Commodity Price Escalation Forecast

TransGrid

COMMODITY PRICE ESCALATION FORECAST 2013/14 – 2018/19

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SKM

TransGrid

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Limitations Statement

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

SKM 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 multiple suppliers and end users, all subject to uncertianty and beyond the control of SKM, and hence SKM cannot warrant the projections contained in this report.

Expert Witness Compliance Statement

In providing the materials cost escalators contained within this report, SKM has read and agreed to be bound by the guidelines for expert witnesses in proceedings in the Federal Court of Australia, as published by Chief Justice M.E.J. Black on 5 May 2008[1].

In providing consultive service in other assignments, SKM acknowledges a pre-existing relationship with TransGrid, but is confident such relationships do not compromise SKM'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.

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

Executive Summary

Sinclair Knight Merz (SKM) was engaged by TransGrid to forecast the real and nominal commodity price escalation indices over the period 2013/14 to 2018/19 for TransGrid's forthcoming regulatory reset.

SKM understands the outputs from this report will form an input in the development of TransGrid submission to the Australian Energy Regulator (AER) for the 2013/14 to 2018/19 regulatory control period.

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 accepted by the AER in these recent decisions sought to model the change in equipment prices and project costs through combining independent forecast movements in the real price of input commodities, with weightings for relative contribution of each commodity to the final equipment and project cost. This in turn generated real cost forecasts for the regulatory control period under review.

In developing its forecast escalation indices for TransGrid's drivers of annual materials costs, SKM has maintained consistency with the method for modelling cost escalation as accepted by the AER in most of its recent decisions. The annual escalation indices presented in this report are specific to the business environment faced by TransGrid, and are based on the most recent information available at the time of preparation.

The following four tables present the results of SKM's analysis and modelling of real and nominal commodity price escalation indices, Australian CPI inflation and foreign exchange rate forecasts. The forecasted annual time period reference in all tables in this report runs from 1 July to 30 June in the following year. The base year for the real dollar term is 2012-13.

The real and nominal annual cost escalation % change forecast for the underlying cost drivers of electricity network infrastructure are presented in Table 1 and Table 3 respectively. These tables provide results for two following scenarios:

- Without the continuation of existing carbon price mechanism from July 2014; and
- With the continuation of existing carbon price mechanism into the foreseeable future.

Regarding the extent of impact of the carbon price mechanism for locally produced materials, it is assumed that only half the cost increase experienced by manufacturers in Australia can be passed through to the customers. SKM expects no Australian carbon price impact on materials and products which are imported.

Table 2 provides the annual inflation measured in Australian CPI % change forecast. Table 4 provides the average annual foreign exchange rate forecast for US dollar against the Australian dollar.

- Table 1 Real annual material cost escalation % change forecast of commodity price indices

Cost Drivers	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Scenario: Without the continuation of existing carbon price mechanism from July 2014							
Aluminium	-11.51%	0.72%	4.69%	4.88%	3.09%	4.42%	2.97%
Copper	-7.54%	0.12%	-0.17%	0.17%	-1.15%	-0.16%	-1.45%
Steel	-11.45%	7.74%	2.84%	2.45%	-0.35%	0.38%	-1.11%
Oil	-4.48%	18.61%	-5.11%	-0.79%	0.74%	1.85%	0.51%
Construction costs	1.00%	1.30%	2.17%	2.25%	2.20%	2.12%	2.10%

Cost Drivers	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Scenario: With the continuation of existing carbon price mechanism							
Aluminium	-11.51%	0.72%	4.89%	5.12%	3.36%	4.71%	3.27%
Copper	-7.54%	0.12%	-0.16%	0.18%	-1.14%	-0.15%	-1.44%
Steel	-11.45%	7.74%	2.92%	2.55%	-0.23%	0.51%	-0.96%
Oil	-4.48%	18.61%	-5.11%	-0.79%	0.74%	1.85%	0.51%
Construction costs	1.00%	1.30%	2.17%	2.25%	2.20%	2.12%	2.10%

- Table 2 Annual Australian CPI % change forecast

Inflation	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Australian CPI % change	2.39%	2.75%	2.50%	2.50%	2.50%	2.50%	2.50%

- Table 3 Nominal annual material cost escalation % change forecast of commodity price indices

Cost Drivers	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Scenario: Without the continuation of existing carbon price mechanism from July 2014							
Aluminium	-9.57%	3.22%	7.36%	7.24%	5.67%	7.03%	5.54%
Copper	-5.52%	2.61%	2.39%	2.42%	1.33%	2.33%	1.01%
Steel	-9.51%	10.43%	5.45%	4.74%	2.15%	2.89%	1.36%
Oil	-2.39%	21.51%	-2.67%	1.45%	3.26%	4.39%	3.02%
Construction costs	3.42%	4.09%	4.73%	4.80%	4.75%	4.67%	4.65%
Scenario: With the continuation of existing carbon price mechanism							
Aluminium	-9.57%	3.22%	7.58%	7.48%	5.95%	7.33%	5.85%
Copper	-5.52%	2.61%	2.39%	2.43%	1.34%	2.34%	1.03%
Steel	-9.51%	10.43%	5.53%	4.84%	2.27%	3.03%	1.52%
Oil	-2.39%	21.51%	-2.67%	1.45%	3.26%	4.39%	3.02%
Construction costs	3.42%	4.09%	4.73%	4.80%	4.75%	4.67%	4.65%

- Table 4 Average annual foreign exchange rate forecast

Forex Rate	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
USD/AUD	1.027	0.925	0.906	0.888	0.878	0.857	0.846

The above figures for scenario with carbon price mechanism exclude the impact for the SF_6 import levy.

1. Introduction

SKM was engaged by TransGrid to develop the commodity price escalation forecast to be used in TransGrid's revenue reset proposal for the forthcoming regulatory period 2014/15-18/19. An integral step to developing annual capital and operating expenditure forecasts is the production of a set of reasonable assumptions with respect to the likely rate of annual material cost escalation.

SKM 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 annual real material escalation indices presented in this report represent SKM'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 AER. Statements in this report that are not based on historical fact are forward looking statements. Although such statements are based on SKM's current estimates and expectations, and currently available competitive market economic data, forward looking statements are inherently uncertain. SKM, therefore, caution the reader 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 commodity escalation indices presented are specific to the business environment faced by TransGrid and are based on the most up-to-date information available at the time of compilation.

1.1 Objective

SKM understands the objective of this assignment is to provide the commodity escalation indices which will assist TransGrid in the preparation of their regulatory proposal. This assistance will be provided through the production of an independent Consultant's report (this report), which can be submitted to the Australian Energy Regulator (AER) and published in the public domain. The commodity indices provided in this report can be used by TransGrid to calculate material cost escalators. The assignment takes into consideration the matters raised in the AER's recent revenue determinations (Powerlink[2], ElectraNet[3], and SPAusNet[4]).

SKM was required to address the specific requirements documented in the consultancy brief provided by TransGrid and produce the following price indices (real and nominal):

- Inflation
- Commodity Forecasts in AUD (taking into account the effects of FOREX).
    - Copper
    - Aluminium
    - Steel
    - Oil
- Construction
- FOREX forecasts for USD/AUD

1.2 Scope

The scope of this assignment prescribes that the modelling and the associated final report will:

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[2] AER Draft and Final decisions of Powerlink reset submission 2012 (SKM's material cost escalation indices forecast report).

[3] AER Draft and Final decisions of ElectraNet reset submission 2013 (SKM's material cost escalation indices forecast report).

[4] AER Draft and Final decision of SPAusNet reset submission 2013 (SKM's material cost escalation indices forecast report).

- Follow the approach adopted by the AER in recent electricity network decisions.

- Describe the annual real and nominal material cost escalation indices for relevant inputs into standard electrical network infrastructure assets (e.g. copper, aluminium, steel etc.) for the next regulatory control period.

- Describe the forecasting methodology used by SKM including the key drivers likely to impact on material escalation of the next regulatory control period.

- Highlight forecasts that will be derived from appropriately sourced independent data and forecasts;

- Illustrate forecasts that will be derived on a consistent basis.

1.3   Project outcomes and deliverables

The primary deliverable for this assignment is a clear and concise independent Consultancy report which supports the resulting escalation factors including an explanation of the approach adopted in developing the annual real and nominal escalation indices and how this approach is consistent with recent electricity network decisions.

2. Methodology

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.

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 2009 final decision on prices 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.[5]

SKM confirms that its method for modelling the forecast changes in the price of commodities ultimately used in TransGrid's expenditure forecasts is consistent with the approach accepted by the AER in its recent decisions.

This section of the report provides a step-by-step description of the method employed by SKM in modelling the commodities price escalation forecast.

The opportunity to develop an enhanced understanding of the drivers of network asset costs originally presented itself to SKM during a 2006 multi-utility strategic procurement assignment. It was from this study that SKM was able to demonstrate that prices were increasing with rate 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.

SKM 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). SKM's knowledge base of network management, operational and asset procurement experience was also drawn upon during this establishment of cost drivers.

The results of SKM'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; and
- Foreign exchange rates – primarily the USD to AUD relationship to convert commodities in international market quoted in USD.

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

The escalation indices of the primary factors, when combined with appropriate weightings and assigned to each material component, provide 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, SKM 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 underlying information used to populate the SKM model and calculate the forecast escalation indices are listed in Table 5.

- Table 5 Underlying information

Escalation Indices	Sources	Application
Australian Inflation Index	Australian Bureau of Statistics, Reserve Bank of Australia	All (to convert nominal to real terms)
US Inflation Index	US-Bureau of Labor Statistics and US-Congressional Budget Office	All imports (to convert nominal to real terms)
Commodity Prices	London Metal Exchange, Consensus Economics, MEPS, Bloomberg, US-Energy Information Administration and NYMEX	Primary equipment, structures, overhead conductors, cables etc.
Construction Index	Australian Construction Industry Forum	Civil, foundation, building etc.
Forecast Foreign Exchange Rates	Reserve Bank of Australia and Bloomberg future contracts	Imported goods in Australian currency (e.g. protection & control, switchgear, insulators, fittings etc.)

3. Movements in Key Cost Drivers

In order to ensure all forecasts incorporate current and recent market information, SKM updates key cost drivers and economic indicators within the SKM 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 are updated.

3.1 Australian Consumer Price Index

The Australian CPI is used as a proxy for the local manufacturing price index. SKM acknowledges that while the historic Australian Producer Price Index (PPI) for electrical equipment manufacturing is available[6], the forecast for such precise activity is not. More importantly, such Australian PPI provides composite price movement indication of the entire input (or output) mix of the manufacturing process, and as such is not an exact indicator of manufacturing activity (or manufacturing labour) only price movement. SKM has therefore relied on the Australian CPI, for which 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.

SKM 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 (September 2013 quarter data for this modelling exercise) and determine the annual Australian CPI % change by comparing it 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 (the November 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 data points for the entire duration of the forecast period; and

- Since this index data is annual measurements and take into account 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 are fairly steady and constant, and generally moves in one predictable direction. Therefore, 'picking' the end 12th month data form 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.

This annual Australian CPI % change forecast used during SKM modelling is presented in Table 6.

- Table 6 Annual Australian CPI % change forecast

Inflation	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19

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

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Inflation	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Australian CPI % change	2.39%	2.75%	2.50%	2.50%	2.50%	2.50%	2.50%

In seeking to understand the overall reasonableness of such annual Australian CPI % change forecast, SKM established that since first targeting its current range of 2-3% in 1993, the RBA has historically achieved an actual average of 2.71% and over the most recent five years the actual average of 2.66%, both of which are higher than the expected midpoint of the target range of 2.5%.

This "above the midpoint of the RBA's targeting range" historic CPI result is illustrated in the following Figure 1.

- Figure 1 RBA historic CPI targeting results
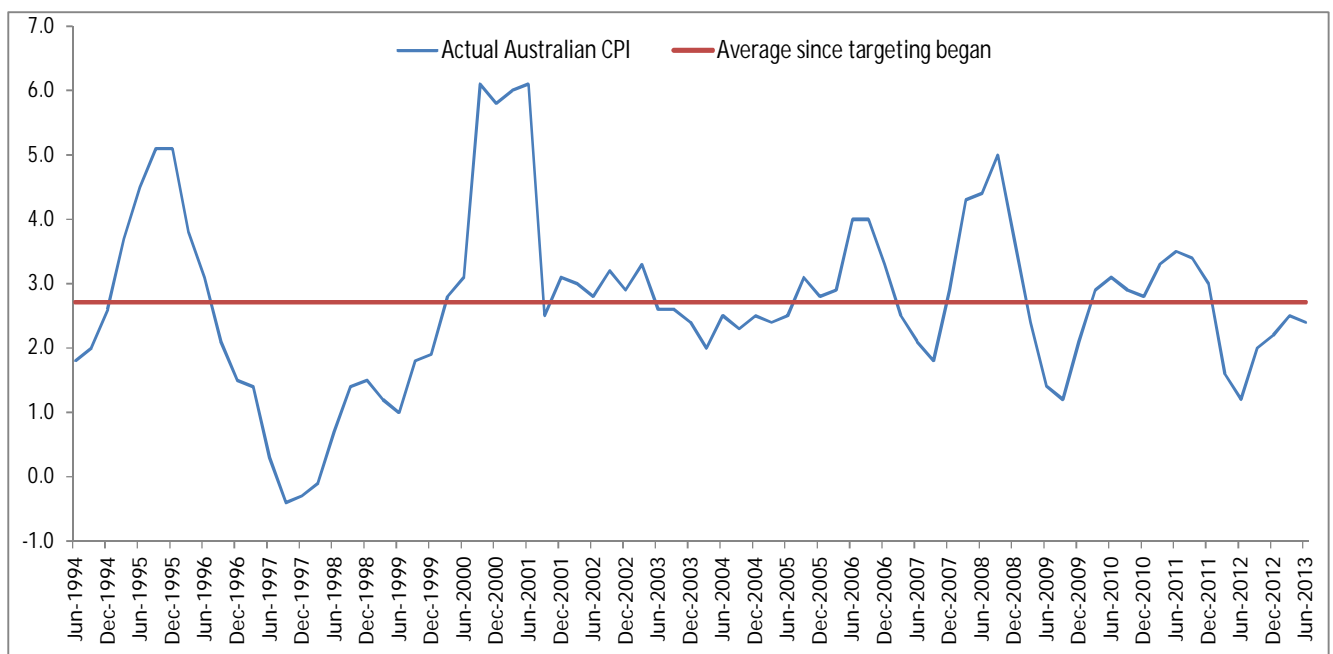
SKM therefore considers that this methodology of including both the midpoint of the RBA target range and short term forecasts provides a conservative estimate of the likely position of this network cost pressure that can reasonably be expected to materialise over the upcoming regulatory control period.

3.2 Australian Dollar to US Dollar exchange rate

The SKM Cost Escalations 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 (November 2013 month data for this modelling exercise);

- Take an average of daily forward rate from the latest available complete month (November 2013) for each forward contract from Bloomberg;

- Thereafter, SKM has adopted the longer term historical average of 0.80 USD/AUD exchange rate as the long term forecast going forward; and

- Apply linear interpolation between the months without forward contract and long term average data point to form a 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 Table 7.

- Table 7 Average annual foreign exchange rates forecast

Forex Rate	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
USD/AUD	1.027	0.925	0.906	0.888	0.878	0.857	0.846

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.

3.3 US Consumer Price Index

The 'USA All Urban Consumer CPI-U' trend is referred 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 (November 2013 month data for this modelling exercise);

- Plot the ten calendar years of US CPI forecast data from the most recent (February 2013) The Budget and Economic Outlook publication of the US Congressional Budget Office; and

- Apply linear interpolation between the above plotted data to form a continuous monthly data points for the entire duration of the forecast period.

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

3.4 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)[7] is the peak consultative organisation of the building and construction sectors in Australia. The ACIF has established the Construction Forecasting Council (CFC)[8] through which it provides a tool kit of analysis and information.

In commenting on activity related to the engineering construction specific to Energy and Pipeline sector the Construction Forecasting Council in its 3 December 2013 news announcement[9] noted *"Activity falling away from the local peak achieved last year. Electricity will lift as regulatory decisions permit necessary investment in networks. Some renewable projects at risk depending on the legislative reform agenda of the new Commonwealth Government."* Similarly, for New South Wales, it noted *"Some tapering off in engineering in the next 2 years, followed by growth in areas including roads, electricity and pipelines and other utilities."*

Figure 2 illustrates the CFC's outlook for electricity and pipeline construction demand out to 2018-19. This illustrates how New South Wales is expected to experience a small decrease in program of construction in this sector in the immediate future before plateauing and maintaining the volume of construction work till 2018-19.

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[7] http://www.acif.com.au
[8] http://www.cfc.acif.com.au/cfcinfo.asp
[9] http://www.acif.com.au/acif-news/engineering-has-peaked-but-remains-high

- Figure 2 CFC electricity and pipeline construction outlook [10]
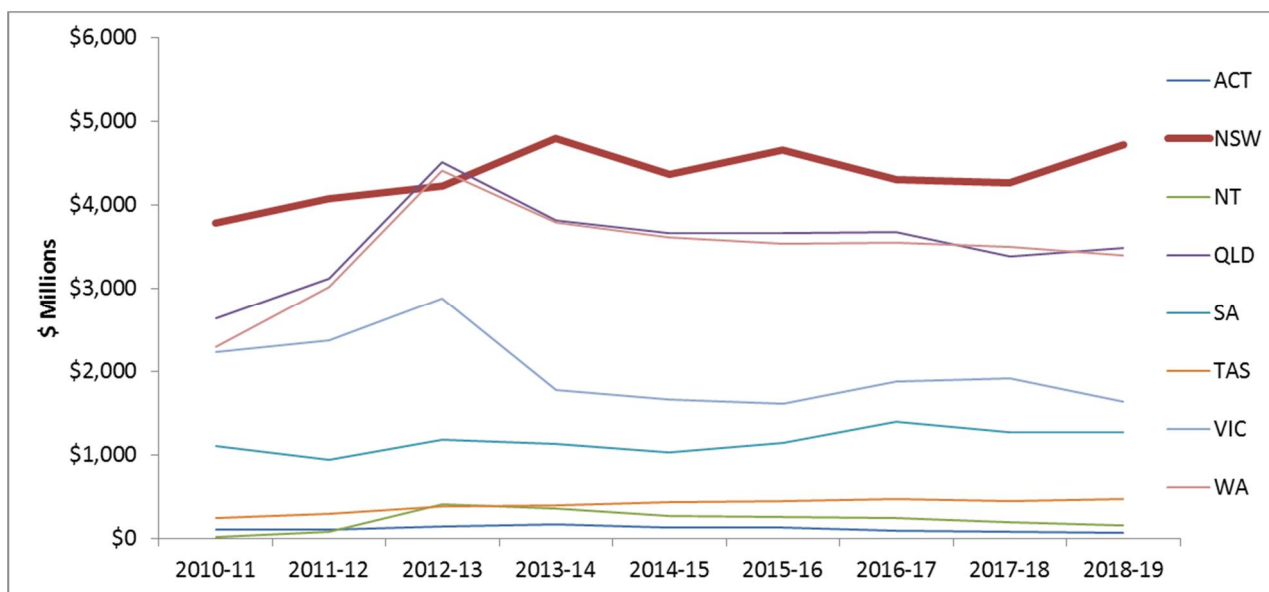
As the CFC considers the overall electricity and pipeline construction activities in Australia to fall within the sector it presently entitles as "Engineering", SKM has adopted these movements presented as Australian National "Engineering" construction cost forecasts as the likely movements in the Australian wide construction cost component of relevance to TransGrid within cost escalation modelling.

The following steps are performed to forecast this economic indicator:

- Plot the most recent actual/ historical and forecast annual 'Engineering' construction price index[11] from the CFC's toolkit;

- Apply linear interpolation between the above plotted index to form a continuous monthly data points for the entire duration of the forecast period; and

- Since this index data is annual measurements and take into account 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 are fairly steady and constant, and generally moves in one predictable direction. Therefore, 'picking' the end 12th month data form 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.

Table 8 provides the relative excerpt of the CFC engineering construction real price index and nominal price index, based on the most recent data available on November 2013.

- Table 8 CFC annual forecast of Engineering construction costs

Construction	Historic			Forecast				
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Real price index	1.034	1.044	1.058	1.081	1.105	1.129	1.153	1.177
% change	n/a	1.00%	1.30%	2.17%	2.25%	2.20%	2.12%	2.10%

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[10] http://data.acif.com.au/forecast_results.asp downloaded 05 December 2013

[11] It is noted here that from October 2012, the ACIF forecasts are being reported in terms of real value instead of nominal value. The base year for this November 2013 forecast is 2010-11.

Construction	Historic			Forecast				
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Nominal price index	1.034	1.069	1.113	1.165	1.221	1.280	1.339	1.402
% change	n/a	3.42%	4.09%	4.73%	4.80%	4.75%	4.67%	4.65%

3.5 Commodity prices

This section of the report presents the methodology employed by SKM 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 SKM modelling methodology incorporates the use of commodity futures contract prices into cost escalation rate computations.

3.5.1 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.

The AER has a strong preference for the future contract market as the basis for forecasts as they are considered to provide greater and more immediate financial risk than the various economic forecasts that do not involve any direct financial risk to the forecasters.

SKM has thus adopted available futures prices into its forecast method, except where expressly noted. This is discussed in further detail in Section 3.5.3.

3.5.2 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. SKM 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 Revenue Determinations in utilising Consensus Economics'[12] quarterly publication "Energy and Metals Consensus Forecasts" as the source from which the long-term position of the copper and aluminium market prices were sourced. 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.

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[12] 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.

In developing annual price movements for copper and aluminium, SKM 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 3.5.3.

3.5.3   SKM's application of futures contracts and long-term forecasts

When updating the position of the key cost drivers, SKM 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, SKM has assumed that there is no price impact on material or items of equipment which are imported, but that 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).

3.5.3.1   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.

SKM employs an eight 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 aluminium and copper. Due to the volatility in daily spot and futures market prices, SKM uses 12 months annual average prices within its modelling process. The steps involved are:

- Plot the daily average of the latest available complete month (November 2013) of LME spot prices;

- Plot the November 2013 daily average of the LME 3 month prices;

- Plot the November 2013 daily average of the LME December year 1 prices;

- Plot the November 2013 daily average of the LME December year 2 prices;

- Plot the November 2013 daily average of the LME December year 3 prices;

- Plot the October 2013 Consensus Economics Long Term forecast position (taken as 7.5 years from the survey date)[13];

- Apply linear interpolation between the plot points; and

- Since this price data trend fluctuates 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 July to June annual period.

This method is illustrated in Figure 3 (*note that the figures are illustrative only and do not refer to the actual position/price of any particular commodity*).

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[13] 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, SKM consider the position to refer to the mid-point of this range, being 7.5 years, or 90 months hence.

- Figure 3 Diagram of method (illustrative only). Steps 1-6 (left) and steps 7-8 (right)
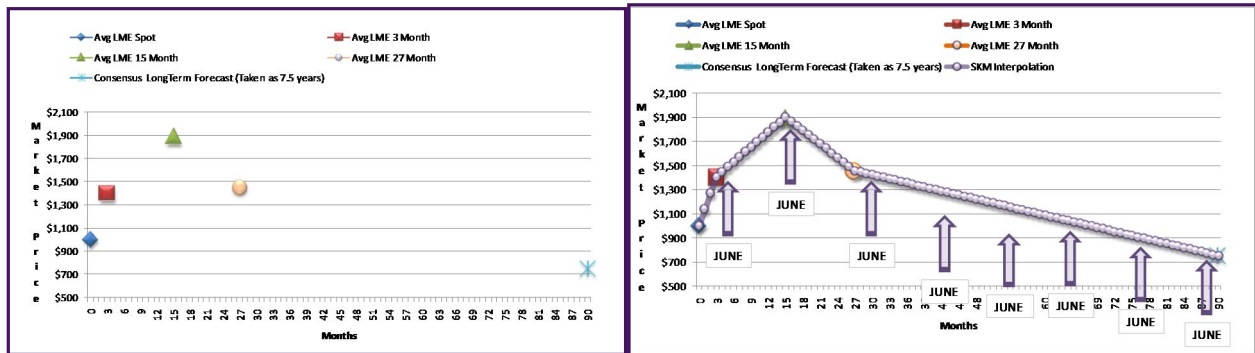
The real and nominal price forecasts for July to June for aluminium market prices are presented in Table 9 and Table 10 respectively. The real and nominal price forecasts for July to June for copper market prices are presented in Table 11 and Table 12 respectively.

- Table 9 Real annual cost escalation indices of aluminium

Aluminium	Historic		Forecast					
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Annual average price in base year 2012-13 real AUD **(Scenario: carbon price mechanism discontinues from July 2014)**	$2,153	$1,905	$1,919	$2,009	$2,107	$2,172	$2,268	$2,336
% annual change	n/a	-11.51%	0.72%	4.69%	4.88%	3.09%	4.42%	2.97%
Annual average price in base year 2012-13 real AUD **(Scenario: carbon price mechanism continues to exist)**	$2,153	$1,905	$1,919	$2,013	$2,116	$2,187	$2,290	$2,365
% annual change	n/a	-11.51%	0.72%	4.89%	5.12%	3.36%	4.71%	3.27%

- Table 10 Nominal annual cost escalation indices of aluminium

Aluminium	Historic		Forecast					
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Annual average price in nominal AUD **(Scenario: carbon price mechanism discontinues**	$2,092	$1,892	$1,952	$2,096	$2,248	$2,375	$2,542	$2,683

Aluminium	Historic			Forecast				
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
from July 2014)								
% annual change	n/a	-9.57%	3.22%	7.36%	7.24%	5.67%	7.03%	5.54%
Annual average price in nominal AUD **(Scenario: carbon price mechanism continues to exist)**	$2,092	$1,892	$1,952	$2,100	$2,258	$2,392	$2,567	$2,717
% annual change	n/a	-9.57%	3.22%	7.58%	7.48%	5.95%	7.33%	5.85%

- Table 11 Real annual cost escalation indices of copper

Copper	Historic			Forecast				
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Annual average price in base year 2012-13 real AUD **(Scenario: carbon price mechanism discontinues from July 2014)**	$8,133	$7,520	$7,529	$7,516	$7,529	$7,443	$7,431	$7,323
% annual change	n/a	-7.54%	0.12%	-0.17%	0.17%	-1.15%	-0.16%	-1.45%
Annual average price in base year 2012-13 real AUD **(Scenario: carbon price mechanism continues to exist)**	$8,133	$7,520	$7,529	$7,517	$7,530	$7,444	$7,433	$7,326
% annual change	n/a	-7.54%	0.12%	-0.16%	0.18%	-1.14%	-0.15%	-1.44%

- Table 12 Nominal annual cost escalation indices of copper

Copper	Historic			Forecast				
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Annual average price in nominal AUD **(Scenario: carbon price mechanism discontinues**	$7,901	$7,465	$7,659	$7,842	$8,032	$8,138	$8,328	$8,413

Copper	Historic			Forecast				
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
from July 2014)								
% annual change	n/a	-5.52%	2.61%	2.39%	2.42%	1.33%	2.33%	1.01%
Annual average price in nominal AUD **(Scenario: carbon price mechanism continues to exist)**	$7,901	$7,465	$7,659	$7,842	$8,033	$8,140	$8,331	$8,416
% annual change	n/a	-5.52%	2.61%	2.39%	2.43%	1.34%	2.34%	1.03%

3.5.3.2   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. SKM 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.

SKM 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 October 2013 Survey. This publication provided quarterly forecast market prices for steel till December 2015, as well as year 3 (2016), year 4 (2017), year 5 (2018), and a long-term forecast pricing position. SKM 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; and

- Since this price data trend fluctuates 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 July to June 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 USD.

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, SKM uses the average of these two forecasts (US HRC and EU HRC) as its Steel price inputs to the cost escalation modelling process.

The real and nominal steel price forecasts are presented in Table 13 and Table 14 respectively, and are consistent with the methodology accepted by the AER in recent electricity network decisions.

- Table 13 Real annual cost escalation indices of average HRC steel

HRC Steel	Historic		Forecast					
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Annual average price in base year 2012-13 real AUD **(Scenario: carbon price mechanism discontinues from July 2014)**	$729	$646	$696	$715	$733	$730	$733	$725
% annual change	n/a	-11.45%	7.74%	2.84%	2.45%	-0.35%	0.38%	-1.11%
Annual average price in base year 2012-13 real AUD **(Scenario: carbon price mechanism continues to exist)**	$729	$646	$696	$716	$734	$733	$736	$729
% annual change	n/a	-11.45%	7.74%	2.92%	2.55%	-0.23%	0.51%	-0.96%

- Table 14 Nominal annual cost escalation indices of average HRC steel

HRC Steel	Historic		Forecast					
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Annual average price in nominal AUD **(Scenario: carbon price mechanism**	$708	$641	$708	$747	$782	$799	$822	$833

HRC Steel	Historic			Forecast				
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
discontinues from July 2014)								
% annual change	n/a	-9.51%	10.43%	5.45%	4.74%	2.15%	2.89%	1.36%
Annual average price in nominal AUD **(Scenario: carbon price mechanism continues to exist)**	$708	$641	$708	$747	$783	$801	$825	$838
% annual change	n/a	-9.51%	10.43%	5.53%	4.84%	2.27%	3.03%	1.52%

SKM observes that the forecast steel price escalation between 2012/13 and 2013/14 is relatively higher than the historical trend. The price increase for steel over this period is a result of a forecast increase in the commodity in USD as well as a significant drop in foreign exchange over the same period.

The significant drop in the USD/AUD foreign exchange rate from the 2012/13 financial year (average rate of 1.027) to the 2013/14 financial year (average rate of 0.925) resulted in an increase in prices for all commodities in AUD terms. However the drop in the foreign exchange rate is largely offset for most commodities, but not for steel, due to the drop in USD prices of most commodities that occurred over the same period. The actual/historical prices of these commodities quoted in USD in the international market which sets the reference or 'starting' point for the forecast price trends generally decreased from February 2013 to August 2013. The influence of the recent foreign exchange rate changes overcomes and supersedes the recent drop in USD price trends. As steel price trends only decreased marginally over this period, the combined effect of this marginal decrease in USD price and significant drop in foreign exchange rate resulted in an overall marginally high escalation between 2012/13 and 2013/14.

3.5.3.3   Oil

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

SKM has researched[14] 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. Future 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 Figure 4, with the blue trend line showing the spot price, with 4 years of future contract prices shown at annual intervals. The "flat" nature of the future contract 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 future contract prices as far as 4 years ahead.

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[14] 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.

■ Figure 4 Oil (Brent[15]) future contact prices compared to spot prices (blue) 2005 – 2012
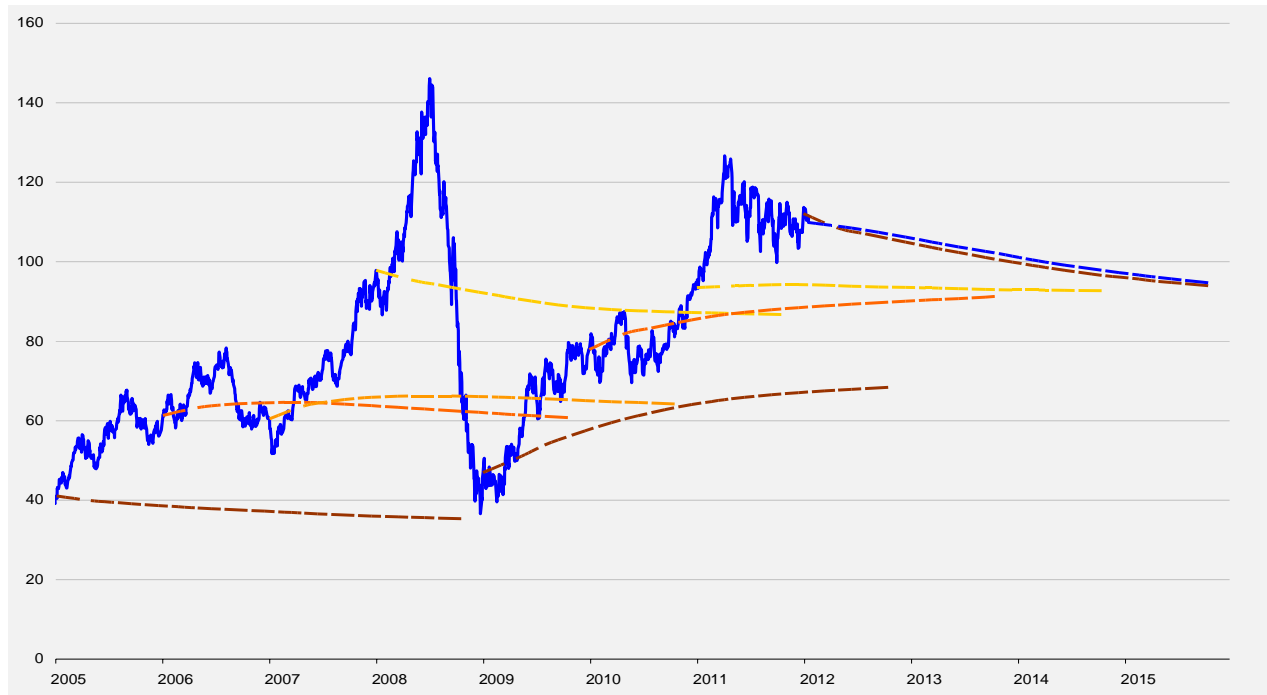

Source: Morgan Stanley Commodities

Future contract volumes beyond one year are low and the market is relatively illiquid, further highlighting the unsuitability of using future contract prices as the basis of long term price expectations. As the chart in Figure 5 illustrates, beyond 3-6 months volumes and liquidity are very low.

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[15] 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 5 Future oil market volumes showing open contracts and traded volumes
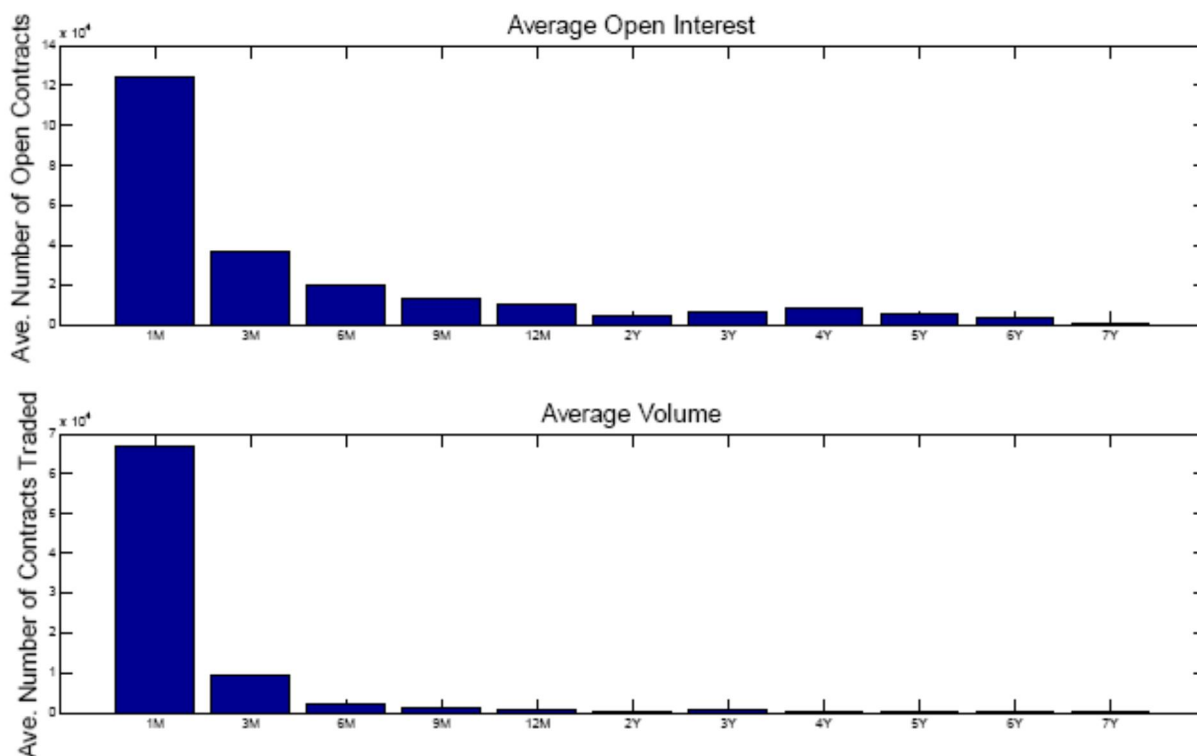
In order to find a more reliable and robust source of future oil prices, SKM compared the actual prices against the historical predictions of oil-WTI price using the three sources from recent (2011–2013) years:

- NYMEX future contracts;

- The US Energy Information Administration (EIA) Annual Energy Outlook; and

- Consensus Economics' "Energy and Metal Consensus Forecasts".

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

- Table 15 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), SKM has selected the Consensus Economics forecast to be the best currently available outlook for oil prices throughout the duration of the TransGrid'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 October 2013 Survey. This publication provided quarterly forecast market prices for oil till December 2015, as well as year 3 (2016), year 4 (2017), year 5 (2018), and a long-term forecast pricing position. SKM 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 oil. 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; and

- Since this price data trend fluctuates 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 July to June annual period.

The resultant forecast for real and nominal oil prices used as the basis for calculating annual escalation is shown in the following Table 16 and Table 17 respectively.

- Table 16 Real annual cost escalation indices of Oil-WTI

Oil-WTI	Historic			Forecast				
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Annual average price in base year 2012-13 real AUD	$95	$90	$107	$102	$101	$102	$104	$104
% annual change	n/a	-4.48%	18.61%	-5.11%	-0.79%	0.74%	1.85%	0.51%

- Table 17 Nominal annual cost escalation indices of Oil-WTI

Oil-WTI	Historic			Forecast				
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Annual average price in nominal AUD	$92	$90	$109	$106	$108	$111	$116	$120
% annual change	n/a	-2.39%	21.51%	-2.67%	1.45%	3.26%	4.39%	3.02%

SKM observes that the forecast oil price escalation between 2012/13 and 2013/14 is materially higher than the historical trend. The price increase for oil over this period is a result of a forecast increase in the commodity in USD as well as a significant drop in foreign exchange over the same period.

The significant drop in the USD/AUD foreign exchange rate from the 2012/13 financial year (average rate of 1.027) to the 2013/14 financial year (average rate of 0.925) resulted in an increase in prices for all commodities in AUD terms. However the drop in the foreign exchange rate is largely offset for most commodities, but not for oil, due to the drop in USD prices of most commodities that occurred over the same period. The actual/historical prices of these commodities quoted in USD in the international market which sets the reference or 'starting' point for the forecast price trends generally decreased from February 2013 to August 2013. The influence of the recent foreign exchange rate changes overcomes and supersedes the recent drop in USD price trends. As oil price trends did not decrease over this period, the combined effect of the increase in USD price and significant drop in foreign exchange rate resulted in an overall high escalation between 2012/13 and 2013/14.

4. Impact of Carbon Price Mechanism

4.1 Basis

Legislation passed in 2011 by the Australian Parliament introduced the Clean Energy Future (CEF) scheme (carbon price mechanism) that has imposed costs on emitters of greenhouse gases from July 2012. However, existing assistance for emission intensive trade exposed (EITE) industries and the fact that these industries are typically trade exposed, will reduce the CEF impact on some emissions intensive industries during at least the early stages of operation of the scheme. The purpose of this section is to outline the method and assumptions used to assess the impact of carbon pricing on costs of key materials used for electricity network assets and therefore the cost of those assets. The cost impact was concentrated on aluminium, copper and steel. All of these commodities are trade-exposed and emission intensive.

The elements of carbon price mechanism impact that were included in this modelling are:

- Projected Australian carbon permit prices based on the latest available Commonwealth Government projection (PEFO August 2013) which takes into consideration that from July 2014 the Australian CEF scheme will be linked with the current European carbon pricing scheme allowing the trading of permits between the two schemes. SKM assumes that the carbon price will be set equivalent to the international carbon price in from July 2014;

- Emissions intensity of emission intensive materials;

- Percentage of costs passed through to take account of assistance to the EITE industries, such as producers of aluminium, copper and steel, which are expected to reduce regularly over the foreseeable future;

- Assumption on the extent of the local manufacturers' ability to pass through the additional carbon cost to the customers and that there would be no carbon price impact on imported materials and products; and

- Based on the results of the 7 September 2013 election and the intention of the ruling Government to repeal the scheme, SKM has assumed a scenario with an estimate of the scheme discontinuation date being July 2014. SKM acknowledges this scenario of the repeal date is an estimate only and the possibility of the actual repeal date may be before or after July 2014. Likewise, SKM also notes that there is a possibility of this scheme to continue in its present format linking with the European scheme from July 2014 as intended in the foreseeable future. Therefore, SKM has modelled and presented the commodity price escalation indices forecast in this report with two scenarios, namely, without and with the continuation of the existing Australian carbon pricing scheme form July 2014.

4.2 Carbon pricing mechanism modelling

The most current projection of the carbon price positions released by the Federal Government is in the Pre-Election Economic and Fiscal Outlook 2013 or PEFO report in August 2013. The appropriate section of the PEFO is reproduced in the following paragraph.

> "The PEFO incorporates the carbon price methodology introduced in the 2013-14 Budget. This methodology uses a three-month average of futures market prices in the forecast years, including the start of emissions trading in 2014-15. Carbon prices in the projection years of 2015-16 and 2016-17 are estimated using a linear transition from market prices to the longer-term modelled price of $38 in 2019-20 from the Strong Growth, Low Pollution Report. Based on this methodology, the carbon price is estimated to be $6.20 in 2014-15, $12.50 in 2015-16 and $18.90 in 2016-17.
>
> The longer-term modelled price is based on analysis contained in the Strong Growth, Low Pollution (SGLP) Report released in 2011. This modelling provides the latest available

comprehensive assessment of the impact of global emissions reduction pledges for 2020 and the prices required to achieve the global environmental goals over time.

While the modelling provides a longer-term estimate for prices in 2020, the carbon price path to 2020 is subject to considerable uncertainty. This price path will continue to be significantly affected by changes in the economic outlook in Europe following a period of profound economic weakness, as well as uncertainty associated with the impacts of short-term and structural reform proposals in the EU ETS. In light of these uncertainties, the use of a linear interpolation to derive carbon prices in the projection years is a simple, transparent approach.

Futures contracts in the projection years are thinly traded, and market analyst views of the carbon price outlook to 2020 vary widely"[16].

With regard to the scenario which assumes the continuation of the existing Australian carbon pricing scheme from July 2014, SKM considers it appropriate to use the latest Federal Government's projections of carbon prices, which take into account all of the relevant changed variables. This takes into account the move towards a floating price linked to the European scheme from July 2014 and the Euro/AUD foreign exchange rate changes. For years subsequent to 2016-17, the nominal price is projected to increase linearly to $38/t CO_2e by 2019-20 financial year.

With regard to the scenario which assumes the discontinuation of the existing Australian carbon pricing scheme from July 2014, SKM considers it appropriate to use the same Federal Government's projection until June 2014 and thereafter adopt $0/t CO_2e.

The nominal prices used by SKM for the relevant forecast years are, therefore, those in the PEFO 2013 report and they are presented in Table 18. SKM converted them into real prices in 2012-13 base year using the projected Australian inflation CPI and they are presented in Table 19.

■ Table 18 Australian carbon permit nominal prices

Carbon	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Carbon price in nominal AUD ($/t CO_2e) **(Scenario: carbon price mechanism continues to exists)**	$23.00	$24.15	$6.20	$12.50	$18.90	$25.30	$31.65
Carbon price in nominal AUD ($/t CO_2e) **(Scenario: carbon price mechanism discontinues from July 2014)**	$23.00	$24.15	----	----	----	----	----

■ Table 19 Australian carbon permit real prices

Carbon	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Carbon price in model base year 2012-13 real AUD ($/t CO_2e) **(Scenario: carbon price mechanism continues**	$23.00	$23.50	$5.89	$11.58	$17.08	$22.31	$27.23

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[16] PEFO 2013, August 2013, page 55.

Carbon	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
to exists)							
Carbon price in model base year 2012-13 real AUD ($/t CO$_2$e) **(Scenario: carbon price mechanism discontinues from July 2014)**	$23.00	$23.50	----	----	----	----	----

The effect of the CEF scheme or the carbon price mechanism on cost drivers is modelled through the assignment of greenhouse emission intensity to each of the cost drivers. The total emission intensity or embodied emission is measured in tonnes of CO_2 emitted per tonnes of produced commodity. It is based on prescribed data in the CEF scheme which is the Commonwealth Government assessments of emissions intensive industries as shown in Table 20. The total emission intensity is the sum of direct and indirect emission intensity. Direct emission intensity reflects the emissions actually produced in the plant that manufactures the material, either from combustion of fossil fuels or from the chemical reactions or the industrial process involved. Indirect emissions cover the embedded emission in the inputs used (i.e. occurring outside of the plant), mainly imported electricity.

- Table 20 Total emission intensity of production

Total emission intensity	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Aluminium (t CO2e/t Al3+)	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Copper (t CO2e/t Cu)	1.95	1.95	1.95	1.95	1.95	1.95	1.95
Steel (t CO2e/t Fe)	2.37	2.37	2.37	2.37	2.37	2.37	2.37

These emission intensity factors are multiplied by projected emissions permit prices to derive an additional "carbon price" effect for each of the individual input drivers or commodities. The model allows for different treatment of EITE commodities (e.g. Aluminium), in line with proposed compensation measures included in the December 2008 CEF White Paper and subsequent policy announcements. Assistance for EITE industries is also part of current policy, with the percentage level of assistance sourced from Department of Climate Change documents relating to the operation of the EITE assistance scheme. The factors used in the CEF modelling are shown in Table 21 below. For EITE industries rated as "High" assistance starts at 94.5% in 2012-13 financial year and reduces by the carbon productivity contribution of 1.3% pa.

- Table 21 EITE assistance levels

EITE assistance	Historic		Forecast				
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Aluminium [EITE Level: High]	94.5%	93.3%	92.1%	90.9%	89.7%	88.5%	87.3%
Copper [EITE Level: High]	94.5%	93.3%	92.1%	90.9%	89.7%	88.5%	87.3%
Steel [EITE Level: High]	94.5%	93.3%	92.1%	90.9%	89.7%	88.5%	87.3%

Pass-through coefficients for each of these price impacts have been developed based on expected EITE assistance levels.

SKM has calculated the expected price impact on each of these commodities by multiplying the carbon price by the emissions intensity, subtracting the percentage impact of EITE existing assistance, to determine a per unit (tonne) emissions cost for each commodity. This impact was then added to the base commodity price forecast to determine a future price path including carbon price mechanism cost impacts.

SKM considers that the impact of the Australian carbon price mechanism on imported material and components will be immaterial as the Australian carbon price is expected to have no or negligible impact on the international price of materials. While it is difficult to gauge the impact of the carbon price on locally manufactured materials and items of equipment, our methodology allows an estimate to be made of the additional carbon costs to local manufacturers which they might be able to pass through to customers. While SKM expects that local producers will attempt to pass through the additional costs to local consumers, it is not clear that such attempts will be successful. Depending on local market circumstances, actual outcomes might range between all or none of the incurred costs being passed through to customers. SKM considers it reasonable to assume that the ability of local manufacturers to pass through this additional carbon cost will be constrained to only half the cost incurred.

It was then assumed that, because of market constraints, local producers could only pass through half the additional costs incurred due the carbon price mechanism. Imported materials and items of equipment were assumed to be unaffected by the Australian carbon price mechanism.

SKM has modelled the following two assumptions or scenarios:

- The existing carbon price mechanism will continue to exist in the same form to June 2019; and
- The existing carbon price mechanism will discontinue from July 2014.

5. Conclusion

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

The real and nominal escalation factors established during this assignment were based on the most up-to-date information available at the time of compilation. These indices therefore constitute SKM's calculated opinion of appropriate materials cost escalation rates that can reasonably be expected to affect TransGrid over the upcoming revenue regulation period.

The results of SKM's modelling during this assignment for forecasting the real commodity price escalation indices, nominal commodity price escalation indices, Australian inflation, and foreign exchange rate against Australian dollar are presented in the Table 1, Table 3, Table 2, and Table 4 respectively in Executive Summary of this report. The escalation indices with carbon price mechanism exclude the impact for the SF_6 import levy.

It is noted that not all TransGrid's asset is impacted by the existence or continuation of the Australian carbon price mechanism. The modelled forecast indices are based on the assumption that the carbon cost impact will be partially (estimated at 50%) passed through for locally manufactured items of equipment, but not impact prices at all for fully imported items. This partial pass through assumption is considered prudent given that some locally manufactured items will be made from imported materials and that competition in the market may act to constrain the ability of local producers to pass through to customers the full cost impact.

In exerting the expected cost pressures on TransGrid, SKM concludes that these material price escalation forecasts form a component of efficient prices for an Australian electricity network business. SKM therefore recommends that TransGrid take account of these material price escalation forecasts within their forthcoming regulatory expenditure proposal.