# 2015/20 Regulatory Submission

ERGON ENERGY

## Cost Escalation Factors 2015-20

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## Contents

# Executive Summary

In previous decisions for electricity network service providers, the Australian Energy Regulator (AER) has allowed for costs related to capital and operational expenditure provisions to be escalated in real terms. Prior to these decisions the Australian Consumer Price Index (CPI) was used by the AER to represent cost escalation in relation to network material costs. The method currently accepted by the AER involves the modelling of the change in equipment prices through combining independent forecast movements in the real price of input commodities, with weightings for relative contribution of each commodity to the final equipment cost. This in turn generates real cost forecasts for the regulatory control period under review.

Jacobs was engaged by Ergon Energy in September 2013 to forecast the real cumulative material and labour cost escalation indices over the period 2015 to 2020 for Ergon Energy's forthcoming electricity regulatory proposal.

In developing the cost escalation factors, Jacobs has applied methodology consistent with the accepted approach for the AER's most recent electricity utility regulatory decisions including SP AusNet, Aurora Energy and Powerlink. The real cumulative material and labour cost escalation indices presented in this report are specific to the asset categories provided by Ergon Energy, and are based on the most recent information available.

## Material cost drivers

The following tables present the forecast results of Jacobs's analysis and modelling of underlying cost drivers and economic indicators, aggregated to Ergon Energy's standard asset classes respectively. The forecasted annual time period referenced in all the tables in this report runs from 1 July to 30 June in the following year. The base annual period for the real dollar values of commodities is the 2012/13 financial year.

These cumulative real indices therefore constitute Jacobs's calculated opinion of appropriate material and labour cost escalation rates that can reasonably be expected to affect Ergon Energy over the upcoming revenue regulation period. The results of Jacobs's modelling for cost escalation factors for the various cost drivers are presented in Table 1.

Table 1 Cumulative real escalation of cost drivers[1]

| Cost Driver | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Aluminium | 1.000 | 0.994 | 1.049 | 1.092 | 1.117 | 1.139 | 1.161 | 1.188 |
| Copper | 1.000 | 0.997 | 0.923 | 0.914 | 0.905 | 0.904 | 0.905 | 0.910 |
| Steel | 1.000 | 1.076 | 1.062 | 1.071 | 1.052 | 1.048 | 1.051 | 1.061 |
| Oil | 1.000 | 1.197 | 1.171 | 1.077 | 1.072 | 1.053 | 1.042 | 1.055 |
| Construction Index | 1.000 | 1.013 | 1.035 | 1.058 | 1.082 | 1.104 | 1.128 | 1.152 |
| TWI | 1.000 | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 |
| General labour | 1.000 | 1.010 | 1.024 | 1.039 | 1.056 | 1.073 | 1.090 | 1.108 |
| Utility sector labour | 1.000 | 1.010 | 1.024 | 1.039 | 1.056 | 1.073 | 1.090 | 1.108 |
| Professional services | 1.000 | 1.021 | 1.035 | 1.049 | 1.065 | 1.081 | 1.097 | 1.113 |
| CPI | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

1 Material cost escalation factors have been based on commodity forecasts in AUD

## Installed cost escalation by asset category

Table 2 presents the cumulative real installed cost escalation indices based on the movements in underlying cost drivers and economic indicators, aggregated at common standard asset class level used by Ergon Energy. In order to aggregate the input cost drivers at this level, Jacobs assigned appropriate weightings for the relative contribution of each of the input cost drivers, economic indicator and labour to each asset category.

Table 2 Cumulative real installed cost escalation of asset categories

| Asset category | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Overhead Subtransmission Lines | 1.000 | 1.025 | 1.038 | 1.053 | 1.062 | 1.073 | 1.086 | 1.102 |
| Underground Subtransmission Cables | 1.000 | 1.017 | 1.017 | 1.023 | 1.033 | 1.044 | 1.056 | 1.069 |
| Overhead Distribution Lines | 1.000 | 1.016 | 1.028 | 1.041 | 1.055 | 1.069 | 1.084 | 1.100 |
| Underground Distribution Cables | 1.000 | 1.013 | 1.027 | 1.040 | 1.055 | 1.070 | 1.086 | 1.102 |
| Distribution Equipment | 1.000 | 1.023 | 1.024 | 1.026 | 1.030 | 1.035 | 1.040 | 1.049 |
| Substation Bays | 1.000 | 1.019 | 1.025 | 1.030 | 1.038 | 1.046 | 1.055 | 1.066 |
| Substation Establishment | 1.000 | 1.014 | 1.034 | 1.055 | 1.077 | 1.098 | 1.120 | 1.142 |
| Distribution Substation Switchgear | 1.000 | 1.023 | 1.024 | 1.026 | 1.030 | 1.035 | 1.040 | 1.049 |
| Zone Transformers | 1.000 | 1.037 | 1.030 | 1.028 | 1.025 | 1.025 | 1.028 | 1.035 |
| Distribution Transformers | 1.000 | 1.026 | 1.029 | 1.034 | 1.040 | 1.046 | 1.055 | 1.066 |
| Low Voltage Services | 1.000 | 1.009 | 1.026 | 1.042 | 1.058 | 1.074 | 1.090 | 1.107 |
| Metering | 1.000 | 1.018 | 1.017 | 1.014 | 1.017 | 1.019 | 1.022 | 1.028 |
| Communications - Pilot Wires | 1.000 | 1.003 | 1.007 | 1.012 | 1.017 | 1.022 | 1.027 | 1.031 |
| Generation Assets | 1.000 | 1.029 | 1.027 | 1.028 | 1.029 | 1.032 | 1.037 | 1.045 |
| Street Lighting | 1.000 | 1.012 | 1.015 | 1.018 | 1.022 | 1.026 | 1.031 | 1.037 |
| Other Equipment | 1.000 | 1.003 | 1.007 | 1.012 | 1.017 | 1.022 | 1.027 | 1.031 |
| Control Centre - SCADA | 1.000 | 1.002 | 1.006 | 1.009 | 1.013 | 1.016 | 1.020 | 1.024 |
| Land & Easements | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Communications | 1.000 | 1.008 | 1.015 | 1.022 | 1.031 | 1.039 | 1.047 | 1.055 |
| IT Systems | 1.000 | 1.008 | 1.015 | 1.022 | 1.031 | 1.039 | 1.047 | 1.055 |
| Office Equipment & Furniture | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Motor Vehicles | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Plant & Equipment | 1.000 | 1.003 | 1.007 | 1.012 | 1.017 | 1.022 | 1.027 | 1.031 |
| Buildings | 1.000 | 1.012 | 1.032 | 1.052 | 1.074 | 1.095 | 1.116 | 1.138 |

The underlying cost drivers for some asset classes such as Communications, SCADA, IT systems, non-network asset categories including office equipment, motor vehicles and plant and equipment closely reflects the Australian CPI trend and as such no real cost escalation is implied.

## Operational expenditure cost escalation

Table 3 shows the cumulative real cost escalation factors for operational expenditure. These factors have been based on the forecast components drawn from historic operational expenditure data provided by Ergon Energy.

Table 3 Cumulative real operational expenditure cost escalation factors

| Component | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Utility sector labour | 1.000 | 1.010 | 1.024 | 1.039 | 1.056 | 1.073 | 1.090 | 1.108 |
| Contractors | 1.000 | 1.021 | 1.035 | 1.049 | 1.065 | 1.081 | 1.097 | 1.113 |
| Materials | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Other costs | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

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## Important note about your report

The sole purpose of this report and the associated services performed by Sinclair Knight Merz ("Jacobs") is to forecast the cumulative real material and labour cost escalation indices over the period 2015 to 2020 in accordance with the scope of services set out in the contract between Jacobs and Ergon Energy ("the Client"). That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs's Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party

**Limitations Statement**

Forecasts are by nature uncertain. Jacobs has prepared these projections as an indication of what it considers the most likely outcome in a range of possible scenarios. These forecasts represent the author's opinion on what is considered to be reasonable forecasts, as at the time of production of this document and based on the information set out in this report.

Jacobs has used a number of publicly available sources, other forecasts it believes to be credible, and its own judgement and estimates as the basis for developing the cost escalators contained in this report. The actual outcomes will depend on complex interactions of policy, technology, international markets, and behaviour of multiple suppliers and end users, all subject to uncertainty and beyond the control of Jacobs, and hence Jacobs cannot warrant the projections contained in this report.

**Expert Witness Compliance Statement**

In providing material cost escalators, Jacobs has read and agreed to be bound by the guidelines for expert witnesses in proceedings in the Fedral Court of Australia, as published by Chief Justice M.E.J. Black on 5 May 2008[2].

In providing consultive service in other assignments, Jacobs acknowledges a pre-existing relationship with Ergon Energy, but is confident such relationships do not compromise Jacobs's objectivity in defending its professional opinion based on specialised knowledge and capabilities held in the area of developing materials cost escalation rates for the Australian Energy Industry.

[2] Available to download from: http://www.fedcourt.gov.au/how/prac_direction.html#current

# 1. Introduction

Jacobs was engaged by Ergon Energy in September 2013 to forecast the cumulative real material, labour and installed cost escalation indices over the period 2015 to 2020 for Ergon Energy's forthcoming electricity regulatory proposal. The terms of engagement required Jacobs to provide its service to Ergon Energy in several stages, including:

1) Generation of cumulative real material, labour and installed cost escalation factors in October 2013, for initial modelling undertaken by Ergon Energy for the development of their regulatory proposal. A draft report to be issued to Ergon Energy by end of February 2014
2) Update of the cost escalation report in September 2014 and June 2015

This report has been prepared in response to the first stage of Jacobs's engagement, with Ergon Energy currently developing their initial proposal to submit to the AER in 2015. An integral step to developing annual expenditure forecasts is the production of a set of reasonable assumptions with respect to the likely rate of annual material and labour cost escalation.

Jacobs has been actively researching the capital costs of electricity network infrastructure works for some time. It has developed a material cost escalation modelling process which captures the likely impact of expected movements of specific input cost drivers on future electricity networks infrastructure equipment pricing, providing robust material cost escalation rates.

The cumulative real material, labour and installed cost escalation indices presented in this report represent Jacobs's calculated best estimate of likely cost escalation components to account for the predicted movement in underlying drivers affecting the cost of undertaking capital and operating expenditure work relative to the Australian CPI, being the base inflation factor used by the Regulators. Statements in this report that are not based on historical fact are forward looking statements. Although such statements are based on Jacobs's current estimates and expectations, and currently available competitive market economic data, forward looking statements are inherently uncertain. Jacobs, therefore, is cautious that there are a variety of factors that could cause business conditions and results to differ materially from what is contained in forward looking statements in this report.

The cumulative real material, labour and installed escalation indices presented are specific to the asset categories provided by Ergon Energy, and are based on the most up-to-date information available at the time of compilation.

## 1.1 Objective and scope of work

Jacobs understands the scope of the proposed study prescribes that the assignment and associated final report will:

- Follow the approach approved by the Australian Energy Regulator (AER) in recent final decisions
- Describe the cumulative real material, labour and installed escalation factor developed for relevant indirect and direct inputs into standard electricity transmission and distribution assets (e.g. steel, aluminium, copper, etc) for the next regulatory control period
- Describe the forecasting methodology used by Jacobs including the key drivers likely to impact on material escalation over the next regulatory control period
- Describe Jacobs's relevant expertise in relation to the scope of works
- Highlight forecasts that will be derived from appropriately sourced independent data and forecasts
- Illustrate forecasts that will be derived on a consistent basis

## 1.2 Deliverables

The primary deliverable for this assignment is a clear and concise independent consultancy report which supports the cumulative real cost escalation factors for materials, labour and installed assets for nominated asset categories, including an explanation of the approach adopted in developing the annual real material cost escalation indices and how this approach is consistent with recent electricity network decisions. The report will:

- Follow the approach approved by the AER in recent final decisions
- Describe the cumulative real material, labour and installed escalation factor developed for relevant direct inputs into standard electricity distribution network assets for the next regulatory control period
- Describe the forecasting methodology used by Jacobs including the key drivers likely to impact on material, labour and installed cost escalation over the next regulatory control period
- Highlight forecasts that will be derived from appropriately sourced independent data and forecasts
- Describe Jacobs's relevant expertise in relation to the scope of works

# 2. Method

In past decisions for electricity network service providers, the AER has allowed the costs related to capital and operational expenditure provisions to be escalated in real terms. Prior to these decisions, the Australian CPI was generally used as a proxy to account for the escalation expected in relation to these network costs.

The methods more recently accepted by the AER sought to better characterise the likely escalation in price of equipment/project costs through combining independent forecast movements in the price of input components, with 'weightings' for the relative contribution of each of the components to final equipment/project costs. This in turn generates real cost forecasts for the regulatory control period under review.

In its final decision for the NSW Electricity Distribution Businesses, the AER stated:

> *In light of these external factors, it was considered that cost escalation at CPI no longer reasonably reflected a realistic expectation of the movement in some of the equipment and labour costs faced by electricity network service providers (NSPs). It was also communicated by the AER at the time of allowing real cost escalations that the regime should systematically allow for real cost decreases. This was to allow end users to receive the benefit of real cost reductions as well as facing the cost of real increases.*[3]

Jacobs confirms that its method for modelling the forecast changes in the costs of materials used in Ergon Energy's capital and operating expenditure forecasts is consistent with the approach accepted by the AER.

This section of the report provides a step-by-step description of the method employed by Jacobs in modelling real material cost escalation forecast.

The opportunity to develop an enhanced understanding of the drivers of network asset costs originally presented itself to Jacobs during a 2006 multi-utility strategic procurement assignment. It was from this study that Jacobs was able to demonstrate that prices were increasing with rates higher than Australian CPI, and was able to develop and calibrate a model that described this escalation.

As part of this strategic procurement study a number of network asset equipment manufacturers and/or suppliers were surveyed to provide a greater understanding of the cost drivers underlying equipment pricing.

Jacobs also drew on information within studies undertaken on contract cost information for a number of turnkey and contracted construction projects (including plant equipment, materials, construction, testing, and commissioning). Jacobs's knowledge base of network management, operation, and asset procurement experience was also drawn upon during this establishment of cost drivers.

The results of Jacobs's research indicated that there are a number of common factors driving the changes in networks' capital infrastructure costs.

The primary factors (in no particular order) influencing material cost movements are considered to be changes in the market pricing position for:

- Metals – copper, aluminium and steel
- Oil – as a material in itself, as a proxy for energy costs, and as a proxy for plastics (primarily High Density Polyethylene HDPE, Cross Linked Polyethylene XLPE)
- Construction costs
- Labour costs
- Foreign exchange rates – primarily the USD to AUD relationship to convert commodities in international market quoted in USD

[3] AER 2009, NSW DNSP Final Decision P478. http://www.aer.gov.au/content/index.phtml/itemId/728076

- Foreign price inflation index – primarily the US Consumer Price Index (CPI) to convert price quoted in nominal USD terms into real USD terms (and vice versa)
- Australian Trade Weighted Index (TWI) – as weighted average purchasing power of Australian dollar in overseas market and as a proxy for imported manufactured goods
- Australian Consumer Price Index (CPI) – as a general price inflation index in itself to convert nominal AUD quotes into real AUD terms (and vice versa) and as a proxy for local manufacturing costs

Having identified these key cost drivers, Jacobs examined each of the main items of plant equipment and materials within its database, in order to establish a suitable percentage contribution, or weighting, by which each of these underlying cost drivers were considered to influence the total price of each completed item.

In its determination and application of final cost driver weightings for these network assets, Jacobs drew on a wide range of information such as its knowledge of commercial rise and fall clauses contained within confidential network procurement contracts sighted by Jacobs during market price surveys, information passed on during its interviews with equipment suppliers and manufacturers; as well as industry knowledge held within its large internal pool of professional estimators, EPCM project managers, economists, engineers and operational personnel.

With appropriate weightings developed and assigned to each component, the key cost drivers thus provided a means by which changes in the forecast price of each underlying cost driver might be foreseen to affect the overall cost of the network asset itself.

While there are benefits in maintaining consistency, particularly with past precedents, Jacobs has incorporated improvements to its modelling method when there was a clear need, particularly in response to regulatory precedents and as improved cost information becomes available. The information and modelling method was further updated during the 2010 multi-utility strategic procurement assignment.

The cost drivers with relevant economic indicators used in the Jacobs model, their major application, and their reference sources is shown in Table 4.

Table 4 Underlying information

| Cost Drivers | Application (mostly used for) | Sources |
|---|---|---|
| Aluminium, copper, steel and oil prices | Primary equipment, structures, overhead conductors, cables etc. | London Metal Exchange, Consensus Economics, MEPS, Bloomberg, US-Energy Information Administration and NYMEX |
| Foreign exchange rates and Australian TWI | Imported goods in Australian currency (e.g. secondary, switchgear, insulators etc.) and for non-metallic and non-oil based items | Bloomberg future contracts and Reserve Bank of Australia |
| Construction index | Civil, foundation, building, establishment etc. | Australian Construction Industry Forum |
| Labour | All assets | Australian Bureau of Statistics and Reserve Bank of Australia |
| Australian CPI | All (to convert nominal to real terms) and manufacturing | Australian Bureau of Statistics and Reserve Bank of Australia |
| US CPI | All imports (to convert nominal to real terms quoted in USD) | US Bureau of Labor Statistics and US Congressional Budget Office |

# 3. Key cost drivers

In order to ensure all forecasts incorporate current and recent market information, Jacobs updates key cost drivers and economic indicators within our internal model for each assignment. This ensures the most practical recent/current date information is used.

The following sections present a discussion of the methods by which the forecast movements of each cost driver and economic indicators are updated.

## 3.1 Australian Consumer Price Index

The Australian Consumer Price Index (CPI) is used as a proxy for the local manufacturing price index. Jacobs acknowledges that while the historic Australian Producer Price Index (PPI) for electrical equipment manufacturing is available[4], this index is more relevant to the manufacture of electrical goods and as such is not considered appropriate for what is largely a construction/equipment maintenance industry; that is, electricity utilities are not electrical goods manufacturers. Jacobs has therefore relied on the Australian CPI, for which a credible forecast is readily available, to represent the forecast trend of the manufacturing activity (manufacturing labour) price index.

The Australian CPI is also used to account for those materials or cost items in equipment whose price trend cannot be rationally or conclusively explained by the movement of commodities price.

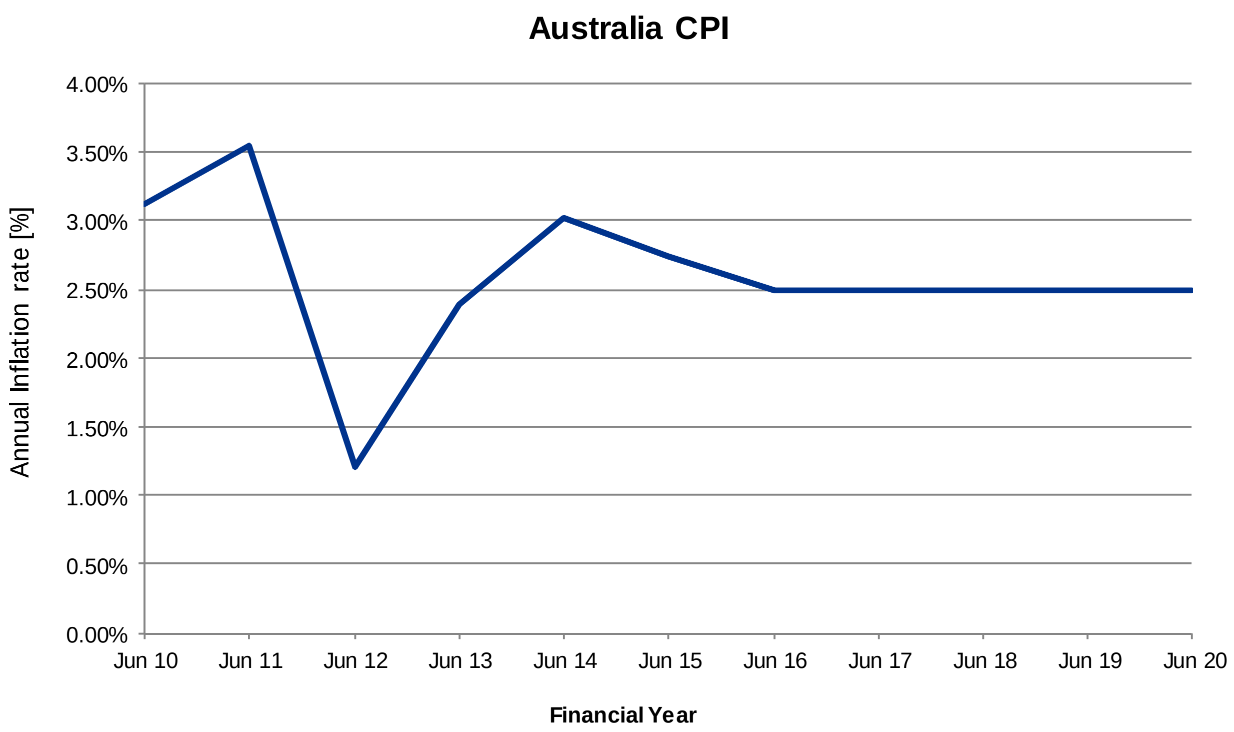
Finally, the Australian CPI is used to convert the Australian based input data from nominal to real term and vice versa.

Jacobs has chosen to adopt the method of forecasting Australian CPI used by the AER in recent electricity network decisions. This method uses the following process:

- Plot the most recent actual/ historical quarterly Australian CPI data from the Australian Bureau of Statistic (ABS) record and determine the annual Australian CPI % change by comparing with past historical data
- Plot two and half years of annual Australian CPI % change forecasts from the most recent Reserve Bank of Australia (RBA) Statement on Monetary Policy (August 2013), with forecasts out to December 2015
- Plot the annual Australian CPI % change as the RBA's inflation target midpoint of 2.5% in long term
- Apply linear interpolation between the above plotted annual % change points to form a continuous monthly set of data points for the entire duration of the forecast period
- Since this index data is annual measurements and takes account of the movements over the previous 12 months, the data point from the last month (i.e. the 12$^{th}$ month data) of the annual period is considered to represent the index level for that year. Also, these data are fairly steady and constant, and generally moves in one predictable direction. Therefore, 'picking' the end 12$^{th}$ month data from an annual period and comparing it with the previous annual period's end 12$^{th}$ month data yields almost the same result as the comparison between the 12 month average from one annual period to 12 month average from the previous annual period

[4] Australian Bureau of Statistics, PPI Table 12.

Figure 1 Historic and forecast annual CPI for period 2009/10 to 2019/20




This annual Australian CPI % forecast is presented in Table 5.

Table 5 Australian CPI % forecast

| | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AUS CPI factor | 1.031 | 1.035 | 1.012 | 1.024 | 1.032 | 1.028 | 1.025 | 1.025 | 1.025 | 1.025 | 1.025 |
| Annual CPI % | 3.12% | 3.55% | 1.21% | 2.39% | 3.02% | 2.75% | 2.50% | 2.50% | 2.50% | 2.50% | 2.50% |

## 3.2 Australian Trade Weighted Index

The Australian Trade Weighted Index (TWI) is a multilateral weighted average exchange rate index. It is the weighted average of exchange rates of the Australian dollar against currencies of its most important trading countries, weighted to reflect the importance or the volume of trade with those countries. Therefore, the movement in the currencies of those countries with a greater share of Australia's trade has greater effect on the index. The weightings of the various foreign currencies which make up the Australian TWI is annually updated or revised by the RBA based on the actual or new Australian-international trading data.

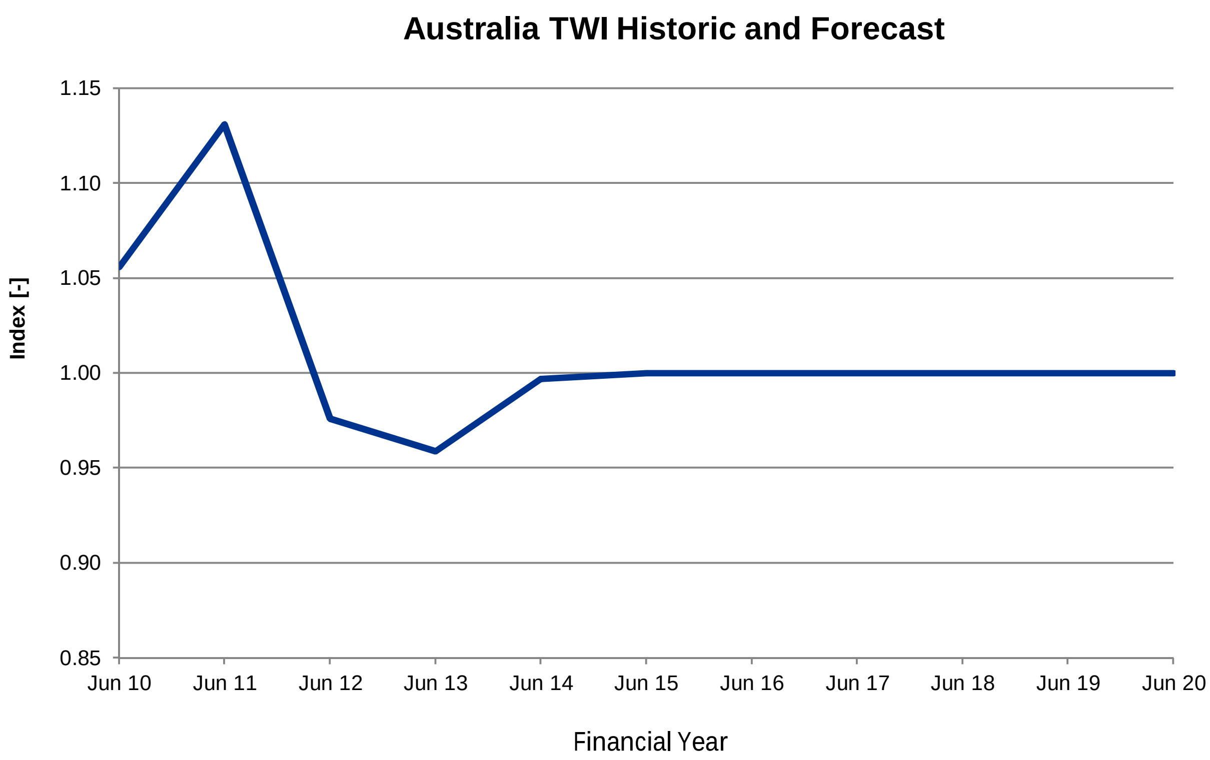
Jacobs uses the combination of Australian CPI and Australian TWI to describe the manufacturing activity for any imported good or equipment. The Australian TWI is also used to account for those materials or cost items in imported equipment whose price trend cannot be rationally or conclusively explained by the movement of commodities price.

In order to forecast the Australian TWI, Jacobs has assumed that the latest actual Australian TWI data as determined by the RBA to continue at the same level in the foreseeable future. This is considered prudent because one of the variables influencing the Australian economic outlook, including the Australian CPI forecast, is the volume of Australian international trade and the relative position of the Australian currency against the currencies of its major trading economies, which is summarised by the Australian TWI indicator. The underlying fiscal policy of the RBA periodically published in the Statement of Monetary Policy requires the TWI to remain in the same present level in the foreseeable future. Therefore this forecast aligns with the RBA's assumption as documented in its August 2013 Statement on Monetary Policy.

The following steps are performed to forecast this economic indicator:

- Plot the most recent actual/ historical monthly average Australian TWI data from the RBA record
- Extend the forecast Australian TWI going forward at the same level as the most recent actual data for every month of the forecast period
- Apply linear interpolation between the above plotted index to form a continuous monthly data points for the entire duration of the forecast period
- Since this index data is in annual measurements and takes account of the movements over the previous 12 months, the data point from the last month (i.e. the 12th month data) of the annual period is considered to represent the index level for that year. Also, these data points are fairly steady and constant, and generally moves in one predictable direction. Therefore, 'picking' the end 12th month data from an annual period and comparing it with the previous annual period's end 12th month data yields almost the same result as the comparison between the 12 month average from one annual period to 12 month average from the previous annual period.

Figure 2 Historic and forecast annual TWI for period 2009/10 to 2019/20




This Australian TWI forecast used during Jacobs modelling is presented in Table 6.

Table 6 Australian Trade Weighted Index

| | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Annual Trade Weighted Index | 0.959 | 0.997 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Cumulative Trade Weighted Index | 1.000 | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 |

## 3.3 Australian dollar to US dollar exchange rate

The Jacobs cost escalation modelling process uses the forecast USD/AUD exchange rates, to restate USD based forecast market prices of commodities, namely copper, aluminium, steel and oil, into their comparable AUD pricing movements. This is undertaken in order to account for any potential movements of base currency commodity market price movements through a strengthening or weakening of the AUD.

The following steps are performed to forecast this economic indicator:

- Plot the most recent actual/ historical monthly average USD/AUD exchange rate from the RBA record
- Thereafter, Jacobs has adopted the longer term historical average of 0.80 USD/AUD exchange rate as the long term forecast from December 2021
- Apply linear interpolation between the months without forward contract and long term average data point to form continuous monthly data points for the entire duration of the forecast period

The annual average of the twelve monthly USD/AUD exchange rate forecast data points as formed in the above steps is presented in the following Figure 3.

Figure 3 AUD/USD Exchange rate forecast

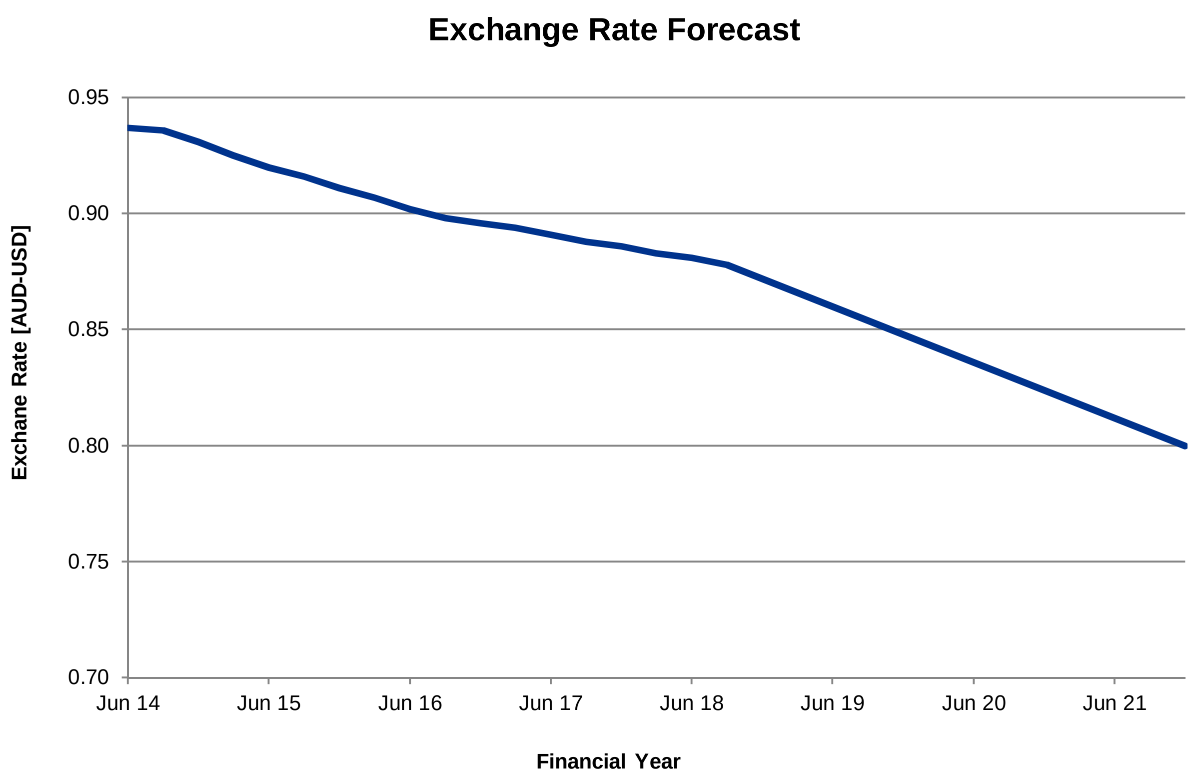



Table 7 Forecast annual average USD/AUD exchange rates

| | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Average annual exchange rate | 1.027 | 0.937 | 0.920 | 0.902 | 0.891 | 0.881 | 0.860 | 0.836 |

All forecast input pricing data quoted in USD at a future point in time is converted into AUD by using the USD/AUD exchange rate forecast from the same point in time.

## 3.4 US Consumer Price Index

The “USA All Urban Consumer CPI-U” trend is referred to as the US CPI to convert the US based input data from nominal to real term and vice versa.

The following steps are performed to forecast this economic indicator:

- Plot the most recent actual/ historical monthly US CPI data from the US Bureau of Labor Statistics record (September 2013 data for this modelling exercise)
- Plot the ten calendar years of US CPI forecast data from the most recent Budget and Economic Outlook publication of the US Congressional Budget Office
- Apply linear interpolation between the above plotted data to form continuous monthly data points for the entire duration of the forecast period

All forecast pricing data is quoted in USD in nominal terms at a future point in time and is converted into real term (or vice versa) by using the US CPI data from the same point in time.

## 3.5 Construction costs

Construction costs are included in the model as a key driver underlying network project construction costs, in order to account for price movements in materials elements of the civil works.

The Australian Construction Industry Forum (ACIF)[5] is the peak consultative organisation of the building and construction sectors in Australia. The ACIF has established the Construction Forecasting Council (CFC)[6] through which it provides a tool kit of analysis and information.

The following steps are performed to forecast this economic indicator:

- Plot the most recent actual/ historical and forecast annual ‘Engineering’ construction price index from the CFC’s toolkit
- Apply linear interpolation between the above plotted index to form continuous monthly data points for the entire duration of the forecast period
- Since this index data is annual measurements and takes account of the movements over the previous 12 months, the data point from the last month (i.e. the 12$^{th}$ month data) of the annual period is considered to represent the index level for that year. Also, these data are fairly steady and constant, and generally moves in one predictable direction. Therefore, ‘picking’ the end 12$^{th}$ month data from an annual period and comparing it with the previous annual period’s end 12$^{th}$ month data yields almost the same result as the comparison between the 12 month average from one annual period to 12 month average from the previous annual period.

[5] http://www.acif.com.au
[6] http://www.cfc.acif.com.au/cfcinfo.asp

Figure 4 CFC Engineering annual construction cost index forecast

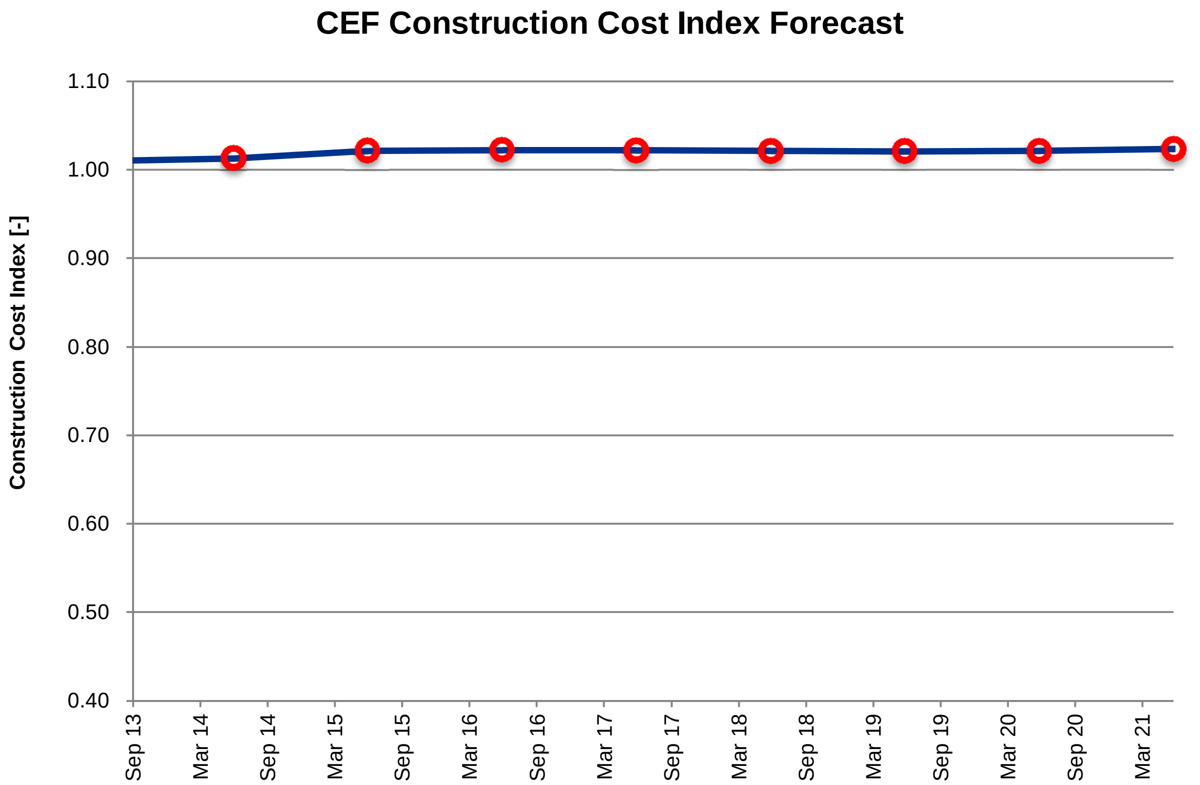



Table 8 provides the relative excerpt of the CFC engineering construction real price index, based on the most recent data available on April 2014.

Table 8 CFC forecast of engineering construction cost index

| | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Annual Construction Cost Index | 1.010 | 1.013 | 1.022 | 1.022 | 1.022 | 1.021 | 1.021 | 1.021 |
| Cumulative Construction Cost Index | 1.000 | 1.013 | 1.035 | 1.058 | 1.081 | 1.104 | 1.128 | 1.152 |

## 3.6 Commodity prices

This section of the report presents the methodology employed by Jacobs in updating the commodity price inputs to its cost escalation model.

Commodity prices have been known to be volatile in recent times as they are influenced by several economic factors, such as overall levels of demand and supply as well as hedging and investment activity, each of which was effected by the 2008 Global Financial Crisis (GFC). Even outside of the period now known as the GFC, prices over a lengthy forward period such as the five year regulatory cycle can be difficult to pin down. It is therefore imperative to model these aspects of cost escalation using recent and credible data.

In seeking to develop appropriate cost escalation rates that effectively characterize the underlying infrastructure asset cost pressures faced by network service providers within Australia, the Jacobs modelling methodology incorporates the use of commodity futures contract prices into cost escalation rate computations.

### 3.6.1 Commodities and the use of futures contract pricing

The inclusion of future contracts pricing, as a means to predict likely market pricing positions of the various commodities going forward, is generally considered suitable, as these contracts represent the firm position of market participants who have actively placed money behind their predictions.

Jacobs is of the opinion that the AER has a strong preference for the future contract market as the basis for forecasts.

Jacobs has thus adopted available futures prices into its forecast method, except where expressly noted. This is discussed in further detail in section 3.6.3.

### 3.6.2 Credible views of a range of professional forecasters

The future price position in the case of copper and aluminium are only available for three years out to December 2016 (prompt dates) from the London Metal Exchange (LME) futures contracts. In order to estimate prices beyond this latest prompt date point, it is necessary to revert to economic forecasts as the most robust source of future price expectations. Jacobs considers this to be superior to "trend" based analysis approaches. This is because economic forecasts consider the changes in global market supply (additional production capacity and/or retirement of excess/old infrastructure) as well as changes in global demand.

This methodology reflects the approach accepted by the AER in the most recent Powerlink Revenue Determination in utilising Consensus Economics[7] quarterly publication "Energy and Metals Consensus Forecasts" as the source from which the long-term position of the copper and aluminium market prices were obtained. These quarterly reports provide details of the price forecasts, of each professional analyst surveyed, for the next 10 quarters. "Energy & Metals Consensus Forecasts" also provides the "mean" or "consensus" of these various individual market predictions. In doing so, the publication allows the user to gather an overall market perception, without the need to apply a weighting to individual predictions in terms of gauging the organisation's perceived strength in forecasting, historical accuracy or such.

In developing annual price movements for copper and aluminium, Jacobs uses a method of linear interpolation between the relevant December prompt date LME contract prices and the Consensus Economics long term predictions of price movements, as described in Section 3.6.3.

### 3.6.3 Jacobs's application of futures contracts and long-term forecasts

When updating the future position of the key cost drivers, Jacobs employs various combinations of futures contract prices and a range of views from credible forecasting professionals to develop the likely year to date June average price positions of specific key cost components.

In order to estimate the impact of the Australian carbon price mechanism on the cost of materials and assets, Jacobs has assumed that there is no price impact on imported material/equipment. However, producers of locally manufactured materials and items of equipment can pass through half of the costs that they incur as a result of the mechanism (see detailed discussion in Section 4).

### 3.6.4 Aluminium and copper

The price trends of aluminium and copper are used to account for those materials or cost items in equipment which are made from it or/and whose price trend can be clearly explained by the movement of these commodity prices.

Jacobs employs an eight step approach to produce specific data points between which linear interpolation is applied in order to arrive at the year-to-March average future pricing positions for aluminium and copper. Due to the volatility in daily spot and futures market prices, Jacobs uses 12 months annual average prices within its modelling process.

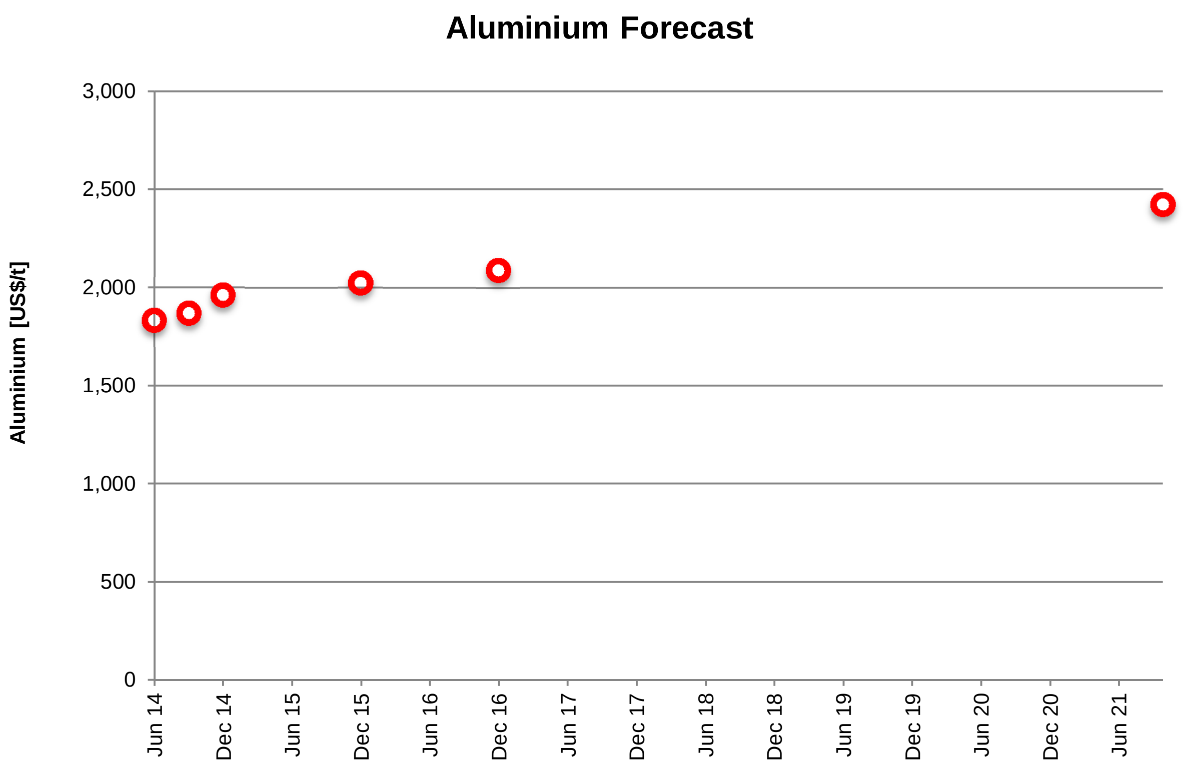
[7] Consensus Economics Inc. is a leading international economic survey organization based in the United Kingdom. Its publication "Energy & Metals Consensus Forecasts" is a subscription based comprehensive quarterly survey of over 30 of the world's most prominent commodity forecasters.

The steps involved are:

- Plot the daily average of the latest available complete month of LME spot prices
- Plot the daily average of the LME 3 month prices
- Plot the daily average of the LME December year 1 prices
- Plot the daily average of the LME December year 2 prices
- Plot the daily average of the LME December year 3 prices
- Plot the Consensus Economics Long Term forecast position (taken as 7.5 years from the survey date)[8]
- Apply linear interpolation between the plot points
- Since this price data trend fluctuates frequently and in both directions (increase or decrease), the year-to-March average (i.e. 12 months average) price data is considered to represent the price level for that April to March annual period

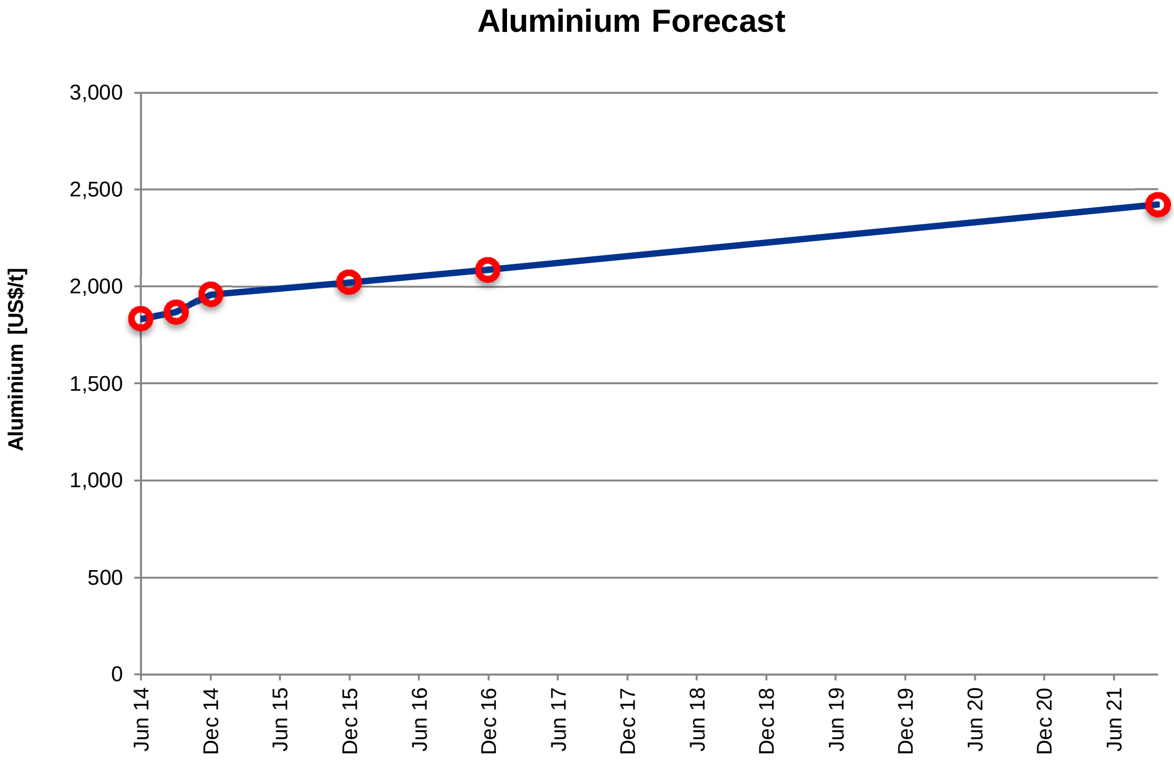
Given the different periods for some of the forecasts, all of the LME and Consensus Economics series are converted to a common base by interpolation.

Figure 5 Aluminium USD price forecast data points out to 2021




[8] The Consensus Long-term forecast is listed in the publication as a 5 – 10 year position. In an attempt to apply this in a reasonable manner, Jacobs consider the position to refer to the mid-point of this range, being 7.5 years, or 90 months hence.

Figure 6 Aluminium USD price forecast with interpolation between data points




The Consensus forecasts in USD and the average year from June to June input numbers used during Jacobs's modelling of the aluminium market prices are presented in Table 9.

Table 9 Real cost movements in aluminium[9]

| | 1/06/2014 | 1/09/2014 | 1/12/2014 | 1/12/2015 | 1/12/2016 | 1/10/2021 |
|---|---|---|---|---|---|---|
| Consensus USD forecasts shown in charts | 1,834.15 | 1,868.55 | 1,959.36 | 2,022.36 | 2,085.98 | 2,422.92 |

| | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Average AUD annual price | 1,894.56 | 1,883.74 | 1,987.40 | 2,068.06 | 2,115.90 | 2,157.07 | 2,199.09 | 2,250.27 |
| Annual escalation factor | 0.880 | 0.994 | 1.055 | 1.041 | 1.023 | 1.019 | 1.019 | 1.023 |
| Cumulative escalation factor | 1.000 | 0.994 | 1.049 | 1.092 | 1.117 | 1.139 | 1.161 | 1.188 |

9 The forecasts for aluminium are provided by Consensus Economics in USD per tonne, and Jacobs converts these to AUD using foreign exchange rates provided by the Reserve Bank of Australia. The escalation factors shown are based on year-on-year cost movements.

Figure 7 Copper USD price forecast data points out to 2021

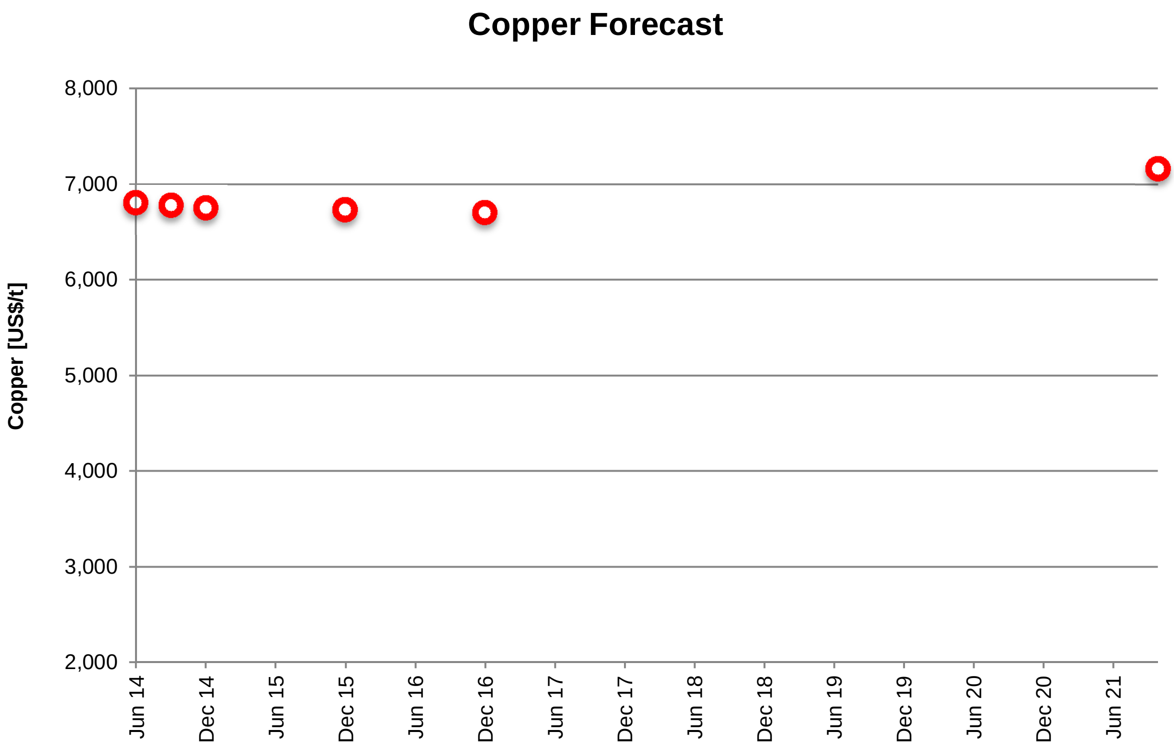
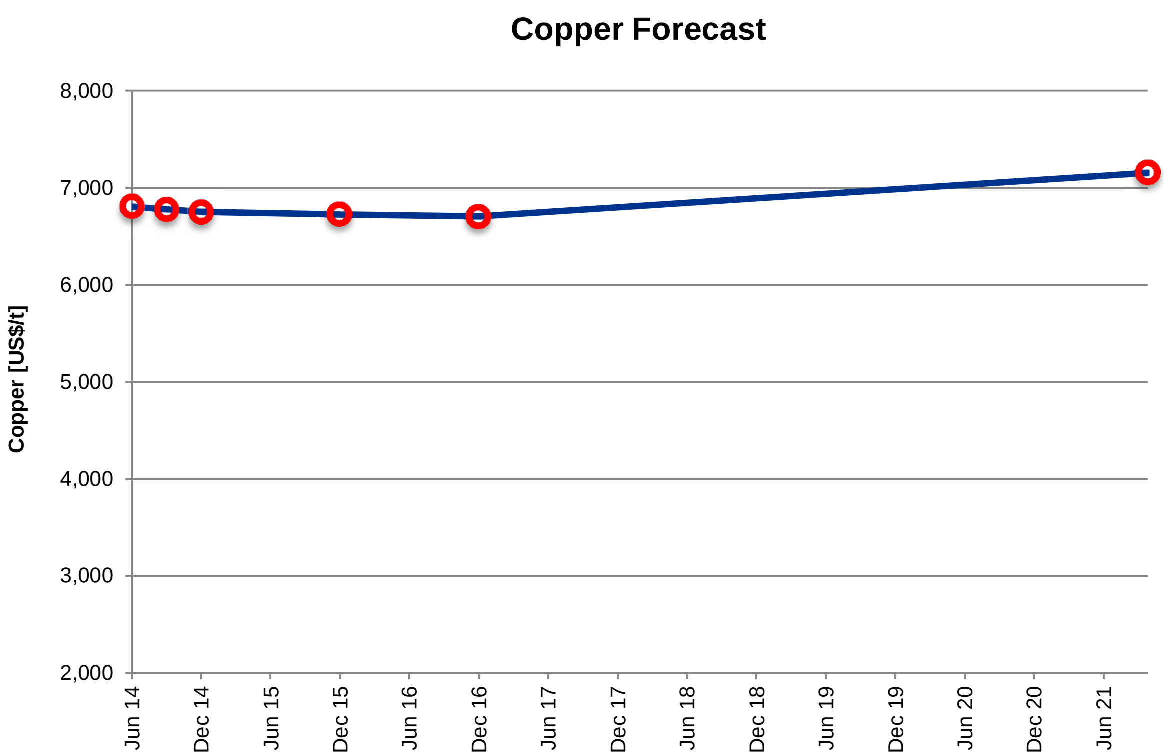



Figure 8 Copper USD price forecast with interpolation between data points



The Consensus forecasts in USD and the average year from June to June input numbers used during Jacobs's modelling of the copper market prices are presented in Table 10.

Table 10 Real cost movements in copper[10]

| | 1/06/2014 | 1/09/2014 | 1/12/2014 | 1/12/2015 | 1/12/2016 | 1/10/2021 |
|---|---|---|---|---|---|---|
| Consensus USD forecasts shown in charts | 6,805.80 | 6,777.36 | 6,750.95 | 6,728.10 | 6,704.05 | 7,156.40 |

| | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Average AUD annual price | 7,518.70 | 7,498.41 | 6,940.86 | 6,869.83 | 6,805.23 | 6,796.99 | 6,804.98 | 6,843.66 |
| Annual escalation factor | 0.924 | 0.997 | 0.926 | 0.990 | 0.991 | 0.999 | 1.001 | 1.006 |
| Cumulative escalation factor | 1.000 | 0.997 | 0.923 | 0.914 | 0.905 | 0.904 | 0.905 | 0.910 |

### 3.6.5 Steel

The methodology utilised for aluminium and copper cannot be applied for the assessment of steel due to the lack of a liquid steel futures market. Jacobs notes that the LME commenced trading in steel futures in February 2008; however, the LME steel futures are still not yet sufficiently liquid to provide a robust price outlook. The current global production of steel averages 1,400 million tonnes per annum and the LME steel billet futures have a traded volume of approximately six million tonnes per annum, less than 0.5% of the global market.

Jacobs has therefore selected the Consensus Economics forecast to be the best currently available outlook for steel prices. Consensus provides quarterly forecast prices in the short term, and a "long term" (5-10 year) price. The most recent Consensus Economics survey available at the time of compiling this report was the April 2014 Survey. This publication provided quarterly forecast market prices for steel till January 2016, as well as year 3 (August 2016), year 4 (August 2017), year 5 (August 2018), and a long-term forecast pricing position. Jacobs undertakes a seventeen step approach to produce specific data points between which linear interpolation is applied in order to arrive at the year-to-June average future pricing positions for steel. The steps involved are:

- Plot the latest available CE spot prices
- Plot the CE 2 month prices
- Plot the CE 5 month prices
- Plot the CE 8 month prices
- Plot the CE 11 month prices
- Plot the CE 14 month prices
- Plot the CE 17 month prices
- Plot the CE 20 month prices
- Plot the CE 23 month prices
- Plot the CE 26 month prices
- Plot the CE 29 month prices
- Plot the CE 36 month prices
- Plot the CE 48 month prices
- Plot the CE 60 month prices
- Plot the Consensus Economics long term forecast position (taken as 7.5 years from the survey date)
- Apply linear interpolation between the plot points

[10] These forecasts and escalation factors have been developed in a similar way to those for aluminium

- Since this price data trend fluctuates frequently and in both directions (increase or decrease), the year-to-March average (i.e. 12 months average) price data is considered to represent the price level for that April to March annual period

Consensus Economics provides two separate forecasts for steel, both being for the Hot Rolled Coil (HRC) variety, with the first being relative to the USA domestic market and the other the European domestic market. Both forecasts are quoted in US$.

The Consensus Economics US HRC price forecasts are presented US$ per *Short Ton*. As historical prices are all quoted in US$ per *Metric Tonne*, it is necessary to convert these prices into their Metric Tonne equivalent. This is a simple operation with the US HRC prices multiplied by a factor of 1.1023, being the standard conversion rate for the number of short tons per Metric Tonne. Once converted to their Metric Tonne pricing position, Jacobs uses the average of these two forecasts (US HRC and EU HRC) as its steel price inputs to the cost escalation modelling process.

Figure 9 Hot rolled coil steel USD price forecast data points out to 2021

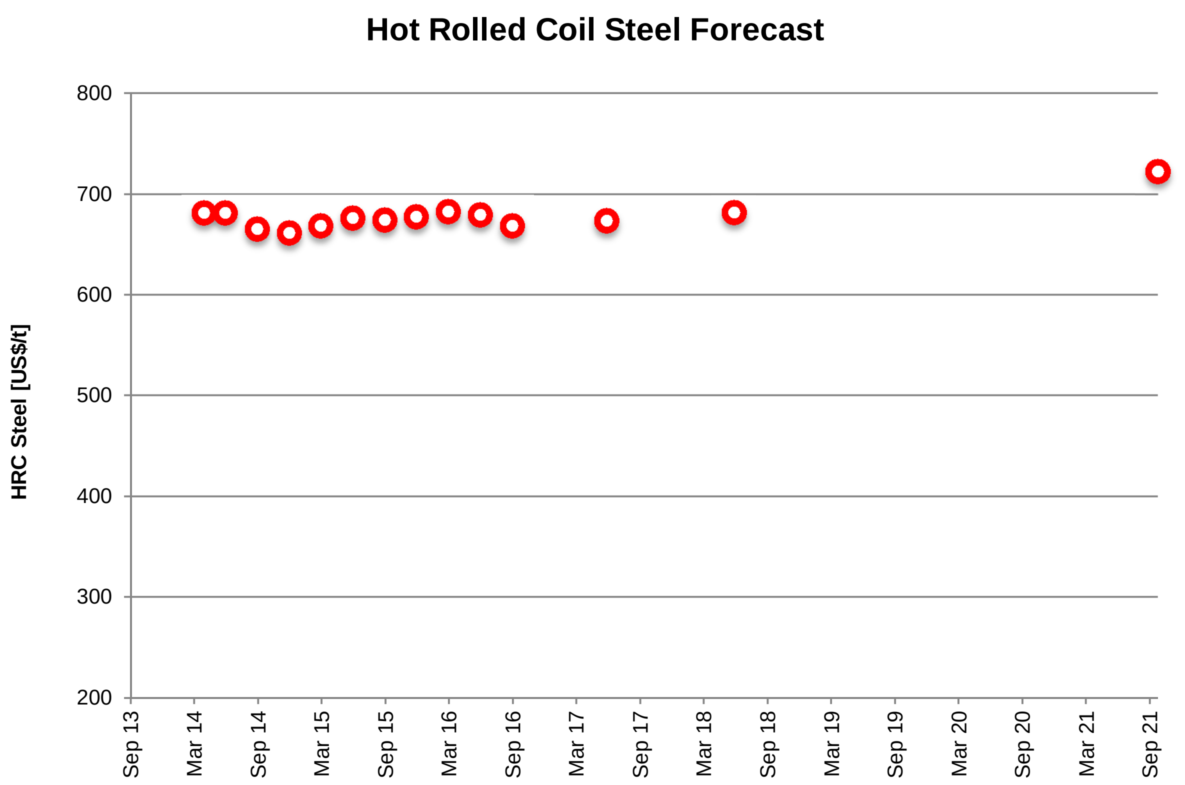
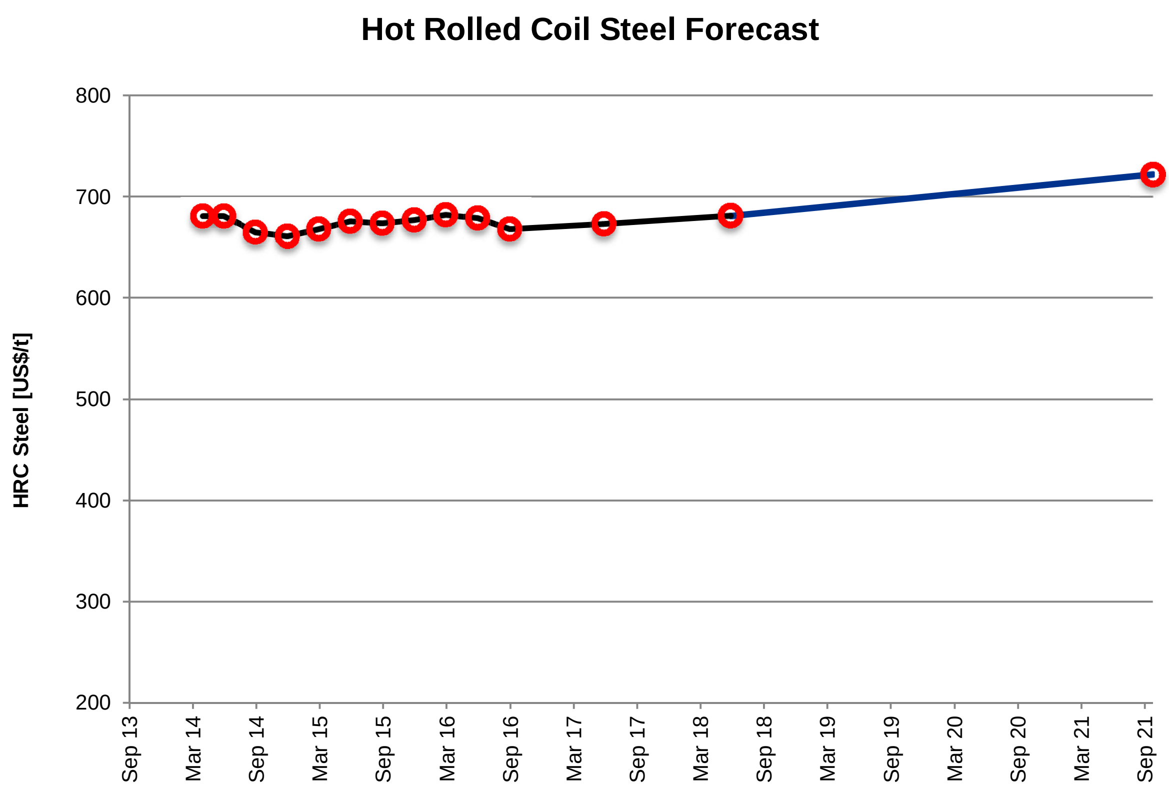


Figure 10 Hot rolled coil steel USD price forecast with interpolation between data points




The Consensus forecasts in USD and the average year from June to June input numbers in AUD used during Jacobs's modelling are presented in Table 11, and are consistent with the method accepted by the AER in recent electricity network decisions.

Table 11 Real cost movements in steel

| | 1/06/2014 | 1/12/2014 | 1/06/2015 | 1/12/2015 | 1/06/2016 | 1/06/2017 | 1/06/2018 | 1/10/2021 |
|---|---|---|---|---|---|---|---|---|
| Consensus USD forecasts | 680.90 | 661.24 | 675.74 | 676.72 | 678.73 | 673.03 | 681.20 | 721.84 |

| | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Average AUD annual price | 644.29 | 693.05 | 686.02 | 691.93 | 679.48 | 677.02 | 678.83 | 685.47 |
| Annual escalation factor | 0.883 | 1.076 | 0.987 | 1.009 | 0.982 | 0.996 | 1.003 | 1.010 |
| Cumulative escalation factor | 1.000 | 1.076 | 1.062 | 1.071 | 1.052 | 1.048 | 1.051 | 1.061 |

### 3.6.6 Oil

The world oil markets provide future contracts with settlement dates sufficiently far forward to cover the duration of Ergon Energy's upcoming regulatory control period. Various professional forecasts of oil prices from credible organisations to cover the duration of Ergon Energy's upcoming control period are also available.

Jacobs has researched[11] the reliability of oil future contracts as a predictor of actual oil prices, and has formed the view that futures markets solely are not a reliable predictor or robust foundation for future price forecasts.

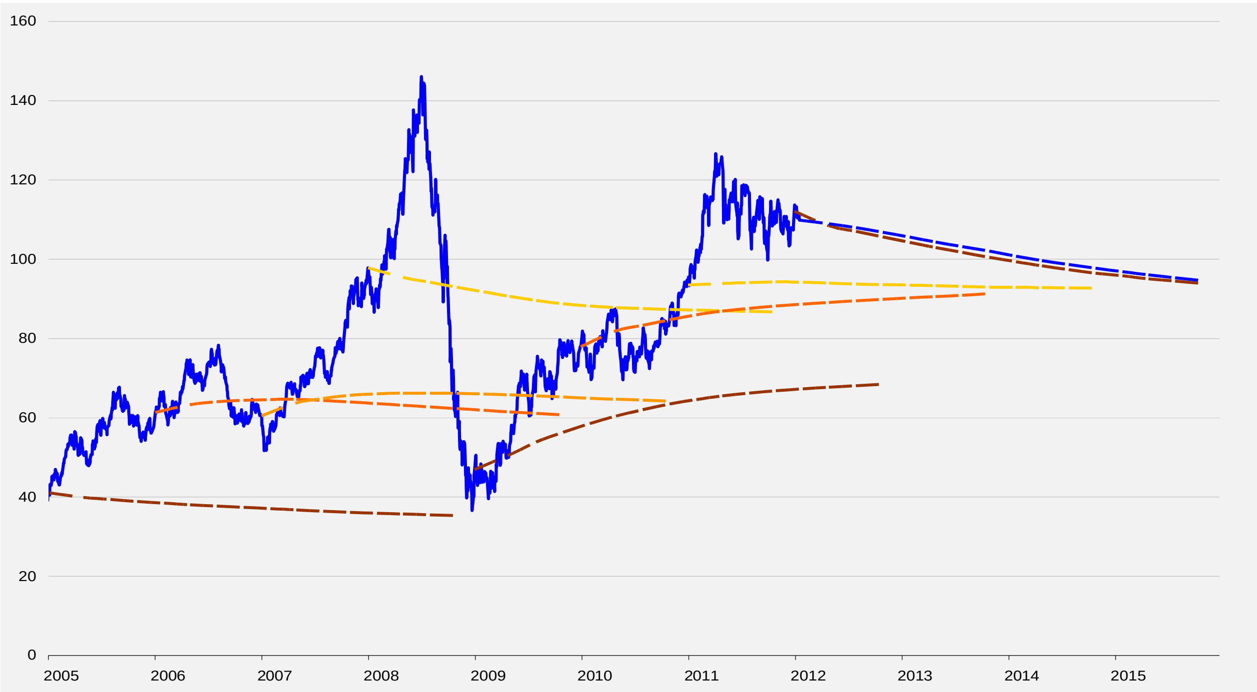
[11] Refer *What do we learn from the price of crude oil futures?,* Alquist & Kilian, Journal of Applied Econometrics, February 2010, and *Forecasting the Price of Oil*, Board of Governors of the Federal Reserve System, International Finance Discussion Papers, July 2011

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. There is no reliable evidence that oil futures prices significantly lower the MSPE[12] relative to the no-change forecast at short horizons, and long-term futures prices often cited by policymakers are distinctly less accurate than the no-change forecast."[13]*

Futures contracts tend to follow the current spot price up and down, with a curve upwards or downwards reflecting *current* (short term) market sentiment. This is illustrated in the Figure 11, with the blue trend line showing the spot price, with 4 years of futures prices shown at annual intervals. The "flat" nature of the futures price curve is clearly seen, with only a small upward or downward trend in the early period, and with the *current* spot price clearly shown to be the primary determinant of futures prices as far as 4 years ahead.

Figure 11 Oil (Brent[14]) futures compared to spot (blue trend line) 2005–2012

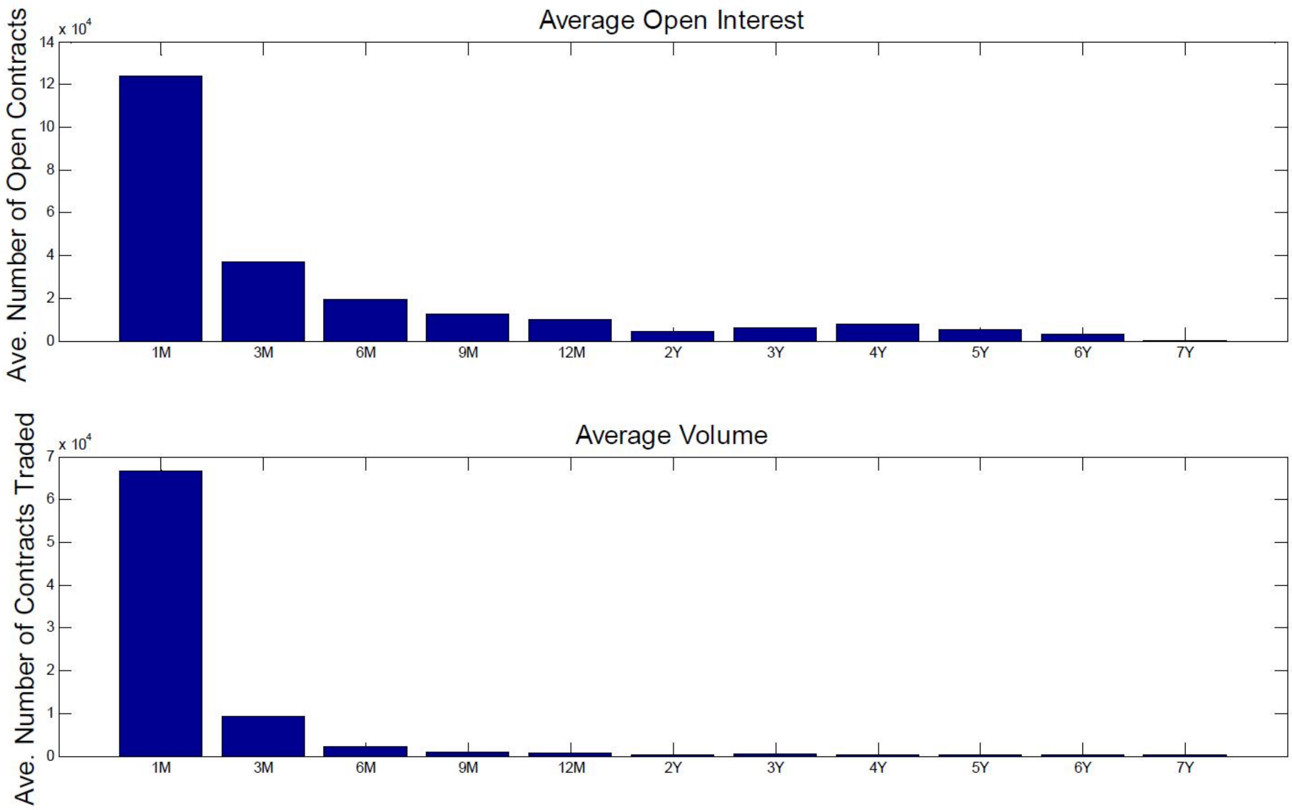



Source: Morgan Stanley Commodities

Future contract volumes beyond one year are low and the market is relatively illiquid, further highlighting the unsuitability of using futures prices as the basis of long term price expectations. As the chart in Figure 12 illustrates, beyond 3-6 months volumes and liquidity are very low.

[12] **M**ean-**S**quared **P**rediction **E**rror which measures the expected squared difference between what a predictor predicts for a specific value and what the true value is. It is thus a measurement of the quality of a predictor.
[13] *Forecasting the Price of Oil*, Board of Governors of the Federal Reserve System, International Finance Discussion Papers, July 2011
[14] While the chart refers to Brent futures, arbitrage opportunities ensure price disparities between West Texas Intermediate (WTI), Brent and other indices are low or with short term deviations related to specific supply constraints.

Figure 12 Future oil market volumes showing open contracts and traded volumes




In order to find a more reliable and robust source of future oil prices, Jacobs compared the actual prices against the historical predictions of oil-WTI price using three sources from recent (2011 – 2013) years:

- NYMEX futures contracts
- The US Energy Information Administration (EIA) Annual Energy Outlook
- Consensus Economics' "*Energy and Metals Consensus Forecasts*"

While none of these sources can claim to be wholly reliable, Jacobs has found that generally, the economic forecast were consistently least inaccurate than the other two sources.

Table 12 Average error in predicting future spot price (2011-2013)

| Time forward from base date | Futures | EIA | CE |
|---|---|---|---|
| 1 year | 4% | 17% | 7% |
| 2 year | 10% | 25% | 7% |
| 3 year | 16% | 28% | 9% |

Based on the least amount of error between the historical actual prices and the various types of historical available predictions (future contracts and forecasts), Jacobs has selected the Consensus Economics forecast to be the best currently available outlook[15] for oil prices throughout the duration of the Ergon Energy's forecast period. Consensus provides quarterly forecast prices in the short term, and a "long term" (5-10 year) price.

The most recent Consensus Economics survey available at the time of compiling this report was the April 2014 Survey. This publication provided quarterly forecast market prices for oil till January 2016, as well as year 3 (August 2016), year 4 (August 2017), year 5 (August 2018), and a long-term forecast pricing position. Jacobs undertakes a seventeen step approach to produce specific data points between which linear interpolation is applied in order to arrive at the year-to-March average future pricing positions for oil.

The steps involved are:

- Plot the CE 2 month prices
- Plot the CE 5 month prices
- Plot the CE 8 month prices
- Plot the CE 11 month prices
- Plot the CE 14 month prices
- Plot the CE 17 month prices
- Plot the CE 20 month prices
- Plot the CE 23 month prices
- Plot the CE 26 month prices
- Plot the CE 29 month prices
- Plot the CE 36 month prices
- Plot the CE 48 month prices
- Plot the CE 60 month prices
- Plot the Consensus Economics Long Term forecast position (taken as 7.5 years from the survey date)
- Apply linear interpolation between the plot points
- Since this price data trend fluctuate frequently and in both directions (increase or decrease), the year-to-June average (i.e. 12 months average) price data is considered to represent the price level for that June to June annual period

[15] In their July 2013 draft report "*Escalation factors affecting expenditure forecasts*" for NSW, ACT and Tasmanian electricity utilities, Competition Economists Group (CEG) noted that the AER had changed its position on the use of future prices for the purpose of predicting oil prices (section 4.3.1, p. 26). AER rejected the use of the Consensus Economics forecast, stating that *"… Consensus Economics and EIA forecasts were both included in the discussion paper's data set and found that, for horizons beyond several years, the nominal price of oil adjusted for expected inflation is the best forecast of nominal oil prices*." Therefore, the AER stated it preferred zero real escalation for crude oil.

CEG questioned the AER logic, suggesting that the analysis the AER had relied upon was based in US dollars (USD), and referred to real prices in USD terms. A constant real price in USD is not equivalent to a constant real price in Australian dollars due to changing foreign exchange rates between US and Australian dollars, and difference in expected inflation between Australia and the United States. CEG presented two alternative cost escalation tables - one based on a zero real escalation for US prices, and another on Consensus Economics forecasts as proposed by SKM. SKM noted the results generated by CEG relying upon the Consensus Economics forecasts were conservative in comparison with the alternative approach based on zero escalation on USD based prices.

Figure 13 Oil USD price forecast data points out to 2021[16]

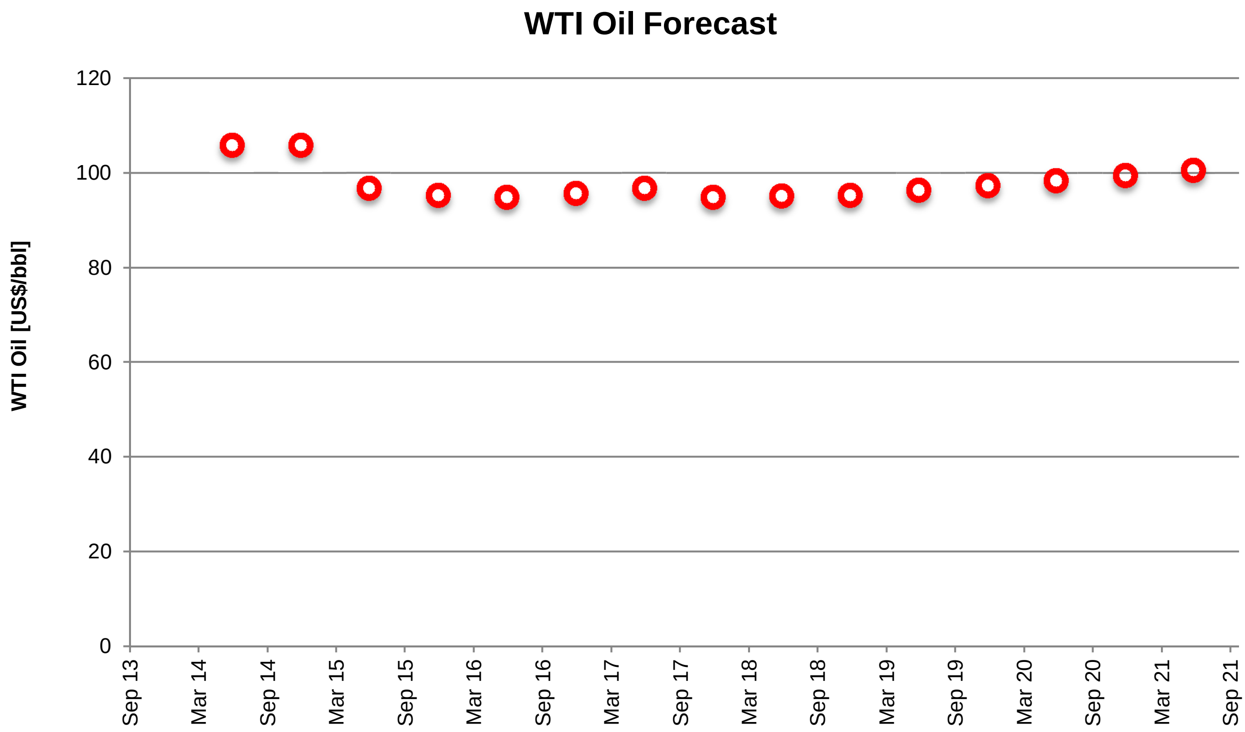
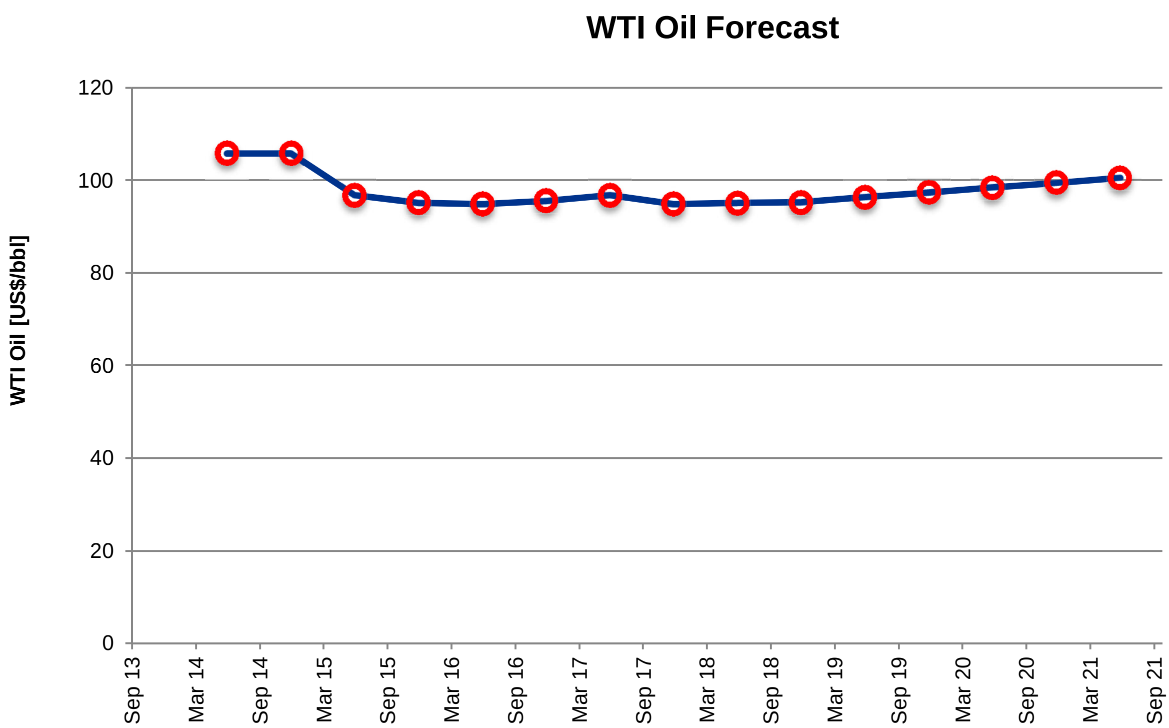



Figure 14 Oil USD price forecast with interpolation between data points




[16] Based on West Texas Intermediate crude oil forecasts in nominal US$/barrel

The Consensus forecasts in USD and resultant forecast in AUD for real oil prices used as the basis for calculating escalation are shown in Table 13.

Table 13 Real cost movements in oil

| | 1/06/2014 | 1/06/2015 | 1/06/2016 | 1/06/2017 | 1/06/2018 | 1/06/2019 | 1/06/2020 | 1/06/2021 |
|---|---|---|---|---|---|---|---|---|
| Consensus USD forecasts | 105.79 | 96.76 | 94.91 | 96.77 | 95.07 | 96.31 | 98.40 | 100.49 |

| | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Oil – WTI AUD/bbl | 90.47 | 108.27 | 105.94 | 97.47 | 97.02 | 95.26 | 94.29 | 95.42 |
| Annual escalation factor | 0.955 | 1.197 | 0.978 | 0.920 | 0.995 | 0.982 | 0.990 | 1.012 |
| Cumulative escalation factor | 1.000 | 1.197 | 1.171 | 1.077 | 1.072 | 1.053 | 1.042 | 1.055 |

# 4. Material asset class cost escalation factors

Table 14 illustrates the cumulative real material only cost escalation factors for the nominated Ergon Energy asset categories, based on the commodity and other cost driver escalation factors.

Table 14 Cumulative real material cost escalation factors for asset categories

| Asset category | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Overhead Subtransmission Lines | 1.000 | 1.031 | 1.044 | 1.059 | 1.064 | 1.073 | 1.084 | 1.099 |
| Underground Subtransmission Cables | 1.000 | 1.023 | 0.999 | 0.992 | 0.992 | 0.994 | 0.997 | 1.004 |
| Overhead Distribution Lines | 1.000 | 1.044 | 1.047 | 1.047 | 1.045 | 1.045 | 1.048 | 1.057 |
| Underground Distribution Cables | 1.000 | 1.031 | 1.042 | 1.042 | 1.049 | 1.053 | 1.058 | 1.068 |
| Distribution Equipment | 1.000 | 1.029 | 1.024 | 1.019 | 1.017 | 1.016 | 1.016 | 1.020 |
| Substation Bays | 1.000 | 1.023 | 1.025 | 1.026 | 1.030 | 1.034 | 1.039 | 1.048 |
| Substation Establishment | 1.000 | 1.013 | 1.035 | 1.058 | 1.081 | 1.104 | 1.127 | 1.151 |
| Distribution Substation Switchgear | 1.000 | 1.029 | 1.024 | 1.019 | 1.017 | 1.016 | 1.016 | 1.020 |
| Zone Transformers | 1.000 | 1.038 | 1.031 | 1.028 | 1.024 | 1.023 | 1.025 | 1.032 |
| Distribution Transformers | 1.000 | 1.034 | 1.031 | 1.031 | 1.031 | 1.033 | 1.037 | 1.045 |
| Low Voltage Services | 1.000 | 1.005 | 1.032 | 1.054 | 1.064 | 1.074 | 1.085 | 1.099 |
| Metering | 1.000 | 1.020 | 1.015 | 1.007 | 1.006 | 1.004 | 1.003 | 1.005 |
| Communications - Pilot Wires | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Generation Assets | 1.000 | 1.037 | 1.029 | 1.023 | 1.017 | 1.014 | 1.014 | 1.018 |
| Street Lighting | 1.000 | 1.013 | 1.011 | 1.009 | 1.007 | 1.006 | 1.006 | 1.007 |
| Other Equipment | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Control Centre - SCADA | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Land & Easements | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Communications | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| IT Systems | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Office Equipment & Furniture | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Motor Vehicles | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Plant & Equipment | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Buildings | 1.000 | 1.013 | 1.035 | 1.058 | 1.081 | 1.104 | 1.127 | 1.151 |

# 5. Labour

## 5.1 Overview of price and wage developments

In general, consumer price inflation tends to be kept on average at 2% to 3% a year across the business cycle. This average applies to both time and materials categories, noting that achieving a target CPI of 2% to 3% requires average increases in labour price to be the same. Over the longer term, nominal growth in unit labour prices does trend near CPI. This is primarily a result of two factors:

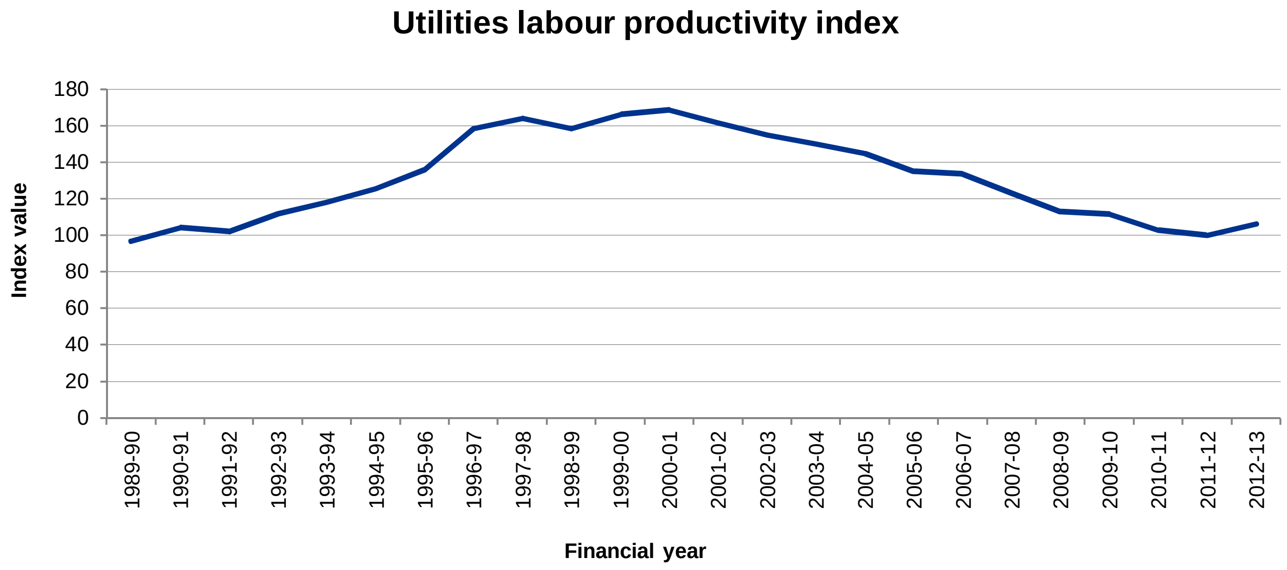
- The collective workforce gains experience and seniority as well as losses through retirements and other departures from the workforce. This creates a system of checks and balances, greatly diminishing the impact of individual wage gains which may be more than CPI on average.
- Productivity gains over time will contribute to reductions in rising wages. As people and technology become more efficient, this lessens the impact of rising wages on labour costs.

Over an extended period, growth in prices will tend to average within the RBA's target range for CPI of 2% to 3%. However, as expected, wages for the average worker tend to grow faster, equivalent to the sum of prices and productivity growth. As productivity has averaged around 3% in the last decade, this would mean that wages for the average worker have grown by approximately 5.5% (2.5% CPI + 3% productivity).

It is important to note that there will be some divergence between price and productivity growth over the course of the business cycle. When demand is high relative to supply of available workers, wage growth will exceed this measure and vice versa. Moreover, wages for the typical 'specific' worker will tend to grow faster still, as their seniority and experience increases each year. As the average or specific worker is becoming more efficient and skilled, so too does the industry they participate in. In this way, productivity gains may also be related to reductions in the number of labour units. For this reason it is important to capture industry and geographically specific cost drivers for labour wherever possible.

The ABS tracks multi-factor productivity for industry sectors using wage price movements as well as industry specific changes in capital spending and other indicators. This measure effectively captures those changes resulting from improved performance of the workforce, as well as reductions to inputs required (multifactor-productivity). It illustrates productivity changes over the last two decades, showing significant improvements over the period between 1995 and 2000, which likely results from technology improvements in the sector.

Figure 15 ABS Multi-factor labour productivity index for utilities sector[17]



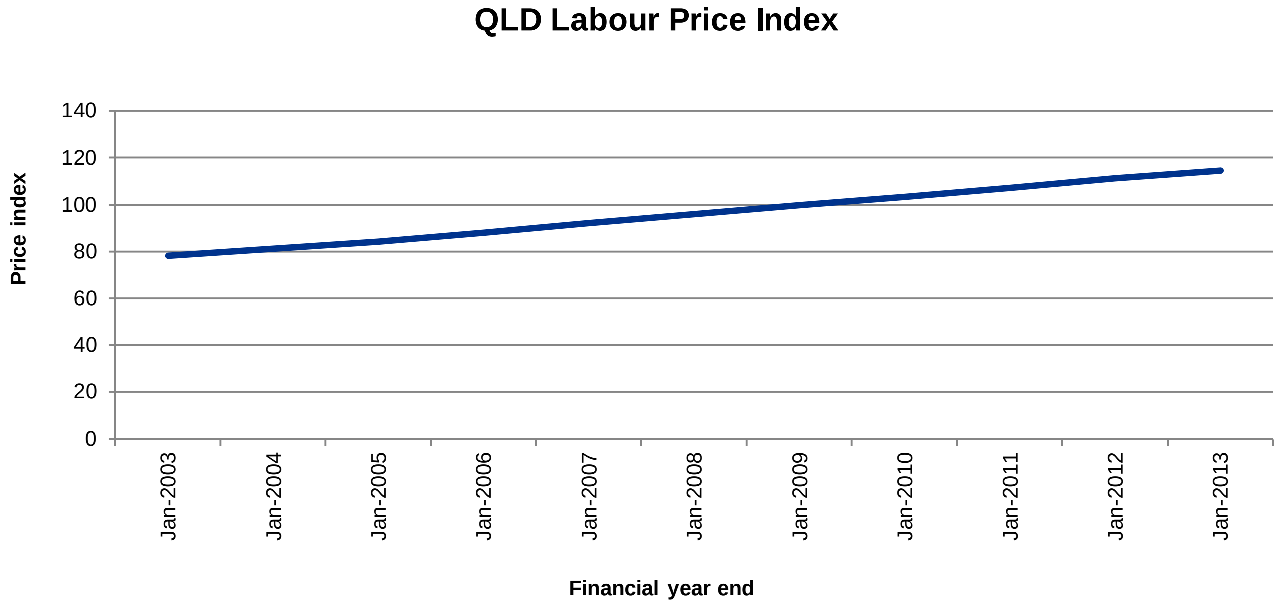

[17] ABS Series: 5260.0.55.002 Estimates of Industry Multifactor Productivity – Electricity, gas, waste and water services

## 5.2 Price and wage developments specific to Queensland

Queensland and Western Australia have experienced the most significant rises to wage costs in recent years compared with other states, probably resulting from the mining and construction industry contributions. Sectors such as construction and mining are relevant to labour cost pressures facing Ergon Energy as many employees or contractors have the potential to work in these sectors. This means that wage competition (or the lack thereof) can affect wages in other sectors.

Over the period between 2010 and 2013, wages for all sectors in Queensland increased by 11%, the highest increase of any state with the exception of Western Australia.

Figure 16 ABS QLD labour price index, all sectors[18]




## 5.3 Wage and price movements specific to Ergon Energy industry sector

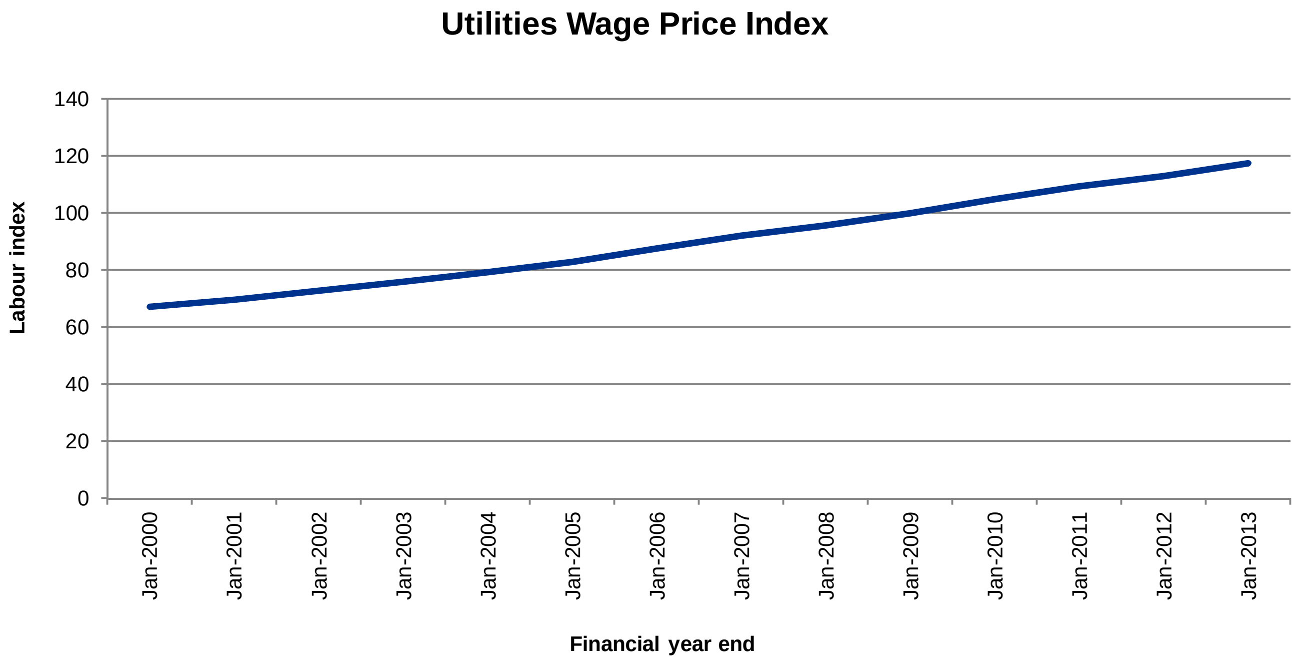
The Australian Bureau of Statistics classification for utilities workers (ANZSIC D – *Electricity, gas and water supply services*) most closely resembles the workforce profile of Ergon Energy. For this reason, Jacobs recommends that projections for labour cost increases be largely based on this indicator. Jacobs considers that the ABS wage price index for utilities workers aligns with pricing trends for this industry and that this is likely to reflect future changes to both internal and external Ergon Energy employees.

Wage movements in the utilities industry have been increasing steadily over the last decade, with higher increases experienced in the private sector. Over the period from 2000 to 2013 wages for private sector utilities workers rose over 20%. Wage growth in this sector was higher than the national industry (all) average and has consistently been so for the last 15 years. The electricity, gas and water sector generally tends to be capital intensive with higher skill levels required and thus commensurate wages. The utilities sector has had the second highest growth in employment over the last decade behind mining. Strong growth in utilities employment has primarily resulted from increased infrastructure spending and subsequently required maintenance, following periods of privatisation and rationalisation in the last few years. It is expected that as the next phase of many resources and construction projects get underway, labour shortages are likely to occur. As economic conditions improve and skilled labour demand continues to increase, it is expected that employers will be required to increase wages to meet shortened supply contributing to continued growth for this sector.

[18] ABS series: A2704662K Wage Price Index QLD all sectors

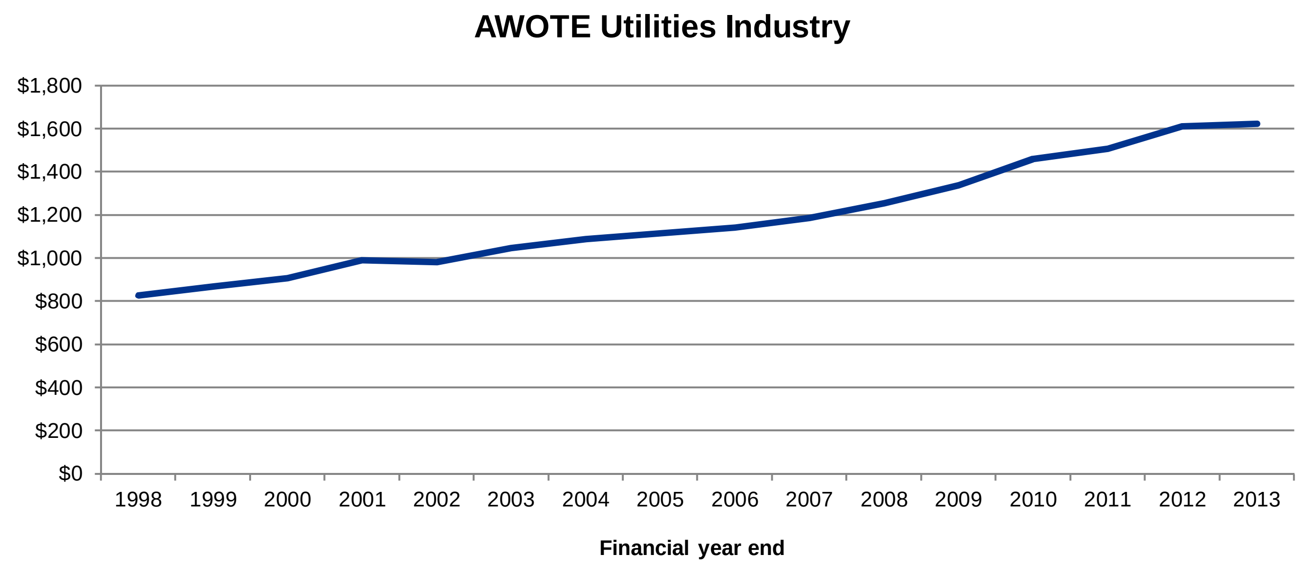
Figure 17 shows the relative increase in public sector utilities wages over the 2000 to 2013 period.

Figure 17 ABS wage price index, public sector utilities industry[19]




The ABS Average Weekly Ordinary Time Earnings (AWOTE) parameter is a measure of quarterly changes to wage earnings for full time adult employees. The AWOTE index for the utilities sector is considered to be another appropriate measure for projecting growth in labour costs for Ergon Energy. The key difference between the labour price index and AWOTE is that AWOTE captures changes in productivity as well as price. The labour price index primarily captures the underlying price of labour but not costs or changes per employee. AWOTE however, takes into account movements between pay grades, up skilling and other compositional effects of the labour force. Figure 18 shows the increase in average wages across the utilities industry over the period between 1998 and 2013.

Figure 18 ABS average weekly ordinary time earnings (utilities)[20]




[19] ABS series: A2705246T Wage Price Index Public Sector Utilities
[20] ABS series: A2719023T AWOTE Utilities Services

## 5.4 Cost drivers and methods for determining the escalators

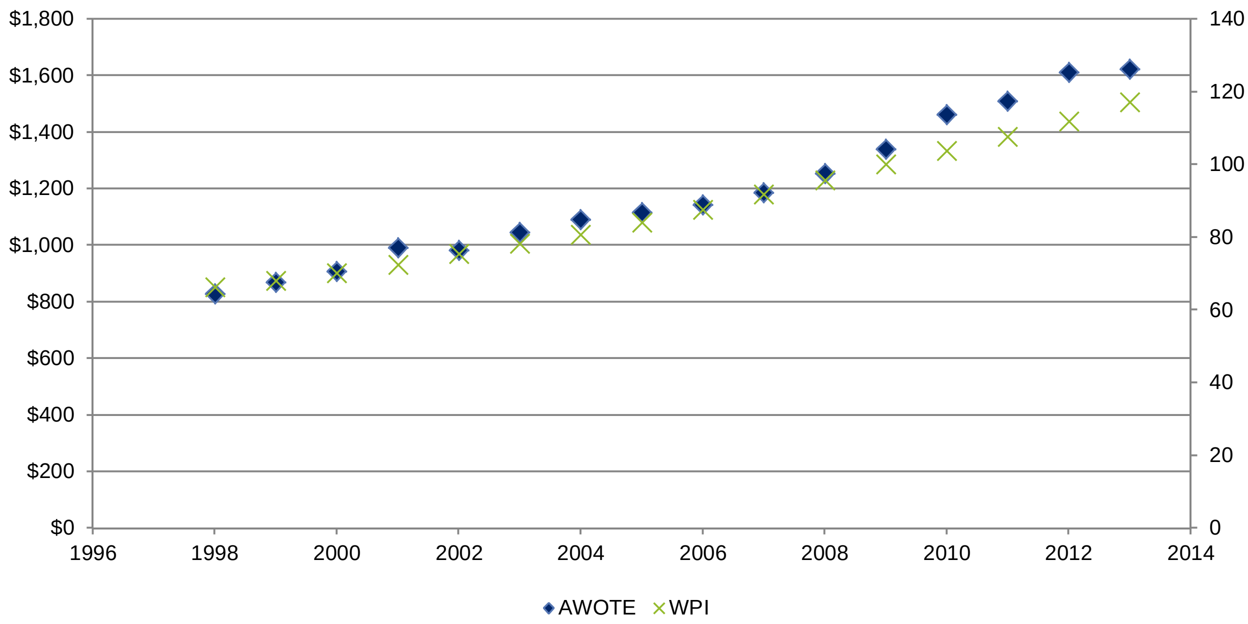
The following cost drivers have been considered in projecting labour and contractors costs relevant to Ergon Energy's business:

- Wage Price Index (WPI) for the utilities sector
- Wage Price Index (WPI) for Queensland
- Labour Productivity Index (LPI) for utilities
- Brisbane Consumer Price Index (CPI) for Queensland
- Non-residential Building Construction Cost Index (BCI) for Queensland

To determine the appropriateness of the cost drivers selected, Jacobs conducted an empirical analysis of each cost driver's contribution to AWOTE for the utilities sector. Using multi-regression analysis, it was determined that increases to Ergon Energy's labour and contractor costs will be a function of wage increases for the utilities sector, non-building construction costs and labour productivity. At a confidence level of 95%, it was determined that WPI for the utilities sector, LPI for utilities and BCI for Queensland were statistically significant in predicting changes to the dependent variable, AWOTE.

Figure 19 shows the relationship and trend between WPI and AWOTE for the utilities sector between 1998 and 2013.

Figure 19 Utilities WPI and AWOTE Trend between 1998 and 2013




Having identified these key cost drivers, Jacobs has assumed a suitable percentage contribution, or weighting, by which each of these underlying cost drivers were considered to influence the total price of labour or contractor costs. These assumptions should be reviewed against any new enterprise agreement that Ergon Energy may have in place.

Table 15 Cost drivers and data sources

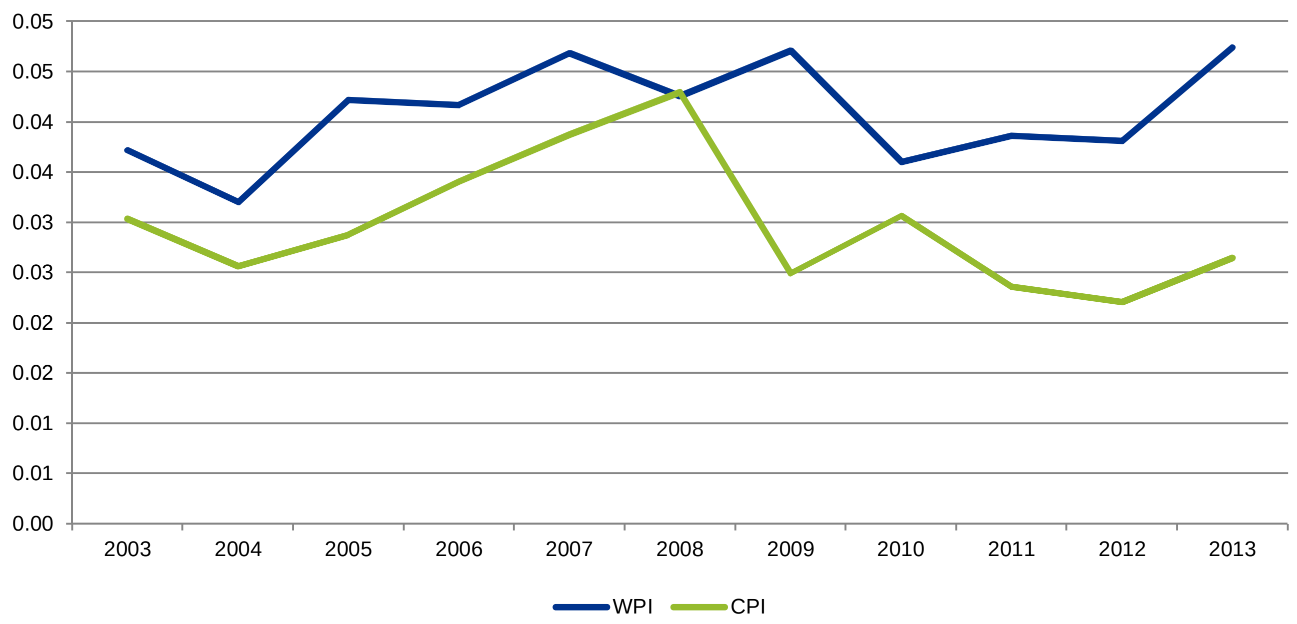
| Cost Drivers / Economic Indicators | Application (mostly used for) | Sources |
|---|---|---|
| Non-residential building construction index | Civil, foundation, building, establishment etc. cost contributions to maintenance | Australian Bureau of Statistics |
| Wage price index | Price changes in labour for:<br>• Queensland in general<br>• Utilities sector workers | Australian Bureau of Statistics |
| Australian CPI | All (to convert nominal to real terms) and general impacts from inflation | Australian Bureau of Statistics and Reserve Bank of Australia. |
| Labour productivity index | Multi-factor changes to utilities sector output per unit of input | Australian Bureau of Statistics |
| AWOTE | Measure productivity and wage contributions to labour price | Australian Bureau of Statistics |

## 5.5 Labour and contractor cost escalation factors

The following labour and contractor cost escalation factors have been determined by Jacobs through empirical investigation and economic modelling. It is important to note that the modelling has assumed the current workplace agreement allocates a nominal 3.5% annual wage increase for all permanent and permanent part time staff. As such, Jacobs expects that wages for Ergon Energy staff will increase at this rate until the end of the contract period (assumed to be June 2015). Any escalation negotiated in future enterprise agreements beyond the nominated period cannot be determined and as such the escalation factors provided below should be utilised.

Labour cost escalation is a nominal 3.5% in the near term (until 2015), with subsequent years trending upwards. Post 2015 Jacobs expects that labour costs will increase steadily in line with market expectations for the utilities sector, resulting from sustaining infrastructure investment, labour supply deficits, competition with the mining and construction industries and strong unions keeping wages elevated. With the exception of 2008 when CPI and WPI met at 4%, over the last decade utilities wage growth has remained on average 1.2% above CPI (refer Figure 20).

Figure 20 Utilities WPI and CPI between 2003 and 2013

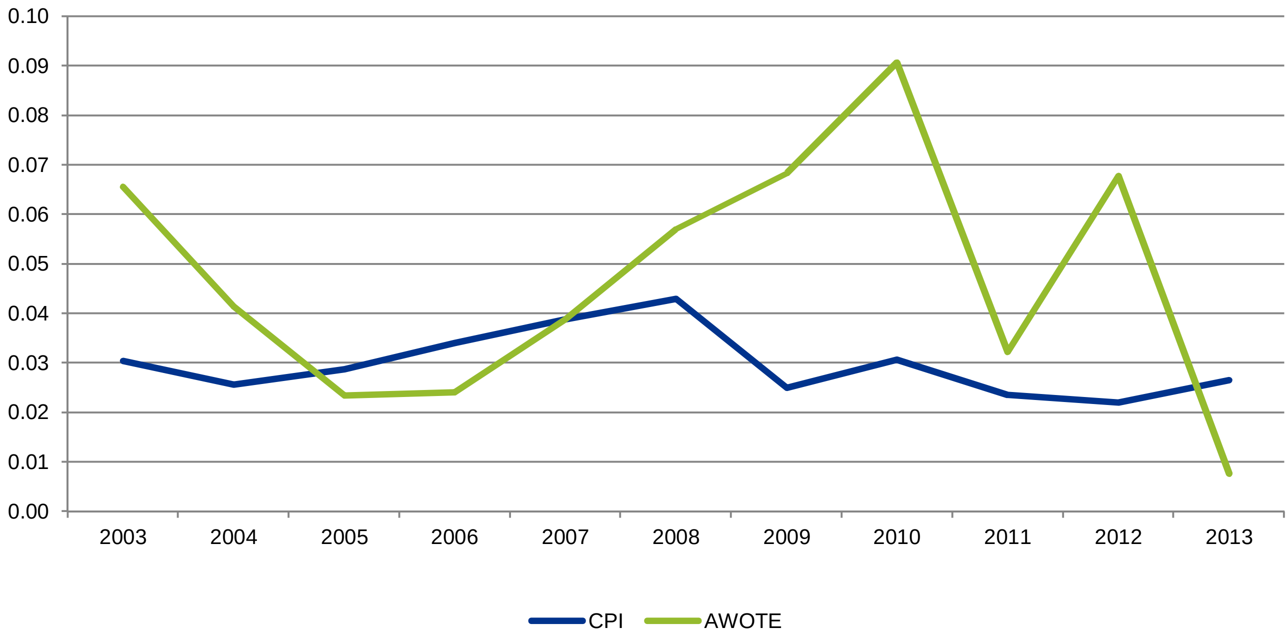


The stronger growth average of WPI over CPI provides some evidence of the likelihood that wages will continue to increase at a higher rate than 2.5%; however historical AWOTE indicate that growth will be even stronger still.

As discussed, Jacobs considers AWOTE to be a better indicator of wages growth as it incorporates composite economic factors in addition to underlying changes in price. WPI does not reliably measure changes in total labour costs, especially when a change in organisation or industry occurs because it doesn't capture changes in the skill levels of employees or productivity. AWOTE measures price changes as well as increases to average unit labour costs for the employer (which includes bonuses, incentives, penalty rates, allowances, etc.).

Figure 21 shows changes in AWOTE for the utilities sector against CPI over the last decade.

Figure 21 Utilities AWOTE and CPI between 2003 and 2013




In line with expectations for utilities sector investment, Jacobs considers that as a cost escalation factor which better reflects changes to the utilities, AWOTE may be more appropriate. We expect that wages growth for this sector will be higher than the industry (all) average and higher than the historical average. This is largely due to labour supply deficits, declining unemployment, continued competition with the mining and construction sectors and generational impacts on the labour force which will push up base pay rates as the workforce ages and up-skills. Our forecast for labour cost escalation in the short term is in line with the current enterprise agreement at a nominal 3.5% however over the medium to longer term Jacobs expects that costs will rise to nominal 4.15%.

Contractor cost escalation is somewhat higher in the near term, with 2014 values projected at nominal 4.64% due to the fact that these rates are not controlled by standardised workplace agreements. The increase in contractor/professional cost in subsequent years, and in the longer term, trends closer to nominal 4% on average.

Table 16 provides the year by year projected escalation factors for both labour and contractor costs, as these pertain to Ergon Energy's business profile.

Table 16 Real labour and contractor cost escalation factors

| | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| General labour annual escalation | - | 0.98% | 1.41% | 1.50% | 1.61% | 1.62% | 1.62% | 1.62% |
| Utility sector labour annual escalation | - | 0.98% | 1.41% | 1.50% | 1.61% | 1.62% | 1.62% | 1.62% |
| Professional services annual escalation | - | 2.09% | 1.33% | 1.40% | 1.48% | 1.50% | 1.48% | 1.48% |
| General labour cumulative factor | 1.000 | 1.010 | 1.024 | 1.039 | 1.056 | 1.073 | 1.090 | 1.108 |
| Utility sector labour cumulative factor | 1.000 | 1.010 | 1.024 | 1.039 | 1.056 | 1.073 | 1.090 | 1.108 |
| Professional services cumulative factor | 1.000 | 1.021 | 1.035 | 1.049 | 1.065 | 1.081 | 1.097 | 1.113 |

# 6. Repeal of carbon price mechanism

On 17 July 2014, the Australian Parliament passed legislation to repeal the carbon pricing mechanism that had been in place since 2011.

As a result, Jacobs has ceased modelling any impact of carbon pricing on the material cost escalation factors.

# 7. Other costs

Jacobs has assumed that “other costs” includes costs generally associated with the activities:

- Consumables and materials
- Materials for maintenance tasks
- Pipes and fittings
- Contractors and sub-contractors
- External fleet hire
- General services including mowing and plumbing

In this instance, Jacobs has concluded that the nature of these activities would largely be subject to price movements based on CPI rather than movements in commodity forecasts.

Table 17 Cumulative real cost escalation factors for other costs

| | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Other costs | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

# 8. Installed asset class cost escalation factors

To assist with the escalation of any expenditure forecasts based on an asset category level, the real material and labour escalations have been combined to generate installed cost escalation factors.

## 8.1 Weightings

Table 18 shows the relative weightings of materials, general labour and contract for each asset category. These weightings have been based on Jacobs reference estimates and advice from other utilities for similar or related asset types.

Table 18 Relative weightings for materials and labour

| Asset category | Materials | General labour | Utility sector labour | Professional services |
|---|---|---|---|---|
| Overhead Subtransmission Lines | 70% | 0% | 30% | 0% |
| Underground Subtransmission Cables | 38% | 10% | 32% | 20% |
| Overhead Distribution Lines | 17% | 0% | 80% | 3% |
| Underground Distribution Cables | 16% | 0% | 81% | 3% |
| Distribution Equipment | 67% | 0% | 30% | 3% |
| Substation Bays | 70% | 0% | 30% | 0% |
| Substation Establishment | 79% | 0% | 9% | 12% |
| Distribution Substation Switchgear | 67% | 0% | 30% | 3% |
| Zone Transformers | 95% | 0% | 5% | 0% |
| Distribution Transformers | 67% | 0% | 30% | 3% |
| Low Voltage Services | 17% | 0% | 80% | 3% |
| Metering | 77% | 0% | 23% | 0% |
| Communications - Pilot Wires | 70% | 0% | 30% | 0% |
| Generation Assets | 70% | 0% | 30% | 0% |
| Street Lighting | 70% | 0% | 30% | 0% |
| Other Equipment | 70% | 0% | 30% | 0% |
| Control Centre - SCADA | 77% | 0% | 23% | 0% |
| Land & Easements | 100% | 0% | 0% | 0% |
| Communications | 49% | 24% | 0% | 27% |
| IT Systems | 49% | 24% | 0% | 27% |
| Office Equipment & Furniture | 100% | 0% | 0% | 0% |
| Motor Vehicles | 100% | 0% | 0% | 0% |
| Plant & Equipment | 70% | 0% | 30% | 0% |
| Buildings | 70% | 0% | 30% | 0% |
| Operational maintenance | 20% | 0% | 32% | 48% |
| Preventative maintenance | 14% | 0% | 16% | 70% |

## 8.2 Installed cost escalation factors

Table 19 illustrates the cumulative real installed cost escalation factors for the nominated Ergon Energy asset categories, based on the material and labour escalation factors.

Table 19 Cumulative real installed cost escalation factors for asset categories

| Asset category | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Overhead Subtransmission Lines | 1.000 | 1.025 | 1.038 | 1.053 | 1.062 | 1.073 | 1.086 | 1.102 |
| Underground Subtransmission Cables | 1.000 | 1.017 | 1.017 | 1.023 | 1.033 | 1.044 | 1.056 | 1.069 |
| Overhead Distribution Lines | 1.000 | 1.016 | 1.028 | 1.041 | 1.055 | 1.069 | 1.084 | 1.100 |
| Underground Distribution Cables | 1.000 | 1.013 | 1.027 | 1.040 | 1.055 | 1.070 | 1.086 | 1.102 |
| Distribution Equipment | 1.000 | 1.023 | 1.024 | 1.026 | 1.030 | 1.035 | 1.040 | 1.049 |
| Substation Bays | 1.000 | 1.019 | 1.025 | 1.030 | 1.038 | 1.046 | 1.055 | 1.066 |
| Substation Establishment | 1.000 | 1.014 | 1.034 | 1.055 | 1.077 | 1.098 | 1.120 | 1.142 |
| Distribution Substation Switchgear | 1.000 | 1.023 | 1.024 | 1.026 | 1.030 | 1.035 | 1.040 | 1.049 |
| Zone Transformers | 1.000 | 1.037 | 1.030 | 1.028 | 1.025 | 1.025 | 1.028 | 1.035 |
| Distribution Transformers | 1.000 | 1.026 | 1.029 | 1.034 | 1.040 | 1.046 | 1.055 | 1.066 |
| Low Voltage Services | 1.000 | 1.009 | 1.026 | 1.042 | 1.058 | 1.074 | 1.090 | 1.107 |
| Metering | 1.000 | 1.018 | 1.017 | 1.014 | 1.017 | 1.019 | 1.022 | 1.028 |
| Communications - Pilot Wires | 1.000 | 1.003 | 1.007 | 1.012 | 1.017 | 1.022 | 1.027 | 1.031 |
| Generation Assets | 1.000 | 1.029 | 1.027 | 1.028 | 1.029 | 1.032 | 1.037 | 1.045 |
| Street Lighting | 1.000 | 1.012 | 1.015 | 1.018 | 1.022 | 1.026 | 1.031 | 1.037 |
| Other Equipment | 1.000 | 1.003 | 1.007 | 1.012 | 1.017 | 1.022 | 1.027 | 1.031 |
| Control Centre - SCADA | 1.000 | 1.002 | 1.006 | 1.009 | 1.013 | 1.016 | 1.020 | 1.024 |
| Land & Easements | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Communications | 1.000 | 1.008 | 1.015 | 1.022 | 1.031 | 1.039 | 1.047 | 1.055 |
| IT Systems | 1.000 | 1.008 | 1.015 | 1.022 | 1.031 | 1.039 | 1.047 | 1.055 |
| Office Equipment & Furniture | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Motor Vehicles | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Plant & Equipment | 1.000 | 1.003 | 1.007 | 1.012 | 1.017 | 1.022 | 1.027 | 1.031 |
| Buildings | 1.000 | 1.012 | 1.032 | 1.052 | 1.074 | 1.095 | 1.116 | 1.138 |

# 9. Operational expenditure escalation

Table 20 shows the cumulative real cost escalation factors for operational expenditure. These factors have been based on the forecast components drawn from historic operational expenditure data provided by Ergon Energy.

Table 20 Cumulative real operational expenditure cost escalation factors

| Component | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Utility sector labour | 1.000 | 1.010 | 1.024 | 1.039 | 1.056 | 1.073 | 1.090 | 1.108 |
| Contractors | 1.000 | 1.021 | 1.035 | 1.049 | 1.065 | 1.081 | 1.097 | 1.113 |
| Materials | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Other costs | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

The labour cost escalation factors are based on the analysis detailed in section 5.

Based on the historic operational expenditure for the period 2010-12, materials constituted only 6% of field maintenance work and 17% of the total operational expenditure. This material was generally consumables, transformer oil and replacement batteries for zone substations. Jacobs notes that the basket of goods used in generating Australian CPI includes consumable items. The other index often used in Australia and the United States with regards to construction/consumable materials is the Producer Price Index (PPI); for the Australian market, this index has been in the nominal range of 2.3% to 3.0% for the financial year to June 2014[21], whilst in the US, the movement in construction costs was nominally 3.2% over the past 12 months.[22]

Therefore, Jacobs is of the opinion that CPI is a reasonable and conservative escalation factor for opex materials given their minor nature, and consistent with the Jacobs recommendation on cost escalation for "other costs" as discussed in section 7.

[21] Australian Bureau of Statistics, *6427.0 - Producer Price Indexes*, Australia, Jun 2014
[22] Associated General Contractors of America, *Construction economics - construction materials*, Aug 2014

# 10. Comparison with historical cost escalation

The AER recently published assessment guidelines for expenditure forecasts[23] which now require electricity utilities to demonstrate how historic price rises have compared with the forecast cost escalation factors. The Jacobs modelling is based on forward looking forecasts only, and does not rely upon historical data.

To support the reasonableness of the projected cost escalation factors, Jacobs has reviewed the escalation factors that are generated using historic cost driver values to determine their consistency with the cost escalation factors based on the forward looking market forecasts, and whether these historic values reflect any known market conditions.

This modelling has been done in lieu of reviewing actual historic asset prices, as any trends in such prices may be distorted by many external market variables, and breaking historic project costs down into the nominated asset categories is problematic.

## 10.1 Global movements in commodity prices

After nearly three decades of low and declining commodity prices, a reversal of the trend with steadily increasing prices for most commodity prices occurred during the decade of the 2000s (2000-2009). Commodity exporting economies were boosted when commodity prices increased sharply in 2006-08 and again in 2010-11.

The boom was largely due to the rising demand from emerging markets such as the BRIC[24] countries and the former Yugoslavia, as well as the result of concerns over long-term supply availability. There was a sharp down-turn in prices during 2008 and early 2009 as a result of the Global Financial Crisis (GFC), but prices began to rise as demand recovered from late 2009 to mid-2010. The commodities super-cycle peaked in 2011 driven by a combination of strong demand from emerging nations and low supply growth. Prior to 2002, only 5-10% of trading in the commodities market was attributable to investors. Since 2002, 30% of trading is attributable to investors in the commodities market which has caused higher price volatility.

### 10.1.1 Commodity price surge

The Global Economic Outlook publication[25] reported that a key economic characteristic of the 2000s was the steady rise in commodity prices especially over the period 2000-08. This was the result of a number of factors:

- prolonged period of strong global growth
- restricted supply
- sharp rise in demand from the emerging BRIC markets

For example, China and India accounted for 2 percent of global fuel and mining imports in 1990, rising to 12 percent by 2008 and further to 18 percent by 2012.

Whilst these basic market fundamentals have played a key role in commodity price movements, the price surges seen during the 2000s were, in part, driven by excess liquidity and speculation. That is, a lot of “new” money as a result of a low interest rate environment found its way into the commodity markets, together with commodities being considered as an investment alternative, contributed to a speculative surge in some commodity prices contrary to the conventional supply-demand pressures. In addition, political events have contributed to marked price fluctuations for crude oil.

Central to most of the price-related analysis of commodity prices has been the price of crude oil which increased by 244 percent between 2000 and 2008, in contrast to declines of 52 percent in the decade 1980-89 and 22 percent between 1990 and 1999. Other commodity prices demonstrated comparable volatility, with copper prices almost tripling during 2000-08 having falling by 41 percent during the decade 1990-99.

[23] *Better Regulation: Expenditure Forecast Assessment Guideline for Electricity Distribution*, Nov 2013
[24] Brazil, Russia, India, China
[25] Deloitte University Press, *Global Economic Outlook: 1st Quarter 2014*, pp 52-62

### 10.1.2 Recent global market conditions

Commodity prices slumped in 2009 due to the effects of the GFC, and although worldwide stimulus programs briefly allowed prices to recover in 2010-11, they appear to have stalled again in 2012.

Constrained global growth is a primary reason for the current period of commodity price weakness, with slowing growth in the emerging BRIC economies and in China where Gross Domestic Product (GDP) growth for the beginning of 2013 was 7.3 percent compared to 12.1 percent in 2010. The decline in growth for India, who is a large commodity consumer, has been greater. China's annual growth is unlikely to return to the double-digit levels of recent years, with GDP growth forecast to remain below 8 percent through to 2018. In addition, commodity prices will be subject to any changes in China's commodity consumption as the country moves away from its investment-orientated economic model. There has also been slowing growth in other large commodity importers such as the United States and the European Union which has adversely affected commodity prices.

There have also been significant changes in the supply situation, with many of the mines started during the boom period in Africa and Asia likely to satisfy demand in the short to medium term. The International Monetary Fund (IMF) expects metal prices to remain nearly flat over 2013-18.

## 10.2 Australian market

As an industrialised economy, Australia is both a user and a supplier of energy and raw materials. Typically, a persistent rise in the price of raw materials or energy represents a negative shock to supply. The capacity of the economy to supply goods and services at a given price has diminished. By itself, this will reduce output and push up prices, resulting in a fall in aggregate demand.

However, as a commodity producer, Australia benefits from increases in commodity prices. The RBA explained this as "*… whereas for a net commodity importer a rise in commodity prices acts analogously to a tax paid to foreigners, we are, or are among, those foreigners to whom these payments are made. That impact is expansionary. It raises real income and … aggregate demand ... So … the case of an industrialised, commodity producer like Australia has more complex dynamics. Potential supply in some areas of the economy falls, but the aggregate demand will probably rise rather than fall, due to the terms of trade gain, and it is more likely that there will be a problem of inflation*"[26]

### 10.2.1 Market conditions prior to GFC

In its July 2008 analysis[27], the RBA highlighted the sharp increases in commodity prices from 2000 to 2008 as shown:

| Index | Year 2000 | Year 2008 |
|---|---|---|
| RBA Index of Commodity Prices | 100 | 231 |
| London Metals Exchange Index | 100 | 249 |
| IMF Commodity Price Index | 100 | 234 |

For many commodities, the main driver of higher prices was strong growth in demand, not reduced supply. In the case of oil, the growth in demand came almost entirely from outside of OECD countries, with Chinese demand representing about one-third of the increase and the balance from developing countries around the world. Similarly, much of the increase in global demand for aluminium and copper was attributed to growing Chinese usage.

As a supplier, Australian companies made large exports of natural gas and thermal coal, whose prices were highly correlated with oil prices at that time. In 2008, contract prices for iron ore were anticipated to double. One of the primary challenges for the RBA in 2008 was understanding whether the change in commodity prices was temporary or permanent, recognising that it would be very difficult to identify a permanent, but one-time, shift in

[26] Reserve Bank of Australia, *Reserve Bank Bulletin: Commodity Prices and Macroeconomic Policy: An Australian Perspective*, July 2008
[27] ibid.

the level of prices and a persistent increase in the rate of change of prices. Had the RBA deemed that the changes were driven by persistent demand factors, then monetary policy adjustments would have been considered.

### 10.2.2 Recent Australian market conditions

For the March quarter 2013, the RBA stated that "*… Strong growth in Asia is expected to continue to provide significant benefits for the Australian economy. Most notable so far has been the resources boom. This boom is characterised by three overlapping phases. The first saw commodity prices and hence Australia's terms of trade rise significantly over a period of a number of years, and this was accompanied by a sizable appreciation of the exchange rate. The phase of strongly rising commodity prices has passed, with the terms of trade having peaked in late 2011; although they still remain at a high level. The surge in investment in the resources sector has been in progress for some years and still has some way to run, with resource investment expected to peak as a share of GDP sometime over the course of this year (2013), but remain quite high for a time. The third phase of increased production and export of resources has also commenced but has much farther to run … Looking further ahead, there will come a time when the demand for commodities will ease as development of economies in the Asian region continues and the focus of consumption shifts away from goods and towards services.*"[28]

Not all parts of the Australian economy benefited from the resources boom. Wage pressures in industries or regions experiencing strong conditions associated with the resources boom did not spill over to parts of the economy experiencing weaker conditions. Some industries experienced a reduction in competitiveness due to the exchange rate appreciation, and all faced increased domestic cost pressures.

The pace of aggregate wage growth picked up between 2003 and 2008. This reflected considerable pressure on capacity in the economy prior to the GFC, with the unemployment rate declining to its lowest level in more than three decades. When the slowdown associated with the GFC occurred, these pressures on capacity eased and there was a significant moderation in wage growth. Aggregate wage growth subsequently picked up from these earlier low levels as activity recovered.

## 10.3 Modelled historic cost escalation

To examine the effects of the various market conditions on the cost escalation factors, Jacobs has used the actual average annual commodity prices and market indices to calculate the material only cost escalation factors for the previous 5 years between 2008/09 and 2012/13. That is, these calculations represent what the cost escalations would have been had the, now known, commodity prices existed at the time of modelling the cost escalation factor forecasts.

Table 21 shows the historic annual real cost escalation for the primary commodity cost drivers for the period 2008/09 to 2012/13 and the forecast annual real cost escalation to 2019/20. It should be noted that during the period following the GFC, there was considerable volatility which translated to varying costs for assets.

Jacobs has used historic values for commodity prices and market indices in its modelling to generate real installed cost escalation factors for the period 2008/09 to 2012/13 as shown in the shaded portion of Table 22. These have been compared with cost escalation factors based on forward-looking market forecasts for the period 2013/14 to 2019/20 to illustrate the effects of the changing economic conditions as discussed in the previous section (refer section 10.1). For example, the marked annual increases in 2010/11 are due to the volatility in particularly the steel and oil markets. The relatively smaller cost escalation factors in 2009/10 are due to the severe market impacts of the GFC.

[28] Reserve Bank of Australia, *Reserve Bank Bulletin: The Resources Boom and the Australian Economy - A Sectoral Analysis*, March Quarter 2013

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Table 21 Comparison with annual historic real cost escalation for cost drivers

| Commodity | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium | 0.813 | 0.901 | 1.020 | 0.852 | 0.880 | 0.994 | 1.055 | 1.041 | 1.023 | 1.019 | 1.019 | 1.023 |
| Copper | 0.727 | 1.143 | 1.119 | 0.886 | 0.924 | 0.997 | 0.926 | 0.990 | 0.991 | 0.999 | 1.001 | 1.006 |
| Steel | 1.071 | 0.708 | 1.061 | 0.914 | 0.883 | 1.076 | 0.987 | 1.009 | 0.982 | 0.996 | 1.003 | 1.010 |
| Oil | 0.827 | 0.912 | 1.023 | 1.003 | 0.955 | 1.197 | 0.978 | 0.920 | 0.995 | 0.982 | 0.990 | 1.012 |

Table 22 Comparison with annual historic real installed cost escalation for asset categories

| Asset category | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Overhead Subtransmission Lines | 0.997 | 0.933 | 1.037 | 0.974 | 0.985 | 1.025 | 1.013 | 1.014 | 1.008 | 1.010 | 1.012 | 1.015 |
| Underground Subtransmission Cables | 0.970 | 1.020 | 1.031 | 0.995 | 1.003 | 1.017 | 1.000 | 1.006 | 1.010 | 1.011 | 1.011 | 1.012 |
| Overhead Distribution Lines | 1.002 | 0.990 | 1.014 | 1.000 | 0.998 | 1.016 | 1.012 | 1.012 | 1.013 | 1.013 | 1.014 | 1.015 |
| Underground Distribution Cables | 0.998 | 1.002 | 1.013 | 1.003 | 1.004 | 1.013 | 1.014 | 1.013 | 1.014 | 1.014 | 1.014 | 1.015 |
| Distribution Equipment | 0.940 | 0.990 | 1.067 | 0.977 | 0.967 | 1.023 | 1.001 | 1.002 | 1.004 | 1.005 | 1.005 | 1.008 |
| Substation Bays | 0.960 | 1.000 | 1.062 | 0.992 | 0.996 | 1.019 | 1.006 | 1.005 | 1.008 | 1.008 | 1.008 | 1.010 |
| Substation Establishment | 1.040 | 1.012 | 1.051 | 1.033 | 1.090 | 1.014 | 1.020 | 1.020 | 1.021 | 1.020 | 1.020 | 1.020 |
| Distribution Substation Switchgear | 0.940 | 0.990 | 1.067 | 0.977 | 0.967 | 1.023 | 1.001 | 1.002 | 1.004 | 1.005 | 1.005 | 1.008 |
| Zone Transformers | 0.952 | 0.929 | 1.037 | 0.954 | 0.948 | 1.037 | 0.994 | 0.998 | 0.997 | 1.000 | 1.003 | 1.007 |
| Distribution Transformers | 0.977 | 0.961 | 1.031 | 0.979 | 0.981 | 1.026 | 1.003 | 1.005 | 1.005 | 1.007 | 1.008 | 1.011 |
| Low Voltage Services | 0.993 | 0.996 | 1.012 | 0.994 | 0.996 | 1.009 | 1.016 | 1.016 | 1.015 | 1.015 | 1.015 | 1.016 |
| Metering | 0.929 | 1.018 | 1.072 | 0.987 | 0.975 | 1.018 | 0.999 | 0.997 | 1.003 | 1.002 | 1.003 | 1.005 |
| Communications - Pilot Wires | 1.003 | 1.003 | 1.003 | 1.003 | 1.003 | 1.003 | 1.004 | 1.005 | 1.005 | 1.005 | 1.005 | 1.005 |
| Street Lighting | 1.004 | 0.983 | 1.007 | 0.997 | 0.995 | 1.012 | 1.003 | 1.003 | 1.003 | 1.004 | 1.005 | 1.006 |
| Control Centre - SCADA | 1.002 | 1.002 | 1.002 | 1.002 | 1.002 | 1.002 | 1.003 | 1.003 | 1.004 | 1.004 | 1.004 | 1.004 |
| Buildings | 1.035 | 1.011 | 1.045 | 1.030 | 1.080 | 1.012 | 1.020 | 1.020 | 1.020 | 1.020 | 1.020 | 1.020 |

Table 22A shows a comparison of the forecast material only cost escalation with the historic values for the period 2008/09 to 2012/13.

Table 22A Comparison with annual historic real material only cost escalation for asset categories

| Asset category | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Overhead Subtransmission Lines | 0.991 | 0.900 | 1.048 | 0.959 | 0.975 | 1.031 | 1.013 | 1.014 | 1.005 | 1.008 | 1.010 | 1.014 |
| Underground Subtransmission Cables | 0.900 | 1.032 | 1.059 | 0.966 | 0.985 | 1.023 | 0.977 | 0.993 | 1.000 | 1.002 | 1.003 | 1.007 |
| Overhead Distribution Lines | 0.962 | 0.894 | 1.033 | 0.950 | 0.939 | 1.044 | 1.003 | 1.000 | 0.998 | 1.000 | 1.003 | 1.008 |
| Underground Distribution Cables | 0.934 | 0.962 | 1.026 | 0.968 | 0.973 | 1.031 | 1.011 | 1.000 | 1.006 | 1.004 | 1.005 | 1.009 |
| Distribution Equipment | 0.905 | 0.980 | 1.094 | 0.961 | 0.946 | 1.029 | 0.995 | 0.995 | 0.998 | 0.999 | 1.000 | 1.004 |
| Substation Bays | 0.939 | 0.996 | 1.085 | 0.984 | 0.990 | 1.023 | 1.002 | 1.001 | 1.004 | 1.004 | 1.005 | 1.008 |
| Substation Establishment | 1.046 | 1.011 | 1.060 | 1.038 | 1.110 | 1.013 | 1.022 | 1.022 | 1.022 | 1.021 | 1.021 | 1.021 |
| Distribution Substation Switchgear | 0.905 | 0.980 | 1.094 | 0.961 | 0.946 | 1.029 | 0.995 | 0.995 | 0.998 | 0.999 | 1.000 | 1.004 |
| Zone Transformers | 0.949 | 0.925 | 1.038 | 0.951 | 0.945 | 1.038 | 0.993 | 0.997 | 0.996 | 0.999 | 1.002 | 1.007 |
| Distribution Transformers | 0.961 | 0.936 | 1.041 | 0.963 | 0.966 | 1.034 | 0.997 | 1.000 | 1.000 | 1.002 | 1.004 | 1.008 |
| Low Voltage Services | 0.908 | 0.924 | 1.023 | 0.916 | 0.926 | 1.005 | 1.027 | 1.021 | 1.010 | 1.009 | 1.010 | 1.013 |
| Metering | 0.905 | 1.020 | 1.090 | 0.980 | 0.965 | 1.020 | 0.995 | 0.992 | 0.999 | 0.998 | 0.999 | 1.002 |
| Communications - Pilot Wires | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Street Lighting | 1.001 | 0.971 | 1.006 | 0.992 | 0.988 | 1.013 | 0.998 | 0.998 | 0.998 | 0.999 | 1.000 | 1.001 |
| Control Centre - SCADA | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Buildings | 1.046 | 1.011 | 1.060 | 1.038 | 1.110 | 1.013 | 1.022 | 1.022 | 1.022 | 1.021 | 1.021 | 1.021 |

## 10.4 Comparison with previous forecasts

To highlight the volatility of forward forecasts for commodity prices, Table 23 illustrates the changing real annual cost escalation rates for the four main commodities for forecasts based in November 2010, March 2011 and December 2011 for the period between 2011/12 and 2016/17.

Table 23 Changing of commodity forecasts 2011/12 to 2016/17

| Forecast | Commodity | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|---|---|---|
| November 2010 | Aluminium | 1.129 | 0.989 | 0.994 | 0.978 | 0.981 | 0.987 |
| | Copper | 1.093 | 0.931 | 0.925 | 0.907 | 0.906 | 0.907 |
| | Steel | 1.131 | 0.987 | 0.962 | 0.963 | 0.965 | 0.972 |
| | Oil | 1.131 | 0.960 | 0.963 | 0.982 | 1.008 | 0.991 |
| March 2011 | Aluminium | 1.170 | 0.989 | 0.989 | 0.970 | 0.973 | 0.979 |
| | Copper | 1.178 | 0.940 | 0.923 | 0.896 | 0.892 | 0.891 |
| | Steel | 1.133 | 0.975 | 0.986 | 0.970 | 0.972 | 0.979 |
| | Oil | 1.087 | 0.952 | 1.087 | 0.967 | 0.911 | 1.011 |
| December 2011 | Aluminium | 0.876 | 1.021 | 1.045 | 1.039 | 1.037 | 1.032 |
| | Copper | 0.874 | 0.982 | 0.999 | 0.984 | 0.980 | 0.975 |
| | Steel | 1.026 | 1.043 | 1.010 | 1.009 | 1.013 | 1.009 |
| | Oil | 1.019 | 1.019 | 0.972 | 0.984 | 1.007 | 1.045 |

These variations in forecasts demonstrate the uncertainties in global markets at the time, and the associated variability in any forecast movements in material costs for different asset types.

Table 24 shows the changes in the forecast of material only cost escalation factors for a sample of asset categories, based on the volatility of the commodity price forecasts between November 2010 and December 2011 for the period 2011/12 to 2016/17.

Table 24 Changes in forecast real material only cost escalation factors 2011/12 to 2016/17

| Forecast | Asset category | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|---|---|---|
| November 2010 | OH distribution lines | 1.070 | 0.990 | 0.982 | 0.983 | 0.991 | 0.989 |
| | Distribution equipment | 1.041 | 0.990 | 0.985 | 0.987 | 0.993 | 0.991 |
| | Distribution transformers | 1.065 | 0.984 | 0.977 | 0.977 | 0.984 | 0.983 |
| March 2011 | OH distribution lines | 1.074 | 0.985 | 1.004 | 0.982 | 0.977 | 0.992 |
| | Distribution equipment | 1.046 | 0.987 | 1.001 | 0.984 | 0.980 | 0.991 |
| | Distribution transformers | 1.077 | 0.980 | 0.994 | 0.974 | 0.970 | 0.983 |
| December 2011 | OH distribution lines | 0.990 | 1.018 | 1.007 | 1.007 | 1.011 | 1.013 |
| | Distribution equipment | 0.993 | 1.009 | 1.001 | 1.001 | 1.004 | 1.006 |
| | Distribution transformers | 0.984 | 1.013 | 1.004 | 1.003 | 1.006 | 1.007 |

## 10.5 Comments

The Jacobs cost escalation factor model is only intended to be used for forecasting, and not for calculating previous years' cost escalation as a means of justifying, or otherwise, actual price movements that may have been experienced. There are a number of specific influences that may affect the procurement of assets for an electricity utility such as the performance of suppliers, outsourcing strategies used by utilities, tender processes, pre-existing purchasing agreements, service agreements, scales of economy due to the size of the utility, supply/demand dynamics (e.g. during and immediately after severe weather events), or the nature of a capital expenditure program, or revised asset specifications due to amended asset management practices. Each of these influences will be particular to a utility, and may vary between regulatory periods depending upon the utility's operational focus and general market conditions.

In reviewing the asset category material only cost escalation factors from the previous 5 years, Jacobs has briefly examined, at a high level, the prevailing global and Australian market conditions of the time, and has illustrated the modelled impact of these conditions on the material only costs. As would be anticipated, these cost escalation factors reflect the market cycles discussed in sections 10.1 and 10.2; however, these "actual" cost escalation factors do not consider any external market or utility-specific influences that may have impacted on actual asset prices, and are therefore not intended to represent actual price movements experienced by Ergon Energy between 2008/09 and 2012/13.

The review of the forecasts of commodity costs and a sample of asset specific material only cost escalation factors that were developed in November 2010, March 2011 and December 2011 in section 10.4 is solely intended to highlight the volatility of commodity price forecasts. It is not intended to be used as a means of a direct comparison of the reasonableness of those forecasts with actual out turns. In the Limitations Statement to this report, Jacobs highlights that forecasts are by nature uncertain and that any projections presented are an indication of what it considers the most likely outcome in a range of possible scenarios. The forecasts developed in November 2010, March 2011 and December 2011 represented Jacobs' opinion on what was considered to be reasonable forecasts, as at the time of production of the document and based on the information that was set out in the accompanying report.

The Limitations Statement continues "*… Jacobs has used a number of publicly available sources, other forecasts it believes to be credible, and its own judgement and estimates as the basis for developing the cost escalators contained in this report. The actual outcomes will depend on complex interactions of policy, technology, international markets, and behaviour of multiple suppliers and end users, all subject to uncertainty and beyond the control of Jacobs, and hence Jacobs cannot warrant the projections contained in this report.*"

Jacobs therefore does not contend that the historic cost escalation factors shown for 2008/09 to 2012/13 in Table 22 represent actual movements in costs incurred by utilities in installing assets on an annual basis. For example, equipment manufacturers during this period would have had to consider whether changes in raw material costs were one-off events or more permanent changes, and suppliers would have had to evaluate the extent to which any fluctuations in equipment costs were passed on to their customers; in this case, the electricity utilities.

Therefore, Jacobs considers the historic cost escalation factors for 2008/09 to 2012/13 presented in Table 22 are indicative only of movements in installed costs based on known values for the identified cost drivers, and do not represent definitive annual price movements for assets as it is not the role of a forecasting model to back forecast actual costs. Rather, back casting, is generally only undertaken to validate the model (or otherwise) by comparing the back cast prices with actuals occurring at the time.

# 11. Conclusion

The Jacobs cost escalation modelling methodology provides a rigorous and transparent process through which reasonable and appropriate cost escalation indices are able to be developed in relation to the prices of electricity distribution network plant and equipment.

The real escalation factors established during this assignment were developed with specific consideration of the operating environment faced by Ergon Energy, and were based on the most up-to-date information available at the time of compilation.

These real indices therefore constitute Jacobs's calculated opinion of appropriate installed asset cost escalation rates that can reasonably be expected to affect Ergon Energy over the upcoming revenue regulation period. The results of Jacobs's modelling during this assignment are presented in Table 25 and Table 26 below.

Table 25 Cumulative real cost escalation of cost drivers[29]

| Cost Driver | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Aluminium | 1.000 | 0.994 | 1.049 | 1.092 | 1.117 | 1.139 | 1.161 | 1.188 |
| Copper | 1.000 | 0.997 | 0.923 | 0.914 | 0.905 | 0.904 | 0.905 | 0.910 |
| Steel | 1.000 | 1.076 | 1.062 | 1.071 | 1.052 | 1.048 | 1.051 | 1.061 |
| Oil | 1.000 | 1.197 | 1.171 | 1.077 | 1.072 | 1.053 | 1.042 | 1.055 |
| Construction Index | 1.000 | 1.013 | 1.035 | 1.058 | 1.082 | 1.104 | 1.128 | 1.152 |
| TWI | 1.000 | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 |
| General labour | 1.000 | 1.010 | 1.024 | 1.039 | 1.056 | 1.073 | 1.090 | 1.108 |
| Utility sector labour | 1.000 | 1.010 | 1.024 | 1.039 | 1.056 | 1.073 | 1.090 | 1.108 |
| Professional services | 1.000 | 1.021 | 1.035 | 1.049 | 1.065 | 1.081 | 1.097 | 1.113 |
| CPI | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

Table 26 Cumulative real installed cost escalation of asset categories

| Asset category | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Overhead Subtransmission Lines | 1.000 | 1.025 | 1.038 | 1.053 | 1.062 | 1.073 | 1.086 | 1.102 |
| Underground Subtransmission Cables | 1.000 | 1.017 | 1.017 | 1.023 | 1.033 | 1.044 | 1.056 | 1.069 |
| Overhead Distribution Lines | 1.000 | 1.016 | 1.028 | 1.041 | 1.055 | 1.069 | 1.084 | 1.100 |
| Underground Distribution Cables | 1.000 | 1.013 | 1.027 | 1.040 | 1.055 | 1.070 | 1.086 | 1.102 |
| Distribution Equipment | 1.000 | 1.023 | 1.024 | 1.026 | 1.030 | 1.035 | 1.040 | 1.049 |
| Substation Bays | 1.000 | 1.019 | 1.025 | 1.030 | 1.038 | 1.046 | 1.055 | 1.066 |
| Substation Establishment | 1.000 | 1.014 | 1.034 | 1.055 | 1.077 | 1.098 | 1.120 | 1.142 |
| Distribution Substation Switchgear | 1.000 | 1.023 | 1.024 | 1.026 | 1.030 | 1.035 | 1.040 | 1.049 |
| Zone Transformers | 1.000 | 1.037 | 1.030 | 1.028 | 1.025 | 1.025 | 1.028 | 1.035 |
| Distribution Transformers | 1.000 | 1.026 | 1.029 | 1.034 | 1.040 | 1.046 | 1.055 | 1.066 |

29 Cost escalation factors have been based on commodity forecasts in AUD

| Asset category | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|---|
| Low Voltage Services | 1.000 | 1.009 | 1.026 | 1.042 | 1.058 | 1.074 | 1.090 | 1.107 |
| Metering | 1.000 | 1.018 | 1.017 | 1.014 | 1.017 | 1.019 | 1.022 | 1.028 |
| Communications - Pilot Wires | 1.000 | 1.003 | 1.007 | 1.012 | 1.017 | 1.022 | 1.027 | 1.031 |
| Generation Assets | 1.000 | 1.029 | 1.027 | 1.028 | 1.029 | 1.032 | 1.037 | 1.045 |
| Street Lighting | 1.000 | 1.012 | 1.015 | 1.018 | 1.022 | 1.026 | 1.031 | 1.037 |
| Other Equipment | 1.000 | 1.003 | 1.007 | 1.012 | 1.017 | 1.022 | 1.027 | 1.031 |
| Control Centre - SCADA | 1.000 | 1.002 | 1.006 | 1.009 | 1.013 | 1.016 | 1.020 | 1.024 |
| Land & Easements | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Communications | 1.000 | 1.008 | 1.015 | 1.022 | 1.031 | 1.039 | 1.047 | 1.055 |
| IT Systems | 1.000 | 1.008 | 1.015 | 1.022 | 1.031 | 1.039 | 1.047 | 1.055 |
| Office Equipment & Furniture | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Motor Vehicles | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Plant & Equipment | 1.000 | 1.003 | 1.007 | 1.012 | 1.017 | 1.022 | 1.027 | 1.031 |
| Buildings | 1.000 | 1.012 | 1.032 | 1.052 | 1.074 | 1.095 | 1.116 | 1.138 |

# Appendix A. Jacobs recent experience

Jacobs has assisted several electricity utilities, both at the transmission and distribution level, in analysing the impact of movements in commodity prices and labour on the costs of network assets, as well as in providing independent validation of their capex and opex modelling processes.

These projects have included:

**ActewAGL Distribution (2013)**

Develop installed real and nominal cost escalation factors for various types of electricity distribution assets, including consideration of cost movements in both materials and labour (commodity and labour cost escalators provided by others).

**Power Water Corporation (2013)**

To provide cost escalation factors support the Power and Water Corporation regulatory submission for its 2014-19 Determination. The escalators are to be provided at both the commodity level (with labour cost escalators provided by others) and at asset class level.

**SP AusNet (2012)**

To undertake the development of forecast capital and operational material cost escalators for SPA's transmission business to be used in the forthcoming Transmission Revenue Reset (TRR) 2014-19 (but actually wants Apr 2014 to Mar 2020).

**SP AusNet Gas Network (2012)**

Jacobs was engaged by the Victorian Gas Distribution Business' (VGDBs) to review factors likely to affect price escalation in their material costs over the period 2013-2017, using a 2011 base date for cost forecasts, and propose suitable materials cost escalation rates.

**Powerlink (2011/12)**

As part of their Revenue Proposal to the AER for 2012/13-2016/17, Powerlink is considering the application of commodity escalation factors to the modelling of future capex and opex. Project is to provide an independent recommendation of the escalation factors to be applied. Cost escalation factors updated upon request during 2011 and 2012.

**Aurora Energy (2010/11)**

Aurora engaged Jacobs to develop cost escalators for their capex program as part of their 2012-2017 regulatory reset with the AER. These cost escalators were updated upon request during 2010 and 2011.

**Joint VIC DNSPs - JEN, UED, SP AusNet, CP & PC (2010)**

Jacobs provided updates of cost escalation rates modelled for the Victorian Distribution companies. These updated rates were included in revised submissions to the AER.

**Country Energy Gas Networks (2010)**

Jacobs was engaged to provide a Due Diligence of the Country Energy regional Gas network in Wagga Wagga (NSW). A section of this study involved reviewing the modelling undertaken to develop cost escalation rates for plant and equipment within the Gas industry.

**Ergon Energy (2010)**

Jacobs was engaged to provide an update of cost escalation rates developed the previous year. The effect of rapid movements in a number of underlying cost drivers was required to be modelled in order to provide a more recent set of outputs.

**Ergon Energy (2010)**

Jacobs was engaged to provide a set of suitable cost escalation rates for Ergon Energy's capex and opex programs of work. Ergon Energy had received an unsatisfactory response from the AER in relation to the cost escalation rate modelling proposed by its consultants during its initial regulatory submission, and engaged Jacobs to provide modelling for its revised submission. The Jacobs rates were received favourably by the AER.

**CitiPower/PowerCor (2009)**

In a separate engagement, Jacobs developed materials cost escalation rates for the CP / PAL opex programs.

**Joint VIC DNSPs - JEN, UED, SP AusNet, CP & PC (2009)**

Jacobs was engaged by the Joint Victorian Distribution Network Service Providers to provide capex escalation rates for their regulatory submissions. The outputs were tailored to individual asset categories nominated by each of the participants.

**TransCo Philippines (2009)**

Jacobs was engaged to apply its cost escalation modelling experience to escalate TransCo's internal asset unit rates to current pricing levels

**ETSA Utilities (2009)**

Jacobs was engaged to provide an independent review of the cost escalation rates within the South Australian DNSP's opex models. This project was initiated as part of ETSA Utilities' preparation for the submission of its revenue proposal to the AER.

In a separate assignment, Jacobs was engaged to provide inputs to the development of materials cost escalation rates within the South Australian DNSP's capex model, as part of ETSA Utilities' preparation for the submission of its revenue proposal to the AER.

**Transend Networks (2009)**

Jacobs was engaged to investigate the long-term average transmission network materials and labour cost escalation rates in Tasmania.

**ElectraNet (2009)**

Jacobs was engaged to apply its cost escalation modelling experience to escalate ElectraNet's internal opex model unit rates to current pricing levels.

**Ergon Energy (2009)**

Jacobs was engaged to provide an update of cost escalation rates developed the previous year. The effect of rapid movements in a number of underlying cost drivers was required to be modelled in order to provide a more recent set of outputs. The resulting cost escalation rates are to be included as part of Ergon Energy's official revenue proposal to the AER.

**Ergon Energy (2008)**

Jacobs was engaged to map key cost drivers within its model, to internal opex cost estimation unit rates within Ergon Energy models.

**Ergon Energy (2008)**

Jacobs undertook Stage 2 of the Ergon Energy assignment relating to Electricity Industry Labour, Commodity and Asset Price & Cost Indices. During this period the Jacobs cost escalation model underwent extensive enhancements.

**Transend (2008)**

Jacobs were engaged to provide cost escalators factors in order to promote Transend's most recent asset valuation , having been based in June 2006 AUD$ terms, to June 2008 amounts as part of the TNSP's regulatory proposal.

**TransGrid (2008)**

During this assignment, Jacobs reviewed TransGrid's capex model, corrected errors in their methodology, and provided an independent validation for use during TransGrid's revenue proposal to the AER.

**ActewAGL (2008)**

Jacobs provided an independent assessment of the escalation factors that apply to ActewAGL's capital works programmes and projects going forward over the period 2007/8 to 2013/14. This was included in ActewAGL's submission to the AER.

**Ergon Energy (2008)**

Jacobs undertook Stage 1 of the Ergon Energy assignment relating to Electricity Industry Labour, Commodity and Asset Price & Cost Indices.

**AER (2007/2008)**

In July 2007, Jacobs was engaged by the Australian Energy Regulator (AER) to review the regulatory revenue proposal submitted by ElectraNet for their next regulatory reset period 2008 to 2013. During this assignment the Jacobs model was both updated and enhanced through consideration of elements presented by ElectraNet. The AER again accepted the Jacobs view to cost escalation index design.

**SP AusNet (2007)**

Jacobs was engaged by SP AusNet to analyse the likely drivers of cost escalation on capital expenditure forecasts over the remaining two years of their current determination (2006/07 and 2007/08), and for the next regulatory reset period (2008/09 to 2012/13, commencing 1 April 2008).

The Jacobs SP AusNet assignment set the precedent for above CPI escalation of capex costs. The AER accepted the Jacobs methodology noting that it produced robust figures.