Electricity Transmission Regulatory Reset

2008/09 – 2013/14

Appendix C

SKM Report

SP AusNet
A member of Singapore Power Group

Escalation Factors affecting Capital Expenditure Forecasts

- Final
- 21 February 2007

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- Final
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1. Executive Summary

After a prolonged period where costs used for the development of capital expenditure forecasts have increased generally in line with movements in the Australian Consumer Price Index (CPI), market cost pressures particularly over the last three years have grown substantially in excess of CPI.

The Reserve Bank of Australia has noted that " … *strong global growth over a number of years has added to demand for commodities and contributed to significant upward pressure on a wide range of resources prices. While world oil prices have declined from their peaks over recent months, other resources prices have remained high, with base metals prices on average around 60 per cent higher than at the beginning of the year. These levels of commodity prices are continuing to have a significant expansionary effect on the Australian economy, having boosted Australia's terms of trade by more than 30 per cent over the past three years. The impact of higher commodity prices over this period has only partly been moderated by the rise in the exchange rate of the Australian dollar.*"[1]

SKM has, for some time, been researching the rapidly increasing cost of capital infrastructure works, particularly in the electrical industry. Many of our transmission and distribution network clients have been reporting rapidly increasing costs of both individual projects (substations, transmission lines etc.) and also annual and five year capital works programs covering the full range of capital expenditure (projects and programs).

As part of this research, SKM has conducted a multi-utility strategic procurement study in which a total of nine (9) Australian transmission and distribution companies (including SP AusNet) provided confidential contract information for the purchase of their main items of plant, equipment and materials (such as power transformers, switchgear, cables and conductors) over the period 2002 to 2006.

SKM has also been privy to contract cost information for a number of turnkey substation and transmission line projects, including plant equipment, materials, construction, testing and commissioning.

[1] Reserve Bank of Australia, *Statement on Monetary Policy*, 13 November 2006, pp 1

The results of SKM's research indicate that there are a number of factors driving the rapid rises in capital infrastructure costs, namely:

- the increase in world wide commodity prices that has occurred since 2002/03;
- subsequent increases in the purchase price of plant, equipment and materials, both locally produced and imported, although these increases are noted to lag increases in commodity prices by a period of 1 to 2 years;
- increases in the cost of local labour and related increases in construction industry costs; and
- general increases in the market price for contracted works in Australia caused by the current demand/supply imbalance and shortages in skilled labour and construction resources.

SKM has researched relevant historical and forecast data, and has constructed a model which captures the likely impact of input cost drivers on future electricity infrastructure costs. The overall output from this model suggests that on a weighted average cost basis, substation costs, transmission line costs and underground cable costs will increase, relative to 2002 costs, as shown in Table 1 and relative to 2006 as shown in Table 2. The projected factors for substations, transmission lines and cables are nominal; that is, they apply in the year in which they have been forecast to occur.

The substation values have been based on average component composition for a selected range of the most common 66kV and 220kV substation switchbays in the SP AusNet transmission network. Minor variations may occur for individual switchbay types.

Table 1 Cost increases for the period 2002 - 2006

Item	2002	2003	2004	2005	2006
Substations (excluding power transformers)	1.000	1.011	1.058	1.095	1.171
Power Transformers	1.000	0.982	1.000	1.048	1.183
CPI actual[2]	1.000	1.027	1.052	1.078	1.121

[2] Based on Australian Bureau of Statistics *CPI All Groups, Weighted Average of Eight Capital Cities, Index Numbers* for June of each year

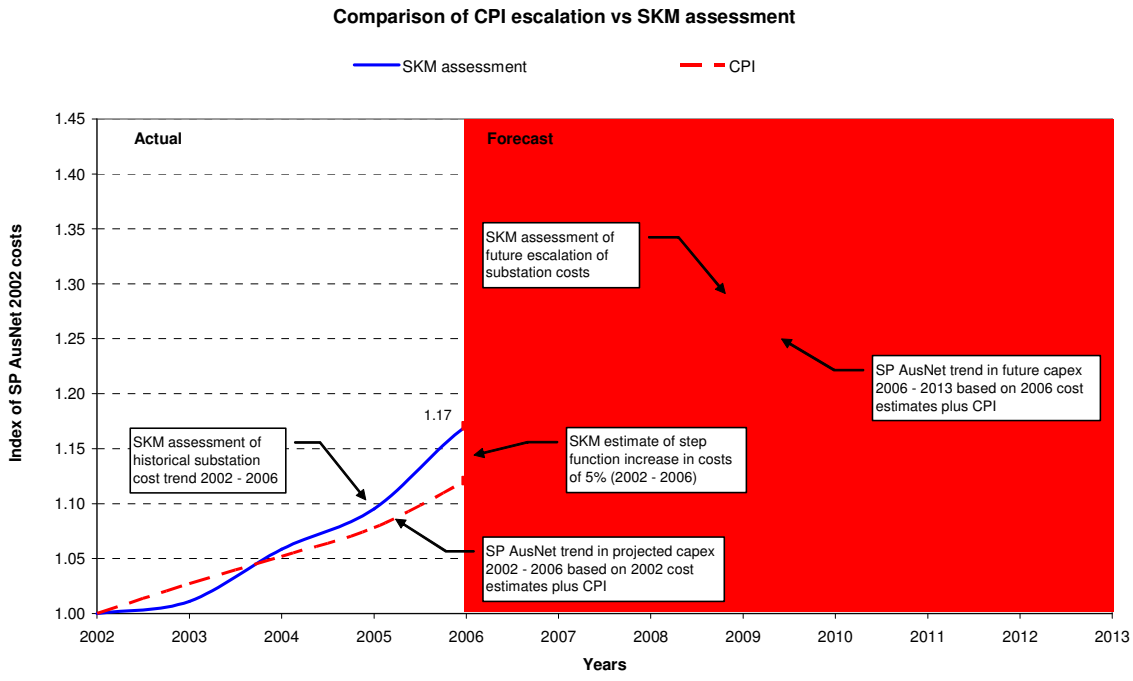
Table 2 Cost increases for the period 2006 - 2013

Item	2006	2007	2008	2009	2010	2011	2012	2013
Substations (excluding power transformers)	1.000	1.038	1.074	1.098	1.119	1.145	1.171	1.200
Power Transformers	1.000	1.058	1.215	1.197	1.139	1.105	1.087	1.083
CPI forecast	1.000	1.025	1.051	1.077	1.104	1.132	1.160	1.189

SKM would make the observation that beyond approximately 2010, many forecasts for commodity prices and foreign exchange are comparable with CPI, as there does not appear to be particular costs drivers built into the estimates more than 5 years out. As a result, the projections for escalation from 2010 to 2013 may be conservative.

Figure 1 below shows the known historical trend in escalation factors for substation assets (equipment, construction and labour), and SKM's projection of future substation costs against CPI trended costs as allowed for in the current SP AusNet 2003 - 2008 determination and as may be considered over the period 2008 - 2013. It should be noted that the 5% step increase in costs at 2006, which SKM assesses is the difference between actual project costs at this date against 2002 costs escalated at CPI.

- **Figure 1 Comparison of SKM historical and forecast substation costs indices and CPI**



It should be noted that the average annual CPI forecast for the period 2006 to 2013 shown in Figure 1 is 2.5% per annum (refer section 5.5). Should CPI exceed these estimates due to pressure on labour costs, it would have the effect of pushing both the CPI based forecast and the SKM projection lines higher.

A more detailed breakdown of the component cost increases is contained in Sections 6 and 7, and Appendices B and C.

2. Scope

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

The scope of the assignment is as contained in the following documents/correspondence:

- SP AusNet request for proposal;
- SKM initial proposal of 29 September 2006; and
- SKM modified proposal (following discussions with SP AusNet staff) in a facsimile of 30 October 2006.

Specifically, SP AusNet sought independent advice from SKM regarding the impact that future cost escalation will have on the capital cost forecasts:

(a) From the reference date of 2006 to the end of the current regulatory period - 2006/07 and 2007/08, ending 31 March 2008; and

(b) For the whole of the next regulatory period - 6 years from 1 March 2008 to 1 March 2014.

SP AusNet also required SKM to develop a simple "guideline document" for use by procurement personnel, which quantified the approximate impact of input cost variables (commodity prices, exchange rates etc.) on the contract prices of groups of asset categories such as power transformers, underground cable, overhead conductor, steelwork and switchgear.

3. SKM Asset Valuation & Estimating Database

3.1 Initial Development

SKM first developed and consolidated its Australian asset valuation and estimating database for transmission assets and project costs in 1997. This was done with the co-operation of all of the TNSPs, who shared their project costings with SKM. These costings were compared with SKM's experience of project costs in the broader electrical contracting market place. While there were some differences between the TNSPs, and the broader industry costs, SKM was able to confidently develop a uniform set of transmission equipment and construction costs that were valid at that time (1997).

3.2 Updating and Refinement

SKM's database of capital costs has been progressively refined and updated since 1997 by various means, including:

- reviewing and updating supplier and contractor costs during subsequent asset valuation assignments;
- obtaining updated budget price information from suppliers and contractors for individual plant, equipment and projects;
- conducting multi-utility market price surveys and plant / equipment procurement studies whereby utilities share their pricing information on a confidential basis with SKM; and
- other external project costs for non-utility clients that are project managed by SKM.

3.3 Recent SKM Transmission Asset Valuation & Project Estimating Experience

Since the establishment of the centralised transmission asset valuation database, SKM has conducted a number of transmission valuations, each of which has required a review and updating of SKM's unit rates to current market prices. These valuations included:

- SPI PowerNet (Victoria) - 2000;
- ElectraNet (South Australia) - 2001;
- Transend (Tasmania) - 2002;
- Power and Water Authority (Northern Territory) - 2000 & 2002;
- NSW Treasury (EnergyAustralia, Integral Energy, Country Energy, Australian Inland) - 2002;
- Queensland Competition Authority (Energex, Ergon Energy) - 2003;
- TXU (Victoria) - 2004; and
- Western Power (Western Australia) - 2005.

In addition, SKM has conducted a number of overseas asset valuations and unit cost reviews for transmission companies which have given an insight into differing international pricing practices and the impact of international exchange rates on project costs. These valuations include:

- Transpower (New Zealand) - 1995 to 2002;
- Ontario Hydro (Canada) - 1999;
- SP PowerGrid (Singapore) - 2003;
- Transco (Philippines) - 2005; and
- Transpower (New Zealand) unit rate review - 2006.

Over this period, SKM has also conducted numerous feasibility studies, project cost estimates and project cost reviews for transmission projects in Australia and overseas that has given it an unparalleled insight into the cost drivers and pricing trends that are currently impacting the cost of electricity infrastructure in Australia.

3.4 Trends in Transmission Line and Substation Costs

Figure 2 shows the trends observed by SKM in commodity prices over the period 1997 to 2006. All rates are displayed relative to 1997, for comparison with values from the SKM database which was established in the same year. The following points to be noted are:

- CPI index (from the Australian Bureau of Statistics) increased 22.08% from December 1997 to December 2004;
- commodity prices (copper, aluminium and steel) generally fluctuated below their 1997 prices up until December 2002 (steel) and September 2003 (copper and aluminium);
- SKM did not witness any sustained reduction in transmission line prices or substation costs during this period (1997 to 2003);
- the weighted average value of all transmission line costs increased by 31.57% to December 2004, compared with CPI of 22.08%;
- the weighted average value of all substation asset costs increased by 19.44% to December 2004, compared with CPI of 22.08%;
- SKM has concluded that transmission line costs increased more rapidly than CPI due to the input cost effects of steel and aluminium, and also local labour and construction costs; and
- SKM has deduced that substation costs have increased less than CPI (up to 2002/03) due to efficiency gains in the technology and manufacturing of electrical equipment and the strengthening of the Australian dollar reducing the cost of imported equipment. This appears to have offset the higher-than-CPI increases in the local labour and construction component of substations.

Figure 2 Commodity price trends 1997 - 2006

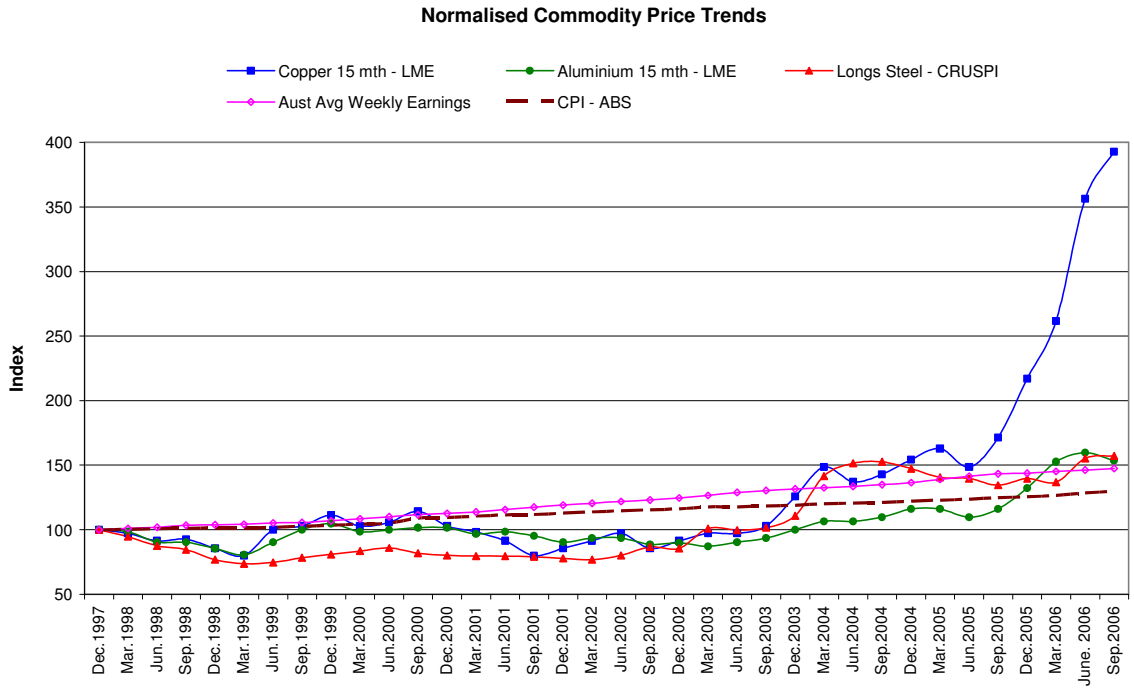


Figure 3 Trends in SKM transmission line and substation values 2002 - 2006

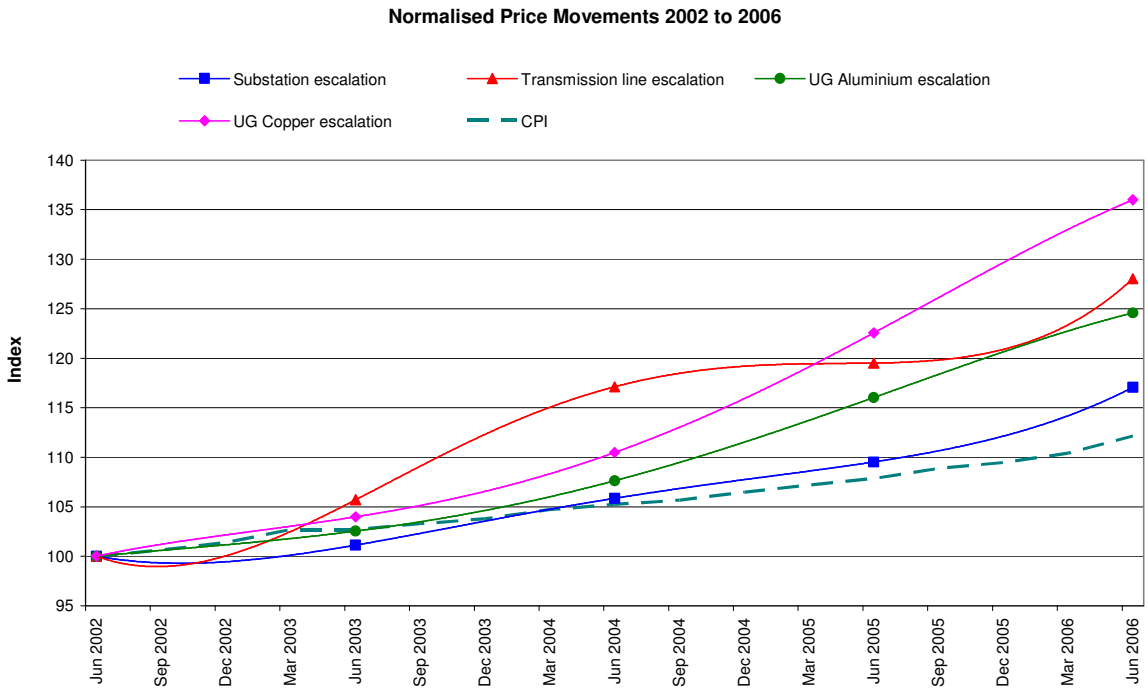


Figure 3 shows the trend of normalised price movements in substations, transmission lines and underground cables for the period 2002 to 2006 compared with CPI. It was during this period when movement in commodity prices became more volatile, and the effect on asset prices outstripped CPI. The movements in asset prices have been based on actual commodity cost indices between 2002 and 2006, with each driver weighted by contribution to the final cost of the asset (refer section 6).

The resultant curves show that in June 2006:

- Substation price movements exceeded CPI by 4.93%;
- Transmission line price movements exceeded CPI by 15.91%;
- Aluminium cable price movements exceeded CPI by 12.45%; and
- Copper cable price movements exceeded CPI by 23.86%.

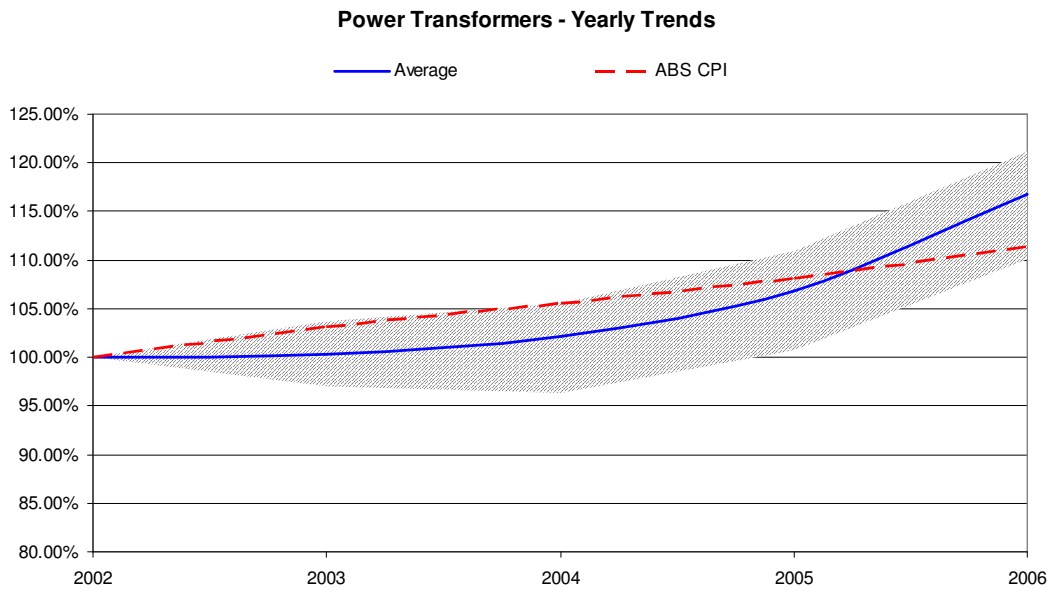
3.5 Rapid Escalation in Equipment / Material Costs

SKM has continually kept abreast of movements in the cost of both transmission and distribution electricity works, including conducting market price surveys in 2001, 2002 and 2003, and more recently (2006) a multi-utility study of procurement practices and prices for transmission and distribution plant, equipment and materials.

In this procurement study, SKM obtained from nine (9) Australian transmission and distribution companies, their actual contract prices for the purchase of their major items of plant, equipment and materials, that go into the construction of substations and transmission lines (overhead and underground). Prices were obtained for the period 2002 to 2006, so that yearly trends could be determined.

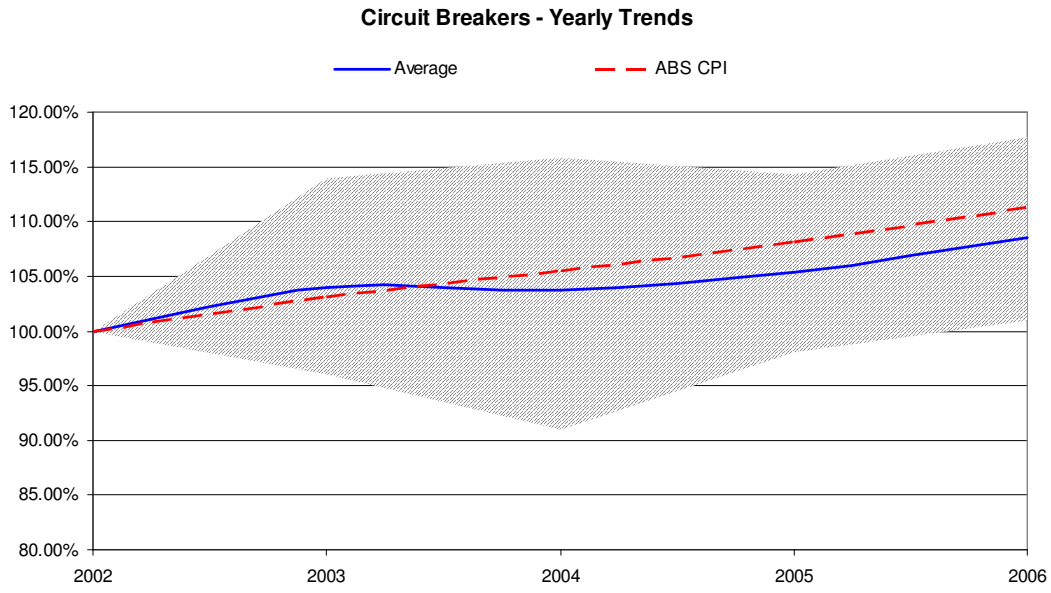
Some of the annual trend graphs for plant / equipment / materials that directly impact transmission project costs are shown in Figure 4 to Figure 11. A shaded area on a graph shows the range of reported prices for that particular asset category.

Figure 4 Annual trends in power transformer costs



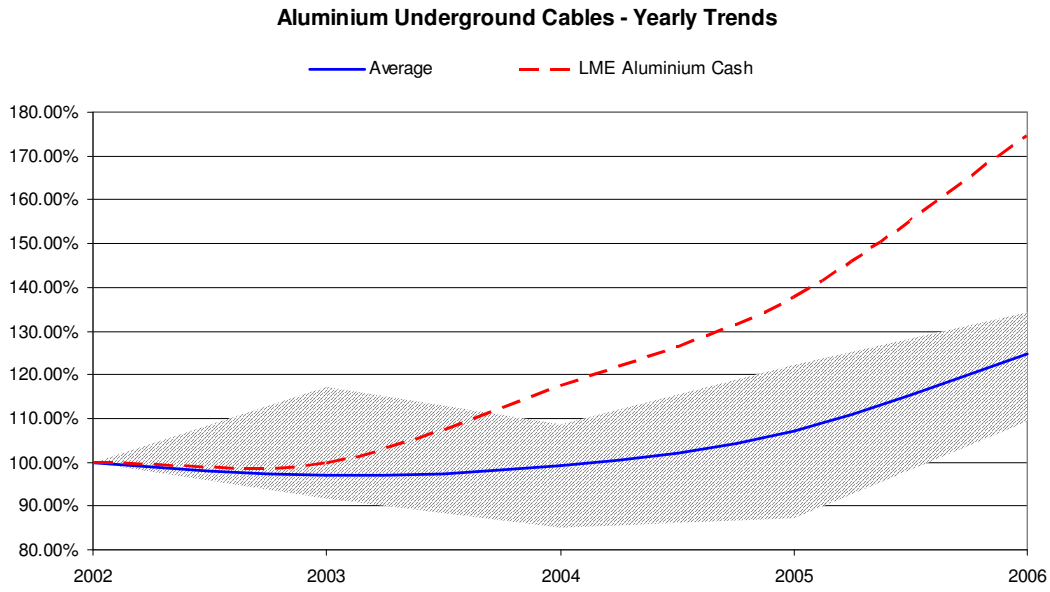
On average, power transformer costs increased by 6.79% from 2002 to 2005, and 9.29% in 2006.

Figure 5 Annual trends in circuit breaker costs



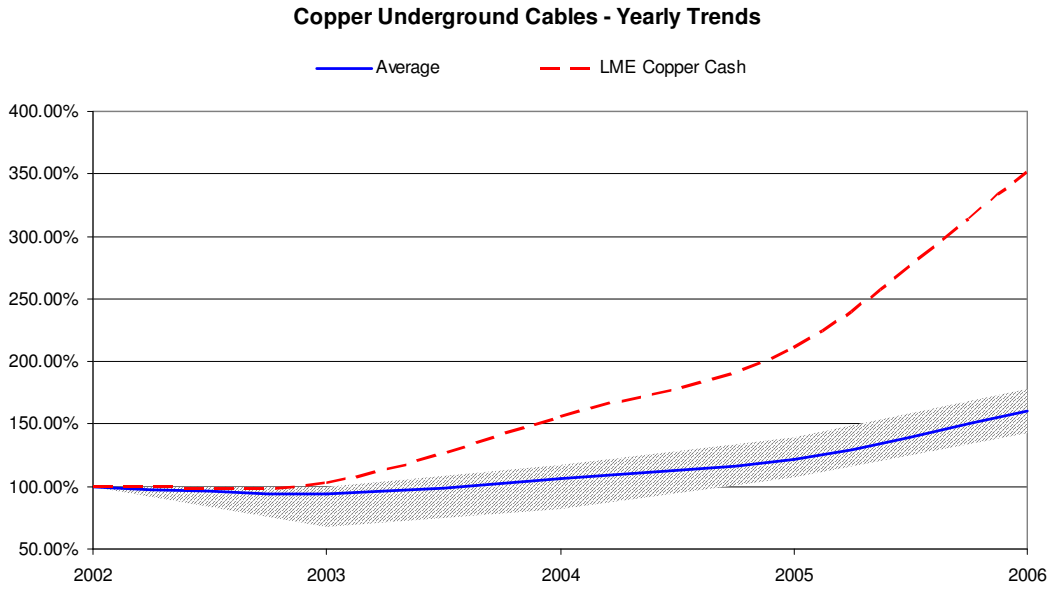
On average, circuit breaker prices increased by 5.35% over the period 2002 to 2005.

Figure 6 Annual trends in underground cable (aluminium) costs



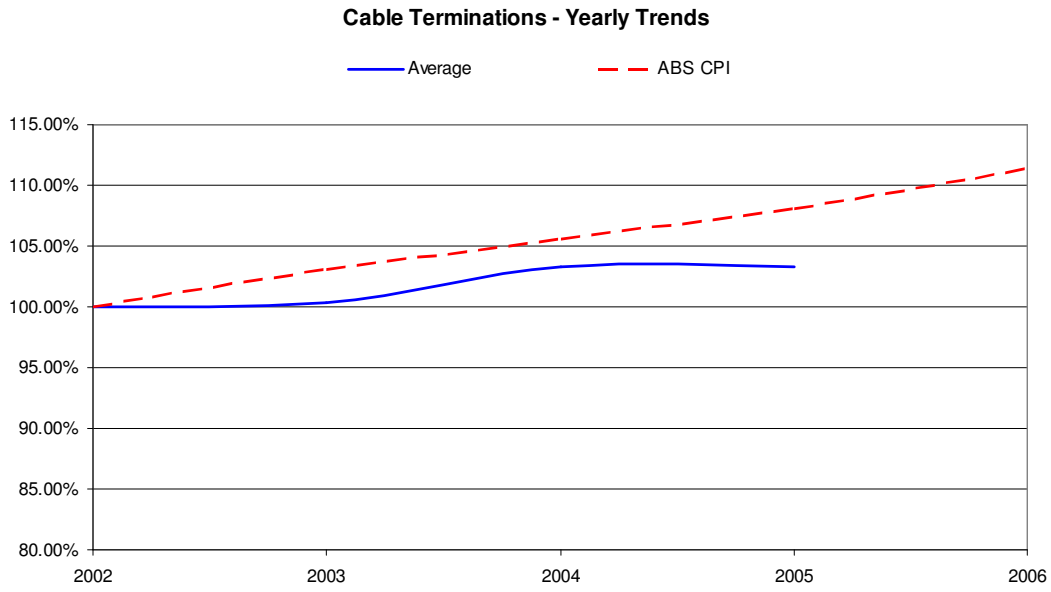
On average, the cost of aluminium cable did not increase from 2002 to 2004, but increased by 7.70% in 2005 and 16.67% in 2006.

Figure 7 Annual trends in underground cable (copper) Costs



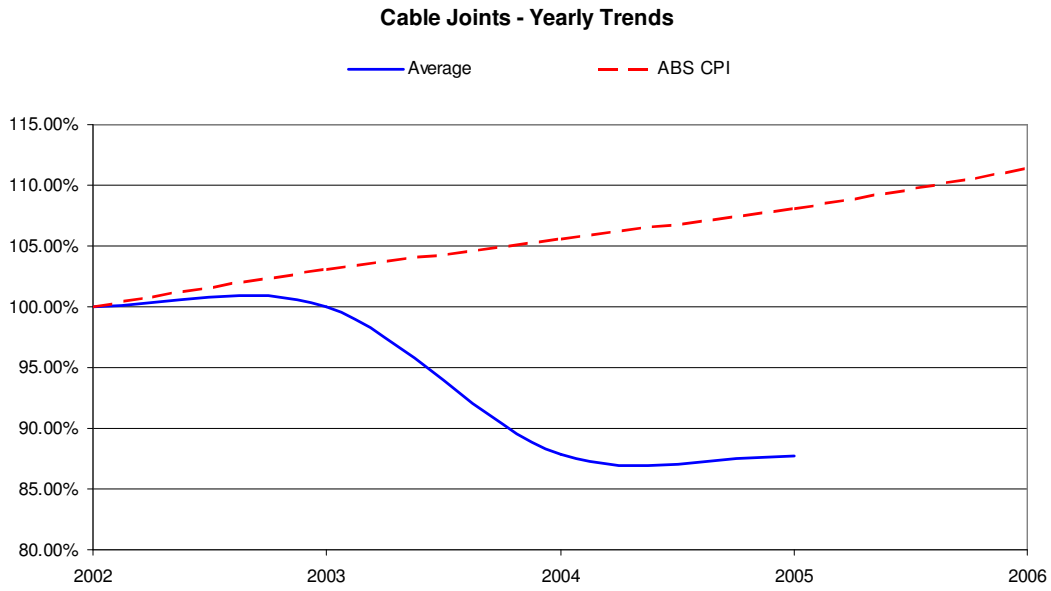
On average, the cost of copper cable increased 5.99% from 2002 to 2004, but then increased by 15.35% in 2005 and 30.91% in 2006.

Figure 8 Annual trends in cable termination costs



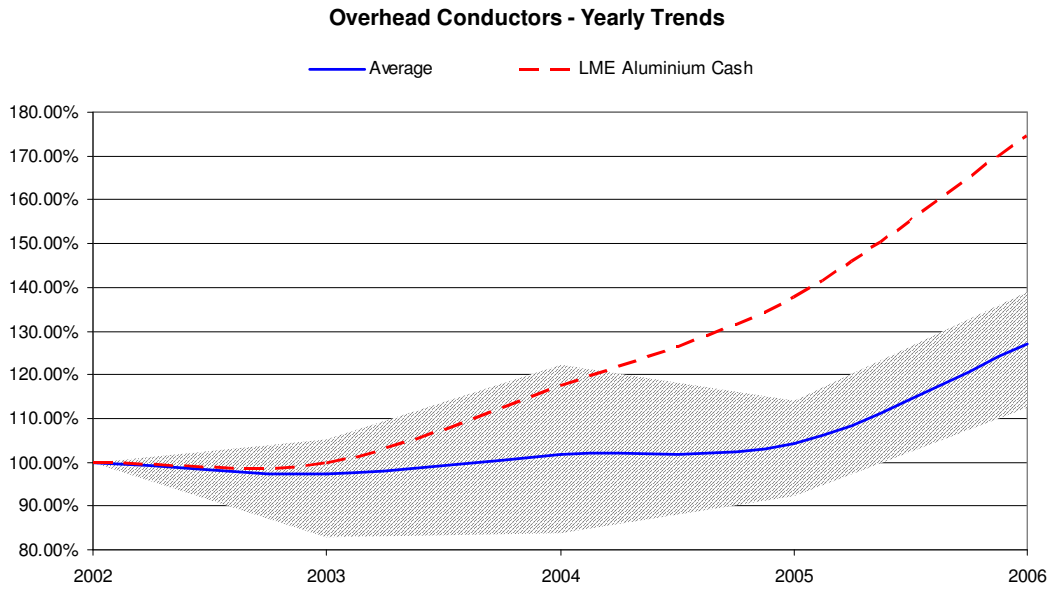
On average, cable termination costs increased by a modest 3.26% over the period 2002 to 2005.

Figure 9 Annual trends in cable joint costs



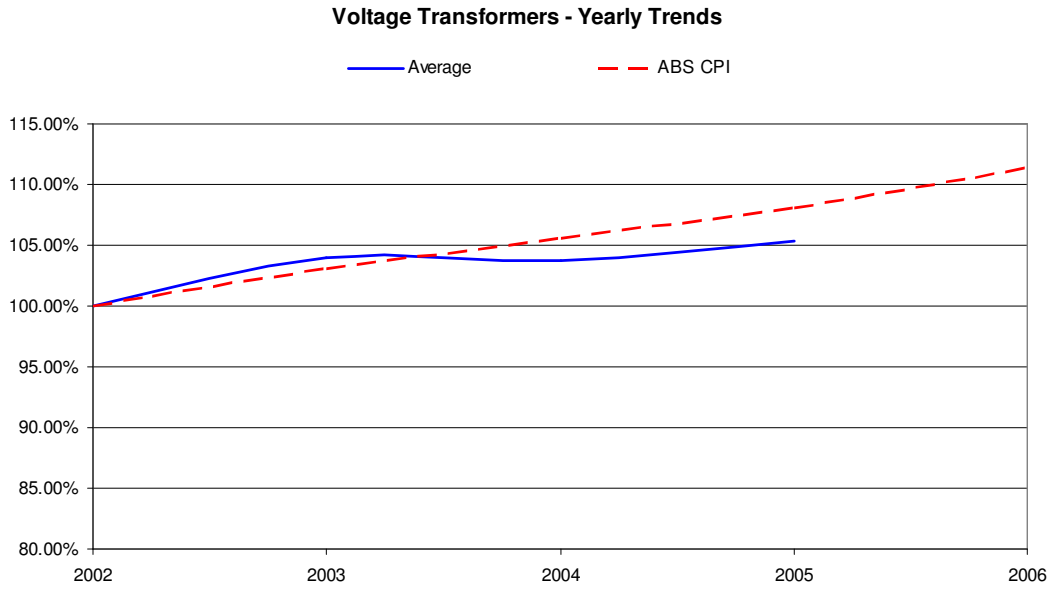
On average, cable joint costs decreased by 12.31% from 2002 to 2005.

- **Figure 10 Annual trends in overhead conductor (AAC & AAAC) costs**



On average, AAC and AAAC overhead conductor costs increased only marginally (1.66%) from 2002 to 2004, but increased by 2.52% in 2005 and a further 21.86% in 2006.

- **Figure 11 Annual trends in voltage transformer costs**



On average, voltage transformer prices have increased by 5.35% over the period 2002 to 2005.

Some significant observations that may be made for these graphs are:

- Power transformer costs were relatively stable over the period 2002 to 2004, but began to rise significantly in 2005, increased by 9.29% in 2006 and are expected to rise by more than 10% in 2007;
- Costs of equipment that are more technology or manufacturing driven rather than commodity price driven (eg. circuit breakers, cable joints / terminations, voltage transformers) tended to be relatively stable during the period;
- Aluminium cable costs were stagnant between 2002 and 2004 (decreasing slightly in 2003), but have risen 27% over the past two years;
- Copper cable costs were also consistent between 2002 and 2004 (dropping slightly in 2003), but have increased 50% in the past two years; and
- AAC and AAAC overhead conductor costs were stagnant between 2002 and 2004 (decreasing slightly in 2003), but have risen by 27% in the past two years, with most of this increase occurring in 2006.

Table 3 summarises the increases relative to CPI.

Table 3 Material / Equipment price increases relative to CPI 2002 to 2006

Item	2002 to 2005 (3 years)	2005 to 2006 (1 year)
CPI	7.99%	3.04%
Power transformers	6.79%	9.50%
Aluminium cable	7.02%	16.67%
Copper cable	22.26%	30.09%
AAC & AAAC conductor		21.86%

3.6 Time Lag Impact of Commodity Price Increases

It is of interest to note from the price trends shown, particularly in Figure 4, Figure 6, Figure 7 and Figure 10, that there appears to be a significant time lag between the rapid increases in commodity prices (which occurred for copper and aluminium between September / December 2003 and June 2005) and the time at which finished product prices began to rise. As an example, Figure 12 and Figure 13 show the time lag impact of approximately two years for aluminium and copper conductor and cables, relative to the respective commodity prices.

Figure 12 Time lag between commodity price increase (copper) and copper cable / conductor price increase

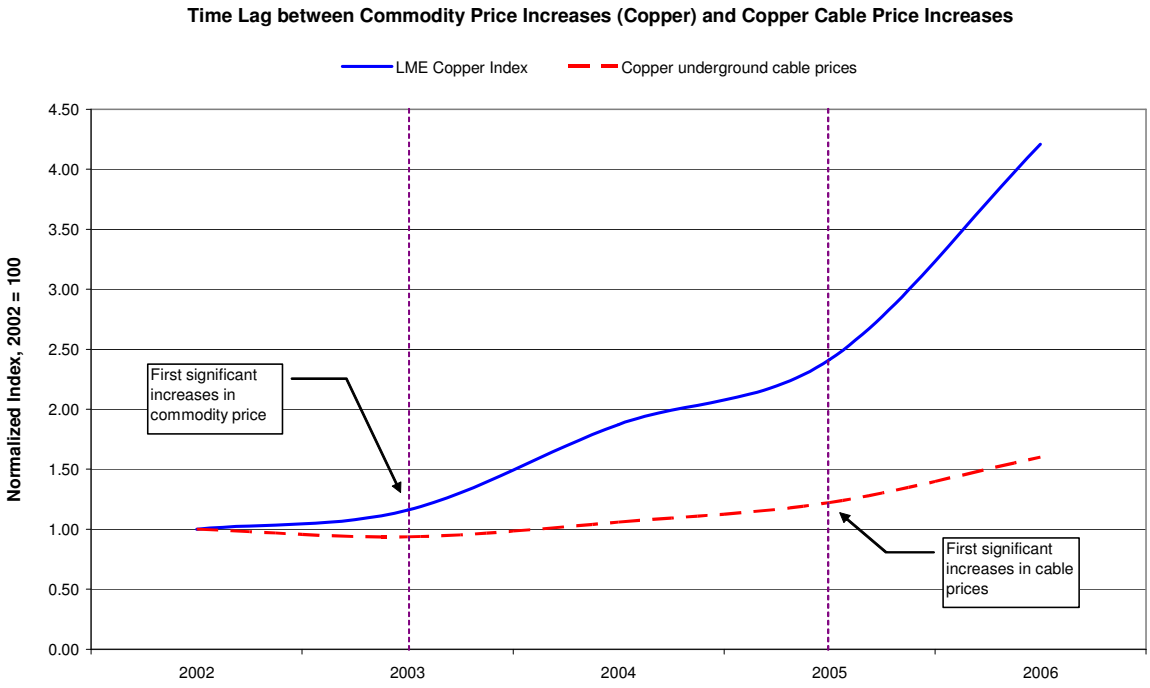
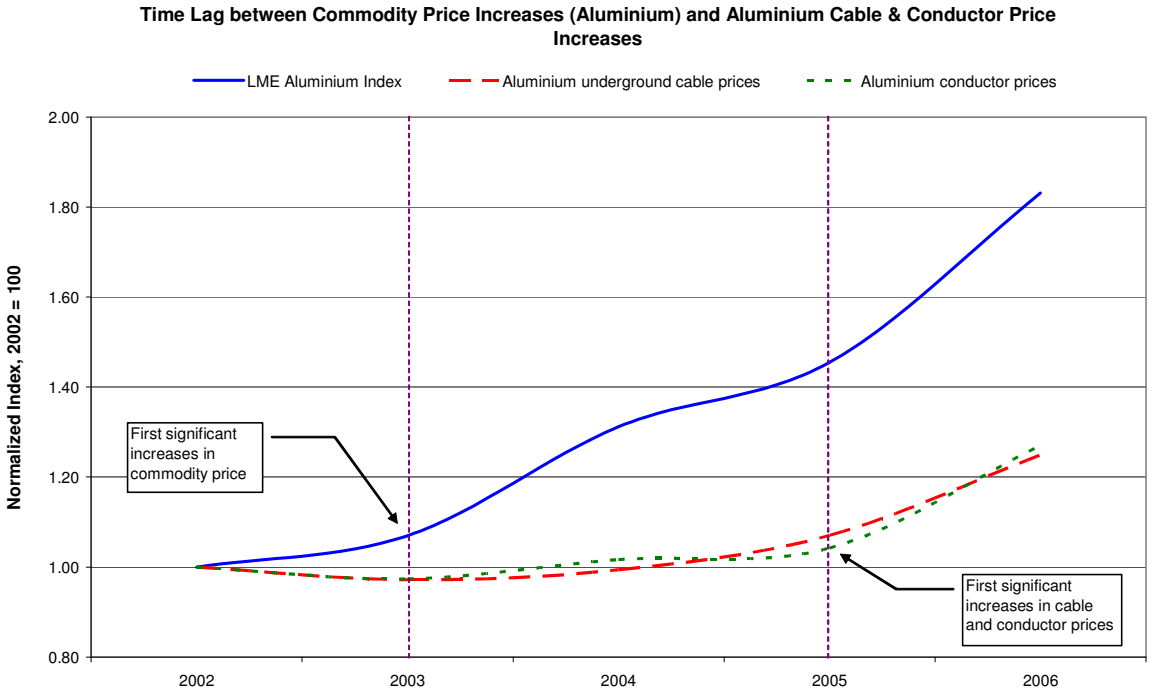


Figure 13 Time lag between commodity price increase (aluminium) and AAC / AAAC conductor price increase



This suggest that the contract prices for finished product, such as transformers, cables and conductors, will continue to rise well beyond the predicted peaks in commodity prices and likely into 2008. This view has been reinforced anecdotally through discussions with equipment manufacturers and suppliers. Depending on the market pressures for various finished products, the higher prices may be sustained potentially into 2009 or 2010.

4. International Markets

Global expansion over the past four years has resulted in significant increases in fuel and non-fuel commodity prices. Metal prices have risen sharply since 2002 to the present by 180% in real terms, whilst oil prices have increased by 157% during the same period.

Almost all periods of large upward movements in metal prices have been associated with strong world growth. However, the continued rise in metal prices during 2006 can in part be attributed to low investment in the metals sector in the late 1990s and early 2000s that followed a period of earlier price declines. The upward price cycle has also been caused by rapidly growing emerging markets (especially China) in the world economy.

China has become a key driver of dynamics in the prices of base metals. During 2002-05, China contributed to:

- almost all of the increase in world consumption of nickel and tin;
- greater than the net world consumption growth for lead and zinc; and
- 50% of the consumption growth for aluminium, copper and steel.

China has become the largest consumer of several key metals, generating about ¼ of the total world demand for aluminium, copper and steel.

Some financial analysts have suggested that rapid industrial growth, construction activity and infrastructure could sustain the growth of demand of emerging markets at high rates in the medium term. To offset this forecast, some of the current demand pressures could be temporary as the Chinese government is currently reviewing fiscal policy with regards to exchange rate and rebalancing of growth from investment to consumption. India has a considerably lower focus in its economy on the industrial sector, and as a result India's continued rapid growth is considered less likely to have a significant impact on metals markets in the future.

4.1 Price Movements

The international demand for metals has risen substantially during the last four years and caught the industry by surprise. Metal prices increased substantially during the same period as production lagged growth levels, particularly nickel, copper, and aluminium prices.

The price movements for metals are shown in Figure 14 and Figure 15. The forecast figures shown for copper and aluminium in 2007 are based on 87.5 percentile projections published by the IMF.[3]

[3] IMF, *World Economic Outlook*, September 2006

Figure 14 World copper and aluminium price movements

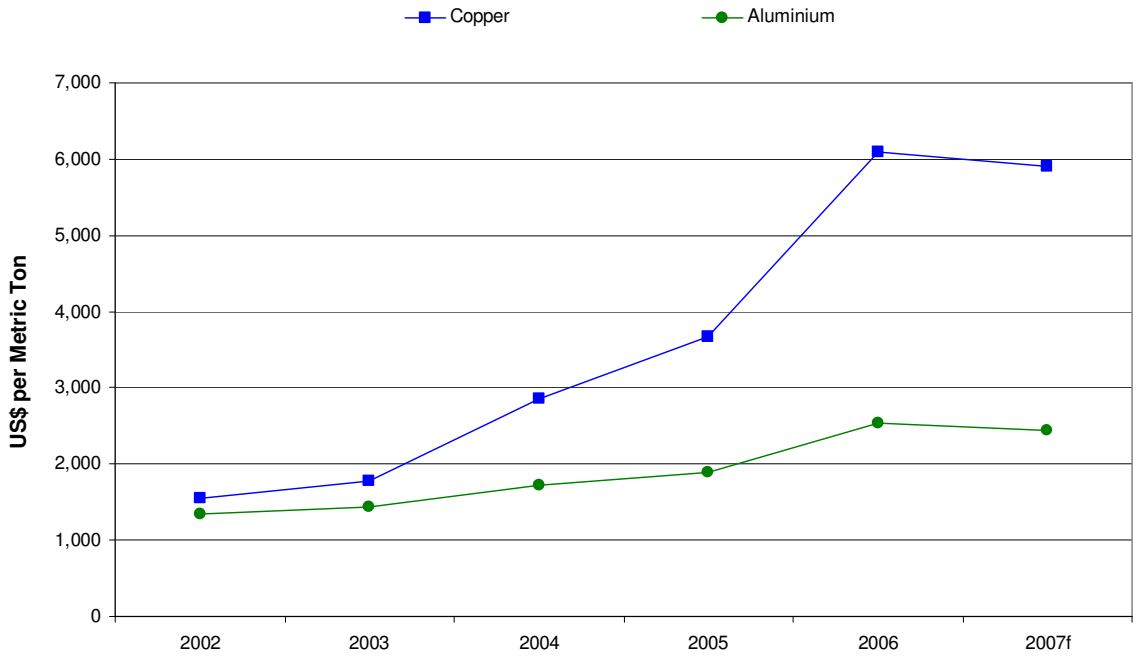
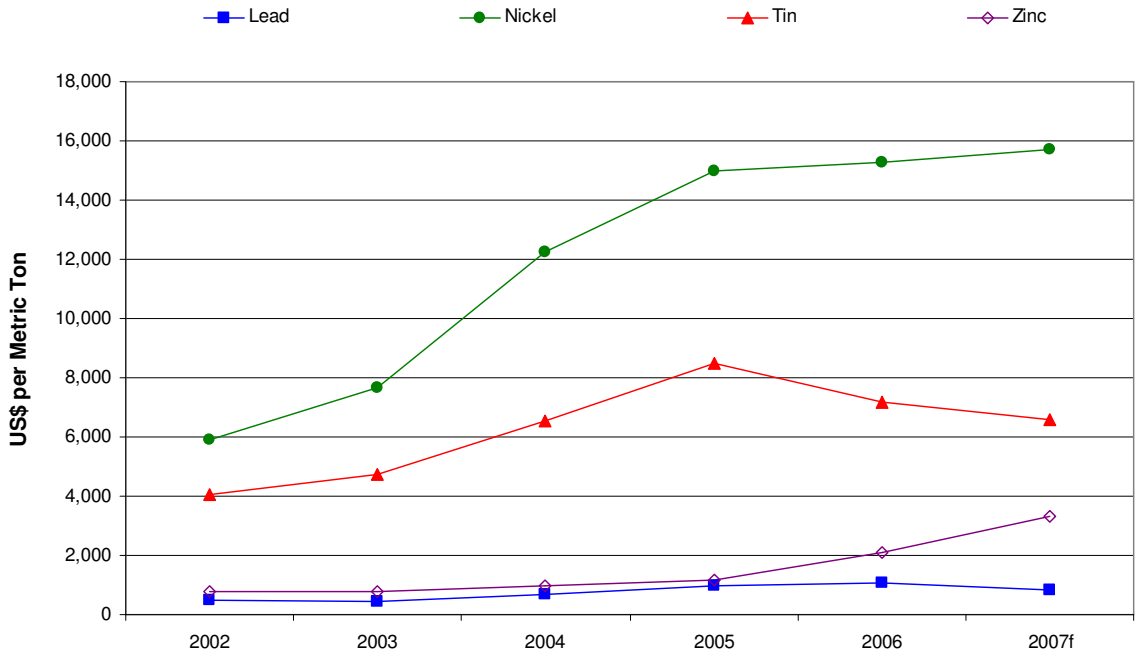


Figure 15 World base metals price movements

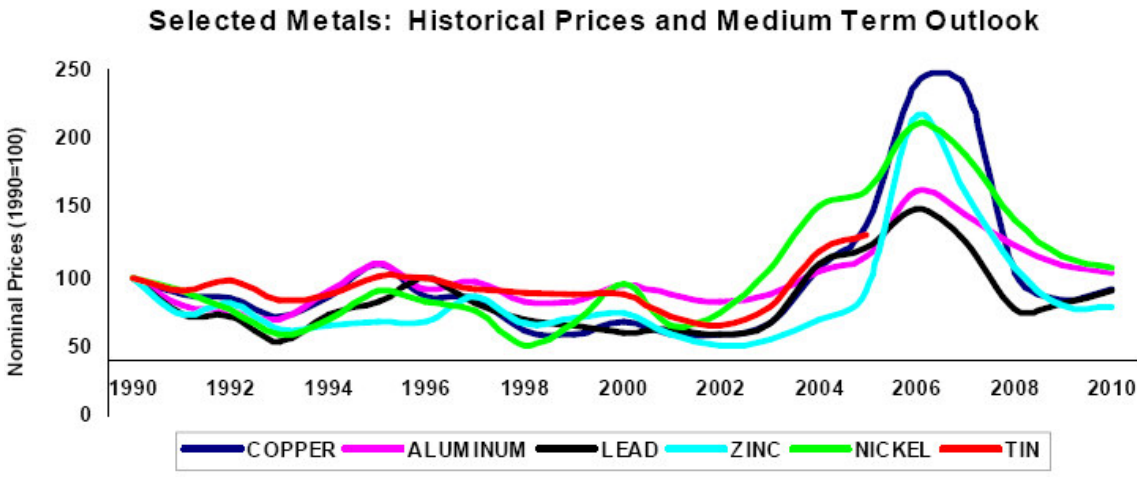


Recent economic growth rates in China and India have been very high and a major factor in the demand for metals. China is currently the largest consumer of all major metals and accounts for more than half of the growth in world demand. The Chinese demand growth has been driven by fast expansion in industrial production, investment in infrastructure, construction, and manufacturing.

Other large developing countries such as Brazil, Indonesia and Russia may also increase in economic importance in coming decades but China and India are by far the most populous developing economies and as such their continued rapid growth impacts largely on the global economy. Led by the strong growth in China, the demand for metals is expected to remain strong in the coming years.

Metal prices are however expected to begin to fall in 2007 and beyond, as production increases and the market moves back to surplus. One of the world's leading metals markets consultants, Commodity Research Unit (CRU), London, summarised the expected outlook on metal prices in a 2006 report to the World Bank Group, as " … *prices are expected to begin to fall back from current levels within the next year or two, but there is some probability that even within the next five years they will not retreat to the average levels of the 1990s.*"

- **Figure 16 Commodity Research Unit (CRU) metal price outlook[4]**



[4] Sources: Background Paper – The Outlook for Metals Markets. Prepared for G20 Deputies meeting held in Sydney 2006; The World Bank Group. Oil, Gas, Mining and Chemicals Department, Washington, September 2006

5. Influences on Market Prices

5.1 Introduction

It has been apparent that many Australian transmission and distribution networks companies have been reporting rapidly increasing costs of both individual projects (substations and transmission lines), and annual and five year capital works programs covering the full range of capital expenditure.

As part of this research, SKM conducted a multi-utility strategic procurement study in which a total of nine (9) Australian transmission and distribution companies provided confidential contract information for the purchase of their main items of plant equipment and materials (power transformers, switchgear, cables, and conductors) for the period 2002 to 2006. Studies have also been undertaken on contract cost information for a number of turnkey substation and transmission line projects (including plant equipment, materials, construction, testing, and commissioning).

The results of SKM's research indicated that there are a number of factors driving the current rapid rises in capital infrastructure costs. The primary factors influencing cost movements are considered to be changes in market prices for:

- Base metals such as copper and aluminium, and steel;
- Oil;
- Labour;
- Construction; and
- Foreign exchange.

To appreciate the effect these factors have had on project costs, an examination has been made of the historical price movements, together with a review of reputable sources of forecast changes for the period 2007 to 2013.

5.2 Commodity Prices

Over the past 4 years, oil and other non-fuel commodity prices have increased significantly. Whilst the developments in the fuel markets, and in particular oil, have dominated the attention of governments and the public, the increase in commodity prices for copper and aluminium, amongst others, have been greater for the same period.

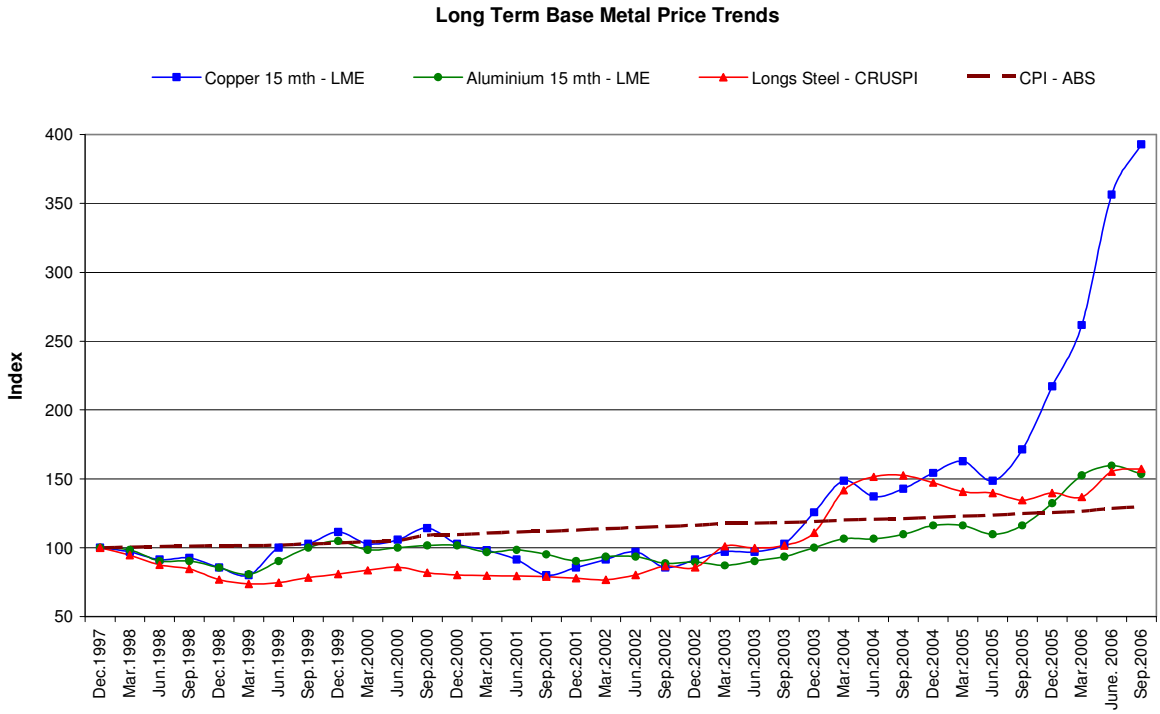
5.2.1 Base Metals

5.2.1.1 Historical Price Movements

Figure 17 below shows the trend in the London Metal Exchange (LME) 15 month contract price for copper and aluminium, as well as the Longs Steel price, all compared with the Australian Consumer Price Index (CPI)[5] over the period December 1997 to September 2006.

It is notable that aluminium and copper prices fell below the 1997 price until the third quarter of 2003, after which, copper has risen to almost 400% of the 1997 price, aluminium over 150% and steel over 200%.

- **Figure 17 Copper, aluminium and steel price trends 1997 - 2006**



5.2.1.2 Future Trends

While demand remains strong, supply concerns have also contributed to high and volatile prices. Many producers, particularly of copper, zinc, and nickel, have been affected by deteriorating ore quality, production disruptions caused by outages and earth slides, and labour disputes. Moreover,

[5] Sourced from the Australian Bureau of Statistics (ABS)

global inventories remain at historically low levels, while the introduction of new capacity has been delayed because of high energy and equipment costs and labour shortages.

A surge in investor interest in commodities has come hand in hand with the tightening of market conditions, but empirical analysis by the International Monetary Fund (IMF)[6] suggests that speculative activity (measured as the number of net long non-commercial positions) has followed rather than been the cause of the high price levels. Looking forward, despite an expected capacity increase in metals this year, the tight market situation will probably continue into late 2007 to early 2008, until sufficient new capacity comes into operation

As a result, metal prices are expected to reduce over the medium term as new production comes on-line to meet the rising demand. However, prices may not fall back to their earlier levels, in part due to the higher energy prices and labour costs leading to increased production costs.

The IMF model base forecasts for copper and aluminium prices from 2007 to 2013 are shown in Figure 18 and Figure 20. These projections are based on four elements:

- Demand for each metal estimated as a function of industrial production and the real price for 17 country groups that make up about 90 percent of world metal consumption;
- A production function that incorporates information about planned increases in capacity, drawing on information from the Australian Bureau of Agricultural and Resource Economics (ABARE);
- The gap between supply and demand and fluctuations in the US Dollar (USD), as metal prices are typically expressed in USD; and
- For each of the 17 country groups, an estimate of industrial production and Gross Domestic Product (GDP) growth rates.

These analyses suggest that aluminium and copper prices should moderate over the period to 2013. However, the uncertainties about growth in the global economy and increases in production capacity result in a wide range of estimated prices. The upper and lower limits are shown by the shaded area.

With consideration of the time lag noted between changes in commodity prices and changes in equipment and conductor costs (refer section 3.6), Figure 19 and Figure 21 illustrate these IMF forecasts delayed by two years.

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[6] IMF, *World Economic Outlook*, September 2006

Figure 18 Forecast aluminium prices

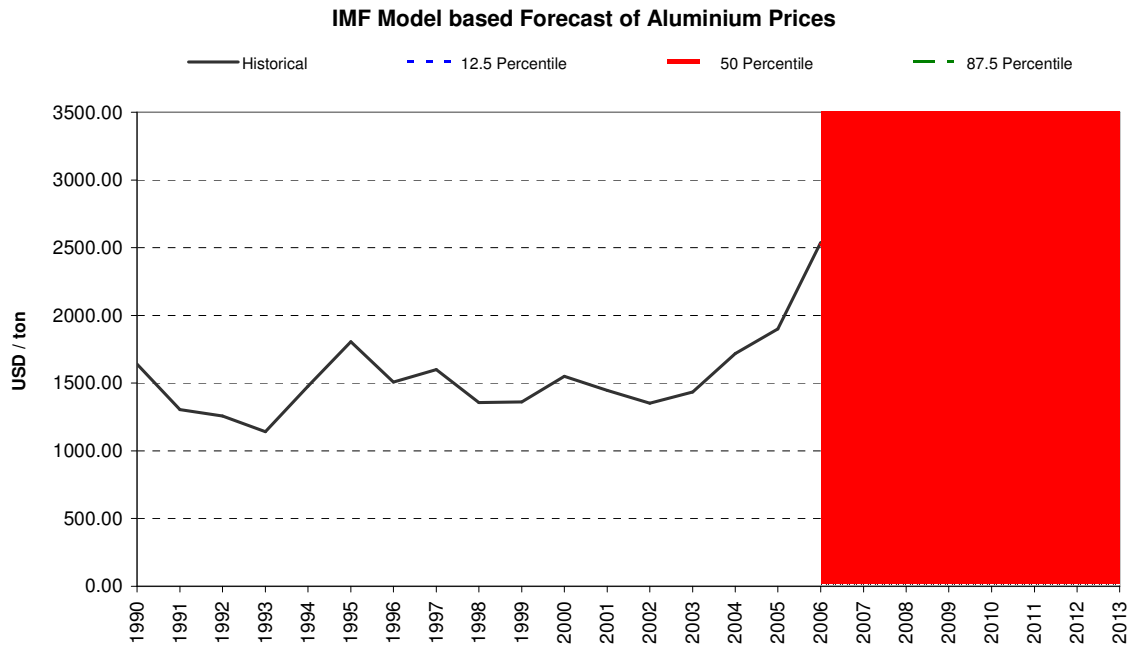


Figure 19 Forecast aluminium prices delayed 2 years

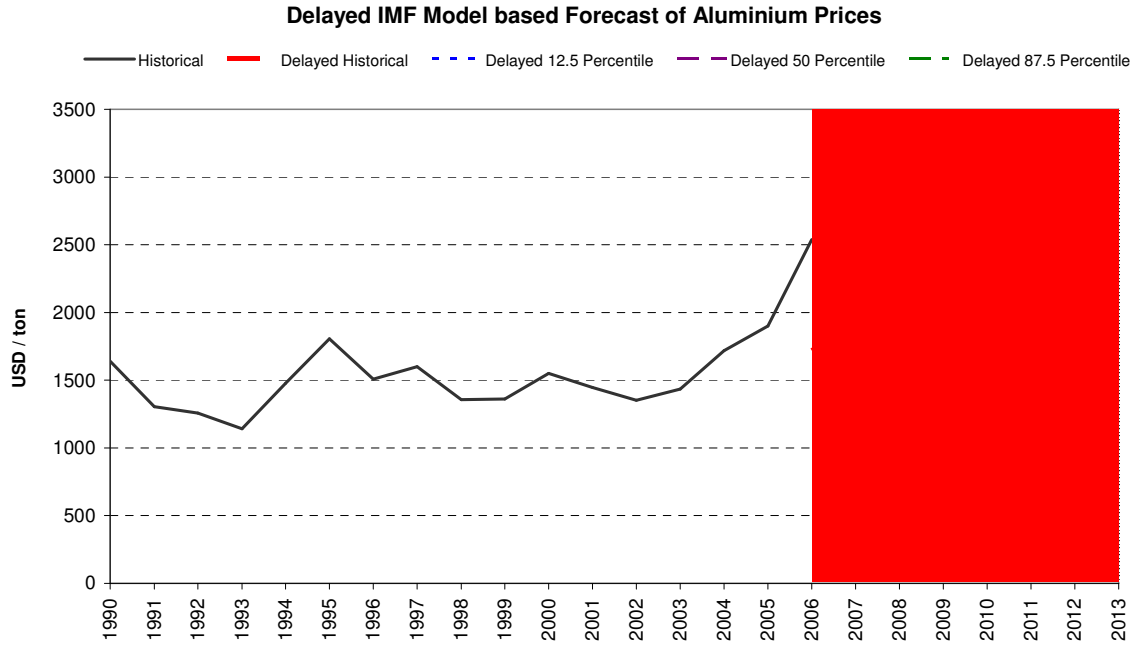


Figure 20 Forecast copper prices

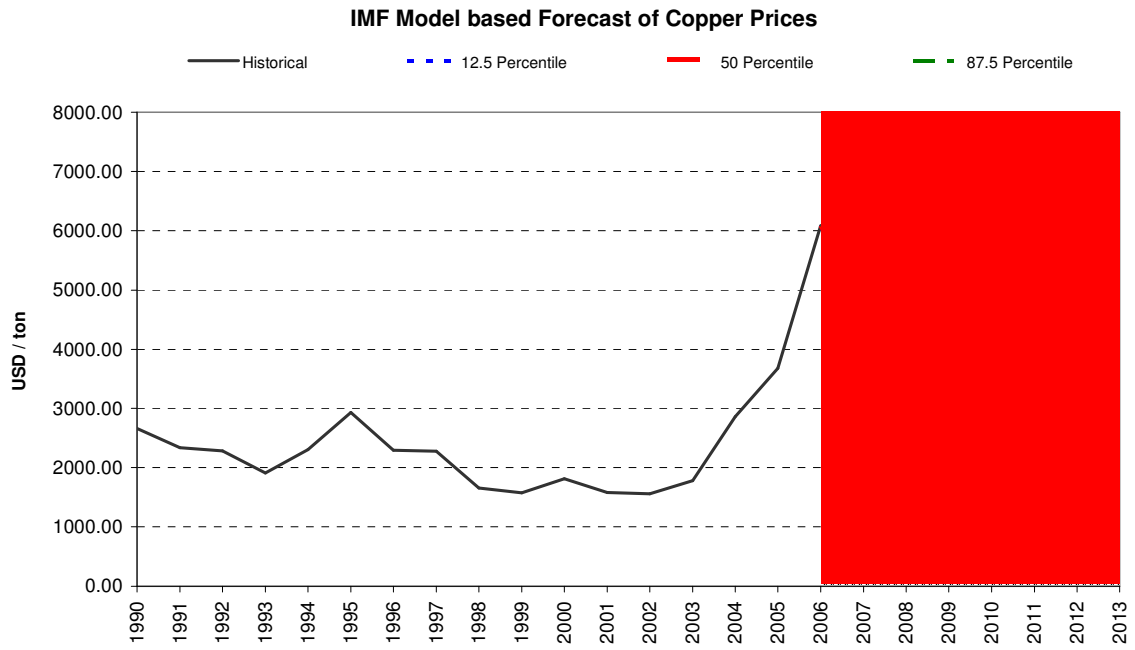
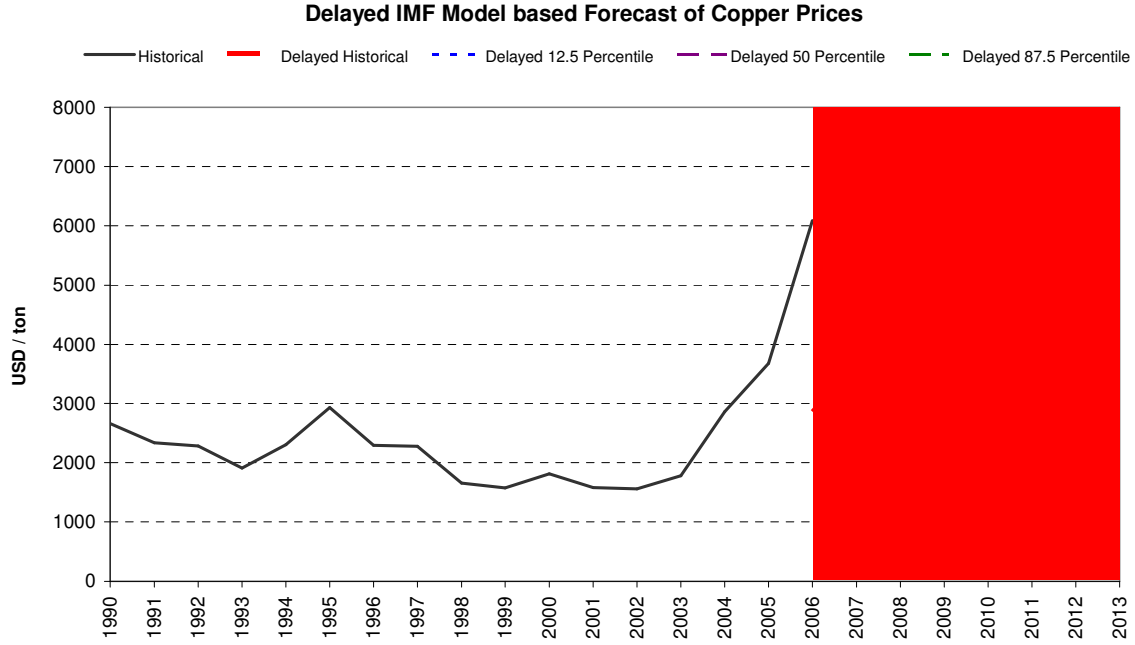
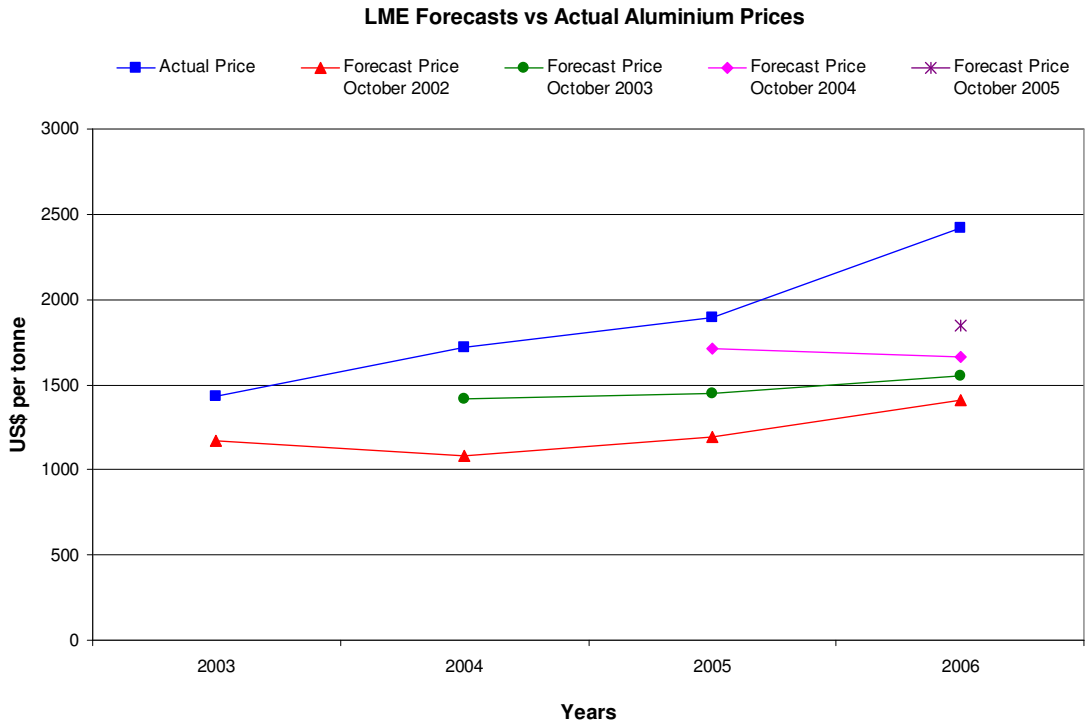


Figure 21 Forecast copper prices delayed 2 years



To demonstrate the difficulty in accurately predicting the price movements for commodity prices, Figure 22 illustrates the variance between the forecasts made by the London Metal Exchange between 2002 and 2005 of the projected aluminium price in 2006 with the actual prices recorded.

- **Figure 22 Variance between LME forecasts and actual aluminium prices**



The percentage variances between the forecasts and actual prices are shown below. All prices shown are in US$ per tonne.

- **Table 4 Percentage variance between LME forecasts and actual prices**

Year	Forecast Price October 2002	Variance to Actual Price	Forecast Price October 2003	Variance to Actual Price	Forecast Price October 2004	Variance to Actual Price	Forecast Price October 2005	Variance to Actual Price	Actual Price
2003	1170	(18.24%)							1431
2004	1084	(36.83%)	1419	(17.31%)					1716
2005	1197	(36.90%)	1450	(23.56%)	1713	(9.70%)			1897
2006	1407	(41.86%)	1555	(35.74%)	1660	(31.40%)	1848	(23.64%)	2420

As would be reasonably expected, the accuracy of the forecasts improved as the time between the date of the forecast and the projected year narrowed, but there remained about a 20% variance which understated the price.

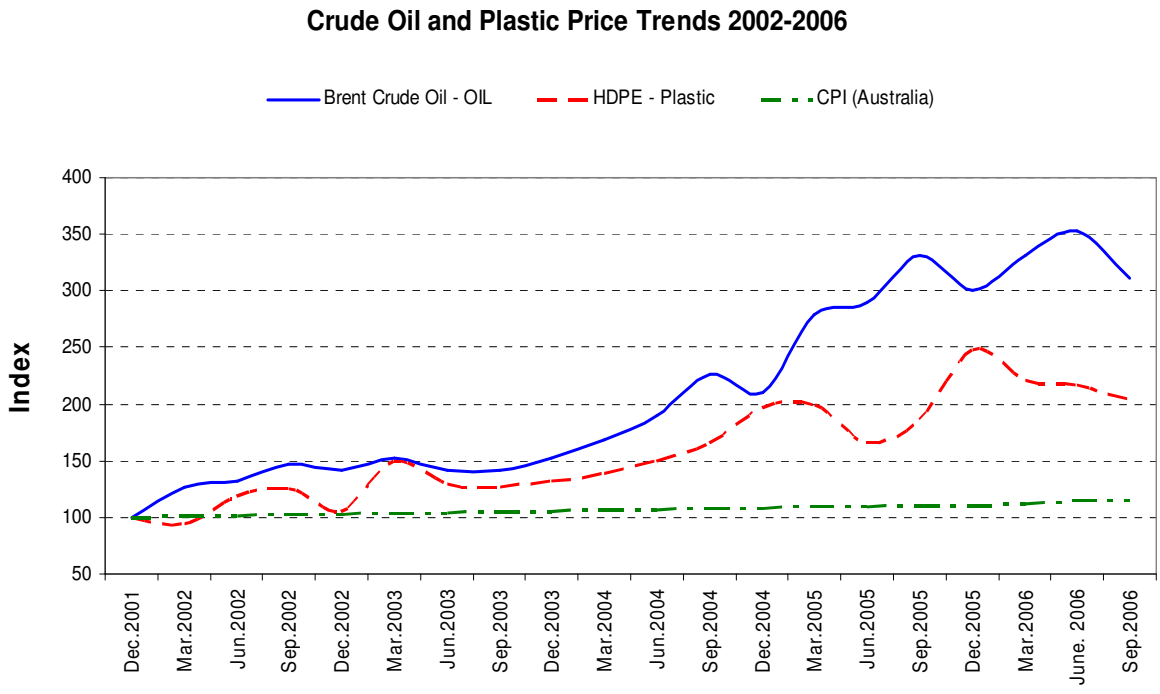
Therefore, SKM is of the view that to use the 50 percentile forecast figures shown in Figure 18 and Figure 20 would be most likely too conservative and understate the values for aluminium and copper. For this reason, SKM has chosen the 87.5 percentile values for use in its forecast modelling for the period 2006 to 2013.

5.2.2 Crude Oil and Plastics

5.2.2.1 Historical Price Movements

Figure 23 below shows the trend in the Brent Sea Sweet Crude Oil price, which is generally accepted as the worldwide benchmark of crude oil prices. In addition, the HDPE – Plastics index[7] is illustrated, which is a spot market for low grade plastic.

- **Figure 23 Oil and plastic trends 2002 - 2006**



[7] Sourced from the Plastics Exchange

5.2.2.2 Future Trends

In its long term strategy, the Organization of the Petroleum Exporting Countries (OPEC) recognizes the major uncertainties surrounding the future demand for oil stems from future world economic growth, and various countries' policies and technology development. OPEC have prepared a number of scenarios, based on a continuation of current world economic conditions, a strengthened demand and a softening of market conditions. These scenarios resulted in the projected amount of oil to be supplied by OPEC over the next 10 to 15 years could range by as much as 10 mbd[8] or more (potentially between 97 and 108 mbd in 2019).

However in reviewing this broad range of future demand for oil, OPEC considered that " … *in meeting the future growth of world oil demand, oil resources are large and sufficient, and oil supply will not peak within the considered timeframe* [to 2020]. *Moreover, the size of the global upstream investment challenge will not be markedly different from the past, despite the growing volumes, as capital will be increasingly used more efficiently in lower cost OPEC Countries. Over the longer-term, OPEC will be relied upon to supply most of the incremental barrel demanded.*

… The strategy re-emphasises OPEC's commitment to support oil market stability. It builds upon the fundamental recognition that extreme price levels, either too high or too low, are damaging for both producers and consumers, and points to the necessity of being proactive under all market conditions. Oil price volatility renders all the more difficult the interpretation of price signals, whether they are an indication of structural change or a reflection of temporary phenomena, and thereby affecting the ability to support longer-term market stability. Given the dynamic and complex behaviour of oil markets, there is a need to support fair and stable prices, sustainability of supply, and security of demand.

In a tight market environment, too high oil price levels may affect the prospects for economic growth, especially in developing countries, and therefore threaten future oil demand growth. On the other hand, low oil price levels would place strains upon the aspirations of OPEC Member Country populations for their economic development and social progress."[9]

It appears that OPEC will continue to remain in a position to meet world market demand, although the cartel retains a largely unchallenged ability to affect prices. SKM has used forecasts for possible oil prices in the period to 2013 provided by ABARE and the World Bank which have speculated that oil prices will effectively decrease.

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[8] Million barrels per day

[9] Organization of Petroleum Exporting Countries, *Long-Term Strategy*, March 2006, pp 13,17

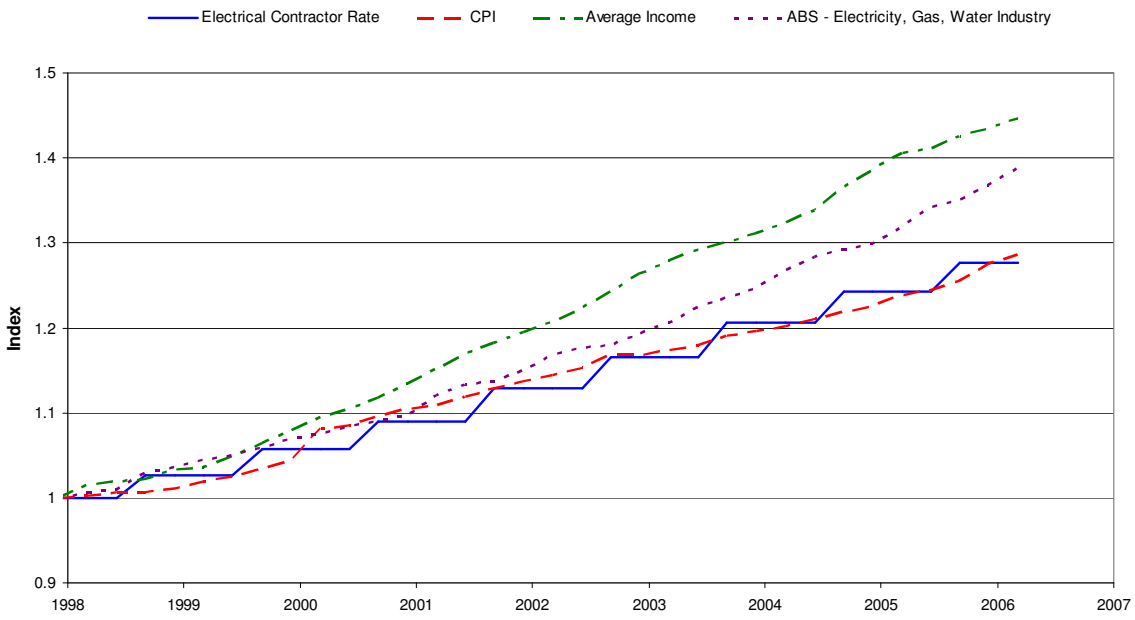
5.2.3 Labour Costs

5.2.3.1 Historical Price Movements

Figure 24 below shows the trend in average Australian weekly earnings, an indicative average electrical award rate for federally determined awards (South Australia, Victoria, Tasmania and ACT) and historical electricity, gas and water industry labour rates (provided by the ABS), compared with CPI.

All three graphs are shown relative to a 100% index value at December 1997.

- **Figure 24 Australian normalised labour rate index**



It is evident that the rate of increase of electrical award payments from 1997 to 2006 tracked the CPI index quite closely, finishing marginally ahead of CPI. However, the average Australian weekly earnings have grown at a higher rate than both electricity industry awards and CPI.

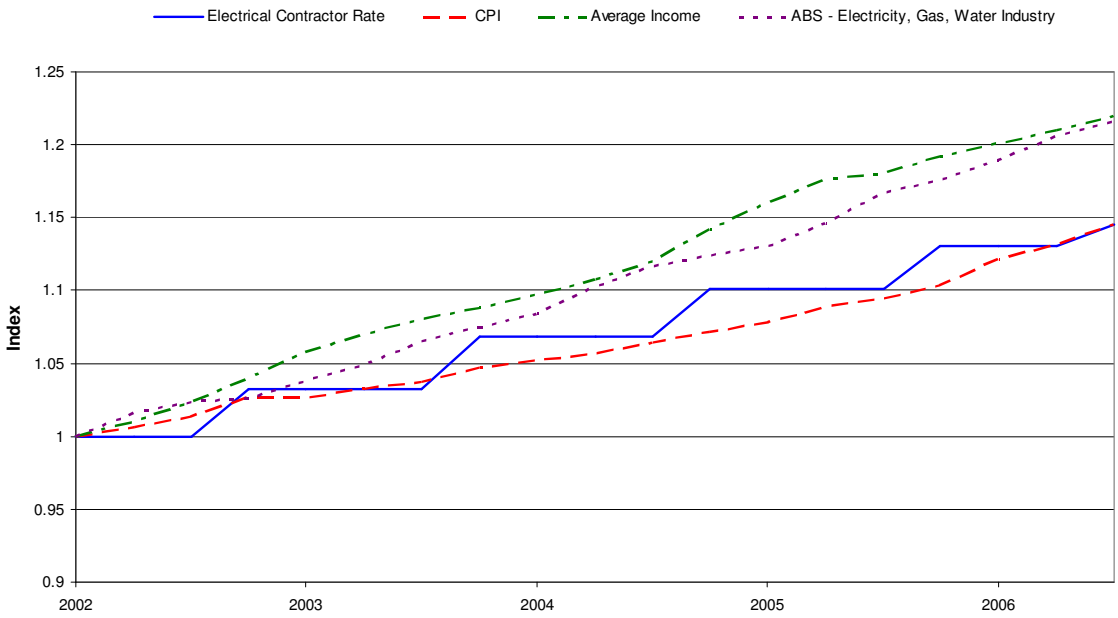
This latter observation is most likely a combination of two factors:

- An increase in average working hours per week, and
- Increasing over award payments.

There has been considerable discussion and speculation in industry and economic circles about the skills shortage in Australia and a number of the manufacturers / suppliers have suggested to SKM that the wages and salaries that must be paid to secure labour, both skilled and unskilled, has been increasing rapidly.

Figure 25 illustrates the trend in Australian average weekly income, compared with the mix of electrical awards, the electrical contractors' rate and CPI referenced to 2002 (the commencement of the current SP AusNet regulatory period).

- **Figure 25 Australian normalised labour rate index - reference 2002**



Since 2002, average weekly income, ABS and the portfolio of electrical awards have all exceeded CPI by the following amounts (as at March 2006):

- average weekly income by 8.00%;
- ABS by 6.46%; and
- electrical awards by 2.41%.

5.2.3.2 Future Trends

The 2006/07 Federal Budget included the following commentary in regards to future trends in labour costs, stating that " … .*Wage growth is forecast to remain solid in the near term, as the effects of tight conditions in the labour market in 2004-05 flow through to wages. However, with employment growth forecast to moderate, the recent momentum in wage growth should ease in 2006-07. The Wage Price Index is forecast to increase by 4 per cent in 2006-07, similar to the growth expected for 2005-06. Businesses continue to report skill shortages, but to date this has not led to significant generalised wage pressures. Strong labour demand in the mining and mining-related sectors may see wages grow temporarily faster in those areas, but they are unlikely to have a noticeable impact on aggregate wage outcomes given the relatively low share of the mining*

sector in total employment. There is a risk that strong wage growth in the mining, construction, health and education sectors over the past year may continue and lead to more widespread wage pressures."[10]

In a report commissioned by the Australian Energy Regulator, Access Economics noted that " … *after remaining close to the expected "long-term" rate of 4¼% until 2003-04, wage growth in the utilities sector has leapt sharply in the past few years, even as productivity levels have reversed … wages growth in the first few years* [from 2005/06] *is likely to remain relatively strong due to the current skills shortages prevalent in the utilities sector. These shortages are not caused solely by growth in the sector itself, but have flowed from the strength in other sectors - notably construction - in recent years and a similar shortage in the mining sector. Shortages in the construction sector from mid-2002 saw sharp short-term increase in wage growth which began to stabilise in mid-2005, partly as workers were drawn from other industrial sectors …* [it is expected] *the current surge in (relative) utilities sector wage growth would last for a similar period of time, keeping growth in utilities sector wages high compared to the broader economy. The gap* ***may*** *close slightly as overall wages growth picks up in response to changes in underlying inflation rates and a generally tight labour market.*"[11]

SKM noted that the annual nominal wages growth projected by Access Economics for the utilities sector on a national basis was higher than Reserve bank projections for CPI over the same period.

The SKM projections for labour increases have been based on forecasts from the Australian Treasury with a differentiation between general labour (regarded as design, project management and approvals) and site labour responsible for on-site construction. SKM would consider the bulk of work undertaken by a utility as "site labour".

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[10] Australian Government, *Budget Paper No. 1 Budget Strategy and Outlook 2006-07 - Statement 3: Economic Outlook*, section 3-27, pp 29

[11] Access Economics, *Wage growth forecasts in the utilities sector*, 17 November 2006, pp i

- **Table 5 Annual labour escalation forecasts vs CPI - reference 2006**

Source	2006	2007	2008	2009	2010	2011	2012	2013
Access Economics[12]	1.000	1.059	1.114	1.152	1.191	1.238	1.280	1.324
SKM								
General Labour	1.000	1.040	1.082	1.122	1.164	1.208	1.253	1.300
Site Labour	1.000	1.054	1.100	1.148	1.199	1.252	1.307	1.365
CPI	1.000	1.025	1.051	1.077	1.104	1.131	1.160	1.189

It can be seen that the labour forecast developed independently by SKM compares favourably with the Access Economics projections, with labour costs expected to escalate at a rate well in excess of CPI.

5.2.4 Construction Costs

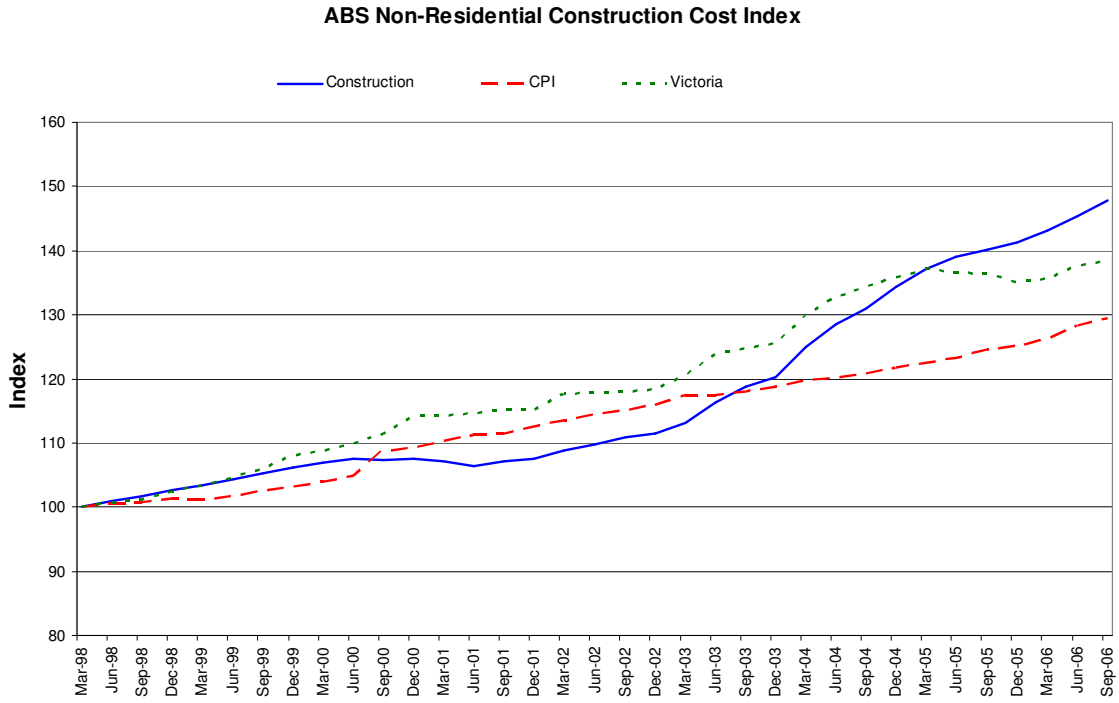
5.2.4.1 Historical Price Movements

- Over the period of time 2002-2006, the cost of installed structural steelwork has almost doubled. Applying data from Rawlinsons Australian Construction Cost Handbook[13], the movement in erected steelwork was in excess of 80%. This number is supported by an increase in Longs Steel index over this same period.
- A similar review of Rawlinsons data for concrete foundations, suggests that this component of substation and transmission line costs has increased by approximately 24.2% over this period.
- Data from the Australian Bureau of Statistics indicates that non-residential construction costs have been increasing more rapidly than CPI. As seen below in Figure 26, over the past 8 years the average Australian costs have risen almost 20% more than CPI. Victoria's increases have lagged behind the national average over the past year, resulting in increases about 8% more than CPI over the 8 year period.

[12] Access Economics, *Wage growth forecasts in the utilities sector*, 17 November 2006, pp iii. Data based on projected national annual nominal wages growth and calculated as year-on-year accumulation relative to 2006/07.

[13] Rawlhouse Publishing Pty Ltd, *Rawlinsons Australian Construction Cost Handbook*, various editions 2003 to 2005

- **Figure 26 Non-Residential construction costs**



5.2.4.2 Future Trends

A recent market survey has forecast a continuation of strong engineering and commercial (non-residential) construction activity in Australia, fuelled by an upturn in Government spending on infrastructure, strong resources investment and sustained economic growth.

An Australian Industry Group (Ai Group) – Australian Constructors Association (ACA) Construction Outlook survey has suggested that total construction work is expected to increase by 7.7% in 2006/07. The growth is in line with a solid project pipeline for the engineering construction sector, including work on infrastructure projects, such as private road and rail projects and electricity construction. The survey also recorded strong expansion in the mining construction sector, consistent with buoyant resources investment.

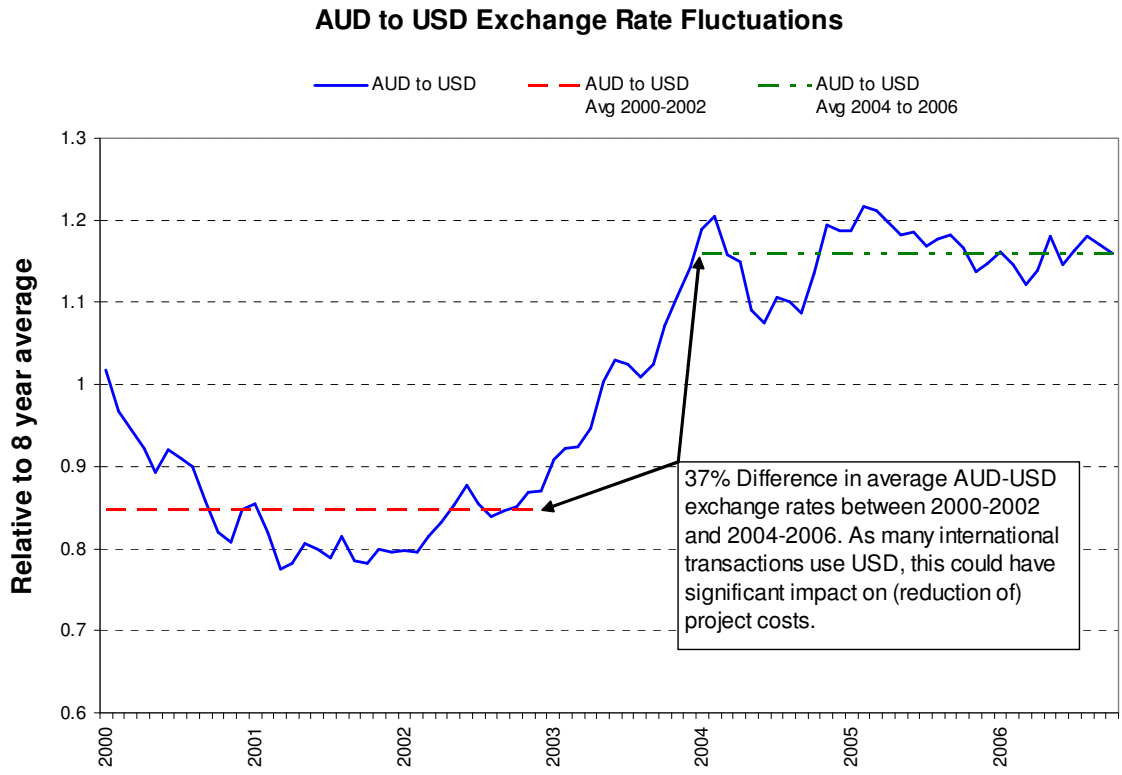
With the commercial and industrial property sectors continuing to exhibit strength, a sustained upturn is also expected in non-residential building through 2006/07, although growth is set to moderate on current levels.

5.3 Foreign Exchange Rates

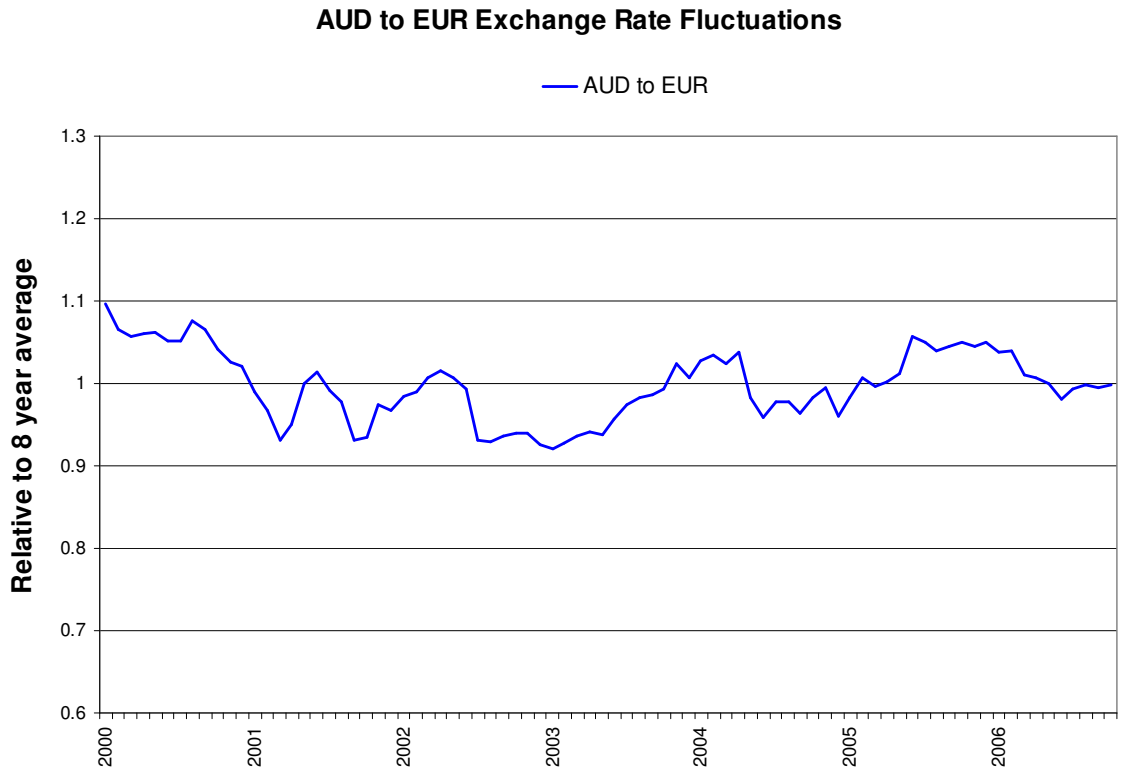
While there have always been fluctuations in foreign rates, there has been significant variation within the last decade. In particular the US Dollar to Australian rate has changed by 37% when looking at 3 year averages as seen in Figure 27 below. The US Dollar is important as it is often used as the basis for international transactions. Figure 28 shows that the exchange rate between the Australian Dollar and the Euro has been much more stable over the same period of time.

Foreign exchange has been considered as a factor affecting the cost of plant and equipment that is typically imported into Australia from overseas manufacturers. The two currencies examined in Figure 27 and Figure 28 are those SKM considers would be mostly commonly used in such transactions.

- **Figure 27 USD foreign exchange rates**



- **Figure 28 Euro exchange rate**



5.4 Supply-and-Demand Influence

There is evidence available suggesting that some electrical plant and equipment suppliers are receiving higher profit margins due to supply and demand pressures in the market, resulting form production rates not matching increased demand, particularly from emerging markets in Asia.

Whilst it is generally accepted throughout the industry that this is a likely influence on the prices being requested for equipment, it is not possible to accurately estimate the quantum of the impact. Some evidence that has been provided to SKM has suggested that this impact could be of the order of 15 to 20 per cent premium on labour and overhead prices (including profit margins).

SKM is of the view that in appraising the impact of fluctuations in commodity prices and other external price drivers, there is also a market influence on costs resulting from pressure on existing production capabilities. This influence is not reflected in any of the commodity price indices or forecast construction indices, but has been included as in factor in the site labour forecasts.

5.5 Projected Escalation Factors

Escalation factors have been calculated using production, demand and cost projections for commodity and financial items drawn from the following sources[14]:

- Australian Bureau of Statistics (ABS);
- ABARE;
- World Bank;
- Reserve Bank of Australia;
- International Monetary Fund;
- Australian Treasury department;
- Banking institutions from the United States; and
- Union organisations.

Projections for CPI are based on expectations for price movements and economic effects outlined in the Federal Budget of 2006/07. Whilst the Budget included a forecast of 2.5% to June 2007 only, the budget papers discuss international and domestic pressures on inflation in Australia and conclude that there is a reasonable expectation that it should remain around this level, at least for the short term. The monetary policy released by the Reserve Bank of Australia in November 2006 generally supported this conclusion, observing that " ... *the generalised price pressures currently evident in the economy are likely to continue in the near term. The central forecast is that underlying inflation will remain at around 3 per cent over the next year. Thereafter, it may decline slightly but is likely to remain near the top of the target band* [of 2 - 3%]."[15]

Detailed accumulative and annual escalation forecasts for the base metal commodity prices, labour and other financial indicators are included in Appendix B.

[14] More details of these forecast sources are contained in Appendix A

[15] Reserve Bank of Australia, *Statement on Monetary Policy*, 13 November 2006, pp 59

6. Relative Impact of Escalation Factors

Table 6 shows the relative impact that SKM considers applies to each of the components within the cost for substation switchbays and power transformers, overhead lines and underground cables.

- **Table 6 Substation components**

Component (based on standard SKM substation switchbay configurations)	Cost Factor									Delayed Cost Factor			
	Fixed costs[16]	Aluminium	Copper	Steel	Oil	General labour[17]	Site labour	CPI	Foreign exchange	Aluminium	Copper	Steel	Oil
Switchgear	-	-	3%	-	2%	-	20%	20%	50%	-	3%	-	2%
Transformers	44%	-	-	-	-	-	-	34%	-	-	10%	9%	4%
Structure	-	-	-	50%	-	-	50%	-	-	-	-	-	-
Foundations	-	-	-	-	-	10%	80%	10%	-	-	-	-	-
Civil	-	-	-	-	-	10%	80%	10%	-	-	-	-	-
Protection & Control	-	-	-	-	-	20%	50%	30%	-	-	-	-	-
Erection	-	-	-	-	-	-	100%	-	-	-	-	-	-
Commissioning	-	-	-	-	-	-	100%	-	-	-	-	-	-
Misc material	20%	-	-	-	-	30%	-	50%	-	-	-	-	-

Delayed cost factor applies where cost factor movement in base material / metal has a lag period before this is reflected in the assembled / manufactured components (can be 1 to 2 years).

[16] Fixed component covers fixed costs such as production facilities, rent, administration and delivery.

[17] General labour relates to design, project management and approvals

Table 7 Overhead AAC/AAAC transmission line components

Component (based on standard SKM transmission line components)	Cost Factor									Delayed Cost Factor			
	Fixed costs[18]	Aluminium	Copper	Steel	Oil	General labour[19]	Site labour	CPI	Foreign exchange	Aluminium	Copper	Steel	Oil
Conductor	5%	-	-	-	-	-	10%	20%	-	60%	-	5%	-
Earthwire	5%	-	-	-	-	-	10%	20%	-	60%	-	5%	-
Towers	-	-	-	50%	-	-	50%	-	-	-	-	-	-
Insulators	-	-	-	-	-	-	50%	50%	-	-	-	-	-
Fittings	-	-	-	-	-	-	50%	50%	-	-	-	-	-
Foundations	-	-	-	-	-	10%	80%	10%	-	-	-	-	-
Erection	-	-	-	-	-	-	100%	-	-	-	-	-	-

Table 8 Underground cable components

Component (based on standard SKM underground cable components)	Cost Factor									Delayed Cost Factor			
	Fixed costs	Aluminium	Copper	Steel	Oil	General labour	Site labour	CPI	Foreign exchange	Aluminium	Copper	Steel	Oil
Cable Al	20%	10%	-	-	-	-	10%	10%	-	45%	-	-	5%
Cable Cu	20%	-	10%	-	-	-	10%	10%	-	-	45%	-	5%
Pits	-	-	-	-	-	10%	80%	10%	-	-	-	-	-
Cable joints	20%	-	-	-	-	30%	-	50%	-	-	-	-	-
Cable terminations	20%	-	-	-	-	30%	-	50%	-	-	-	-	-
Installation	-	-	-	-	-	-	100%	-	-	-	-	-	-

[18] Fixed component covers fixed costs such as production facilities, rent, administration and delivery.

[19] General labour relates to design, project management and approvals

7. Price Impacts on Electrical Plant

Based on the relative impact of the cost drivers for each network component, Table 9 summarises the accumulative escalation factors for the period between 2006 and 2013.

Detailed tables for accumulative and annual escalation factors are included in Appendix C. The projected factors for substations, transmission lines and cables and their components are nominal; that is, they apply in the year in which they have been forecast to occur.

- **Table 9 Accumulative escalation factors to 2013 - reference 2006**

Component	2006	2007	2008	2009	2010	2011	2012	2013
Substation[20]	**1.000**	**1.038**	**1.074**	**1.098**	**1.119**	**1.145**	**1.171**	**1.200**
Switchgear	1.000	1.035	1.086	1.096	1.098	1.105	1.111	1.120
Transformers	1.000	1.058	1.215	1.197	1.139	1.105	1.087	1.083
Structure	1.000	1.014	0.970	0.958	0.941	0.947	0.953	0.960
Foundations	1.000	1.049	1.093	1.139	1.187	1.236	1.288	1.342
Civil	1.000	1.049	1.093	1.139	1.187	1.236	1.288	1.342
Protection & Control	1.000	1.043	1.082	1.123	1.165	1.208	1.254	1.301
Erection	1.000	1.054	1.100	1.148	1.199	1.252	1.307	1.365
Commissioning	1.000	1.054	1.100	1.148	1.199	1.252	1.307	1.365
Misc material	1.000	1.025	1.051	1.077	1.104	1.132	1.160	1.190
Overhead Line[21]	**1.000**	**1.040**	**1.073**	**1.085**	**1.093**	**1.114**	**1.138**	**1.166**
Conductor	1.000	1.148	1.121	1.085	1.065	1.052	1.055	1.061
Earthwire	1.000	1.148	1.121	1.085	1.065	1.052	1.055	1.061
Towers	1.000	1.014	0.970	0.958	0.941	0.947	0.953	0.960
Insulators	1.000	1.040	1.076	1.114	1.153	1.194	1.236	1.280
Fittings	1.000	1.040	1.076	1.114	1.153	1.194	1.236	1.280
Foundations	1.000	1.049	1.093	1.139	1.187	1.236	1.288	1.342
Erection	1.000	1.054	1.100	1.148	1.199	1.252	1.307	1.365
Underground Cable Aluminium	**1.000**	**1.082**	**1.098**	**1.115**	**1.139**	**1.165**	**1.200**	**1.236**
Underground Cable Copper	**1.000**	**1.155**	**1.160**	**1.145**	**1.149**	**1.172**	**1.202**	**1.234**
Cable Al	1.000	1.129	1.094	1.060	1.038	1.022	1.021	1.024
Cable Cu	1.000	1.396	1.303	1.136	1.029	0.980	0.953	0.924
Installation	1.000	1.054	1.100	1.148	1.199	1.252	1.307	1.365

[20] Based on a selected number of 66,132,220 and 275kV substation bays

[21] Based on sample of 132,220 and 275kV transmission lines

Table 10 Annual escalation factors to 2013 - reference 2006

Component	2006 - 2007	2007 - 2008	2008 - 2009	2009 - 2010	2010 - 2011	2011 - 2012	2012 - 2013
Substation	**1.038**	**1.035**	**1.022**	**1.019**	**1.023**	**1.023**	**1.025**
Switchgear	1.035	1.049	1.009	1.002	1.006	1.005	1.009
Transformers	1.058	1.148	0.985	0.952	0.970	0.984	0.996
Structure	1.014	0.956	0.988	0.982	1.006	1.007	1.008
Foundations	1.049	1.042	1.042	1.042	1.042	1.042	1.042
Civil	1.049	1.042	1.042	1.042	1.042	1.042	1.042
Protection & Control	1.043	1.038	1.037	1.038	1.038	1.038	1.038
Erection	1.054	1.044	1.044	1.044	1.044	1.044	1.044
Commissioning	1.054	1.044	1.044	1.044	1.044	1.044	1.044
Misc material	1.025	1.025	1.025	1.025	1.025	1.025	1.025
Overhead Line	**1.040**	**1.032**	**1.011**	**1.008**	**1.019**	**1.021**	**1.025**
Conductor	1.148	0.977	0.968	0.982	0.987	1.003	1.006
Earthwire	1.148	0.977	0.968	0.982	0.987	1.003	1.006
Towers	1.014	0.956	0.988	0.982	1.006	1.007	1.008
Insulators	1.040	1.035	1.035	1.035	1.035	1.035	1.035
Fittings	1.040	1.035	1.035	1.035	1.035	1.035	1.035
Foundations	1.049	1.042	1.042	1.042	1.042	1.042	1.042
Erection	1.054	1.044	1.044	1.044	1.044	1.044	1.044
Underground Cable Aluminium	**1.082**	**1.015**	**1.016**	**1.021**	**1.024**	**1.029**	**1.031**
Underground Cable Copper	**1.155**	**1.005**	**0.987**	**1.003**	**1.020**	**1.026**	**1.027**
Cable Al	1.129	0.969	0.969	0.979	0.984	0.999	1.002
Cable Cu	1.396	0.934	0.872	0.906	0.953	0.972	0.969
Installation	1.054	1.044	1.044	1.044	1.044	1.044	1.044

8. Brownfield Construction Factors

In investigating previous transmission project estimates, SKM developed a selected number of brownfield factors to reflect staged construction of assets in substations. These brownfield adjustments were based on a comparison of the labour hours typically included in an asset valuation building block, and actual labour hours recorded by an Australian TNSP for a limited number of contracts.

In developing the capital expenditure forecast, it will be necessary to allow for project specific conditions within the SP AusNet network that will have a direct impact on the final project estimate. These will most likely vary from site to site.

Table 11 SKM substation indicative brownfield factors

Asset type	Brownfield Factor
132,275kV switchbays	1.23
11,33,66kV switchbays	1.29
CBs, CTs, VTs (all voltages)	1.10
275kV 160MVA transformer	1.018
275kV 225MVA transformer	1.016
132kV 10MVA transformer	1.067
132kV 25MVA transformer	1.054
132kV 60MVA transformer	1.038
Capacitor banks, reactors	1.018 - 1.067
Static VAr Compensators (SVCs)	1.018

Essentially, these brownfield factors demonstrate the increased costs, predominately increased labour costs, which stem from having to construct / reconstruct assets within the confines of a live substation. These extra costs arise from things such as forward / reverse switching, man-handling tools and equipment in a live substation, temporary works and generally lower productivity levels.

It should be noted that the SKM brownfield factors shown above relate to substation bays that are constructed as an extension to, or within an existing live substation. This is quite a different situation to that faced by SP AusNet, whereby many of their refurbishment projects involve the partial or full reconstruction of whole substations while maintaining adequate security of supply. Such reconstructions involve multiple stages of rebuild and associated higher engineering design and drafting costs, as well as the higher on-site construction costs. SKM would expect the brownfield factors associated with the type of refurbishment / reconstruction projects faced by SP AusNet to be significantly higher than those shown in Table 11.

9. Sample 2006 Switchbay Costs

SKM has provided a selected number of comparative estimates, which have incorporated the escalation factors determined for base metals and labour. The reference date for these estimates is 30 June 2006. The standard SKM switchbay configurations are based on a modern equivalent reference asset, which assumes average conditions for construction difficulty.

These building blocks are based on a large volume installation (typically 10 substation bays), as opposed to a one-off construction as may be more usual for capital expenditure projects.

These estimates include:

- any applicable indirect taxes (but are exclusive of GST);
- indirect costs associated with the acquisition and/or creation of the asset such as:
  - on-costs;
  - design and engineering costs;
  - project management;
  - freight; and
  - local delivery.

The labour rate applied is $81 per hour, and is based on wage rates established within the Power and Energy Industry Electrical, Electronic & Engineering Employees Award 1998 (updated 22 February 2006) and market average overheads and on-costs.

Table 12 Summary of SKM switchbay estimates

Voltage	SP AusNet standard bay	SKM equivalent standard bay	Estimated Value as at 30 Jun 2006 ($k)
66kV	TM Single CB	Feeder incl CB	$ 423.03
132kV	TM Single CB	Feeder incl CB	$ 672.09
275kV	TI One & a Half CB	1.5 CB layout 3 CB	$ 3,226.96
275kV	TJ Double CB	Double Bus 2 CB	$ 1,969.90

SKM notes that the standard construction practices adopted by SP AusNet use similar switchgear, particularly circuit breakers, for both 220kV and 275kV installations. Similarly, the costs for 66kV bays will be dependent upon the nature of particular substation design and construction requirements.

The details of the estimates are included in Appendix D.

Appendix A Data Sources

SKM has used historical and forecast information that is publicly available from independent Australian and international authorities. The data sources used in the development of escalation factors were:

Historical

- Australian Bureau of Statistics (ABS)
- Reserve Bank of Australia
- London Metal Exchange (LME)
- CRU Group

Forecast

- Australian Government - Department of Treasury
- Australian Bureau of Agricultural and Resource Economics (ABARE)
- International Monetary Fund (IMF)
- World Bank
- Wachovia Corporation

In making use of the different forecasts available, SKM has applied weighting factors to give increased reliance to more recent documents, and forecasts considered to be more relevant to the Australian economy.

Also, SKM has relied upon contract price information provided under confidentiality arrangements for switchgear, transformers, overhead conductor and underground cable. The survey related to both distribution and transmission equipment and was conducted between February and September 2006.

A.1 Historical Data

A.1.1 Australian Bureau of Statistics

The Australian Bureau of Statistics (ABS) is Australia's national statistical agency, and has a key central role in expanding and improving the range of statistics available on the performance of the Australian economy, the well-being of the population, the condition of the environment, and the challenges faced by regional and rural communities.

The ABS collects, compiles, analyses and disseminates a wide range of statistics, and works with other federal, state and local government agencies to help them do likewise, with the vast array of data collected during the course of administrative processes.

The ABS:

- maintains an internet web site with a wide range of freely available statistics;
- design and conduct the five yearly national Census of Population and Housing;
- design and conduct complex surveys such as the Household Expenditure Survey and the Economic Activity Survey from which national economic indicators are derived;
- analyse and release the data collected to provide statistics, which are widely used by governments and businesses; and
- provide statistical consulting, modelling and data analysis, training and support .

SKM has used ABS historical data for labour wage indices and CPI figures (weighted average of 8 capital cities).

A.1.2 Reserve Bank of Australia

The Reserve Bank of Australia's (RBA) main responsibility is monetary policy. Policy decisions are made by the Reserve Bank Board, with the objective of achieving low and stable inflation over the medium term. Other major roles are maintaining financial system stability and promoting the safety and efficiency of the payments system. The Bank is an active participant in financial markets, manages Australia's foreign reserves, issues Australian currency notes and serves as banker to the Australian Government.

The information provided by the Reserve Bank includes statistics - interest rates, exchange rates and money and credit growth - and a range of publications on its operations and research.

Whilst most the data publicly available and reviewed by SKM was historical in nature, we have also examined and incorporated projections from the Reserve Bank in any general monetary statements that have been released. The historical information has been considered to be very reliable, and SKM has considered that some of the data contained in forecasts in the monetary statements may be speculative, and have therefore used RBA projections in conjunction with other authorities.

A.1.3 London Metal Exchange

The London Metal Exchange (LME) is one of the world's premier non-ferrous metals market with highly liquid contracts and a worldwide reputation.

The primary roles of the LME are:

- Hedging - providing a market where participants, primarily from non-ferrous base metal and plastics-related industries, have the opportunity to protect against risks arising from movements in base metals and plastics prices.

- Pricing - providing reference prices which are accepted globally and widely used in the non-ferrous metals and plastics industries for benchmarking.
- Delivery - providing for appropriately located storage and delivery facilities to enable market participants to make or take physical delivery of approved brands of LME traded contracts.

The London Metal Exchange has historical LME prices and other data for all contracts traded on the Exchange.

SKM has made use of historical data in relation to copper and aluminium prices between 2000 and 2006. This data is considered to be highly reliable.

A.1.4 CRU Group

CRU is an independent business analysis and consultancy group focused on the mining, metals, power, cables, fertilizer and chemical sectors. Founded in the late 1960s and still privately owned to ensure its independence, the group employs more than 150 experts in London, Beijing, Sydney and key centres within the United States.

CRU do not make forecasts publicly available, but SKM has made use of their steel price index from 2000.

A.2 Forecasts 2008 to 2013

A.2.1 Australian Government - Department of Treasury

Since its inception in 1901 following federation, Treasury was required to establish policy in areas such as public service pay and conditions, bank notes, the taxation system including land and income tax, pensions and other welfare payments, postage stamps and the collection of statistics. Today, the department focuses primarily on economic policy.

The department is divided into four groups, Fiscal, Macroeconomic, Revenue and Markets with support coming from the Corporate Services Division. These groups were established to meet four policy outcomes:

- Sound macroeconomic environment

  The Treasury monitors and assesses economic conditions and prospects, both in Australia and overseas, and provides advice on the formulation and implementation of effective macroeconomic policy, including monetary and fiscal policy, and labour market issues.
- Effective government spending and taxation arrangements

  The Treasury provides advice on budget policy issues, trends in Commonwealth revenue and major fiscal and financial aggregates, major expenditure programmes, taxation policy, retirement income, Commonwealth-State financial policy and actuarial services.

- Effective taxation and retirement income arrangements

  The Treasury provides advice and assists in the formulation and implementation of government taxation and retirement income policies and legislation as well as providing information on material changes to taxation revenue forecasts and projections.

- Well functioning markets

  The Treasury provides advice on policy processes and reforms that promote a secure financial system and sound corporate practices, remove impediments to competition in product and services markets and safeguard the public interest in matters such as consumer protection and foreign investment.

Speculation on future movements in labour costs are related to expectations in the resolution of the skills shortage currently being experienced in Australia. SKM has examined data made available by Treasury with regards to anticipated market influences on labour.

A.2.2 Australian Bureau of Agricultural and Resource Economics

The Australian Bureau of Agricultural and Resource Economics (ABARE), located in Canberra, is an Australian government economic research agency noted for its professionally independent research and analysis.

The bureau is responsible for the research methods employed, the conclusions reached and the dissemination of results. ABARE disseminates the results of its research through the media, their internet web site, the national Outlook conference, regional Outlook conferences around Australia and many other speaking engagements. All information on the web site is available free.

Their research contributes to some of the most important items on the Australian and international policy agendas:

- multilateral trade negotiations and more open agricultural markets;
- greenhouse gas emissions and climate change response policies;
- water policy reform;
- energy;
- minerals exploration and policies;
- issues in regional Australia;
- Australian farm performance; and
- Australian farm surveys.

In addition, ABARE produces regular quarterly forecasts for the full range of export commodities, to assist industries with future planning. The commodity results cover agriculture, minerals, energy,

fisheries and forestry. ABARE is one of the few bodies producing medium term and regular quarterly forecasts for Australia's major export commodities.

SKM noted that ABARE was an authority often referred to by independent monetary organizations, and has relied heavily upon their forecasts for commodity items (aluminium, copper, steel, and oil), together with consideration of their forecasts for foreign exchange rates and CPI in conjunction with other authorities.

A.2.3 International Monetary Fund

The International Monetary Fund (IMF) is an international organization that oversees the global financial system by observing exchange rates and balance of payments, as well as offering financial and technical assistance when requested. Its headquarters are located in Washington, D.C.

IMF describes itself as "an organization of 184 countries, working to foster global monetary cooperation, secure financial stability, facilitate international trade, promote high employment and sustainable economic growth, and reduce poverty". With the exception of North Korea, Cuba, Liechtenstein, Andorra, Monaco, Tuvalu and Nauru, all UN member states either participate directly in the IMF or are represented by other member states.

SKM has relied upon an annual economic outlook document produced by the IMF, drawing upon statistical data from many international sources including International Iron and Steel Institute, World Bank, ABARE and Bloomberg Financial Markets, together with employing their own modelling and estimating techniques.

In the World Economic Outlook published in September 2006, the IMF stated that the following assumptions had been made:

" *… It has been assumed that real effective exchange rates will remain constant at their average levels during July 5–August 2, 2006, except for the currencies participating in the European exchange rate mechanism II (ERM II), which are assumed to remain constant in nominal terms relative to the euro; that established policies of national authorities will be maintained (for specific assumptions about fiscal and monetary policies in industrial countries, see Box A1); that the average price of oil will be $69.20 a barrel in 2006 and $75.50 a barrel in 2007, and remain unchanged in real terms over the medium term; that the six-month London interbank offered rate (LIBOR) on U.S. dollar deposits will average 5.4 percent in 2006 and 5.5 percent in 2007; that the three-month euro deposits rate will average 3.1 percent in 2006 and 3.7 percent in 2007; and that the six-month Japanese yen deposit rate will yield an average of 0.5 percent in 2006 and of 1.1 percent in 2007. These are, of course, working hypotheses rather than forecasts, and the uncertainties surrounding them add to the margin of error that would in any event be involved in*

the projections. The estimates and projections are based on statistical information available through end-August 2006."[22]

SKM has used IMF forecast data for movements in aluminium and copper prices (shown in Figure 18 and Figure 20), which have been developed using a model based on metal consumption, industrial output and "real" price of the metal. Comprehensive details of the model are publicly available in the World Economic Outlook 2006 document (Appendix 5.1) on the IMF internet website http://www.imf.org/external/pubs/ft/weo/2006/02/index.htm

A.2.4 World Bank

The World Bank is an important source of financial and technical assistance to developing countries around the world. It is made up of two unique development institutions owned by 184 member countries—the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA). Each institution plays a different but supportive role in its stated mission of global poverty reduction and the improvement of living standards.

The IBRD focuses on middle income and creditworthy poor countries, while IDA focuses on the poorest countries in the world. Together these institutions provide low-interest loans, interest-free credit and grants to developing countries for education, health, infrastructure, communications and many other purposes.

SKM recognized that the World Bank draws its information from a number of different authorities around the world, and has considered their forecasts for copper, aluminium, iron ore, nickel and oil in developing the escalation factors.

A.2.5 Wachovia Corporation

Wachovia Corporation is the fourth largest bank holding company in the United States and third largest full-service retail brokerage firm. Their retail banking presence is predominantly on the East Coast, but also stretches across the Southeast and west to Texas and California.

SKM has used the Wachovia forecasts for copper, aluminium, steel, nickel and oil, but has placed a lower weighting on these forecasts as SKM is concerned that the focus of the estimates may potentially be more orientated to the United States market rather than the international market.

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[22] IMF, *World Economic Outlook*, September 2006, pp viii

Appendix B Forecast Escalation Factors for Commodities & Labour

The following tables detail the forecast escalation factors for the base metals, labour and financial indicators that SKM consider impact on the price of substation equipment and material, overhead transmission line and underground cable. These projections have been presented as accumulative escalation from a nominated reference year.

- **Table 13 Accumulative escalation factors to 2008 - reference 2002**

Cost Driver	2002	2003	2004	2005	2006	2007	2008
Aluminium	1.000	1.070	1.312	1.455	1.831	1.745	1.650
Copper	1.000	1.159	1.873	2.413	4.208	3.934	3.274
Steel	1.000	1.255	1.801	1.685	1.819	1.798	1.610
Oil	1.000	1.077	1.452	2.192	2.423	2.259	2.125
General Labour	1.000	1.034	1.068	1.108	1.152	1.198	1.246
Site Labour	1.000	1.039	1.082	1.133	1.185	1.248	1.304
CPI	1.000	1.028	1.052	1.080	1.115	1.143	1.172
Foreign Exchange	1.000	0.894	0.829	0.809	0.820	0.831	0.854
Aluminium + 1 yr	1.000	0.956	1.022	1.253	1.390	1.749	1.668
Copper + 1 yr	1.000	1.033	1.197	1.934	2.492	4.346	4.063
Steel + 1 yr	1.000	1.041	1.307	1.875	1.754	1.894	1.872
Oil + 1 yr	1.000	1.118	1.204	1.624	2.452	2.710	2.526
Aluminium + 2 yrs	1.000	0.900	0.860	0.920	1.128	1.251	1.574
Copper + 2 yrs	1.000	0.841	0.869	1.007	1.628	2.097	3.657
Steel + 2 yrs	1.000	0.954	0.993	1.247	1.789	1.674	1.807
Oil + 2 yrs	1.000	0.795	0.889	0.957	1.291	1.949	2.154

Table 14 Accumulative escalation factors to 2008 - reference 2004

Cost Driver	2002	2003	2004	2005	2006	2007	2008
Aluminium			1.000	1.109	1.396	1.331	1.258
Copper			1.000	1.288	2.247	2.100	1.748
Steel			1.000	0.935	1.010	0.999	0.894
Oil			1.000	1.510	1.669	1.556	1.464
General Labour			1.000	1.037	1.078	1.121	1.166
Site Labour			1.000	1.047	1.095	1.154	1.204
CPI			1.000	1.027	1.060	1.087	1.114
Foreign Exchange			1.000	0.975	0.988	1.002	1.030
Aluminium + 1 yr			1.000	1.226	1.360	1.711	1.632
Copper + 1 yr			1.000	1.616	2.082	3.631	3.395
Steel + 1 yr			1.000	1.435	1.342	1.449	1.433
Oil + 1 yr			1.000	1.348	2.036	2.250	2.097
Aluminium + 2 yrs			1.000	1.070	1.312	1.455	1.831
Copper + 2 yrs			1.000	1.159	1.873	2.413	4.208
Steel + 2 yrs			1.000	1.255	1.801	1.685	1.819
Oil + 2 yrs			1.000	1.077	1.452	2.192	2.423

Table 15 Accumulative escalation factors to 2008 - reference 2006

Cost Driver	2002	2003	2004	2005	2006	2007	2008
Aluminium					1.000	0.953	0.901
Copper					1.000	0.935	0.778
Steel					1.000	0.989	0.885
Oil					1.000	0.932	0.877
General Labour					1.000	1.040	1.082
Site Labour					1.000	1.054	1.100
CPI					1.000	1.025	1.051
Foreign Exchange					1.000	1.014	1.042
Aluminium + 1 yr					1.000	1.258	1.200
Copper + 1 yr					1.000	1.744	1.631
Steel + 1 yr					1.000	1.080	1.068
Oil + 1 yr					1.000	1.105	1.030
Aluminium + 2 yrs					1.000	1.109	1.396
Copper + 2 yrs					1.000	1.288	2.247
Steel + 2 yrs					1.000	0.935	1.010
Oil + 2 yrs					1.000	1.510	1.669

Table 16 Accumulative escalation factors to 2013 - reference 2006

Cost Driver	2006	2007	2008	2009	2010	2011	2012	2013
Aluminium	1.000	0.953	0.901	0.867	0.839	0.832	0.829	0.827
Copper	1.000	0.935	0.778	0.672	0.625	0.600	0.571	0.542
Steel	1.000	0.989	0.885	0.834	0.772	0.748	0.722	0.697
Oil	1.000	0.932	0.877	0.831	0.769	0.733	0.703	0.671
General Labour	1.000	1.040	1.082	1.122	1.164	1.208	1.253	1.300
Site Labour	1.000	1.054	1.100	1.148	1.199	1.252	1.307	1.365
CPI	1.000	1.025	1.051	1.077	1.104	1.132	1.160	1.189
Foreign Exchange	1.000	1.014	1.042	1.088	1.121	1.138	1.138	1.138
Aluminium + 1 yr	1.000	1.258	1.200	1.134	1.090	1.055	1.046	1.043
Copper + 1 yr	1.000	1.744	1.631	1.357	1.173	1.090	1.046	0.996
Steel + 1 yr	1.000	1.080	1.068	0.955	0.901	0.834	0.807	0.780
Oil + 1 yr	1.000	1.105	1.030	0.969	0.918	0.850	0.811	0.777
Aluminium + 2 yrs	1.000	1.109	1.396	1.331	1.258	1.210	1.171	1.161
Copper + 2 yrs	1.000	1.288	2.247	2.100	1.748	1.510	1.405	1.347
Steel + 2 yrs	1.000	0.935	1.010	0.999	0.894	0.843	0.780	0.755
Oil + 2 yrs	1.000	1.510	1.669	1.556	1.464	1.386	1.284	1.224

Table 17 Accumulative escalation factors to 2013 - reference 2008

Cost Driver	2006	2007	2008	2009	2010	2011	2012	2013
Aluminium			1.000	0.961	0.930	0.922	0.920	0.917
Copper			1.000	0.864	0.803	0.770	0.734	0.697
Steel			1.000	0.943	0.873	0.845	0.816	0.787
Oil			1.000	0.947	0.877	0.836	0.801	0.765
General Labour			1.000	1.038	1.076	1.117	1.159	1.202
Site Labour			1.000	1.044	1.090	1.138	1.189	1.241
CPI			1.000	1.025	1.051	1.077	1.104	1.132
Foreign Exchange			1.000	1.044	1.076	1.092	1.092	1.092
Aluminium + 1 yr			1.000	0.946	0.909	0.880	0.872	0.870
Copper + 1 yr			1.000	0.832	0.719	0.669	0.641	0.611
Steel + 1 yr			1.000	0.895	0.844	0.781	0.756	0.730
Oil + 1 yr			1.000	0.941	0.891	0.825	0.787	0.754
Aluminium + 2 yrs			1.000	0.953	0.901	0.867	0.839	0.832
Copper + 2 yrs			1.000	0.935	0.778	0.672	0.625	0.600
Steel + 2 yrs			1.000	0.989	0.885	0.834	0.772	0.748
Oil + 2 yrs			1.000	0.932	0.877	0.831	0.769	0.733

Appendix C Projected Escalation Factors

The following tables detail the forecast escalation factors for the base metals, labour and financial indicators that SKM consider impact on the price of substation equipment and material, overhead transmission line and underground cable. These projections have been presented as accumulative escalation from a nominated reference year.

- **Table 18 Accumulative escalation factors to 2008 - reference 2002**

Component	2002	2003	2004	2005	2006	2007	2008
Substation[23]	**1.000**	**1.011**	**1.058**	**1.095**	**1.171**	**1.215**	**1.258**
Switchgear	1.000	0.958	0.971	1.012	1.119	1.159	1.216
Transformers	1.000	0.982	1.000	1.048	1.183	1.251	1.436
Structure	1.000	1.147	1.442	1.409	1.502	1.523	1.457
Foundations	1.000	1.037	1.078	1.125	1.175	1.233	1.285
Civil	1.000	1.037	1.078	1.125	1.175	1.233	1.285
Protection & Control	1.000	1.035	1.070	1.112	1.157	1.207	1.252
Erection	1.000	1.039	1.082	1.133	1.185	1.248	1.304
Commissioning	1.000	1.039	1.082	1.133	1.185	1.248	1.304
Misc material	1.000	1.024	1.046	1.072	1.103	1.131	1.160
Overhead Line[24]	**1.000**	**1.057**	**1.171**	**1.195**	**1.280**	**1.331**	**1.374**
Conductor	1.000	0.993	1.061	1.222	1.316	1.510	1.475
Earthwire	1.000	0.993	1.061	1.222	1.316	1.510	1.475
Towers	1.000	1.147	1.442	1.409	1.502	1.523	1.457
Insulators	1.000	1.033	1.067	1.106	1.150	1.196	1.238
Fittings	1.000	1.033	1.067	1.106	1.150	1.196	1.238
Foundations	1.000	1.037	1.078	1.125	1.175	1.233	1.285
Erection	1.000	1.039	1.082	1.133	1.185	1.248	1.304
Underground Cable Aluminium	**1.000**	**1.025**	**1.076**	**1.160**	**1.246**	**1.348**	**1.368**
Underground Cable Copper	**1.000**	**1.040**	**1.105**	**1.226**	**1.360**	**1.571**	**1.578**
Cable Al	1.000	1.000	1.065	1.212	1.361	1.536	1.489
Cable Cu	1.000	1.043	1.199	1.614	2.095	2.924	2.730
Installation	1.000	1.039	1.082	1.133	1.185	1.248	1.304

[23] Based on a selected number of 66,132,220 and 275kV substation bays

[24] Based on sample of 132,220 and 275kV transmission lines

Table 19 Accumulative escalation factors to 2008 - reference 2004

Component	2002	2003	2004	2005	2006	2007	2008
Substation			**1.000**	**1.035**	**1.106**	**1.148**	**1.188**
Switchgear			1.000	1.043	1.153	1.194	1.253
Transformers			1.000	1.048	1.183	1.252	1.437
Structure			1.000	0.977	1.042	1.057	1.010
Foundations			1.000	1.044	1.090	1.144	1.192
Civil			1.000	1.044	1.090	1.144	1.192
Protection & Control			1.000	1.039	1.081	1.127	1.170
Erection			1.000	1.047	1.095	1.154	1.204
Commissioning			1.000	1.047	1.095	1.154	1.204
Misc material			1.000	1.025	1.054	1.081	1.108
Overhead Line			**1.000**	**1.020**	**1.093**	**1.137**	**1.173**
Conductor			1.000	1.153	1.241	1.424	1.390
Earthwire			1.000	1.153	1.241	1.424	1.390
Towers			1.000	0.977	1.042	1.057	1.010
Insulators			1.000	1.037	1.078	1.121	1.160
Fittings			1.000	1.037	1.078	1.121	1.160
Foundations			1.000	1.044	1.090	1.144	1.192
Erection			1.000	1.047	1.095	1.154	1.204
Underground Cable Aluminium			**1.000**	**1.078**	**1.158**	**1.252**	**1.271**
Underground Cable Copper			**1.000**	**1.109**	**1.231**	**1.422**	**1.428**
Cable Al			1.000	1.138	1.278	1.443	1.399
Cable Cu			1.000	1.346	1.746	2.438	2.276
Installation			1.000	1.047	1.095	1.154	1.204

Table 20 Accumulative escalation factors to 2008 - reference 2006

Component	2002	2003	2004	2005	2006	2007	2008
Substation					**1.000**	**1.038**	**1.074**
Switchgear					1.000	1.035	1.086
Transformers					1.000	1.058	1.215
Structure					1.000	1.014	0.970
Foundations					1.000	1.049	1.093
Civil					1.000	1.049	1.093
Protection & Control					1.000	1.043	1.082
Erection					1.000	1.054	1.100
Commissioning					1.000	1.054	1.100
Misc material					1.000	1.025	1.051
Overhead Line					**1.000**	**1.040**	**1.073**
Conductor					1.000	1.148	1.121
Earthwire					1.000	1.148	1.121
Towers					1.000	1.014	0.970
Insulators					1.000	1.040	1.076
Fittings					1.000	1.040	1.076
Foundations					1.000	1.049	1.093
Erection					1.000	1.054	1.100
Underground Cable Aluminium					**1.000**	**1.082**	**1.098**
Underground Cable Copper					**1.000**	**1.155**	**1.160**
Cable Al					1.000	1.129	1.094
Cable Cu					1.000	1.396	1.303
Installation					1.000	1.054	1.100

Table 21 Annual escalation factors 2002 to 2008

Component	2002 - 2003	2003 - 2004	2004 - 2005	2005- 2006	2006 - 2007	2007 - 2008
Substation	**1.011**	**1.047**	**1.035**	**1.069**	**1.038**	**1.035**
Switchgear	0.958	1.014	1.043	1.105	1.035	1.049
Transformers	0.982	1.018	1.048	1.128	1.058	1.148
Structure	1.147	1.257	0.977	1.066	1.014	0.956
Foundations	1.037	1.039	1.044	1.044	1.049	1.042
Civil	1.037	1.039	1.044	1.044	1.049	1.042
Protection & Control	1.035	1.035	1.039	1.041	1.043	1.038
Erection	1.039	1.042	1.047	1.046	1.054	1.044
Commissioning	1.039	1.042	1.047	1.046	1.054	1.044
Misc material	1.024	1.022	1.025	1.029	1.025	1.025
Overhead Line	**1.057**	**1.108**	**1.020**	**1.071**	**1.040**	**1.032**
Conductor	0.993	1.068	1.153	1.076	1.148	0.977
Earthwire	0.993	1.068	1.153	1.076	1.148	0.977
Towers	1.147	1.257	0.977	1.066	1.014	0.956
Insulators	1.033	1.033	1.037	1.039	1.040	1.035
Fittings	1.033	1.033	1.037	1.039	1.040	1.035
Foundations	1.037	1.039	1.044	1.044	1.049	1.042
Erection	1.039	1.042	1.047	1.046	1.054	1.044
Underground Cable Aluminium	**1.025**	**1.050**	**1.078**	**1.074**	**1.082**	**1.015**
Underground Cable Copper	**1.040**	**1.063**	**1.109**	**1.110**	**1.155**	**1.005**
Cable Al	1.000	1.065	1.138	1.123	1.129	0.969
Cable Cu	1.043	1.150	1.346	1.298	1.396	0.934
Installation	1.039	1.042	1.047	1.046	1.054	1.044

Table 22 Accumulative escalation Factors to 2013 - reference 2006

Component	2006	2007	2008	2009	2010	2011	2012	2013
Substation	**1.000**	**1.038**	**1.074**	**1.098**	**1.119**	**1.145**	**1.171**	**1.200**
Switchgear	1.000	1.035	1.086	1.096	1.098	1.105	1.111	1.120
Transformers	1.000	1.058	1.215	1.197	1.139	1.105	1.087	1.083
Structure	1.000	1.014	0.970	0.958	0.941	0.947	0.953	0.960
Foundations	1.000	1.049	1.093	1.139	1.187	1.236	1.288	1.342
Civil	1.000	1.049	1.093	1.139	1.187	1.236	1.288	1.342
Protection & Control	1.000	1.043	1.082	1.123	1.165	1.208	1.254	1.301
Erection	1.000	1.054	1.100	1.148	1.199	1.252	1.307	1.365
Commissioning	1.000	1.054	1.100	1.148	1.199	1.252	1.307	1.365
Misc material	1.000	1.025	1.051	1.077	1.104	1.132	1.160	1.190
Overhead Line	**1.000**	**1.040**	**1.073**	**1.085**	**1.093**	**1.114**	**1.138**	**1.166**
Conductor	1.000	1.148	1.121	1.085	1.065	1.052	1.055	1.061
Earthwire	1.000	1.148	1.121	1.085	1.065	1.052	1.055	1.061
Towers	1.000	1.014	0.970	0.958	0.941	0.947	0.953	0.960
Insulators	1.000	1.040	1.076	1.114	1.153	1.194	1.236	1.280
Fittings	1.000	1.040	1.076	1.114	1.153	1.194	1.236	1.280
Foundations	1.000	1.049	1.093	1.139	1.187	1.236	1.288	1.342
Erection	1.000	1.054	1.100	1.148	1.199	1.252	1.307	1.365
Underground Cable Aluminium	**1.000**	**1.082**	**1.098**	**1.115**	**1.139**	**1.165**	**1.200**	**1.236**
Underground Cable Copper	**1.000**	**1.155**	**1.160**	**1.145**	**1.149**	**1.172**	**1.202**	**1.234**
Cable Al	1.000	1.129	1.094	1.060	1.038	1.022	1.021	1.024
Cable Cu	1.000	1.396	1.303	1.136	1.029	0.980	0.953	0.924
Installation	1.000	1.054	1.100	1.148	1.199	1.252	1.307	1.365

Table 23 Accumulative escalation Factors to 2013 - reference 2008

Component	2006	2007	2008	2009	2010	2011	2012	2013
Substation			**1.000**	**1.022**	**1.041**	**1.065**	**1.090**	**1.117**
Switchgear			1.000	1.009	1.011	1.017	1.022	1.031
Transformers			1.000	0.985	0.938	0.910	0.895	0.891
Structure			1.000	0.988	0.970	0.976	0.983	0.990
Foundations			1.000	1.042	1.085	1.131	1.178	1.227
Civil			1.000	1.042	1.085	1.131	1.178	1.227
Protection & Control			1.000	1.037	1.076	1.117	1.159	1.203
Erection			1.000	1.044	1.090	1.138	1.189	1.241
Commissioning			1.000	1.044	1.090	1.138	1.189	1.241
Misc material			1.000	1.025	1.050	1.077	1.104	1.132
Overhead Line			**1.000**	**1.011**	**1.019**	**1.038**	**1.060**	**1.086**
Conductor			1.000	0.968	0.951	0.938	0.941	0.947
Earthwire			1.000	0.968	0.951	0.938	0.941	0.947
Towers			1.000	0.988	0.970	0.976	0.983	0.990
Insulators			1.000	1.035	1.072	1.109	1.149	1.189
Fittings			1.000	1.035	1.072	1.109	1.149	1.189
Foundations			1.000	1.042	1.085	1.131	1.178	1.227
Erection			1.000	1.044	1.090	1.138	1.189	1.241
Underground Cable Aluminium			**1.000**	**1.016**	**1.037**	**1.062**	**1.093**	**1.126**
Underground Cable Copper			**1.000**	**0.987**	**0.990**	**1.010**	**1.036**	**1.064**
Cable Al			1.000	0.969	0.949	0.934	0.933	0.936
Cable Cu			1.000	0.872	0.790	0.752	0.731	0.709
Installation			1.000	1.044	1.090	1.138	1.189	1.241

Table 24 Annual escalation Factors 2006 to 2013

Component	2006 - 2007	2007 - 2008	2008 - 2009	2009 - 2010	2010 - 2011	2011 - 2012	2012 - 2013
Substation	**1.038**	**1.035**	**1.022**	**1.019**	**1.023**	**1.023**	**1.025**
Switchgear	1.035	1.049	1.009	1.002	1.006	1.005	1.009
Transformers	1.058	1.148	0.985	0.952	0.970	0.984	0.996
Structure	1.014	0.956	0.988	0.982	1.006	1.007	1.008
Foundations	1.049	1.042	1.042	1.042	1.042	1.042	1.042
Civil	1.049	1.042	1.042	1.042	1.042	1.042	1.042
Protection & Control	1.043	1.038	1.037	1.038	1.038	1.038	1.038
Erection	1.054	1.044	1.044	1.044	1.044	1.044	1.044
Commissioning	1.054	1.044	1.044	1.044	1.044	1.044	1.044
Misc material	1.025	1.025	1.025	1.025	1.025	1.025	1.025
Overhead Line	**1.040**	**1.032**	**1.011**	**1.008**	**1.019**	**1.021**	**1.025**
Conductor	1.148	0.977	0.968	0.982	0.987	1.003	1.006
Earthwire	1.148	0.977	0.968	0.982	0.987	1.003	1.006
Towers	1.014	0.956	0.988	0.982	1.006	1.007	1.008
Insulators	1.040	1.035	1.035	1.035	1.035	1.035	1.035
Fittings	1.040	1.035	1.035	1.035	1.035	1.035	1.035
Foundations	1.049	1.042	1.042	1.042	1.042	1.042	1.042
Erection	1.054	1.044	1.044	1.044	1.044	1.044	1.044
Underground Cable Aluminium	**1.082**	**1.015**	**1.016**	**1.021**	**1.024**	**1.029**	**1.031**
Underground Cable Copper	**1.155**	**1.005**	**0.987**	**1.003**	**1.020**	**1.026**	**1.027**
Cable Al	1.129	0.969	0.969	0.979	0.984	0.999	1.002
Cable Cu	1.396	0.934	0.872	0.906	0.953	0.972	0.969
Installation	1.054	1.044	1.044	1.044	1.044	1.044	1.044

Appendix D SKM Switchbay Estimates

- 66kV TM Single CB ~ SKM equivalent 66kV Feeder incl CB
- 132kV TM Single CB ~ SKM equivalent 132kV Feeder incl CB
- 275kV TI One & a Half CB ~ SKM equivalent 275kV 1.5 CB layout 3 CB
- 275kV TJ Double CB ~ SKM equivalent 275kV Double Bus 2 CB

SINCLAIR KNIGHT MERZ

SKM

Substation Switch Bay Configuration
Unit Cost in AUD

Voltage	66 kV	**Country**	Australia		
Configuration	Feeder incl CB	**Source**	SKM standard switch bay		
Date	07.02.2007	Labour rate AUD	**81.00**	per hour	**Market** rates

Equipment	Unit Rate	Quantity	Total
Current Transformer	13,000	3.0	39,000
Circuit Breaker	43,800	1.0	43,800
Cap Voltage Transformer	9,900	3.0	29,700
Isolator	7,700	1.0	7,700
Isolator + Earth Switch	12,000	1.0	12,000
Surge Diverter	1,900	3.0	5,700
Station Post	330	15.0	4,950
Subtotal			**142,850**

Structure	Unit Rate	Quantity	Total
Current Transformer	2,360	3.0	7,080
Cap Voltage Transformer	2,360	3.0	7,080
Isolator	5,900	1.0	5,900
Isolator + Earth Switch	5,900	1.0	5,900
Surge Diverter	980	3.0	2,940
Station Post	980	6.0	5,880
Towers	8,900	1.5	13,350
Beams	3,900	1.0	3,900
Subtotal			**52,030**

Foundations	Unit Rate	Quantity	Total
Circuit Breaker	2,500	1.0	2,500
Current Transformer	1,490	3.0	4,470
Cap Voltage Transformer	1,490	3.0	4,470
Isolator	1,860	1.0	1,860
Isolator + Earth Switch	1,860	1.0	1,860
Surge Diverter	1,000	3.0	3,000
Station Post	750	6.0	4,500
Towers	2,500	1.5	3,750
Subtotal			**26,410**

Installation - Equipment		455 hours	**36,815**
Civil - other			7,000
Minor material			12,000
Commissioning			22,000
Protection & control			55,000
Installation - PC		170 hours	13,750
Subtotal			**109,750**
Engineering Procurement and Contract Management (EPCM)		15%	**55,178**
Unit switch bay total			**423,033**

SINCLAIR KNIGHT MERZ SKM

Substation Switch Bay Configuration
Unit Cost in AUD

Voltage	275 kV	**Country**	Australia
Configuration	1.5 CB layout 3 CB c/w surge diverters	**Source**	SP AusNet standard switch bay
Date	07.02.2007	Labour rate AUD	**81.00** per hour **Market** rates

Equipment	Unit Rate	Quantity	Total
Current Transformer	32,800	9.0	295,200
Circuit Breaker	193,000	3.0	579,000
Cap Voltage Transformer	18,100	6.0	108,600
Isolator + Earth Switch	43,300	6.0	259,800
Isolator + 2 Earth Switch	51,500	2.0	103,000
Surge Diverter	10,500	3.0	31,500
Line Trap & Coupling Set	57,900	2.0	115,800
Coupling Capacitor Set	27,300	2.0	54,600
Station Post	1,800	6.0	10,800
Subtotal			**1,558,300**

Structure	Unit Rate	Quantity	Total
Current Transformer	1,900	9.0	17,100
Cap Voltage Transformer	1,900	6.0	11,400
Isolator + Earth Switch	10,500	6.0	63,000
Isolator + 2 Earth Switch	10,500	2.0	21,000
Surge Diverter	1,400	3.0	4,200
Line Trap & Coupling Set	4,200	2.0	8,400
Coupling Capacitor Set	4,200	2.0	8,400
Station Post	1,050	6.0	6,300
Towers	25,500	3.0	76,500
Beams	11,100	3.0	33,300
Subtotal			**249,600**

Foundations	Unit Rate	Quantity	Total
Circuit Breaker	5,600	3.0	16,800
Current Transformer	2,700	9.0	24,300
Cap Voltage Transformer	2,700	6.0	16,200
Isolator + Earth Switch	4,400	6.0	26,400
Isolator + 2 Earth Switch	4,400	2.0	8,800
Surge Diverter	1,500	3.0	4,500
Line Trap & Coupling Set	2,700	2.0	5,400
Coupling Capacitor Set	2,700	2.0	5,400
Station Post	1,000	6.0	6,000
Towers	12,900	3.0	38,700
Subtotal			**152,500**

Installation - Equipment	2,839 hours	**229,953**
Civil - other		23,500
Minor material		128,000
Commissioning		59,200
Protection & control		324,000

SINCLAIR KNIGHT MERZ

SKM

Substation Switch Bay Configuration
Unit Cost in AUD

Voltage	275 kV	**Country**	Australia		
Configuration	1.5 CB layout 3 CB c/w surge diverters	**Source**	SP AusNet standard switch bay		
Date	07.02.2007	Labour rate AUD	**81.00**	per hour	**Market** rates

Installation - PC	1,000	hours	81,000
Subtotal			**615,700**
Engineering Procurement and Contract Management (EPCM)	15%		**420,908**
Unit switch bay total			**3,226,961**

SINCLAIR KNIGHT MERZ SKM

Substation Switch Bay Configuration
Unit Cost in AUD

Voltage	275 kV	**Country**	Australia		
Configuration	Double Bus 2 CB	**Source**	SKM standard switch bay		
Date	07.02.2007	Labour rate AUD	**81.00**	per hour	**Market** rates

Equipment	Unit Rate	Quantity	Total
Current Transformer	32,800	6.0	196,800
Circuit Breaker	193,000	2.0	386,000
Cap Voltage Transformer	18,100	6.0	108,600
Isolator + Earth Switch	43,300	4.0	173,200
Isolator + 2 Earth Switch	51,500	1.0	51,500
Station Post	1,800	6.0	10,800
Subtotal			**926,900**

Structure	Unit Rate	Quantity	Total
Current Transformer	1,900	2.0	3,800
Cap Voltage Transformer	1,900	2.0	3,800
Isolator + Earth Switch	10,500	4.0	42,000
Isolator + 2 Earth Switch	10,500	1.0	10,500
Station Post	1,050	6.0	6,300
Subtotal			**66,400**

Foundations	Unit Rate	Quantity	Total
Circuit Breaker	5,600	2.0	11,200
Current Transformer	2,700	2.0	5,400
Cap Voltage Transformer	2,700	2.0	5,400
Isolator + Earth Switch	4,400	4.0	17,600
Isolator + 2 Earth Switch	4,400	1.0	4,400
Station Post	1,000	6.0	6,000
Subtotal			**50,000**

Installation - Equipment	1,651 hours	**133,728**
Civil - other		41,100
Minor material		56,200
Commissioning		77,000
Protection & control		289,300
Installation - PC	893 hours	72,325
Subtotal		**535,925**
Engineering Procurement and Contract Management (EPCM)	15%	**256,943**
Unit switch bay total		**1,969,896**