Escalation factors affecting expenditure forecasts

A report for NSW Electricity Businesses

Dr. Tom Hird
Daniel Young

April 2008

Table of Contents

Figures

Tables

Executive Summary

The NSW electricity transport businesses[1] have asked CEG to advise on the development of annual escalation factors for their expenditure program. To do this we have identified the core inputs into the businesses' expenditure program. These inputs are purchased both directly by the businesses and indirectly (ie, embodied in the equipment or services purchased by the businesses).

- Labour in the electricity gas and water sector;
- Labour more generally;
- Construction services;
- Copper;
- Aluminium;
- Crude oil;
- Fabricated steel;
- Equipment producers' margins; and
- Land

We have then used a combination of futures market data (where this is available) and surveys of professional forecasters to estimate the rate of price growth of each of the above over the regulatory period.

The results of which are summarised in table 26 (repeated below). This table also summarises historical price movements and highlights the very significant real growth in equipment input prices over the last regulatory period – growth that was generally not anticipated (and therefore not compensated) by regulators in the current regulatory period.

[1] EnergyAustralia, Integral Energy, Country Energy and TransGrid.

Summary of escalation factors (year ended June)

	2003 (a)	2004 (a)	2005 (a)	2006 (a)	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
Copper (nominal)	-5.7%	18.9%	28.8%	62.1%	33.2%	2.5%	-1.0%	-4.1%	-1.9%	-0.4%	-0.6%	-0.8%
Aluminium (nominal)	-10.3%	-5.6%	9.1%	25.2%	14.0%	-2.8%	6.3%	1.9%	2.3%	2.8%	2.6%	2.4%
Crude oil (nominal)	11.2%	-9.0%	33.7%	40.0%	-0.6%	28.1%	15.4%	-1.4%	1.0%	2.0%	0.5%	1.5%
Steel (real)	0.8%	0.3%	4.8%	-0.4%	1.8%	0.2%	0.1%	0.3%	0.2%	0.2%	0.2%	0.2%
EGW NSW wages (real)	1.6%	1.9%	1.8%	1.5%	4.3%	3.1%	3.6%	3.9%	1.9%	2.8%	3.5%	3.7%
Construction costs (real)	0.0%	0.6%	2.7%	1.7%	8.4%	2.3%	2.1%	0.9%	0.7%	1.1%	1.9%	2.6%
Wages general (real)	-0.1%	1.6%	1.1%	0.8%	2.5%	1.8%	1.6%	2.4%	1.9%	1.8%	2.0%	2.0%
Producer's margin (real)				24.2%	24.2%	9.5%	5.4%	6.1%	7.6%	0.0%	0.0%	0.0%
Land (real)						4.1%	4.1%	4.1%	4.1%	4.1%	4.1%	4.1%
CEG CPI	2.7%	2.5%	2.5%	4.0%	2.1%	3.0%	2.8%	2.4%	2.4%	2.5%	2.5%	2.4%
Copper (real)	-8.2%	16.0%	25.6%	55.9%	30.5%	-0.4%	-3.7%	-6.3%	-4.2%	-2.8%	-3.1%	-3.1%
Aluminium (real)	-12.6%	-7.9%	6.5%	20.4%	11.6%	-5.6%	3.5%	-0.5%	-0.2%	0.3%	0.0%	0.0%
Crude oil (real)	8.3%	-11.2%	30.5%	34.7%	-2.6%	24.4%	12.3%	-3.8%	-1.3%	-0.5%	-2.0%	-0.9%

1. Description of Method

The NSW electricity transport businesses[2] have asked CEG to advise on the development of annual escalation factors for their expenditure program. We have recently performed a similar task for Electranet and are also simultaneously advising Transend on these issues.

In order to perform this task it is necessary to obtain or develop forecasts of either:

a) the price of goods and services directly purchased by the business for the purpose of delivering its expenditure program; or

b) the price of inputs used in the production of goods and services directly purchased by the business for the purpose of delivering its expenditure program.

This task would best be achieved by examining forecasts of prices for all inputs purchased by NSW electricity transport businesses (ie, category a) above). Unfortunately, with the exception of labour costs, such forecasts generally do not exist. For example, while there are forecasts for labour costs in the NSW electricity sector there are few if any forecasts of the cost of equipment purchased by the businesses (such as transformers, switchgear, high/low voltage conductor and cable etc).

The lack of such forecasts for most goods and services purchased by the businesses reflects the specialised and heterogeneous nature of these goods and services – such that there is insufficient demand for forecasts of these prices and no active trading in 'futures' for these goods and services. For example, there is no formal 'futures market' for high voltage transformers.

However, forecasts do exist for many of the inputs used in the production of equipment/services purchased by the businesses. For example, the transformers purchased have themselves been produced using labour, capital and materials (eg, fabricated steel, copper, oil, energy etc). For many of these inputs there are raw material forecasts and/or futures prices that can inform forecasts for the prices of transformers themselves. Specifically:

a) Forecasts/futures prices for refined copper can be used to inform price forecasts for the fabricated copper used in transformers;

b) Forecasts/futures prices for crude oil can be used to inform price forecasts for the insulating oil used in transformers;

[2] EnergyAustralia, Integral Energy, Country Energy and TransGrid.

c) Forecasts of labour costs can be used to inform forecasts of the labour costs for equipment manufacturers;

d) Forecasts of the price of steel at the 'mill gate' can be used to derive forecasts of the cost of the fabricated steel used by The businesses;

e) Forecasts in financial markets of the profit margins earned by equipment manufacturers can be used to inform forecasts of the return on capital charged by equipment makers; and

f) Forecasts of general cost movements (eg, consumer price index or producer price index) can be used to derive changes in the cost of other inputs used by transformer manufacturers not captured above (eg, energy costs and equipment leases etc).

At a high level, this is largely the approach taken by SKM in developing forecasts for the costs of SP AusNet's capital program[3] and accepted by the AER in its draft decision on ElectraNet's capital program.[4]

The necessary steps required to develop a forecast for the escalation of a capex program are as follows.

Step 1- break down the capex program into different cost categories for which there are unit cost forecasts (or for which unit cost forecasts can be derived);

Step 2 – source/derive the relevant unit cost forecasts;

Step 3 – calculate a weighted average escalation factor using weights derived in Step 1 and forecasts from Step 2.

In order to complete Step 2 where there are no forecasts available for a particular good or service (eg, for transformers) it may be necessary to derive a forecast for that good or service from other forecasts. The methodology taken in deriving a forecast for, say, transformers is similar to the above – the only difference being the starting point is not a breakdown of the costs of the overall capex program but a breakdown of the costs of a transformer. It can be described as follows:

Step A – breakdown the cost of production for that good/service into component inputs parts for which there are forecasts available (eg steel, copper and labour);

Step B – source the relevant unit cost forecasts;

[3] SKM, Escalation Factors affecting Capital Expenditure Forecasts, 21 February 2007.

[4] AER, Draft Decision: ElectraNet Transmission Determination 2008-09 to 2012-13, 9 November 2007.

Step C – calculate a weighted average escalation factor using weights derived in Step A and forecasts from Step B.

The remainder of this report:

1. Details the relevant direct and indirect inputs to the business' expenditure programs for which there are credible forecasts that CEG is aware of. That is, performs Step 1 above;

2. Describes the properties of each forecast, eg, when they were made, who they were made by, for what purpose they were made. It also selects and explains the choice of point estimate for each forecast. That is, Step 2 above; and

3. Derives forecasts, or provides information useful in deriving forecasts, of the costs of equipment/services for which there are no published forecasts available.

The businesses will use weights derived from their own capex programs to perform Step 3 above (ie, to calculate a weighted average escalation factor that applies to their capex program).

2. Inputs into the Businesses Expenditure Program

The businesses' expenditure program involves the purchase of a number of goods and services. These include:

- Direct purchase of labour services from employees;
- Indirect purchase of labour services from external contractors who provide labour intensive services (such as electrical design services, and civil design services);
- Civil construction services;
- Equipment purchases (eg, transformers, switchgear, conductor and cable, secondary systems, etc);
- Fabricated steel used in construction of substations and other structures; and
- Other inputs.

Clearly, labour is the dominant input into the first two categories of services purchased by the businesses. Labour is also an important input into all of the other purchases made by the businesses. That is, civil construction service providers also use labour as do equipment and steel manufacturers. Similarly, electrical equipment manufacturers also tend to use a number of other common inputs due to their electrical properties (such as copper and aluminium).

For the purpose of this report we have identified the following inputs (direct and indirect) into the businesses expenditure program for which there are forecasts available:

- specialised labour purchased by electricity transport businesses;
- general labour purchased by electrical equipment manufacturers;
- raw copper;
- raw aluminium;
- crude oil;
- hot rolled coil steel (ie, steel at the mill gate before fabrication);
- suppliers' margin (ie, return on and of capital assets owned by the supplier); and

- other inputs (for which a general cost escalation forecast can be used).

This categorisation of costs is similar although not identical to the categorisation used by SKM in its report for SP AusNet.

3. Forecasts of Component Cost Inputs

3.1. A note on real versus nominal escalation

In the following sections we present both real (wage costs, construction costs and steel costs) and nominal forecasts (all other categories) for particular cost categories.

For wage and construction costs we have relied on professional forecasters' opinions. Where the forecaster is also an acknowledged macro-economic forecaster we have used its CPI forecasts to derive an associated real forecast from its nominal forecast. Where the forecaster is a sectoral specific forecaster (rather than a macro-economic forecaster) we have used our own estimate of expected inflation derived from an average of all credible macro-economic forecasters.

For example, in the following section we present real wage cost forecasts from Econtech and Macromonitor. Econtech has acknowledged expertise in macro-economic forecasts and we have derived real wage forecasts by deflating Econtech's nominal wage forecasts by the CPI forecasts published in Econtech's Australian National, State and Industry Outlook (ANSIO) December 2007. By contrast, Macromonitor specialises in sectoral analysis of the construction and utility sector – focussing its forecasts on wages and prices in this sector. It does not regard general inflation forecasting (ie, forecasting the prices of all domestically consumed goods and services including the Australian dollar price of imports) as one of its core skills. Consequently, we have deflated Macromonitor's nominal forecasts of wages growth in the utility sector by the average of expert macro-economic forecasters.

Similarly, where we have relied on futures markets to derive forecasts of particular prices (eg, for copper) we have deflated these by the average of CPI forecasts. This is because futures contracts tend to be written in nominal terms and it is not possible to 'see' the inflation expectations of the parties to that contract.

Our best estimate for inflation each year out to 2014 is provided in Table 1 below. This is derived as the mean of the inflation forecasts provided in Table 2 of our companion report for the businesses.[5]

Table 1: CEG inflation forecasts (year ended June)

	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
Year ended June	2.1%	3.0%	2.8%	2.4%	2.4%	2.5%	2.5%	2.4%

Note: a=actual, f=forecast.

[5] Excluding the BIS Shrapnel forecast as explained in CEG, *A Methodology for Estimating Expected Inflation,* March 2008.

We also note that for the year to June 2007 actual CPI growth was 2.07%. We use this actual figure to derive real forecasts for the year to June 2007.

3.2. Forecast NSW EGW labour cost movements

The businesses have commissioned Macromonitor to provide forecasts of real unit labour cost movements in NSW in the electricity gas and water (EGW) sectors.[6] We are also aware of Econtech forecasts for nominal wage growth in the Australia-wide EGW sector.[7] The results are summarised in the table below.

Table 2: AWOTE growth in the EGW sector (real, year ended June)

	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
Econtech (Aus wide)		2.0%	2.8%	5.6%	5.0%	3.9%	3.4%	3.1%
Macromonitor (NSW)*	4.3%	4.2%	4.4%	2.3%	-1.2%	1.7%	3.7%	4.2%

**Productivity adjusted*

The Econtech forecasts are based on forecasts in Attachment D to its 13 August 2007 report to the AER in the context of the SPAusnet review. The 2007 figure is based on the actual change in the labour price index in the Australia wide EGW sector and actual change in CPI as reported by the ABS[8] and the estimated change in productivity (see section 3.2.1 below). In our opinion the LPI figure is the best estimate of the actual change in wage growth (although is probably an underestimate).[9] However, the LPI figure is not available for EGW at the State level so we report the national figure here. The nominal figures reported by Econtech have been deflated by Econtech's forecast of CPI growth as contained in its December 2007 ANSIO document[10] and actual CPI growth for the year ended June 2007.

The Macromonitor forecasts are sourced from Macromonitor's report to the businesses and are deflated by the CPI forecasts contained in Table 1 above.

As can be seen in Table 2 above, Macromonitor has the highest forecast increase in real unit labour costs in some years and the lowest in others In order to gauge any

6 Forecasts of Cost Indicators for the Electricity Distribution and Transmission Sector New South Wales & Tasmania, March 2008.

7 Econtech, Labour Costs Growth Forecasts, August 2007, Attachment D.

8 ABS, Catalogue No. 6345.0, Table 5a, Series ID A2248226V.

9 The Labour Price Index (LPI) is a weighted average of compensation for specific occupation. However, in a tight labour market it will tend to underestimate the change in labour costs because it does not capture the fact that employees are promoted in order to retain them not necessarily because their skill level has increased. As a result, the LPI figure is likely to underestimate true unit labour cost movements. Average weekly earnings figures (such as AWOTE) are likely to be even more biased as, during a tight labour market, the proportion of low skilled workers in an industry tends to increase. This happens both as previously unemployed or underemployed workers (who tend to be low skilled) get drawn into the labour market and as industries with particularly strong demand for workers need to take on and train workers not previously in that industry (and hence without some of the industry specific skills required).

10 Econtech, Australian National, State and Industry Outlook, December 2007.

absolute difference over the relevant period we can examine the differences in labour costs over the five years from year ended June 2010 to year ended June 2014 inclusive.

Table 3: Cumulative labour costs 5 years to 2014 (increase from year ended June 2006)

Econtech (Aus-wide)	25.5%
Macromonitor (NSW)	18.8%
	%

Table 3 illustrates, for each forecast, the impact of escalation on total labour costs over the five years to 2014. For example, imagine that $1 worth of labour services was purchased in the year 2006. If there were no real escalation in unit costs (or change in productivity) then purchasing the same amount of labour services over the five years to 2014 would cost $5 (ie, remain at $1 pa). However, under the Econtech forecast, cost increases will result in $6.28 needing to be spent (or 25.5% more than if no escalation in unit costs occurred since the end of 2006). By contrast, under the Macromonitor forecasts $5.94 will need to be spent (or 18.8% more than if there were no escalation).

Econtech's forecasts are clearly higher over the period. This can also be demonstrated by comparing the relative estimated impact of escalation (from end June 2006) on labour costs over the regulatory period (June 2009 to June 2014).

Table 4: Relative impact on forecast labour expenditure over 5 years (Econtech = 1.00)

Econtech	1.00
Macromonitor	0.95

Table 4 is simply the ratio of the figures in Table 3 relative to the Econtech estimate. It describes the difference in the estimated cost of purchasing a constant quality adjusted amount of labour services in each year from 2009 to 2014. It states that the real cost of purchasing that labour will be 5% lower under the Macromonitor forecasts than under the Econtech forecasts.

In our opinion, an average of the above escalation factors provides an appropriate estimate of labour cost escalation in the NSW EGW sector. This is summarised in the table below.

Table 5: Recommended EGW labour escalation for NSW businesses (real, year ended June)

	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
EGW labour escalation	4.3%	3.1%	3.6%	3.9%	1.9%	2.8%	3.5%	3.7%

3.2.1. Productivity adjustment

In the current cycle, it appears likely that businesses in the electricity, gas and water sectors are increasing their employment of apprentices and relatively lowly skilled employees. This reflects the fact that newly trained employees are the only way for the sector as a whole to meet its heightened labour requirements. This will tend to push measured Average Weekly Full time, Ordinary Tim Earnings (AWOTE) down (as the proportion of lower skilled workers increases). However, this would not be associated with a reduction in constant quality unit labour costs because the average level of productivity would also fall (and quite possibly by more than the fall in AWOTE).

This is consistent with the forecasts of Macromonitor, which is simultaneously predicting rising real average wages and a reduction in productivity per worker over the next few years – followed by a reversal of both trends. This reflects the need to hire less skilled (and cheaper) workers in order to meet the high levels of demand. As Macromonitor state:

> *"At this stage of the cycle, labour productivity is falling, less experienced staff are given more responsibility and less qualified workers are hired. This means that the actual labour costs of a given amount of work will be increasing even more rapidly than nominal wages."* [11]
>
> and
>
> *"A declining level of labour productivity is a natural consequence of the presently very tight labour market, where it is difficult to obtain and keep good staff, where less qualified or capable staff are given more responsibility and where a large proportion of the workforce is able to demand reasonably good pay increases, with or without productivity offsets"*
>
> *"It may also be the end result of many years of efficiency improvements in the utilities sectors (through the 1980s and 1990s) which exhausted all of the 'easy' or obvious productivity improvements, with any further improvements in work practices or manning levels now much harder to achieve."* [12]

Thus, Macromonitor's forecast for AWOTE is depressed by the fact that the proportion of low skilled workers is increasing. This masks the true change in the cost of labour (for a constant quality of labour). However, we are able to adjust for this bias using Macromonitor's forecasts of productivity growth over the same period.

---

[11] Macromonitor, Australian Construction Outlook 2008, November 2007, p.5

[12] Macromonitor, Forecasts of Cost Indicators for the Electricity Transmission Sector, February 2008, p.11

The nature of this adjustment is as follows. Macromonitor forecasts annual changes in labour productivity in the Australian EGW sector. If we define "X" as the percentage change in real average wage costs and "Y" as the percentage change in average productivity then the percentage change in average unit labour costs is given by:

$$X - Y\frac{(1+X)}{(1+Y)}$$

The equation above makes it clear that if real wages growth matches productivity growth then real unit labour costs remain constant. The above equation can be intuitively understood by noting that the first term "X" is the increase in unit costs if the same size workforce is required to produce the same output (ie, if productivity remains unchanged). Y/(1+Y) is the percentage change in the workforce required to achieve the same output if productivity increases by Y%.[13] To convert this into a percentage dollar saving this needs to multiplied by (1+X).

The above equation can be used to derive Macromonitor's real unit labour cost forecasts as per the table below.

Table 6: Derivation of Macromonitor forecast unit labour costs

	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
Nominal wages	5.0%	6.5%	6.5%	4.0%	0.5%	3.5%	5.5%	6.0%
CPI	2.1%	3.0%	2.8%	2.4%	2.4%	2.5%	2.5%	2.4%
Real wages	2.9%	3.4%	3.6%	1.6%	-1.9%	1.0%	2.9%	3.5%
Productivity annual	-1.3%	-3.5%	-2.5%	-1.5%	-0.5%	0.5%	1.0%	1.5%
Averaged productivity		-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%
Real unit labour cost	4.3%	4.2%	4.4%	2.3%	-1.2%	1.7%	3.7%	4.2%

The forecast annual productivity reduction above of -0.7% is the average of Macromonitor's annual forecast reductions in productivity from 2008.[14] As discussed above, Macromonitor's forecast is for large falls in productivity during in 2008 and 2009 with productivity actually improving from 2012 onwards. The large upfront forecast reduction in productivity is consistent with the very tight labour market generally and especially in the EGW sector.

For the purpose of this report we have used Macromonitor's forecast average change in productivity over the period 2008 to 2014 in order to derive forecast movements in real unit labour costs. For example, the 4.2% real unit labour cost growth is explained by 3.4% increase in real wages plus a 0.7% reduction in productivity. We use the average productivity change over the period in preference to the individual annual

[13] For example, if productivity doubles (Y=1) then half of the workforce can be released (1/(1+1) = ½).

[14] See table 3 and 5 of the February Macromonitor report. Note that Macromonitor reports -0.7 average annual change in productivity from 2007 to 2014. However, by the convention used by Macromonitor this is from the end of 2006/07 to the end of 2013/014.

figures because changes in productivity levels at individual businesses will depend on the timing of their work program and their need to access incremental labour resources. As such, the average change in productivity across the industry is likely to be a more accurate proxy for the average change in productivity at a particular business over the period to 2014 than it is in any individual year.

Relative to using the annual productivity forecasts this approach is conservative because it tends to delay the impact of forecast reductions in productivity. It significantly reduces the overall impact of escalation on total labour costs over the five years to 2014.

In the absence of any other information we have assumed that Econtech have built into their forecasts any underlying trend in productivity[15] – such that wage forecasts can be interpreted as 'constant quality' unit labour cost forecasts.

3.3. Forecast of refined copper prices

Production of copper used in electrical equipment has many stages. Each stage of copper production is tradable, for example a copper mine may mine the ore and produce copper concentrate which it then sells on to a custom smelter, the smelter may then produce blister copper which is copper ingot of about 98% purity. However most of today's technologies require virtually pure copper, or copper of 99.95% purity. As a result, smelted copper needs to be refined.

This copper must then be transformed into the particular specifications required for any given piece of equipment. For example, in the case of copper cabling used in the electricity sector it must be transformed into cable with particular electrical characteristics and this process involves capital, labour and energy. It must also be combined with other materials such as insulating material.

It is important to be clear when we talk about movements in "the" price of copper we are really talking about movements in the price of copper at a particular stage in its production – namely refined copper to a particular specification. The prices quoted in this section are prices for copper traded on the London Metals Exchange that meets the specifications of that exchange. Specifically, prices are per tonne for parcels of copper of 25 tonnes of "Grade A" quality conforming to BSEN 1978:1998.[16]

The prices quoted are **not** the prices paid for copper by electrical equipment makers. For example, producers of transformers purchase fabricated copper to be used in their

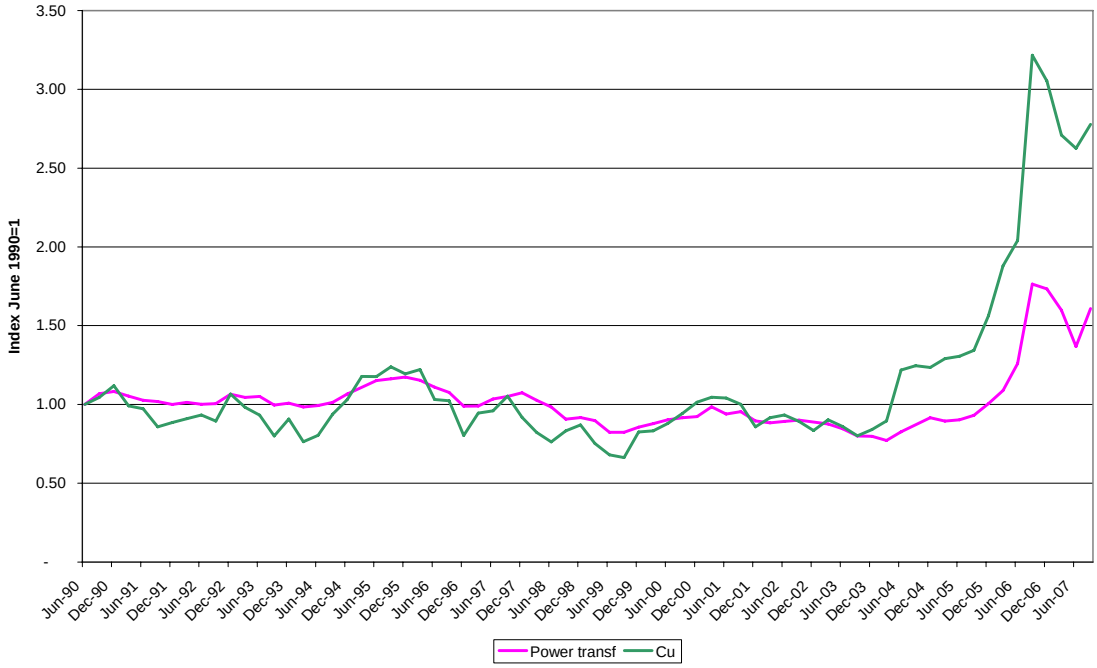
[15] By this we mean changes in the average skill level 'quality' of the workforce rather than partial measures of productivity (such as hours per unit of output). The latter are artificially influenced by economies of scale (increasing or decreasing) and by changes in the type of work being done (eg, increases/decreases n the amount of labour intensive work). What we are interested in is a change in the number of hours/employees required to perform a constant basket of tasks (eg, building a substation or managing payroll).

[16] See the London Metals Exchange website, http://www.lme.co.uk/copper_contractspec.asp.

manufacturing processes. This fabricated copper has gone through further stages of production than the refined copper traded on the LME. Its price can be expected to be influenced by refined copper prices but it cannot be expected to move 'one-for-one' with refined copper prices. Similarly, the cost of producing 'copper cable' is much more than the cost of refined copper that is used in its production. As discussed above, that refined copper must itself be transformed into cable and must be combined with other materials. It would therefore be a serious error to assume that 'copper cable' moves one-for-one with the price of refined copper.

This issue can be illustrated by comparing the change in the LME copper price (converted into Australian dollars) with the change in the price of copper used in production of power transformers (as published by the ABS[17]). From when the ABS publication started in March 1990 to September 2007 refined LME copper prices rose 169%. However, over the same period, the price of copper used in transformers rose only 56% (and this was no doubt explained in part by other cost increases such as increases in wages costs). Thus, far from there being a one-for-one relationship between these factors there is more like a less than one-for-three relationship. The following graph illustrates the relevant time series for these variables.

Figure 1: Refined copper prices versus prices for fabricated copper used in the production of transformers



[17] ABS Catalogue No. 6427.0, Table 47, Series ID A2314301X.

In CEG's opinion the most reliable forecast for copper prices is provided by prices determined in the futures market – provided that the relevant market is sufficiently liquid. That is, the most reliable predictor of prices on a particular date in the future is the price at which market participants are willing to commit to trading on that day. If there were a better estimate of future prices then investors could expect to profit by buying/selling futures until today's futures price reflected the best estimate of spot prices on the relevant future date.

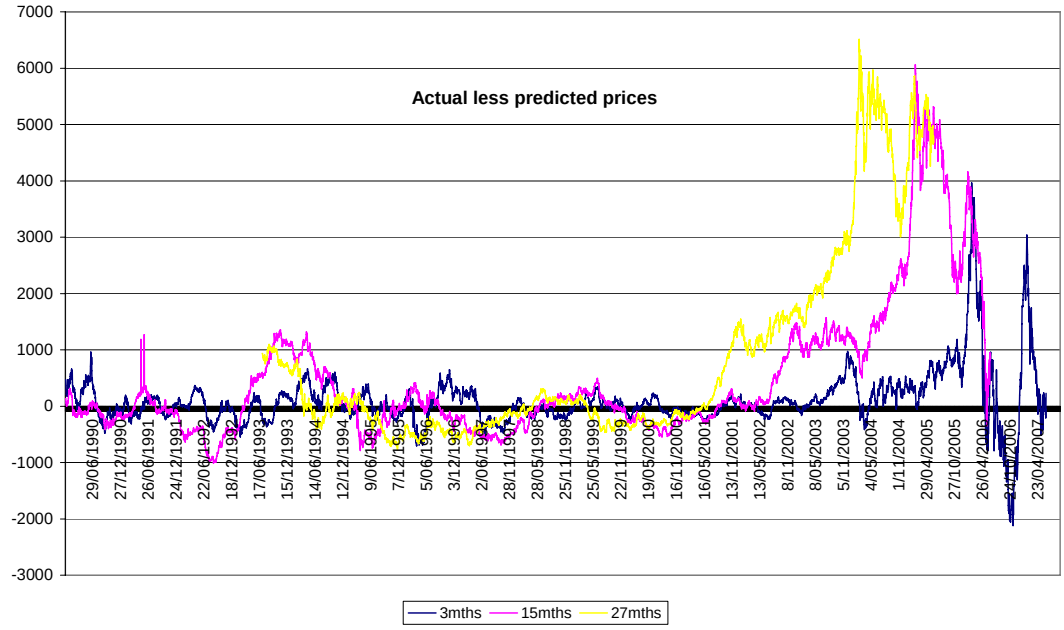
Of course, futures prices will be very unlikely to exactly predict future spot prices given that all manner of unexpected events can occur. In fact, futures prices have spectacularly underestimated refined copper prices in the last few years (see below graph). However, they nonetheless provide the best estimate of future spot prices. An important reason why futures markets are more reliable than professional forecasters is that in order to participate in a futures market (and help set the price in that market) you must be willing to risk real money.

This is a standard proposition in finance theory not just limited to futures markets for base metals. The IMF also makes the same point when it states:

> *"While futures prices are not accurate predictors of future spot prices, they nevertheless reflect current beliefs of market participants about forthcoming price developments. Bowman and Husain (2004) find that futures-prices-based models produce more accurate forecasts than the models based on historical data or judgment, especially at long horizons."*[18]

[18] IMF, World Economic Outlook, April 2007, p.8

Figure 2: Actual prices less prices predicted by LME futures (nominal, USD/tonne)



Source: London Metals Exchange

The graph above shows that, over most of the 1990's, futures prices were a reasonable predictor of future spot prices. However, during the first half of the current decade futures prices have systematically underestimated spot prices (ie, failed to anticipate the increase in spot prices and overestimated the rate at which they would subsequently fall).

The table below details average LME refined copper prices in USD and AUD out to the year ended June 2009. The LME's longest dated future for refined copper is 27 months, allowing us to forecast prices out to and including June 2010. We show this as an additional column in Table 7.

Table 7: LME copper prices (nominal, year ended June)

	2006 (a)	2007 (a)	2008 (e)	2009 (f)	2010 *(f)
USD/tonne	5,060	7,089	8,065	8,073	7,475
AUD/tonne	6,774	9,026	9,255	9,163	
% change from previous year (USD)	60.6%	40.1%	13.8%	0.1%	
% change from previous year (AUD)	62.1%	33.2%	2.5%	-1.0%	

** The longest dated future available from the LME data prices copper for 5 June 2010 at US$7,475/tonne. Futures prices are as prevailing on 5 March 2008.*

The prices in Table 7 are actual prices for dates up to the year ended June 2007 and are estimates and forecasts for dates up to the year ended June 2009 – which is as far

out as future prices that are available on the LME website allow us to calculate. Arguably, less weight should be given to longer dated futures due to declining liquidity at longer time horizons. Nonetheless, for the purpose of this report we have ignored such differences in liquidity/reliability. The price for 2008 is calculated as the average of the forecast price on 2 July 2007 and the forecast price on 1 July 2008. The forecast price on 1 July 2008 is calculated in the following manner:

- The forecast price for 5 June 2008 is calculated as the 3 month future price prevailing on 5 March 2008 (which gives a predicted price on 5 June 2008);
- The forecast price for 5 June 2009 is calculated as the 15 month future price prevailing on 5 March 2008; and
- The forecast price for 1 July 2008 is calculated as straight line interpolation between these prices.

Similarly, the average price in the year ended June 2009 is calculated as the average of the forecast price on 1 July 2008 and 1 July 2009. The forecast price on 1 July 2009 is also calculated by straight line interpolation between forecast prices implied by 15 and 27 month futures.

In order to calculate the AUD price for copper we convert using the contemporaneous exchange rate. For forecasts we have used Econtech forecasts of the AUD/USD exchange rate.[19] These forecasts are provided in the table below.

Table 8: Econtech exchange rate forecasts

	2007	2008	2009
Forecast on 1 July	0.849	0.884	0.878
Average over year ended 1 July		0.867	0.881

As can be seen from Table 7, the price of refined (LME) copper in the year ended June 2009 is expected to be above the price of refined copper in the year ended June 2006. This is true whether that price is measured in USD or AUD (using the Econtech exchange rate forecasts). This is largely due to the increase in copper prices in 2007 with the market expecting less than fully offsetting price reductions beyond 2007. Beyond 2009 the price fall in the AUD price of copper is expected to be lower than the price fall in USD terms due to an anticipated devaluation in the AUD. (Falling commodity prices are generally associated with a falling Australian dollar as discussed in section 3.10 below. This generally acts a 'shock absorber' for Australian purchasers of commodities – ie, commodity price rises are offset by currency appreciations and vice versa.)

[19] Econtech, Australian National, State and Industry Outlook, December 2007, p.110

The above forecasts rely on futures prices. However, available futures prices do not extend out to the end of the businesses' regulatory period (ie, to the year ended June 2014). In this case we have two choices. We can assume that copper prices will remain constant from 2010 onwards or we can have regard to professional forecasts.

In our view, given the volatility of metals prices, a reasonable approach would be to assume that prices remain constant in real terms. However, it is relevant to nonetheless examine the forecasts made by professional forecasters. Consensus Economics surveys professional forecasters on a range of economic variables. They have recently performed a survey of forecasters' opinions on future commodity prices.[20] In relation to copper prices there is a wide variety of forecasts. These forecasters provide quarterly forecasts out to June 2010. In June 2010 the highest forecast is by BIPE (7,265 real USD as at January 2008 per tonne) while the lowest is by Scotiabank (3,307 real USD as at January 2008 per tonne).

This obviously creates a difficulty in interpreting this data. For example, what weight should be given to different forecasts? Should some outlier forecasts be excluded? Should forecasters be judged on past performance etc. These questions are largely imponderable and any answers will inevitably be subjective (just like the forecasts). For the purpose of this report we work only with the mean of all forecasts. For June 2010 this mean forecast is 5,413 USD per tonne, in real prices as at January 2008. Assuming 2.5% annual inflation in the US from then to June 2010 this USD 5,413 figure becomes USD 5,735. The implied future price at 5 June 2010 of USD 7,475, calculated from LME data, is 30% higher than this. For the reasons outlined above we regard the futures price as the better estimate.

However, beyond June 2010 there are no futures prices available (and even if there were they would likely suffer from low levels of liquidity). By contrast, beyond June 2010 Consensus Economics does provide a single mean estimate of 'long term' USD copper prices. This forecast is for a price of USD 3,882 per tonne, real inflation adjusted dollars as at January 2008.

Unlike with shorter term forecasts, Consensus Economics does not disclose how many or which institutions contributed to the forecasts nor give any information on the range of forecasts. Moreover, it is unclear what the definition of 'long term' is – Consensus Economics only states "long term 5-10 year forecasts in real (inflation adjusted) 2008 dollar terms".[21] For these reasons we must treat these forecasts with some caution.

In our opinion the best way to exercise this caution is to treat the 'long term' forecasts as relating to 10 years (rather than the 7.5 year middle of the range provided). Consistent with our view that futures prices are the most reliable forecasts for copper prices available, we have adjusted the Consensus forecast by the same percentage

[20] Consensus Economics, Energy & Metals Consensus Forecasts: Minerals Monitor, 28 January 2008

[21] Consensus Economics, Energy & Metals Consensus Forecasts: Minerals Monitor, 28 January 2008, p.5

that the June 2010 mean forecast differs from the June 2010 futures prices (30%). That is, we have increased the USD 3,882 figure by 30% to USD 5,059 then included 10 years of inflation at 2.5% to get USD 6,477. If we do both of these things we are able to add an extra date to our Table 7 above.

Table 9: LME copper prices plus Consensus Economics 'Long Term' forecast (nominal, year ended June)

	2006 (a)	2007 (a)	2008 (e)	2009 (f)	2018* (f)
USD/tonne	5,060	7,089	8,065	8,073	6,477
AUD/tonne	6,774	9,026	9,255	9,163	

** Long term forecast calculated as at 28 January 2018.*

It is then possible to apply straight line interpolation between June 2010 and 2018 to give forecasts for the copper price over the period from year ended June 2006 to year ended June 2014. This is provided in the table below (noting that Econtech exchange rate forecasts are used to derive AUD prices following the same methodology as described above).

Table 10: Annual escalation factors to June 2014 derived from futures prices and Consensus Economics forecasts (nominal, year ended June)

	2006 (a)	2007 (a)	2008 (e)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
USD/tonne	5,060	7,089	8,065	8,073	7,661	7,401	7,270	7,139	7,009
AUD/tonne	6,774	9,026	9,255	9,163	8,790	8,620	8,588	8,535	8,470
USD % change	60.6%	40.1%	13.8%	0.1%	-5.1%	-3.4%	-1.8%	-1.8%	-1.8%
AUD % change	62.1%	33.2%	2.5%	-1.0%	-4.1%	-1.9%	-0.4%	-0.6%	-0.8%

Table 10 above provides escalation factors derived using a combination of forecasts associated with refined copper prices over the period 2006 to 2014. Over that period the average annual escalation factor is 0.92% pa (ie, the price of AUD 6,774 in year ended June 2006 escalates to AUD 8,470 in 2014 at an average rate of 2.83% pa). The escalation factors are in nominal terms.

As described above, the escalation factors beyond 2010 must be treated with caution due to their reliance on the Consensus Economics mean forecast. An alternative cautious approach would be to assume a zero escalation factor in real terms beyond 2010.

3.4. Forecast of refined aluminium prices

The same issues discussed above apply to the use and derivation of forecast aluminium prices. Just as copper cable embodies many more inputs than 'refined copper' (including capital and labour) so does aluminium conductor constitute more than refined aluminium.

In order to derive our estimates of historical and forecast changes in refined aluminium prices we have followed the same approach and used the same data sources (LME

and Consensus Economics). Rather than repeating the discussion above we simply provide the relevant data with minimal repetition of discussion.

The table below details average LME aluminium prices in USD and AUD out to the year ended June 2009. As with copper the longest dated futures contracts are for delivery in April 2010 – see Table 11 below.

Table 11: LME aluminium prices (nominal, year ended June)

	2006 (a)	2007 (a)	2008 (e)	2009 (f)	2010* (f)
USD/tonne	2,246	2,694	2,904	3,120	3,143
AUD/tonne	3,008	3,428	3,331	3,542	
USD	24.2%	20.0%	7.8%	7.4%	
AUD	25.2%	14.0%	-2.8%	6.3%	

** The longest dated future available from the LME data prices aluminium for 5 June 2010 at US$3,143/tonne. Futures prices are taken as at 5 March 2008.*

The prices in Table 11 are actual prices up to the year ended June 2007 and are estimates/forecasts up to the year ended June 2009. The methodology used to derive these is the same as for copper described above. The escalation factors are in nominal terms.

As can be seen from Table 11, the price of refined (LME) aluminium in the year ended June 2009 is expected to be above the average price of refined aluminium in the year ended June 2006. This is true whether that price is measured in USD or AUD (using actual and the Econtech forecast exchange rate forecasts).

Using the same methodology as for copper we use the Consensus Economics 'long term' forecasts to derive an estimate of the aluminium price in 2018 of US$2,867 per tonne (noting that in this case Consensus Economics mean forecast at June 2010 of US$2,596 per tonne (nominal) is 21% lower than implied by LME futures).

Table 12: LME aluminium prices plus Consensus Economics 'Long Term' forecast (nominal, year ended June)

	2006 (a)	2007 (a)	2008 (e)	2009 (f)	2018* (f)
USD/tonne	2,246	2,694	2,904	3,120	2,867
AUD/tonne	3,008	3,428	3,331	3,542	

** Long term forecast calculated as at 28 January 2018.*

It is then possible to apply straight line interpolation between June 2010 and 2018 to give forecasts for the aluminium price over the period from year ended June 2006 to year ended June 2014. This is provided in the table below (noting that Econtech exchange rate forecasts are used to derive AUD prices following the same methodology as described above).

Table 13: Annual escalation factors to June 2014 derived from futures prices and Consensus Economics forecasts (nominal, year ended June)

	2006 (a)	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
USD/tonne	2,246	2,694	2,904	3,120	3,145	3,168	3,211	3,254	3,297
AUD/tonne	3,008	3,428	3,331	3,542	3,608	3,690	3,793	3,890	3,984
USD% change	24.2%	20.0%	7.8%	7.4%	0.8%	0.7%	1.4%	1.3%	1.3%
AUD% change	25.2%	14.0%	-2.8%	6.3%	1.9%	2.3%	2.8%	2.6%	2.4%

Table 13 above provides escalation factors derived using a combination of forecasts associated with refined aluminium prices over the period 2006 to 2014. Over that period the average annual escalation factor is 3.6% pa (ie, the AUD price of 3,008 in year ended June 2006 escalates to 3,984 in 2014 at an average rate of 3.6% pa). These escalation factors are in nominal terms.

3.5. SKM critique of the CEG use of Consensus forecasts

3.5.1. SKM recommended changes

The same methodology as described above was used by CEG in developing forecasts for copper and aluminium prices in the context of Electranet's submission in response to the AER's recent draft decision in South Australia.[22] The AER asked SKM to review the methodology and SKM was largely supportive of the approach taken. SKM states:

> *"In general, SKM considers the approach used by CEG, and the weightings applied by ElectraNet, to be reasonable.*
>
> *SKM notes the CEG methodology used two data sources to develop its aluminium and copper price forecasts: LME 27 month forward contracts for short-term price forecasts out to April 2010 and consensus economics' long-term price forecasts from March 2010 to 2017. SKM agrees with CEG that in the short-term LME forward contract prices provide the best estimate of the price of aluminium and copper for a relevant future date. SKM's forecasts accepted in the Draft Decision were developed using a similar approach, but it considers that adopting the consensus economics forecasts provides additional transparency and rigour to developing the materials cost escalators."*

Notwithstanding this general agreement, SKM did not support three elements of the approach. SKM argues:

[22] See http://www.aer.gov.au/content/item.phtml?itemId=717176&nodeId=3101cc8012f4f310091a75aefea7cdd5&fn=Appendix%20A4%20-%20CEG%20report,%20Escalation%20factors%20affecting%20capital%20expenditure%20forecasts,%2018%20January%202008.pdf

"However, there are elements of the CEG methodology that SKM does not consider to be reasonable. These are:

- *CEG has adjusted the consensus economics long term forecast prices.*
- *CEG has taken the long term (5-10year) forecast to occur at the extreme end of the date range indicated, that is the 10 year point.*
- *CEG has use a single day LME/NYMEX forward contract prices.*

CEG notes that there is a discrepancy between the economic forecast and futures price for some input commodities, notably copper and aluminium. CEG reasons that the market is a more credible predictor of prices, and has "recalibrated" the economic forecasts by adjusting future economic forecasts up by a percentage to equal the futures price at the 27 month point.

SKM does not consider this approach to be reasonable. Its view is that if we consider the forecasts to be the best information available, and are to rely on economic forecasts (including wages which forms the major component of ElectraNet's escalators) then we should not be making adjustments to those forecasts, particularly as there is not sufficient information available through the consensus economics report to understand the thinking behind the individual economic forecasts it uses.

SKM makes two specific points to support this position:

- *The economic forecasters had the futures prices available to them at the time they produced their forecast, and consciously chose to forecast different values.*
- *The difference between the forward curve and the economic forecast at a specific point in time (27 months) could be due to relatively small differences in thinking about the timing of price cycles, rather than fundamentally different views about the long term value of the commodity price." …*

"The second point where SKM has disagreed with CEG is on the point in time at which the consensus "long term" (5-10 year) forecast is taken to apply. CEG has taken this to be at the 10 year point. Alternatively, the 5-10 year price could be taken to apply for the whole of the period from 5 to 10 years. SKM considers the mid point of this time period is a more reasonable and balanced approach to the treatment of the ambiguity regarding the date at which the long term forecasts are taken to apply." …

"Lastly, CEG based its LME and NYMEX futures contract prices on the closing price on a single day: 2 January 2008 and 6 January 2008 respectively. SKM notes that LME futures prices can fluctuate significantly from day to day and that this

approach lends itself to potentially biasing the future price. To overcome this, SKM recommend that a monthly average be used to establish the future prices for aluminium, copper and oil.

SKM therefore concluded that our methodology should be adjusted by:

- making no adjustment to the long-term consensus forecast for the discrepancy between these forecasts and LME futures;
- treating the long term forecast as a ten year forecast rather than a 5 year forecast;
- adopting a 20 day averaging period for the futures prices used.

The AER accepted SKM's recommended changes.

3.5.2. CEG response

In our view, SKM has not shown that the CEG methodology gives rise to input forecasts that are inconsistent with the relevant test under the Rules (the capital expenditure criteria). Specifically, SKM has not shown that the CEG methodology gives rise to estimates that are inconsistent with:

> *"a realistic expectation of the demand forecast and cost inputs required to achieve the capital expenditure objectives".*

In our view, the AER should be satisfied that the adoption of our methodology, as set out above, will give rise to copper and aluminium forecasts that represent *a realistic expectation of the cost inputs required to achieve the capital expenditure objectives.*

That said, we find that two of the recommended changes by SKM may also give rise to 'realistic' forecasts.

First, the assumption that the Consensus 'long-term' equates to 7.5 years instead of 10 years is not obviously unreasonable given that it is in the middle of the range provided by Consensus. Fundamentally, the lack of transparency in what the Consensus forecasts actually represent makes this issue difficult to analyse. In our view, and as described in the previous sections, the uncertainty around the meaning of the Consensus forecast justifies a conservative approach to their use – even if there was no apparent bias at 27 months. This is the reason we adopted an assumed time frame of 10 years (at the top of the 5 to 10 year range specified by Consensus Economics).

However, we accept that reasonable minds may disagree on this approach. While we continue to consider our approach reasonable, we do not find SKM's proposed adoption of 7.5 years unreasonable.

The use of an averaging period for futures markets prices is also not unreasonable. In this report we have used an 'on the day' value for futures prices but in future applications little harm would be done to the analysis in adopting an average value of over a short period of trading (say 10 or 20 days).

By contrast, we do not believe that the same is true for the adoption of SKM's other amendment. In particular, we believe that failing to calibrate the Consensus Economics long term forecast with the LME futures prices gives rise to unrealistic forecasts for copper and aluminium prices.

SKM accepted that future markets are a more reliable predictor of future prices than are stated forecasts (such as those reported by Consensus Economics). This reflects the fact that futures prices only exist where someone has been prepared to 'put their money where their mouth is'. That is, every future trade not only reflects the opinions of those involved about future prices but also those opinions are strong enough and well informed enough for the participants to risk losing their money if they are wrong. It is also consistent with empirical finance literature and the IMF's views expressed above and repeated here:

> *"While futures prices are not accurate predictors of future spot prices, they nevertheless reflect current beliefs of market participants about forthcoming price developments. Bowman and Husain (2004) find that futures-prices-based models produce more accurate forecasts than the models based on historical data or judgment, especially at long horizons."*[23]

In summary, futures markets are more reliable than the Consensus Economics forecasts. The Consensus Forecast is just an average of different forecasts – many of which are from institutions with little obvious need to be well informed about the long term price of copper or aluminium. For example, it is reasonable to assume that the Commonwealth Bank has little at stake when making a forecast about the future price of copper – and certainly has much less at stake than an company trading in copper futures. Moreover, Consensus Economics does not report who gave 'long-term' forecasts or how many such forecasts were received.

Importantly, we observe that the Consensus Economics' forecast is everywhere below the futures market prices for both aluminium and for copper (around 30% higher at 27 months based on the January 2008 forecasts).

The same is true for every other commodity covered by Consensus Economics[24] for which there are also futures markets with only the one exception of uranium. That is,

---

[23] IMF, World Economic Outlook, April 2007, p.8

[24] Consensus Economics, Energy & Metals Consensus Forecasts: Minerals Monitor, 28 January 2008

the list of commodities where futures markets are predicting higher medium-term prices than the Consensus forecasts are:

1. Crude oil;
2. US Gasoline and Heating Oil
3. European gas;
4. Natural gas;
5. Aluminium;
6. Copper;
7. Nickel;
8. Lead;
9. Zinc;
10. Gold
11. Silver
12. Platinum; and
13. Palladium.

The list of commodities where the longest term future market price is above the longest term Consensus forecast is:

1. Uranium

We note that the same is true in the most recent April 2008 Consensus Forecasts (which we have not used elsewhere in this report due to timing considerations).

SKM has argued that the fact that futures markets are predicting higher prices over the next few years does not mean that they would predict higher prices in the long-term. SKM argues that the apparent difference between Consensus forecasts and futures markets may simply be an artefact of the fact that forecasters are predicting a drop in prices earlier than futures markets – not that they are predicting lower prices in the long-term.

We note that this is a *logical* possibility but that it would be a remarkable coincidence if it explained the phenomenon observed across all of the above listed commodities. For SKM's proposition to hold, the only difference between futures markets and the average Consensus forecast must relate to the timing of price movements. Specifically, despite having near universal higher price predictions over the horizon when futures are observable, beyond that horizon futures markets predictions (were they available) must be assumed to converge to the Consensus forecast.

In our view it is not 'realistic' to rely on the assumption that 13 out of 14 commodities have higher future market prices than Consensus forecasts in the medium term but would have the same forecasts in the long term. Certainly, this is not realistic unless there is a theoretical or empirical basis for this assumption. In our view, it is more realistic to assume that the difference between the forecasts in the medium term will persist into the long term.

Moreover, we do not need to simply assume this but can, for one commodity, test this assumption. For crude oil there are long dated futures prices traded. On 14 May 2004 the longest dated trading for NYMEX crude oil (light) futures was for delivery in December 2015 at a price of 119USD per barrel. [25] By contrast, the long-term Consensus forecast was 83USD (based on April 2008 Consensus forecasts). That is, for the one commodity where futures markets do extend out to the 'long-term' the medium term difference between futures markets and Consensus was maintained.

SKM has accepted that in forecasting crude oil prices it is appropriate to rely solely on futures market prices and to ignore Consensus forecasts. One can therefore presume that the long-term futures price of 119USD per barrel is the appropriate benchmark to test SKM's methodology against CEG's methodology. However, to test the two methodologies we must hypothetically imagine that we do not have long term futures prices. In this hypothetical world SKM's methodology would lead to a long-term forecast of 83USD (The Consensus forecast). CEG's method would estimate a value equal to 83USD multiplied by the ratio of medium term futures to medium term Consensus forecasts (120/88=1.36[26]). This would give rise to a CEG forecast of 113USD per barrel. Clearly, in the one case where the SKM and CEG methodologies can be tested the CEG methodology performs considerably better (underestimating the benchmark price of 119USD by only 5% compared to a 30% underestimate by the SKM methodology).

On this basis we believe that the CEG methodology provides a realistic forecast of long term copper and aluminium prices. We do not believe that SKM's approach provides a realistic forecast.

---

[25] http://futures.tradingcharts.com/marketquotes/index.php3?market=CL downloaded on the 14th May 2008.

[26] On the 14th of May 2008, September 2010 NYMEX crude oil futures were quoted at 120USD while Consensus forecasts for September 2010 crude oil forecasts were 88USD .

Finally, SKM states in support of their adjustment:

> "…*we remain of the view that it is not reasonable to adjust someone else's forecast without understanding the basis for that forecast*." (Page 10)

In response, we note that our method is best described as using two separate sources of forecasts (futures markets and Consensus forecasts) in a manner that is internally consistent and recognises the greater reliability of the futures market. By contrast, SKM's approach is to simply adopt the long-term Consensus forecasts despite:

- recognising that future markets are superior sources of forecasts in the medium term;
- Consensus forecasts are biased downwards in the medium term relative to futures markets; and
- having no evidence of other basis to believe that this bias would correct itself in the long-term (and with clear evidence that the bias does not correct itself in the case of crude oil).

3.6. Forecast of crude oil prices

In order to derive our estimates of historical and forecast changes in crude oil prices we have followed the same approach and used for copper and aluminium. Historical data on crude oil prices have been sourced from the US Department of Energy (DoE).[27] Crude oil futures (NYMEX Crude Oil Light) have been sourced from TFC Commodity Charts.[28]

The table below details average crude oil prices both historically and forecast to 2014. Crude oil futures extend out beyond 2014 and, consequently, these can be relied on completely to develop forecasts of future prices.

Table 14: Crude oil prices (nominal, year ended June)

	2006 (a)	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
USD prices	57.4	60.0	85.3	99.4	96.9	96.5	97.0	96.3	96.7
AUD prices	76.8	76.3	97.8	112.9	111.2	112.4	114.6	115.1	116.9
USD % change	39.1%	4.4%	42.2%	16.6%	-2.5%	-0.5%	0.5%	-0.7%	0.5%
AUD % change	40.0%	-0.6%	28.1%	15.4%	-1.4%	1.0%	2.0%	0.5%	1.5%

[27] http://tonto.eia.doe.gov/dnav/pet/pet_pri_wco_k_w.htm. We have used the All Countries Spot Price FOB Weighted by Estimated Export Volume (Dollars per Barrel).

[28] http://futures.tradingcharts.com/marketquotes/index.php3?market=CL downloaded on the 6th January 2008.

The prices in Table 14 are actual prices up to the year ended June 2007 and are estimates/forecasts up to the year ended June 2014. The prices in 2006 and 2007 are the average of weekly prices in those years as published by the US DoE. These prices are converted into AUD prices using the simple average AUD/USD exchange rate during that week. Prices in 2008 onwards are simple averages of the forecast prices on 30 June in the preceding year and 30 June in the marked year (for example, the reported price in 2013 is the average of the forecast prices in June 2012 and June 2013). These escalation factors are in nominal terms.

3.7. Forecast construction costs

CEG is aware of two forecasts for construction costs in Australia by Econtech[29] and Macromonitor[30]. Both forecasters are predicting strong positive growth in construction costs. Their forecasts are provided below.

Table 15: Construction cost forecasts (real, year ended June)

	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
Econtech (Aus)								
Non-residential	3.0%	0.7%	0.5%	0.9%	0.8%	1.4%	2.0%	2.6%
Total engineering	8.2%	0.2%	0.6%	1.3%	1.1%	1.2%	1.8%	2.4%
Macromonitor (Aus)								
Non-residential	3.8%	3.9%	3.6%	2.1%	-2.8%	-1.5%	na	na
Total engineering	8.6%	4.3%	3.5%	0.5%	0.3%	1.0%	2.1%	2.8%
Electricity engineering	10.2%	6.8%	5.1%	-1.9%	0.6%	1.4%	na	na
Total utilities	8.0%	4.7%	3.7%	-0.8%	0.3%	1.2%	na	na

The Econtech forecasts have been deflated by Econtech CPI forecasts and the Macromonitor forecasts have been deflated by CEG CPI forecasts (as detailed in Table 1 above).

The selection of the most appropriate forecast depends on the purpose to which the businesses are going to use it. Were the businesses to apply the escalation factor to the total capex program then the most appropriate escalation factor would probably be Macromonitor's forecast for engineering construction in the electricity sector.

However, the businesses intend to use a more granular 'bottom up' approach to estimating escalation factors (consistent with the structure of this report). Specifically, we understand that the businesses will classify some of its expenditure as 'construction'

[29] See http://www.cfc.acif.com.au/analysis2.asp. It is not obvious when these forecasts were last updated, however, the linked page above was dated 15 November on 7 March. On this basis we assume that the forecasts were updated on this date.

[30] Macromonitor, Australian Construction Outlook 2008, November 2007; and Macromonitor, Forecasts of Cost Indicators for the Electricity Transmission Sector, February 2008.

related and it is this expenditure that is to be escalated using a construction cost forecast.

In this case, it may be that using the electricity engineering forecast will 'double count' the relatively higher level of wage growth expected in the electricity sector relative to other construction sectors.

On the basis of the above we consider that the total engineering construction cost forecast is the most appropriate forecast to use. We consider that this is more appropriate because it is the category within which all construction within the electricity sector falls.

We propose taking an average of the two available forecasts. The escalation factors that result are summarised in Table 16 below.

Table 16: Construction cost escalation (real, year ended June)

	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
Total engineering	8.4%	2.3%	2.1%	0.9%	0.7%	1.1%	1.9%	2.6%

It is worth noting that recent evidence suggests that cost pressures in construction have been accelerating in the six months to December 2007.

On the 8th of January 2008 the Australian Industry Group released the results of its monthly survey of construction businesses.[31] In this survey there has been a clear acceleration in reported cost pressure in the second half of 2007. Over this six month period reports of cost increases from survey participants increased by 10% relative to the first half of calendar 2007. Similarly, reports of cost increases were 16% higher in the December quarter compared to the March quarter of 2007.

3.8. Forecast for fabricated steel costs

A component of the businesses costs is associated with the purchase of products using transformed steel. For example, fabricated steel is used to house transformers and to mount them in substations. Structural steel products are also used in the construction of towers and substations.

Once more, it is important to draw a distinction between the steel products used by the businesses and the steel 'at the mill gate'. Just as is the case with copper and aluminium, the steel used by the businesses (eg, steel used in towers and transformers) has been fabricated and, as such, embodies both labour, capital and other inputs (eg, energy).

[31] AIG/HIA, Performance of Construction Index, December 2007. This index surveys 120 construction firms asking them about their experience and expectations of activity and cost changes.

Based on information from the ABS 2001/02 input-output tables for the Australian economy[32] 'raw' steel (the output of the 'iron and steel' industry is a small (in the order of 15%) component of the direct expenses of those industries that transform this steel into the types of products that The businesses buy. By contrast, labour expenditure is in the order of 24% to 30% of total costs and profits and taxes 6% to 18%. This is illustrated in the table below.

Table 17: Input costs as a percentage of total value of output

	Structural metal products (2703)	Sheet metal products (2704)	Fabricated metal products (2705)
Compensation of employees (P1)	31%	23%	24%
Profit margin and taxes (P2+P3+P4)	9%	6%	18%
Iron and steel (2701)	16%	13%	15%

Source: ABS Catalogue No. 5209.0.55.001, Table 2

In any event, since 2005/06 there has been a dramatic increase in steel prices in Asia. According to MEPS International[33] the price of steel (at the mill gate) in Asia has increased by 34% between December 2005 and December 2007. Of course, for the reasons described above, this does not mean that steel products purchased by the businesses have necessarily risen by 34% over this period – given that they also embody substantial labour and capital above and beyond that embodied in steel prices. However, in combination with rising real labour costs it does suggest that one would expect to see at least a moderate real increase in the prices of the steel products purchased by the businesses.

This expectation is borne out by estimates from the ABS of changes in the relevant producer price indices. Specifically, the ABS estimates that prices of "fabricated metal products" (274-276) increased by 5.3% over the same period.[34] This index covers all transformed metal products. More specifically, the price of "structural steel fabricating" (2741) products (a sub category of fabricated metal products) is estimated to have increased by 6.4% pa over the same period.[35] This is clearly well short of the increase in the price of steel reported by MEPS.

While there is clearly a much less than fully proportional relationship, it is still relevant to consider what is expected to happen to 'mill gate' steel prices. There are currently no futures markets for steel products although we do note that the LME is exploring developing such a market. There are, however, forecasts for steel prices available from Consensus Economics.[36] Consensus Economics mean forecast for hot rolled coil

[32] ABS, Catalogue No. 5209.0.55.001, Table 2

[33] See MEPS website, http://www.meps.co.uk/world-price.htm. MEPS International is an independent consultancy specialising in providing steel market information from around the world.

[34] ABS, Catalogue No. 6427.0, Tables 10 and 11, Series ID A2305805K

[35] ABS, Catalogue No. 6427.0, Tables 10 and 11, Series ID A2307686T

[36] Consensus Economics, Energy & Metals Consensus Forecasts: Minerals Monitor, 28 January 2008.

(HRC) steel prices is a moderate real price increase out to June 2010 of 1.2% in the US and a decrease over the same period of 12.8% in Europe – Consensus Economics does not publish forecasts for Asian steel prices. Over the long-term (5-10 years) the average forecast is for a 16.8% real reduction in Northern Europe steel prices and a 5.2% decrease in real US steel prices. The short-term forecast in the price of HRC steel is in spite of the strong forecast increases in the price of iron ore predicted by Consensus over the same period.

Taking the average of US and European long term forecasts gives an 11.0% fall in real prices over 5 to 10 years. This translates into average real per annum price falls of between 2.3% (interpreting long term as 5 years) and 1.2% (interpreting the long-term as 10 years). For the reasons described when we discuss copper forecasts we believe that the 10 year interpretation of long-term is most appropriate – associated with a 1.2% pa real price reduction.

In our opinion the best estimate of future increases in the real price of steel products can be derived using the information in Table 17 above. While we do not have a forecast of changes in profit margins we do have forecasts for 'mill gate' steel prices and changes in the real cost of labour in the economy (see Table 21 below). The average weight for compensation of employees in total costs is 26% for the products listed in Table 17. Similarly, the average weight for 'iron and steel' is 14%. We assume that the costs for the remaining components of the final price for steel products paid by the steel fabricator do not change in real terms over the period from 2007 to 2014.

Using these weights in conjunction with the Econtech real wage growth forecast in Table 21 (ie, weighted at 26%) and the -1.2% pa HRC steel forecasts (ie, weighted at 14%) results in the following forecast escalation factors.

Table 18: Escalation for steel products (real, year ended June)

	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
Steel products	1.8%*	0.2%	0.1%	0.3%	0.2%	0.2%	0.2%	0.2%

**Based on the actual real increase in measured prices for fabricated steel products (274-276)*

Table 18 above are our proposed escalation factors for steel products from 1 July 2006 through to 30 June 2014.

3.9. Forecast for producer's margins and wage costs

In addition to the above commodity costs (copper, steel, aluminium and crude oil) electrical equipment and other suppliers use at least two further important inputs – labour and capital. Ideally, forecasts for the cost of labour (used by suppliers) and the return on capital (received by suppliers) would also be incorporated into such analysis.

3.9.1. Labour costs – weights and forecasts

The first step to doing so is to determine the weights that are applied to labour and producers margins. The equipment that the businesses purchase can be classified into broad groupings as follows:

- Primary plant & materials supply;
- Secondary systems & materials supply;
- Transformers;
- Aluminium conductor; and
- Copper cable; and
- Concrete poles.

In order to estimate the contribution of labour to the price of equipment from each of these groups, we have had recourse to the Australian Bureau of Statistics' (ABS) most recent input-output tables.[37] These tables examine the supply and use of goods and services in the Australian economy.

An input-output table identifies the inputs used by a particular industry grouping, including the total compensation of employees in each industry and the value of inputs from all other industries. For example, the industry grouping "Other electrical equipment" uses inputs from a range of different industries including "Scientific research, technical and computer services" and even a small amount of inputs from the 'textile products' industry (possibly reflecting the cost of protective clothing for employees).

We have estimated the proportion of inputs associated with labour in each relevant industry by calculating the ratio of the compensation of employees against the combined sum of this and the total value of production. .

In order to be able to estimate the proportions specific to the expenditure categories listed above it is necessary to map each of these expenditure categories to an industry category employed by ABS in its input-output tables. We used the 1993 edition of the Australian and New Zealand Standard Industrial Classification (ANZSIC), which the ABS based their classification on, as a guide in this process. However, it is important to note that the industry codes used in the input-output tables have different code numbers and are much wider in their scope than the more detailed ANZSIC codes. We show in Table 19 below the ANZSIC code and corresponding industry code assumed for each equipment grouping.

Table 19: Equipment grouping industry codes

	ANZSIC code	ANZSIC label	Industry code	Industry code label
Primary plant &	2859	Electrical equipment	2808	Other electrical

[37] See in particular: ABS, Australian National Accounts: Input-Output Tables 2001/02, Catalogue Number 5209.0.55.001, Table 2.

materials supply		manufacturing		equipment
Secondary systems & materials supply	2859	Electrical equipment manufacturing	2808	Other electrical equipment
Transformers	2859	Electrical equipment manufacturing	2808	Other electrical equipment
Aluminium conductor	2852	Electric cable and wire manufacturing	2808	Other electrical equipment
Copper cable/conductor	2852	Electric cable and wire manufacturing	2808	Other electrical equipment
Concrete poles	2635	Concrete product manufacturing	2604	Plaster and other concrete products

Source: ABS Catalogue Numbers 5209.0.55.001, 1292.0.

We calculated the proportion of labour as an input to the production process for each of the industries identified in Table 19 using the ABS input output tables. These figures are shown in Table 20 below.

Table 20: Proportion of labour by equipment grouping

	Industry code	Proportion labour
Primary plant & materials supply	2808	27%
Secondary systems & materials supply	2808	27%
Transformers	2808	27%
Aluminium	2808	27%
Copper	2808	27%
Concrete poles	2604	23%

Source: ABS Catalogue Numbers 5209.0.55.001, 1292.0.

We recommend the above weights for labour costs be used when attempting to forecast increases in the cost of the above equipment purchases.

We likewise recommend that these weights be applied to forecasts for general real wage increases in the Australian economy. Econtech is predicting that wages in the general economy will experience material real increases over the relevant period.[38] These are detailed in the table below.

Table 21: Econtech AWOTE across the Australian economy (real, year ended June)

	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
Wages	2.5%	1.8%	1.6%	2.4%	1.9%	1.8%	2.0%	2.0%

Source: Econtech December ANSIO

[38] Econtech, Australian National, State and Industry Outlook, December 2007.

3.9.2. Producer's margins – weights and forecasts

It is also highly likely that producers' margins will increase in real terms over the period to 2014. An important factor in determining the cost of equipment is the balance between supply and demand in world equipment markets. This balance appears to have tipped significantly in the favour of producers in the last year and is forecast to continue to do so for the immediate term. This applies across the board for the suppliers of specialised electricity distribution and transmission equipment.

Relevant market commentary includes:

- In relation to ABB, maker of power transformers and switchgear:

  "The new five-year targets unveiled on Wednesday reflect the fact that the Swiss-Swedish engineer is sitting pretty in several of its markets. ***Strong demand for power products and systems is anticipated for years to come.*** *The developed world has to update ageing power grids, add capacity and connect new renewable sources of power to existing networks. For emerging markets to continue industrialising requires the building of a whole energy infrastructure."*[39] [Emphasis added.]

  "Backlog increasing further: Like for like sales growth was 19% compared to 16% expected. The order backlog rose to $22.2bn from $20.4bn at the end of Q2. The twelve months rolling book to bill ratio stays at the elevated level of 1.20x reached at the end of Q2 (1.19) and is likely going to be one of the best in the sector."[40]

- In relation to Prysmian, maker of electrical cable:

  "We continue to believe Prysmian deserves to trade in-line with the average target multiple we use for the sector of 10x 09E EV/EBITA, which gives our December 08 price target of €27. Its higher cyclicality is offset by its high exposure to ***strong Energy infrastructure markets****."*[41] [Emphasis added.]

  *"****Against a backdrop of growing investments in power transmission infrastructures by utilities*** *and an upturn in the telecoms cable market (optical fibre cables in particular), Prysmian has successfully reaped the opportunities presented by the market, to combine a rise in sales and profitability."*[42] [Emphasis added.]

- In relation to Schneider, maker of switchgear:

---

[39] UK Financial Times, http://www.ft.com/cms/s/1/c5badc6a-5b8b-11dc-bc97-0000779fd2ac.html

[40] JPMorgan analyst report on ABB, October 2007.

[41] JPMorgan analyst report on Prysmian, November 2007.

[42] Prysmian description of market conditions, 2 December 2007, http://www.prysmian.com/about-us/key_figures.html

"We raise our Dec 08 target price for Schneider to €102 from €100. We believe Schneider deserves to trade in line with the sector average multiple to reflect its ability to continue to restructure its portfolio of companies and products and its ***exposure to electrical infrastructure build-out****."*[43] [Emphasis added.]

"'The initial impact of synergies and the deployment of additional efficiencies plans have driven a remarkable improvement in profitability,' in a 'booming market', it said. Sales in the full-year at the unit are seen at 3.5 bln usd and are expected to generate current EBITA of around 430 mln and EBITA of 390 mln. Looking further ahead, Schneider Electric said it revises certain targets for 2009 upwards and now expects sales at the unit of 4.3-4.5 bln usd, representing average annual organic growth of 11-13 pct. and EBITA of 650-750 mln, for a margin of 15-17 pct."[44]

- In relation to Siemens Energy Division, competitor of both ABB and Schneider:

  Revenue is expected to grow at the *"square of GDP"* and "*margins to increase despite low margin project backlog."*[45] The total market is expected to increase at 11% pa compounding from 2006 to 2010.[46]

  "PTD [Power Transmission and Distribution operations for Siemens] completed a year of continuous earnings improvement with Group profit of €225 million for the fourth quarter... Higher revenue enabled all divisions within PTD to increase their earnings, and the Group achieved its best quarterly Group profit margin of the year. ***In a strong global market for secure, high-efficiency power transmission and distribution, PTD delivered revenue of €2.283 billion, up 24% from the prior-year quarter.*** *Orders for the quarter rose 12% above the prior-year level, to €1.882 billion, including a major order in the U.S."*

  "PTD's full-year results follow the same trends as in the fourth quarter. Group profit more than doubled, to €650 million, on improving margins and higher revenue. Revenue rose 18% year-over-year, to €7.689 billion, while orders climbed 23%, to €9.896 billion. Among numerous major orders were large new contracts in the Middle East and China, taking PTD's full-year book-to-bill ratio up to 1.29."[47]

Specific estimates of margin increases are provided by JPMorgan analyst reports:

---

43 JPMorgan analyst report on Schneider, October 2007.

44 Schneider advice to investors as reported in http://uk.biz.yahoo.com/28112007/323/schneider-electric-sees-fy-current-opg-margin-critical-power-ops.html

45 Siemens, Annual Analyst Briefing: Tap the potential of Siemens, 9 November 2007, p.25, http://w1.siemens.com/en/investor/index.htm

46 Ibid, p.9

47 Siemens Earnings Release, Munich, 8 November 2007.

- ABB's earnings before interests and taxes (EBIT) as a percentage of sales in 2006 was 12.9% in power products and 6.9% in power systems. This is estimated to increase to 17.6% and 9.1% respectively by 2009. Overall operating margin is forecast to increase from 10.7% in 2006 to 15.4% in 2009. **These increases represent a 30% to 45% increase in margins.**

- Schneider's EBIT margin is forecast to remain constant at (historically high) 2006 levels of 14.6%. It is worth noting that this 14.6% EBIT margin is 18% higher than the average from 1990 to 2006 and was not exceeded in that period.

- Prysmian's EBIT margin for sales to "Utilities" in 2006 was 8.2% (which was itself well above EBIT margins for the prior two years). This is nonetheless forecast to increase to 10.9% in 2009 and continue to increase to 13.5% in 2011. **This represents a 64% increase in margin.**

The above evidence of tightening supply conditions is confirmed by anecdotal domestic evidence surrounding contract renegotiations and even refusal to supply under existing contract terms:

The real forecast and past actual increases in margins predicted by JPMorgan for ABB and Prysmian are provided in the table below. Arguably, the best measure of margins for our purpose is EBITDA (being the margin remaining after labour and other consumables are paid for). However, JP Morgan only forecasts EBIT and so this is reported in Table 22. Goldman Sachs forecasts of EBITDA are reported in Table 23. The information in both tables is used to derive estimates of increases in margin (as forecast changes in EBIT and EBITDA will naturally be strongly correlated).

Table 22: JP Morgan Forecast Increase in EBIT Margins (year ended June)

	2005 (a)	2006 (a)	2007 (f)	2008 (f)	2009 (f)	2010 (f)	2011 (f)
ABB*							
Power products	9.4%	12.9%	16.5%	17.1%	17.6%	na	na
Power systems	4.6%	6.1%	8.0%	8.6%	9.1%	na	na
Prysmian**	6.3%	7.1%	8.5%	10.1%	11.1%	11.8%	12.7 %

**26 October 2007, JP Morgan Analyst report for ABB. **6 November 2007 JP Morgan Analyst report for Prysmian.*

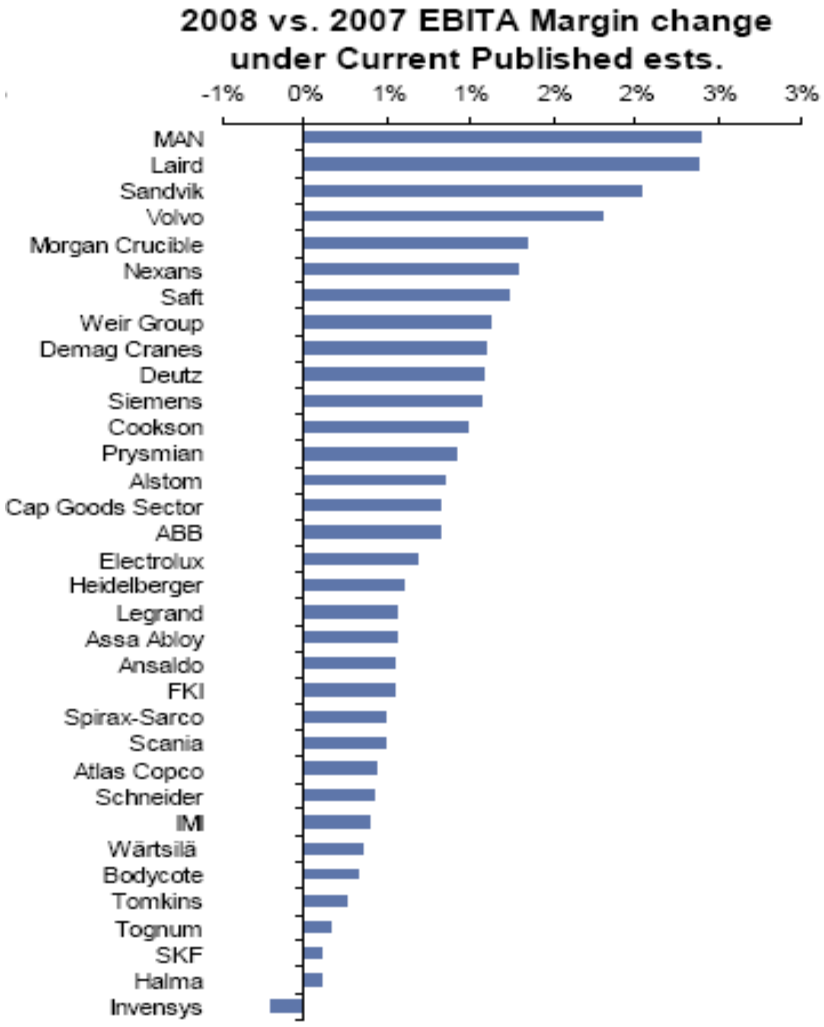
Table 23: Goldman Sachs Forecast Increase in EBITDA Margins (year ended June)

	2005 (a)	2006 (a)	2007 (f)	2008 (f)	2009 (f)	2010 (f)	2011 (f)
ABB***		12.5%	15.7%	16.5%	17.0%		
Prysmian**	7.10%	8.1%	10.1%	11.1%	11.7%	12.4%	
Nexans*		8.8%	10.2%	11.4%	12.0%		

July 26 2007 Goldamn Sachs Analyst report on Nexans (page 2). ** July 26 2007 Goldman Sachs Analyst report on Prysmian (page 35). * October 25 2007 Goldman Sachs "Company Update", ABB (page 2).*

Of course, it is always possible that ABB and Prysmian are 'special cases' of equipment suppliers that, peculiar to the rest of their competitors, can expect to earn high margins in future years. However, while we cannot locate similar long term forecasts for other firms, we note that short term forecasts from a different investment bank (Goldman Sachs) has similarly robust forecasts of earnings growth across all firms in the sector.

As the figure below demonstrates, 33 out of 34 firms covered in the industry were expected to have margin growth between 2007 and 2008. Notably, ABB and Prysmian are in the 'middle of the pack'. When interpreting the below graph it is important to remember that the forecast increases are in percentage points of margin. That is, a one percentage point increase in a margin from 10% to 11% results in a 10 percent increase in the absolute size of the margin. It is also important to note that because margins are always measured as a percent of concurrent sales they are always in real terms (ie, already capture changes in the equipments price from year to year).



Source: Goldman Sachs, Europe Capital Goods report, November 2007, p.15

On this basis, we believe that the best estimate of increasing margins is to take an average of the change in margins reported in Table 22 and Table 23 above. The changes in individual company margins and the resulting average percentage increase in margins are shown in the table below.

Table 24: Percentage change in margins (real, year ended June)

	2006 (a)	2007 (f)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)
ABB (JP Morgan)							
Power products	37.2%	27.9%	3.6%	2.9%	na	na	na
Power systems	32.6%	31.1%	7.5%	5.8%	na	na	na
Prysmian (JP Morgan)	12.7%	19.7%	18.8%	9.9%	6.3%	7.6%	na
ABB (G. Sachs)	na	25.6%	5.1%	3.0%	na	na	na
Prysmian (G. Sachs)	14.1%	24.7%	9.9%	5.4%	6.0%	na	na
Nexans (G. Sachs)	na	15.9%	11.8%	5.3%	na	na	na
Average	**24.2%**	**24.2%**	**9.5%**	**5.4%**	**6.1%**	**7.6%**	**na**

We have assumed zero increase in margins beyond 2011 as we have no financial analysts forecasts extending out beyond that date.

In terms of the weights that should be assumed for producers' margins we recommend having reference to Table 22. This is a conservative approach because EBIT is, by definition, a smaller estimate of producer margins than EBITDA. The weights in that table change over time and depending on the equipment (with profit margins for power systems being lowest). However, between 2005 and 2008[48] the average margin (across time and equipment was 9.6%.[49]

3.9.3. Producer margins faced by smaller customers

It is important to recognise that the above estimates relate to changes in total margins for equipment suppliers and might reflect the margins charged to large customers. It is likely that small customers will face even higher increases in margins being charged by suppliers. This reflects:

a) relatively small scale in world markets of these customers; and

b) the booming equipment market resulting in close to full capacity for manufacturers (large backlogs of work as outlined above).

As a matter of economics, one would expect the effect of b) is likely to hit small customers worse than large customers. The cost to a supplier of a customer switching demand to a competitor is associated with any excess capacity that such switching behaviour would create. That is, if switching your demand to a competitor will leave

[48] This time period is reported because the middle of the period is around the time that businesses have performed their cost estimations.

[49] Because this weight is based on the margins for actual suppliers to the businesses it is likely to be more accurate than having regard to weights for profit margins derived from ABS input-output tables. Unfortunately, the suppliers financial statements do not allow us to estimate labour costs as a percentage of total costs.

your current supplier with idle machines/workforce then you will be able to use the threat of that switching when negotiating over price.

Where all suppliers are operating at under capacity then all customers (large and small) can threaten to impose costs by switching demand and, therefore, all customers (large and small) can negotiate on similar terms with suppliers.[50] However, in times of excess demand, when suppliers are operating at full capacity (with significant backlogs of work) only when large customer take their business elsewhere will suppliers have idle machines. That is, only when the customers' purchase is significant in relation to the supplier's backlog of orders will the customer have material countervailing power.

The bargaining position of small customers is likely to worsen over time as the boom in demand for electrical equipment continues.

3.10. Forecasting movements in the AUD

An important determinant of future equipment prices is the future value of the Australian dollar. This is clearly true of imported equipment (such as high voltage switchgear) but is also true in relation to the purchase of domestically produced equipment that is nonetheless sold on a world market (eg, power transformers) and in relation to the input costs for domestic suppliers (eg, the AUD cost of copper for Australian manufacturers of cable).

However, it is notoriously difficult to forecast even short term movements in exchange rates let alone long-term movements. Futures markets for the AUD are relatively thin beyond a few months and these short dated futures are, in any event, driven by differences in risk free interest rates across countries.[51] It is not possible to use futures markets to forecast out the value of the AUD in 2014.

Some economic forecasters do provide forecasts of exchange rates going out more than one year. Econtech has forecast a depreciation of the AUD as described above. We understand that BIS Shrapnel has a more aggressive depreciation forecast (which is consistent with BIS Shrapnel's more aggressive inflation forecast).

Consensus Economics compiles the average of such forecasts with the longest dated average forecast for the AUD/USD exchange rate being 0.800.[52] This is 9.0% lower than the exchange rate prevailing on the date (10 December 2007) that the Consensus

[50] Of course, large customers will have additional bargaining power if large orders can be provided at lower cost (eg, by enabling easier planning of activities and/or greater scale economies in dealing with a particular order – such as lower unit costs associated with contract negotiation.)

[51] That is, futures reflect the difference in those interest rates such that it is possible for bond holders to 'lock in' the same risk free rate in their home currency by holding foreign bonds. This phenomenon is known as covered interest parity.

[52] Consensus Economics, Asia Pacific Consensus Forecasts, December 2007

Economics performed their survey. With the exception of the New Zealand dollar, this is the largest forecast depreciation in an Asia Pacific countries currency against the USD (with most other countries' currencies forecast to appreciate against the USD).

Arguably, the RBA has indicated some expectation of AUD depreciation as explaining its willingness to build up foreign exchange while the AUD is at record levels.

> *"With the Australian dollar reaching a 23-year high against the US dollar, the Reserve Bank has continued its purchases of foreign exchange in recent months."*[53]

An expectation of depreciation may reflect the fact that the AUD is currently at record highs against the USD and that predicted future falls in commodity prices (such as the price of copper discussed above) may lead to the AUD falling back relative to other currencies.

The fact that there is a recognised link between commodity prices and the value of the AUD is particularly important to this project as it means that cost reductions associated with falling commodity prices can be expected to be at least partially offset by concurrent depreciation in the AUD. This link between the AUD and commodity prices is accepted by both the Reserve Bank of Australia (RBA) and in academia. The RBA has recently sought to explain record high AUD values in relation to high levels of commodity prices.

> *"The continued strength in commodity prices, together with higher interest rates in Australia than abroad, helped underpin the Australian dollar's rise to multi-year highs against the US dollar and on a trade-weighted basis in July, before the currency depreciated somewhat following the disturbances in credit markets. It has also contributed to the larger increase in the Australian stock market than in other major markets, as the share prices of resource companies have been particularly strong."*[54]

Similarly, the link between the AUD and commodity prices has been confirmed in academic studies such as that by Hatzingkolaou and Polasek (2005) who state that their empirical results:

> *"…strongly supports the widely held view that the floating Australian dollar is a 'commodity currency'."*[55]

---

[53] RBA Statement on Monetary Policy, November, 2007, p.30

[54] RBA, August Statement on Monetary Policy http://www.rba.gov.au/PublicationsAndResearch/StatementsOnMonetaryPolicy/statement_on_monetary_0807.html

[55] Hatzinkolaou, D., and Polasek, *Journal of Applied Economics*, Vol VIII, No. 1, May 2005, pp.81-99.

On this basis it is important to use a forecast for the AUD that is consistent with the forecast for commodity prices used. Certainly, it would be inconsistent to adopt an assumption of dramatic falls in commodity prices without also forecasting a similarly dramatic reduction in the value of the Australian dollar.

The only long term forecasts of the AUD we are aware of are provided by Econtech in their December 2007 ANSIO. For the purpose of this report we adopt these forecasts to convert USD forecasts for commodity prices to the AUD price of those commodities. We note that Econtech is predicting only small changes in the value of the AUD.

Table 25: Econtech AUD/USD exchange rate forecasts (1 July of relevant year)

	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)
AUD/USD exchange rate	84.9	88.4	87.8	86.5	85.2	84.1	83.2

Adopting the Econtech forecasts is a conservative approach given that the AUD is currently at record highs against the USD. Adopting a more dramatic forecast depreciation in the AUD would result in a significantly higher estimate of the AUD price of equipment.

3.11. Forecasting movements in land prices

Based on BIS Shrapnel forecasts[56] we estimate that the average real annual escalation in land values in Sydney will be 4.1% per annum for Sydney CBD B Grade property and the same value (4.1%) for non-CBD B Grade property (based on the average forecast for North Sydney, Chatswood, Parramata and North Ryde). B Grade property refers to non-price property (eg, land that is not ideally suited for retail or office development) and is the type of property most likely to be used by the businesses to house substations.

This is consistent with the estimates of Jones Lang Lassalle[57] in report to TransGrid who have estimated a range for nominal land value growth of 5% to 10%pa for Sydney metro areas and 7% to 13% for non-metro areas.

The above figures are based on BIS Shrapnel forecasts over the period end 2006 to 2014. CEG recommends the use of an average annual escalation factor for land values because of the extreme difficulty in predicting price movements in any one year. Land values, like stock market values, are based on investor's views regarding the NPV of future cash-flows from the asset. This means that growth in land values, like growth in stock market values, will reflect growth in the expected level of future earnings (other things constant). In the case of land values future earnings relate to future rental income while, in the case of the stock market, future earnings relate to company profits.

[56] Sydney Commercial Property Prospects 2007 – 2021 BIS Shrapnel, May 2007

[57] JLL, Revenue Reset Program – Land Value Growth Factors, January 2008.

For a long lived asset such as land, if future expected rents grow at X% per annum then land values will also grow at X% per annum. The only reason that growth in land values change dramatically from one year to the next is if investors' perceptions of expected rent growth changes dramatically (or if investors discount rates applied to future rents suddenly change). This means that predicting annual changes in land prices is akin to predicting: a) that investors will change their expectations about the future and; b) when investors will do this.

3.12. Using CEG escalation factors to escalate unit costs

The escalation factors reported in the sections above are for the year ended June. Different businesses will have to use these escalation factors differently to the extent that their unit cost estimates relate to different periods of time.

For example, if one business' unit costs were estimated as prevailing in June 2006 and another business' unit costs were estimated as prevailing in December 2007 then the later business would have to apply six months less escalation than the former in order to accurately estimate its costs.

We report in Table 26 a summary of all of our proposed escalation factors in year ended June terms.

These escalation factors can be converted into a different year ended format – such as year ended December. In order to convert the year ended June escalation factors into year ended December factors we recommend applying the following transformations. For example, year ended December 2007 can be calculated as:

(1+ Year ended June 2007 escalation) ^{½}*(1+Year ended June 2008 escalation)^{½}

Table 26: Summary of escalation factors (year ended June)

	2003 (a)	2004 (a)	2005 (a)	2006 (a)	2007 (a)	2008 (f)	2009 (f)	2010 (f)	2011 (f)	2012 (f)	2013 (f)	2014 (f)
Copper (nominal)	-5.7%	18.9%	28.8%	62.1%	33.2%	2.5%	-1.0%	-4.1%	-1.9%	-0.4%	-0.6%	-0.8%
Aluminium (nominal)	-10.3%	-5.6%	9.1%	25.2%	14.0%	-2.8%	6.3%	1.9%	2.3%	2.8%	2.6%	2.4%
Crude oil (nominal)	11.2%	-9.0%	33.7%	40.0%	-0.6%	28.1%	15.4%	-1.4%	1.0%	2.0%	0.5%	1.5%
Steel (real)	0.8%	0.3%	4.8%	-0.4%	1.8%	0.2%	0.1%	0.3%	0.2%	0.2%	0.2%	0.2%
EGW NSW wages (real)*	1.6%	1.9%	1.8%	1.5%	4.3%	3.1%	3.6%	3.9%	1.9%	2.8%	3.5%	3.7%
Construction costs (real)	0.0%	0.6%	2.7%	1.7%	8.4%	2.3%	2.1%	0.9%	0.7%	1.1%	1.9%	2.6%
Wages general (real)	-0.1%	1.6%	1.1%	0.8%	2.5%	1.8%	1.6%	2.4%	1.9%	1.8%	2.0%	2.0%
Producer's margin (real)				24.2%	24.2%	9.5%	5.4%	6.1%	7.6%	0.0%	0.0%	0.0%
Land (real)						4.1%	4.1%	4.1%	4.1%	4.1%	4.1%	4.1%
CEG CPI	2.7%	2.5%	2.5%	4.0%	2.1%	3.0%	2.8%	2.4%	2.4%	2.5%	2.5%	2.4%
Copper (real)	-8.2%	16.0%	25.6%	55.9%	30.5%	-0.4%	-3.7%	-6.3%	-4.2%	-2.8%	-3.1%	-3.1%
Aluminium (real)	-12.6%	-7.9%	6.5%	20.4%	11.6%	-5.6%	3.5%	-0.5%	-0.2%	0.3%	0.0%	0.0%
Crude oil (real)	8.3%	-11.2%	30.5%	34.7%	-2.6%	24.4%	12.3%	-3.8%	-1.3%	-0.5%	-2.0%	-0.9%

*Historical figures for 2003 to 2006 are not productivity adjusted.

This table also summarises historical price movements and highlights the very significant real growth in equipment input prices over the last regulatory period – growth that was generally not anticipated (and therefore not compensated) by regulators in the current regulatory period.

3.12.1. Using CEG escalation factors to escalate unit costs

In using the above escalation factors it is also important to recognise that a change in commodity prices (such as copper, aluminium, and oil) will not immediately feed through into higher equipment prices. The AER has recognised this in its SP AusNet draft decision where it states:

"On the balance of the available information SKM's assumption of a lag between movements in base metals prices and transmission equipment prices appears reasonable, however the AER considers that the lag is not likely to be greater than one year over the forthcoming regulatory control period." [58]

We agree with the AER's analysis and recommend that a six month to one year lag is applied when using the above escalation factors for commodities. For example, when attempting to estimate the impact of the -2.6% real reduction in oil prices in the year ended June 2007 on, say, transformer prices, this should be assumed to impact consumer prices in either December 2007 (six months lag) or June 2008 (12 months lag).

[58] AER, SP AusNet Transmission Determination: 2008-09 to 2013-14, August 2007, p.90