3.6%	3.1%

In the past, much of the steel in network assets imported by Australian companies has come from the USA or Europe, which makes the above approach appropriate – particularly for previous regulatory periods. However, the USA and European sources of steel production and steel-based products, and our trading alliances, are increasingly shifting to Asia as Australia's relationships with that region strengthen, evidenced by free trade agreements commencing.

Recently, Consensus Economics released its forecast of HRC Asian steel prices. Assuming Powerlink procures assets that are increasingly comprised of steel or steel products sourced from Asia, we consider this to be a credible alternative to our past practice of using HRC USA/European steel prices.

Accordingly, and to maintain the currency of our method, we have provided our forecasts of HRC Asian steel prices in Table 2.4.

Table 2.4: Forecast steel prices from 2015 to 2022 based on the Asian HRC steel market

FY	2015	2016	2017	2018	2019	2020	2021	2022
Price (AUD)	595	560	613	675	724	765	808	849
Nominal growth rate	-	- 5.9%	9.5%	10.0%	7.3%	5.6%	5.7%	5.0%

Table 2.4 shows that, except for 2016, Asian HRC steel prices escalate more quickly than USA/European HRC steel prices in each of the years. The simple average nominal escalation rate between 2016 and 2022 for Asian steel is 5.3% while that for USA/European steel is lower at 4.7%.

Recommendation

We recommend estimating cost escalation for steel using Consensus Economics' short- and long-term nominal forecasts for HRC Asian steel prices.

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[5] See 2014 volumes for Steel Mediterranean Billet at: https://www.lme.com/en-gb/metals/reports/monthly-volumes/annual/2014/
[6] Refer to last column in second page of: http://www.worldsteel.org/dms/internetDocumentList/steel-stats/2015/Crude-steel-production-Jan-Apr-2015-vs-2016/document/Crude%20steel%20production%20Jan-Apr%202014%20vs%202015.pdf

2.4 Crude oil

Crude oil is important for manufacturing key inputs to transmission and distribution assets.

Crude-oil markets provide futures contracts with settlement dates sufficiently far forward to cover the duration of Powerlink's upcoming regulatory proposal. We have researched[7] the reliability of oil futures contracts as a predictor of actual oil prices, and consider that these contracts are – on their own - not a sufficiently robust foundation for forecasting future prices. For example, the US Federal Reserve concluded that:

> *"… more commonly used methods of forecasting the nominal price of oil based on the price of oil futures or the spread of the oil futures price relative to the spot price cannot be recommended."*

To address the shortcoming of using futures contracts, we referred to three relevant data sources (only one of which reflects oil futures contracts) to support our analysis, namely:

- Consensus Economics' Energy and Metals Consensus Forecasts
- New York Mercantile Exchange (NYMEX) future contracts[8]
- US Energy Information Administration (EIA) Annual Energy Outlook.

In previous cost-escalation work, we compared actual oil prices against those forecast by each of the data sources from 2011 to 2013. Table 2.5 reveals our analysis on percentage errors relating to those data sources.

Table 2.5: Forecast oil prices by data sources vs actuals (2011 to 2013) - percentage errors

Time forward from base date	Consensus Economics	NYMEX futures	EIA
1 year	7%	4%	17%
2 years	7%	10%	25%
3 years	9%	16%	28%
Simple Average	8%	10%	23%

Source: Jacobs' analysis (adapted from our cost-escalation report for Energex in October 2014, p.23)

Table 2.5 shows Consensus Economics' estimates had the lowest forecasting error (simple average of 8%) when compared with 10% (NYMEX) and 23% (EIA) from the other sources. Accordingly, we rely on Consensus Economics' forecasts for the oil-price estimates. Our approach for forecasting crude oil escalation rates is as follows:

- Use Consensus Economics' short- and long-term nominal forecasts for oil prices as the anchoring data points.
- Linearly interpolate between these quarterly and annual figures to derive monthly prices
- Derive escalation rates from the linearly interpolated data.

Table 2.6 shows our forecast crude-oil prices and the changes (in nominal terms) as a basis for cost escalation.

Table 2.6: Forecast crude-oil prices from 2015 to 2022

FY	2015	2016	2017	2018	2019	2020	2021	2022
Price (AUD)	82	81	95	103	108	112	116	121
Nominal growth rate	-	- 0.5%	16.8%	8.3%	5.3%	3.9%	2.8%	4.9%

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[7] *Forecasting the Price of Oil*, Board of Governors of the Federal Reserve System, International Finance Discussion Papers, July 2011
[8] NYMEX is one of the world's largest physical commodity futures exchanges.

2.5 Construction costs

Construction costs account for the price movements in civil works that Australian network service providers undertake to expand and renew their infrastructure. Our main data source for forecast construction costs is the Australian Construction Industry Forum (ACIF).

The ACIF is the peak consultative organisation in Australia's building and construction sectors. It established the Construction Forecasting Council (CFC), which is responsible for generating forecast construction costs. The CFC published its most recent forecasts on 24 July 2015; we have incorporated these forecasts in our cost escalation model. The CFC forecasts the demand for 20 work types, for the next 10 years, across residential and non-residential building as well as engineering construction, across all states and territories.

Our approach for forecasting construction costs is as follows:

- Identify CFC's most recent forecast annual 'Engineering' construction price index
- Linearly interpolate between the index's (annual) data points to form continuous monthly data points over the regulatory period.

Table 2.7 presents our forecasts of construction costs based on CFC's index for engineering construction costs, which is published in real terms.

Table 2.7: Forecast construction costs (Real annual average) from 2015 to 2022

FY	2015	2016	2017	2018	2019	2020	2021	2022
CFC's Index (real)	0.874	0.793	0.763	0.758	0.783	0.797	0.822	0.838
Change (%) vs previous year[9]	-	-9.3%	-3.8%	-0.7%	3.3%	1.8%	3.1%	2.0%

Table 2.7 shows CFC expects real construction costs to decrease between 2015 and 2018, before exhibiting growth between 2019 and 2022.

2.6 CPI

2.6.1 Escalation of manufacturing costs for power-related equipment

The AER uses the Australian CPI as a proxy for Australian manufacturing activity index.

Alternatively, a historical Australian Producer Price Index (PPI) is available for electrical equipment manufacturing. The PPI relates primarily to the *manufacture* of electrical goods; however, network services providers do not manufacture electrical goods. Rather, they install and maintain electrical and other network equipment. Accordingly, we do not consider the PPI to be appropriate as a proxy for the networks.

Generally, we only consider using Australian CPI to escalate cost items for which we cannot identify a more suitable escalation rate. We therefore rely on CPI, for limited application, to represent the forecast trend of local manufacturing activity (manufacturing labour).

We use CPI to convert Australian-based input data from nominal to real terms (and from real to nominal where required).

2.6.2 Our CPI forecast

For historical data, we use the CPI published by the ABS. The ABS does not, however, publish CPI *forecasts*.

We rely on the RBA's Statement of Monetary Policy and its position on maintaining the CPI growth within a 2-3% pa band, as a basis for our CPI forecasts. We assume the long-term CPI growth rate for Australia would be 2.5% (i.e. the inflation band's midpoint).

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[9] Some rounding adjustments have been made.

Our approach is as follows:

- Use most recent quarterly data from ABS (i.e. June 2015)
- Use CPI forecasts from RBA's Statement of Monetary Policy 2015, with:
  - specific forecasts of 1.5% in June 2015 and 2.5% in December 2015
  - average forecasts of 2.5% in June 2016, December 2016 and June 2017
- Use 2.5% pa, the midpoint of RBA's target inflation band, as the long-term CPI change rate till March 2022
- Linearly interpolate current forecast rates with the long-term CPI growth rate.

To summarise, we assume the CPI grows at 2.5% pa for each of the regulatory control period's years.

2.7 Real to nominal conversions

To convert a cost driver's price from nominal to real terms, we multiply its current nominal price by the ratio of the base year's CPI to the current CPI.

$$Real\ Price\ (t) = Nominal\ Price\ (t) * \frac{CPI\ (base\ period)}{CPI(t)}$$

While we apply this conversion to the commodities' monthly prices, we report our escalation rates at year-to-date levels. Our traditional cost-escalation model addresses this technical matter.

2.8 Summary of escalation rates for key cost drivers (nominal)

Table 2.8 summarises the nominal cost escalation rates for the key cost drivers.

Table 2.8: Nominal escalation rates for cost drivers

Cost category	2016	2017	2018	2019	2020	2021	2022	Simple Average	'+' or '-' CPI
Aluminium	3.9%	6.3%	4.7%	6.1%	6.1%	5.3%	4.7%	5.3%	+
Copper	-1.5%	2.9%	2.3%	5.8%	6.0%	5.3%	4.6%	3.6%	+
Steel	-5.9%	9.5%	10.0%	7.3%	5.6%	5.7%	5.0%	5.3%	+
Oil	-0.5%	16.8%	8.3%	5.3%	3.9%	2.8%	4.9%	5.9%	+
Construction Costs	-7.0%	-1.4%	1.8%	5.9%	4.4%	5.7%	4.5%	2.0%	-
TWI	-3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.4%	-
CPI	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	-

We expect aluminium, copper, steel and oil prices to increase, in simple average terms, by more than forecast CPI increases. Oil prices will have the largest average increase (5.9% pa), which is driven by price spikes anticipated in 2017 and 2018 (16.8% and 8.3% respectively). However, construction costs (on average) will escalate at a rate lower (i.e. 2.0% pa) than forecast CPI increases.

2.9 Summary of escalation rates for key cost drivers (real)

Table 2.9 summarises the real cost escalation rates for the key cost drivers.

Table 2.9: Real cost escalation rates for cost drivers

Cost category	2016	2017	2018	2019	2020	2021	2022
Aluminium	1.5%	3.7%	2.2%	3.5%	3.5%	2.7%	2.1%
Copper	-3.7%	0.4%	-0.2%	3.2%	3.4%	2.7%	2.1%
Steel	-8.0%	6.8%	7.3%	4.7%	3.0%	3.1%	2.5%
Oil	-2.8%	14.0%	5.6%	2.7%	1.4%	0.3%	2.3%
Construction Costs	-9.3%	-3.8%	-0.7%	3.3%	1.8%	3.1%	2.0%
TWI	-5.5%	-2.4%	-2.4%	-2.4%	-2.4%	-2.4%	-2.4%
CPI	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

We commented on a selection of nominal escalation rates in section 2.8 (above). The same observations apply to this summary of real rates, so we do not repeat them here.

Appendix A. References

Alquist, R., Kilian, L & Vigfusson, R. J 2015, Board of Governors of the Federal Reserve System, International Finance Discussion Papers Number 1022, *Forecasting the Price of Oil*, July 2011, p. 69

Australian Bureau of Statistics (ABS) 2015, *6401.0 - Consumer Price Index, Australia, Jun 2015*, viewed 23 August 2015, < http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Jun%202015?OpenDocument>.

Australian Construction Industry Forum 2015, *Forecasts*, subscribed data, viewed 23 August 2015, < https://www.acif.com.au/forecasts/forecasts>.

CME Group 2015, *Australian Dollar Futures Quotes – Globex*, viewed 14 August 2015, < http://www.cmegroup.com/trading/fx/g10/australian-dollar.html>.

Consensus Economics 2015, Energy & Metal Consensus Forecasts, subscribed data, Survey Date June 15, 2015.

London Metal Exchange 2015, *Current calendar year MASP prices*, viewed 13 August 2015, < https://www.lme.com/metals/reports/averages/>.

Reserve Bank of Australia 2015, *Exchange Rates*, viewed 14 August 2015, < http://www.rba.gov.au/statistics/historical-data.html>.

Reserve Bank of Australia 2015, *Statement on Monetary Policy May 2015*, viewed 12 June 2015, < http://www.rba.gov.au/publications/smp/2015/may/pdf/0515.pdf>.

U.S. Energy Information Administration (EIA) 2015, Annual Energy Outlook 2015 with projections to 2040, viewed 12 June 2015, < www.eia.gov/forecasts/aeo>.

Appendix B. Response to AER position regarding cost escalation

Below is an excerpt of a report (publically available) we provided ActewAGL for its response submission to the AER's draft determination on matters concerning commodity price forecasting. We include this for Powerlink's reference:

Excerpt from Chapter 5 of that report:

Jacobs' response to the AER's summarised statements is set out below:

- **AER comments on page 6-114 of their Draft Determination that:**

  'Recent reviews of commodity price movement show mixed results for commodity price forecasts based on futures prices. Further, nominal exchange rates are in general extremely difficult to forecast and based on the economic literature of a review of exchange rate forecast models, a "no change" forecasting approach may be preferable.'

  Based on our review of the AER's draft decision, it appears the above statement relates to changes in either commodity prices or nominal exchange rates (or both).

  We consider the statement, in so far as it relates to commodity price escalation forecasts, inaccurate. Commodity price movements, including metal prices, have been forecast for many decades by the LME. The exchange's years of experience suggest a high level of credibility and certainty in developing these forecasts.

  BIS Shrapnel[10] accurately predicted the current drop in commodity prices including for steel, aluminium, copper which is most relevant to DNSPs. Its current forecast is that there will be a recovery in these commodity prices from 2016/17 onwards. This aligns with CEG's forecasts, which draw on a range of commodity price forecasts to produce a mean forecast within an envelope forecast. Jacobs' market intelligence from its mining-industry partners corresponds with these findings.

  Indeed, as country growth forecasts are well known and reasonably accurate, and as available capacity to supply commodities (and the change in that capacity over a given period, given the time taken to bring on new capacity) is relatively well known, then the demand-supply balance is well known. This, coupled with a good understanding of commodity price elasticity, allows reasonably accurate forecasts of commodity prices to be made.

  By default, no forecast can be guaranteed but it is an essential aspect of planning and budgeting for future activities. Robust forecasts are generally developed through applying experience and research, as the LME's and other commodity exchange forecasts are. Whilst they may not be precise, the outturn is usually within the envelope forecast.

  Taken to the extreme, the AER's position would suggest there is no merit in attempting to forecast commodity prices because no forecast can be accurate. If this position is to be adopted, then the AER is effectively saying there is no merit in planning, since planning must be based on both historical and forecast data.

  If, however, the AER's comment relates primarily to exchange rate forecasts, then Jacobs concurs that exchange rate fluctuations are more difficult to project over the medium term than commodity price movements. That said, we consider the difficulties in forecasting exchange rates, in itself is not a sufficient reason to reject the use of commodity price forecasts. We consider our analysis on the merits of using commodity price forecasts outweigh the inaccuracies of exchange rate movements -- especially in a context where the AER's proposed alternative is to use the CPI, our critique for which is set out below.

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[10] http://www.bis.com.au/reports/economic_outlook_r.html

- **AER comments on page 6-114 of their Draft Determination that:**

  'It is our view that where we are not satisfied that a forecast of real cost escalation for materials is robust, and we cannot determine a robust alternative forecast, then real cost escalation should not be applied in determining a service provider's required capital expenditure.'

  Jacobs (previously SKM) has produced, and continues to produce, commodity, insurance, wage, electricity forecasts that have been and are adopted by:

  - utilities (electricity, water, rail)

  - regulators (we note the AER adopted MMA's forecasts in the past), QCA and others

  - the State and Australian Governments.

  Most recently, we advised the QCA on forecast costs regarding the regulation of water (i.e. Gladstone Area Water Board and SEQ water utilities including SunWater) and rail companies (i.e. Aurizon Network). We also advised the Queensland Government on forecast costs related to proposed asset transactions.

  During the commodity boom, Jacobs successfully demonstrated that DNSPs' capital costs were (and are) strongly linked to commodity prices of steel, copper and aluminium. We do not consider that this linkage has changed, nor do we consider it logical to challenge an established commodity forecasting industry as being of no value.

  Many industries, banks, governments utilise such forecasts for planning and budgeting purposes. We also note the International Monetary Fund (IMF) and World Bank draw on commodity price forecasting. It seems unusual the AER would take such a dismissive position on such forecasts, without substantiation or providing a reasonable alternative.

- **The AER comments on page 6-115 of the their Draft Determination that:**

  'We accept that there is uncertainty in estimating real cost changes but we consider the degree of the potential inaccuracy of commodities forecasts is such that there should be no escalation for the price of input materials used by ActewAGL to provide network services.'

  We note the AER does not substantiate the statement, nor indicate the level of inaccuracy to which it refers. Hence, the statement lacks definition. Whilst we agree commodity forecasts, by definition, cannot always be accurate, they can be valuable for planning purposes. If this were not the case, then the commodity forecasting industry would not still be in existence from its foundation over a century ago.

  It would be helpful if the AER substantiated its statement with analysis and supporting data. We seek to clarify whether the AER is asserting that there is only an even chance the forecast is correct, or at least of the right order of magnitude, or of the correct sign (i.e. positive or negative growth). Substantiating a decision to not adopt forecasts (which are often considered valuable for network planning activities) requires the AER to make that clarification.

  The AER's statement can be deemed to be a non sequitur: using the premise that there are potential inaccuracies with commodity forecasts to conclude that escalation should not be applied is inappropriate. Rather, we consider it more appropriate to decide whether to apply commodity escalation on the basis of whether the relevant projections are more often right (in terms of being in the vicinity of percentage changes in the CPI) than wrong.

  Indeed, we note future CPI assumptions are also forecasts, but based on a basket of goods that is not representative of electricity DNSPs' cost bases.

- **The AER comments on page 6-115 of the their Draft Determination that:**

  'In previous AER decisions, namely our Final Decisions for Envestra's Queensland and South Australian networks, we took a similar approach. This was on the basis that as all of Envestra's real costs are escalated annually by CPI under its tariff variation mechanism, CPI must inform the AER's underlying assumptions about Envestra's overall input costs. Consistent with this, we applied zero real cost escalation and by default Envestra's input costs were escalated by CPI in the absence of a viable and robust alternative. Likewise, for ActewAGL, we consider that in the absence of a well-

founded materials cost escalation forecast, escalating real costs annually by the CPI is the better alternative that will contribute to a total forecast capex that reasonably reflects the capex criteria. The CPI can be used to account for the cost items for equipment whose price trend cannot be conclusively explained by the movement of commodities prices. This approach is consistent with the revenue and pricing principles of the NEL which provide that a regulated network service provider should be provided with a reasonable opportunity to recover at least the efficient costs it incurs in providing direct control network services.'

We consider that the AER has failed to substantiate the direct link between material cost escalation factors for network and system assets, and the principle of applying CPI to tariff variation or revenue and pricing mechanisms based on overall input cost movements. There are a range of costs that can contribute to the overall expenditure for a utility (of which network operating and capital expenditure is a part), for which it can seek to earn revenue through pricing and tariff mechanisms.

The Jacobs material cost escalation factor modelling considers the forecast movements in material costs for specific main asset types used in electricity distribution networks based on movements in primary cost drivers such as commodity prices, and these factors are used in forecasting escalation in annual capital expenditure forecasts. Escalation in operating expenditure forecasts will be related directly to any provisions in a current Certified Work Agreement concerning agreed movements in labour costs, or market based forecasts for labour cost escalation provided by reputable companies such as BIS Shrapnel.

Jacobs has long argued that CPI is not a reasonable proxy for cost movements in electricity asset material costs, as CPI relates to a basket of domestic goods. However, Jacobs agrees with the AER that it is appropriate to apply CPI as the cost escalation factor for non-network and general costs, such as consumables, plant and vehicles,

Therefore, and in accordance with the provisions of the National Electricity Law, the network operator should be provided with the opportunity to recover the efficient costs directly related to providing network services, recognising the primary cost drivers relevant to the primary network assets, which the AER has previously agreed consider movements in commodity prices.

- **The AER comments on page 6-151 of their Draft Determination that:**

  'The limited number of material inputs included in ActewAGL's material input escalation model may not be representative of the full set of inputs or input choices impacting on changes in the prices of assets purchased by ActewAGL. ActewAGL's materials input cost model may also be biased to the extent that it may include a selective subset of commodities that are forecast to increase in price during the 2014-2019 period'

The Jacobs model is based on the following primary factors which are considered to influence cost movements:

- Base metals such as copper, aluminium and steel
- Oil
- Construction costs
- Foreign exchange

These cost drivers were selected following a multi-utility strategic procurement study which researched contract information for main items of plant equipment and materials (such as power transformers, switchgear, cables and conductors) together with contract cost information for turn-key substation and overhead line projects (including plant equipment, materials, construction, testing and commissioning).

All of the modelling done by Jacobs during the past decade for Australian electricity distribution utilities has been based on these primary inputs, and this basis and approach has been accepted by the AER during this time. Whilst there may be other commodities such as nickel, zinc, tin and lead that could potentially contribute to movements in asset material costs, from our research Jacobs considered these were secondary factors only.

Drawing on extensive data and information gained over the last ten years through numerous assignments undertaken for the AER and Electricity Distribution Businesses, Jacobs has been able to periodically adjust and refine the commodity weightings applied in its model to make sure no bias is introduced into the weighting process.

The cost escalation model used by Jacobs for ActewAGL is identical to that used in developing material cost escalation factors for other electricity distribution utilities, and generates material cost escalation factors that are asset specific rather than utility specific. This is done so that any other known external factor that may affect asset costs specific to ActewAGL would be separately identified and any such impact separately quantified.

For ActewAGL, the cost escalation factors provided by Jacobs were installed cost escalation factors, and considered any labour escalation specific to ActewAGL (including consideration of provisions of the Certified Work Agreement).

In summary, Jacobs firmly considers the AER's indicated position on the lack of veracity of use of composite escalators based on weighted indices appropriate to specific capital cost building blocks and specific operational cost expenditures, drawing on price component forecasts from reputable and established bodies such as the ABS, BIS Shrapnel (and other metals market forecasting houses) is at odds with general thinking in developed (and developing) nations.

Jacobs has developed, applied and reviewed (e.g. through established back-casting methods) its method for producing such composite indices for over a decade. These methods are applied and accepted as being robust by regulators (including the AER), utilities throughout Australia and in other jurisdictions, international banks, and other investors.

We firmly believe, in line with other reputable forecasters in the private and public sectors, that using a composite basket of weighted indices, appropriate and specific to the cost item in question, to forecast price movements of that cost item is both robust and more reliable. We also consider this practice less prone to bias than applying a forecast single non-specific escalator such as CPI movements. This is because the CPI tracks a basket of consumer goods rather than costs relevant to electricity DNSPs.