KPMG

Labour Cost Forecasts

This report was prepared for
Country Energy Gas Pty Ltd

10 February 2010

ADVISORY

Contents

Key Findings

- Country Energy Gas Pty Ltd (Country Energy) is preparing a submission to the Australian Energy Regulator (AER) regarding access arrangements for the Wagga Wagga natural gas distribution network. KPMG Econtech has been engaged to provide updated labour cost forecasts.

- KPMG Econtech's outlook for the economy has been revised upward since it provided its previous report to the AER in March 2009. It is now forecasting a recovery to occur earlier and be stronger than was previously expected. This is due to three factors: consumption growth has been stronger than expected; the recovery of the Chinese economy which will support Australia's net export; and the upturn in housing occurring ahead of expectations. As a consequence, the current labour cost growth projections are stronger than those forecast in March 2009.

- Australia has avoided a technical recession. While annual real GDP growth for 2009 slowed to a weak 1 per cent, the Australian economy came through the Global Financial Crisis (GFC) better than many other industrialised countries.

- The economic slowdown caused a weakening in the labour market which has led to wage growth moderation in 2009/10. However, over the medium term, the labour market is expected to rebound and unemployment is expected to return to around 5 per cent. In line with the rebound in the labour market, wage growth is expected to pick up.

- Over the next five years, strong real average annual labour cost growth in the Electricity, Gas, Water and Waste Services (EGWW) industry is forecast at around 4.5 per cent in NSW and 4.2 per cent nationally.

- Growth in the NSW EGWW industry will be boosted by the NSW Government's $62.9 billion spend on infrastructure investment, which includes $15.7 billion on upgrading power networks[1] (part of the EGWW industry).

- Across NSW, real average annual labour costs are expected to grow at 3.0 per cent, as the NSW economy picks up. Meanwhile, labour costs across Australia are also forecast to grow at a higher rate in line with the economic recovery.

---

[1] Australian Financial Review, "Federal cash bolsters NSW infrastructure", 15 June 2009.

1. Introduction

Country Energy Gas Pty Ltd (Country Energy) is preparing a submission to the Australian Energy Regulator (AER) regarding access arrangements for the Wagga Wagga natural gas distribution network. The AER makes transmission and distribution revenue determinations for network service providers in Australia under the National Electricity Rules (NER). These revenue determinations require the AER to assess claims regarding expected capital and operating expenses. Labour costs are a key expense in gas. Hence, KPMG Econtech has been engaged by Country Energy to provide updated labour cost escalators for the Electricity, Gas, Water and Waste Service (EGWW) industry in NSW and Australia.

In March 2009, the AER engaged KPMG Econtech to provide labour cost forecasts. Since then the outlook for economic growth in Australia has improved markedly. This upward revision in the outlook for economic growth has important implications for the wage growth outlook. Therefore, Country Energy has engaged KPMG Econtech to update the labour cost forecasts for NSW and Australia.

These forecasts reflect the following factors.

- National Accounts data up to September quarter 2009 (published by the Australia Bureau of Statistics in December 2009).

- Average Weekly Earnings data obtained by special request from the Australian Bureau of Statistics (ABS). This includes historical Average Weekly Earnings data up to November 2009.

- Changes to the ABS industry classification from Australian and New Zealand Standard Industry Classification (ANZSIC) 1993 to ANZSIC 2006.

This report provides labour cost growth forecasts and commentary on the NSW and national EGWW industry. It also provides forecasts and commentary for the total of industries in NSW and Australia.

This report is structured as follows.

- Section 2 provides an update on the state of the national economy.

- Section 3 describes the modelling approach used to forecast labour cost growth rates.

- Section 4 provides commentary on the labour cost forecasts for NSW and Australia. It also compares these latest forecasts to those prepared for the AER in March 2009.

While all care, skill and consideration has been used in the preparation of this report, the findings refer to the terms of reference outlined by Country Energy and are designed to be used only for the specific purpose set out below.

The purpose of this report is to provide updated labour cost forecasts for NSW and Australia over the period 2009/10 to 2014/15. KPMG Econtech has provided labour cost growth forecasts and commentary for the EGWW industry.

The findings in this report are subject to unavoidable statistical variation. While all care has been taken to ensure that the statistical variation is kept to a minimum, care should be taken whenever using this information. This report only takes into account information available to KPMG Econtech up to the date of this report and so its findings may be affected by new information.

2. National Economic Outlook

Australia has avoided a technical recession. While annual real GDP growth for 2009 slowed to a weak 1 per cent, the Australian economy came through the Global Financial Crisis (GFC) better than many other industrialised countries.

Although employment was flat in 2009, the labour market held up better than expected. This is a reflection of the overall economy which weakened, but did not recede. With weak employment, unemployment is forecast to peak at around 6 per cent in early 2010. In the medium term, the labour market will rebound and the unemployment rate will return to normal levels of around 5 per cent. The short-term weakness in the labour market has caused wage growth to moderate. In 2009/10, wage growth is estimated to be a feeble 1.7 per cent, compared to a normal rate of growth of around 4 per cent.

The Reserve Bank of Australia (RBA) has begun to increase interest rates to more normal levels as the economy recovers. The official cash rate was lifted from 3 per cent per annum to 3.25 per cent in October 2009. It continued to lift rates in November and December, and the cash rate currently stands at 3.75 per cent per annum. The cash rate is forecast to achieve a neutral stance in 2010 of around 5 per cent per annum. In line with the economic recovery, inflation is expected to return to the RBA's target band.

3. Modelling Approach

This section describes in detail the modelling approach used in this report.

To forecast labour costs, KPMG Econtech has utilised its Labour Cost Model (LCM) that provides forecasts of labour costs by state by industry over the period 2009/10 to 2014/15. The LCM allows an independent assessment of labour cost conditions for the EGWW industry (and indeed all ANZSIC broad industries) in each state and territory. The LCM was purpose-built for the AER in 2007. Further details about the LCM are provided at Attachment A.

The LCM forecasts are fully consistent with KPMG Econtech's Murphy Model 2 (MM2) modelling outputs, including the existing national wage forecast and the state and industry employment forecasts. More details on MM2 are available in Attachment B.

Labour market forecasts from MM2 are used as inputs into the LCM model. As MM2 is a macro-computable general equilibrium (CGE) model, the labour market forecasts that are used in the LCM are grounded in sound economic theory. For instance, as labour market conditions tighten, the MM2 will predict an increase in wages. Further, over the long term, the Australian economy will converge to a natural rate of unemployment. As such, total employment figures will depend on total labour supply.

The general structure of the LCM is illustrated in Figure 3.1 below. The key steps involved in the LCM modelling process are summarised below.

3.1 Data Analysis

The first step involves collecting the appropriate data sources to forecast labour costs. There are a number of ways in which labour costs could be measured. The Australian Bureau of Statistics (ABS) publishes several wage indicators including Average Weekly Earnings (AWE), Wage Price Index (WPI), Mean Weekly Earnings (MWE) and Compensation of Employees (CPE).

KPMG Econtech analysed all data sources at the detailed state by industry level. For the purpose of this study, the detailed unpublished state by industry AWE data appears to be the best source to measure wage movements. There was insufficient historical data (approximately twelve years) for the WPI to allow robust econometric analysis. At the detailed state by industry level, MWE was found to be too volatile. On balance, AWE was generally less volatile than CPE across industries and states and therefore AWE is considered the most appropriate wage measure for this project. The AWE data series in this report includes total earnings for all employees.

3.2 Forecasting Employees by State and by Industry Separately

Step 2 is to forecast employees by state and by industry separately. As mentioned above, MM2 provides forecasts of total employment by state and by industry separately. Total employment, by definition, includes both employees and self-employed persons. Therefore, to estimate wages per employee it is necessary to convert the total employment figures produced by MM2 into total employee figures. This conversion is based on an economic analysis of the historical employee share of employment in each industry and in each state.

3.3 Forecasting Labour Costs by State and by Industry Separately

The next step in the modelling involves forecasting labour costs by state and by industry separately. This is done using historical state and industry wage data in combination with the existing MM2 forecast of the national wage. These two data sources are used to forecast consistent wage relativities for each state and territory, and for each of the ANZSIC broad industries, separately, using robust econometric analysis. The key driver of these forecasts is the tightness of the labour market in each state and in each industry.

3.4 Forecasting Labour Cost by State by Industry

The final step is to forecast labour costs by state, by industry. A widely accepted estimation technique known as Residual Allocation System (RAS)[2] is applied to the forecast of wages for each separate state and each separate industry. This technique allows for the estimation of wages by state for each industry. Importantly, this technique ensures that the wage figures by state by industry are fully consistent with the national numbers.

---

[2] This technique is also used by the ABS – for example in producing their input-output tables.

Figure 3.1
The Labour Cost Modelling (LCM) System
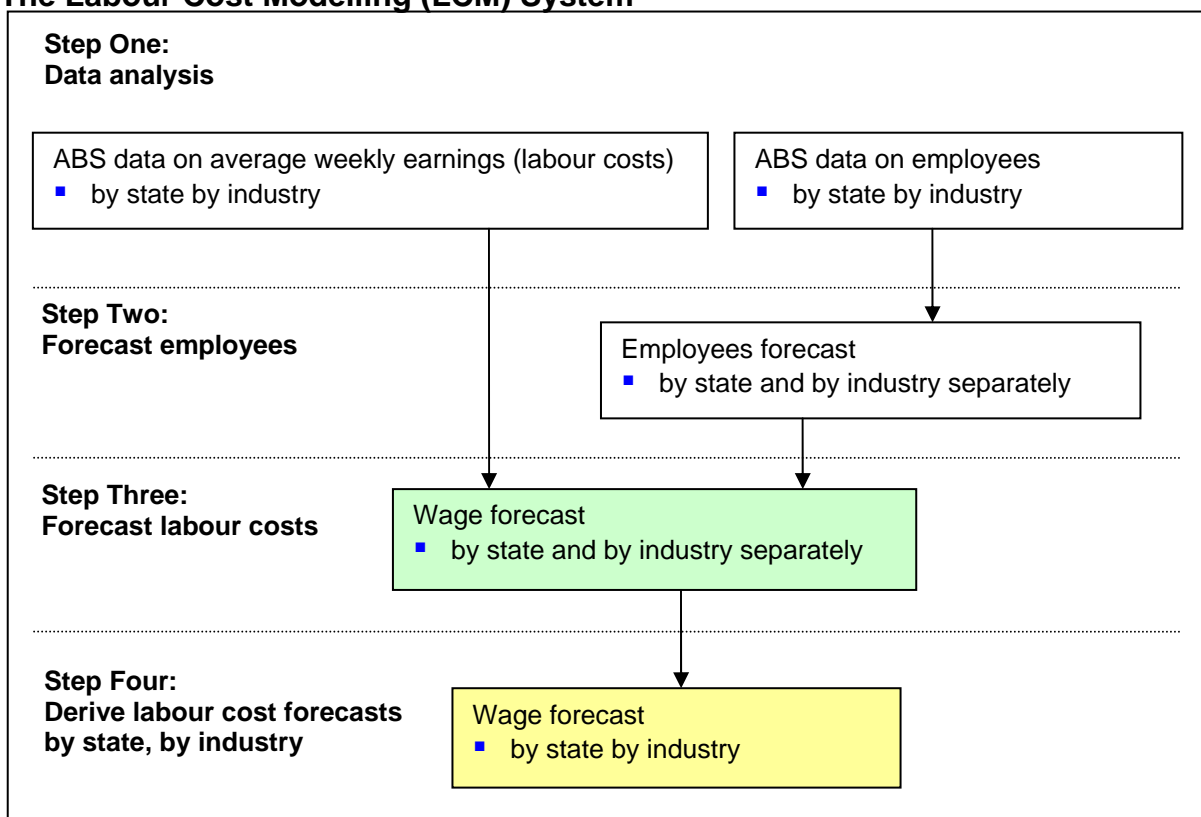
3.5 Change in Industry Classification

The ABS recently changed its industry classification. Under the previous system ("ANZSIC 1993"), 17 ANZSIC broad industries were included in the classification. The new industry standard classification ("ANZSIC 2006") includes 19 ANZSIC broad industries.

The ANZSIC 1993 classification described the Electricity Gas and Water Supply industry in the following way.

> "Electricity, Gas and Water Supply, includes all units mainly engaged in the generation, transmission or distribution of electricity; the manufacture of town gas from coal and/or petroleum or the distribution of manufactured town gas, natural gas or liquefied petroleum gas through a mains reticulation system; the storage, purification or supply of water; or the operation of sewerage or drainage systems including sewage treatment plants."[3]

---

[3]

http://www.abs.gov.au/AUSSTATS/abs@.nsf/66f306f503e529a5ca25697e0017661f/C53AC7FF6B897047CA25697E0018FBAA?opendocument

The ANZSIC 2006 classification expands the industry to capture waste services. The Electricity, Gas, Water and Waste Services industry is described as follows.

> "The Electricity, Gas, Water and Waste Services Division comprises units engaged in the provision of electricity; gas through mains systems; water; drainage; and sewage services. This division also includes units mainly engaged in the collection, treatment and disposal of waste materials; remediation of contaminated materials (including land); and materials recovery activities."[4]

A concordance table was used to re-classify ANZSIC 1993 industries to ANZSIC 2006 industries. This report uses the new ANZSIC 2006 industry classification to present results. Thus, the Electricity, Gas, Water and Waste Services (EGWW) industry is reported. These results are presented in the following section.

---

[4] Australian Bureau of Statistics, Statistics New Zealand, *Australia and New Zealand Standard Industry Classification 2006*, ABS Catalogue Number 1292.0, page 200

4. Detailed Labour Cost Forecasts

This section describes the outlook for labour costs in NSW and Australia. It begins with a comparison of labour costs in the EGWW industry, and is followed by a comparison of general labour costs in NSW and Australia. Finally, it compares these updated forecasts with those prepared for the AER in March 2009. Detailed labour cost results are contained in Attachments C and D.

4.1 NSW and Australia EGWW Labour Cost Forecasts

Over the last five years, average annual growth in labour costs across the EGWW industry have been 1.6 per cent in NSW, and 1.3 per cent at the national level (see Table 4.1). Looking forward, we are expecting much stronger real annual growth in the industry, at around 4.5 per cent in NSW and 4.2 per cent nationally.

Interestingly, labour cost growth in the NSW EGWW industry is expected to expand at a similar rate as the national EGWW industry. Specifically, while real labour cost growth in the EGWW industry is forecast to pick up at the national level, from 1.3 to 4.2 per cent per annum, the real growth rate in NSW is expected to rise from 1.6 to 4.5 per cent per annum). Over the next four years, the NSW Government is set to spend $62.9 billion on infrastructure investment. This includes $15.7 billion on upgrading power networks[5] (part of the EGWW industry). The overall building program is expected to generate a very high level of investment which is expected to support up to 160,000 jobs a year[6]. This higher demand for workers in the NSW EGWW industry will support growth in labour costs.

More generally, labour cost growth rates are expected to be higher in the forecast period than the past five years due to the strengthening of the economy. 2008/09 was a particularly slow year, and the labour market weakened. This flowed through to weaker labour cost growth in the historical period. Now that the economy is beginning to show signs of a recovery, the labour market is expected to pick up. Employment growth generally follows economic growth in output with a lag. Hence, the more optimistic economic outlook is forecast to lead to a strengthening in the labour market. The unemployment rate is expected to reach 6 per cent by early 2010, then decline back around 5 per cent. This stronger labour market will lead to higher labour costs.

In addition, investment in capital has been rising strongly over the last few years. This will lead to future improvements in labour productivity (as the capital to labour ration increases) and hence strong wage growth. This capital deepening is clearly illustrated in Chart 4.1 which shows that the ratio of investment to GDP has increased significantly. Over the last four years, investment has accounted for a very high 15 to 18 per cent of GDP.

---

[5] Australian Financial Review, "Federal cash bolsters NSW infrastructure", 15 June 2009.
[6] http://www.budget.nsw.gov.au/

Chart 4.1
Historical Investment to GDP Ratio
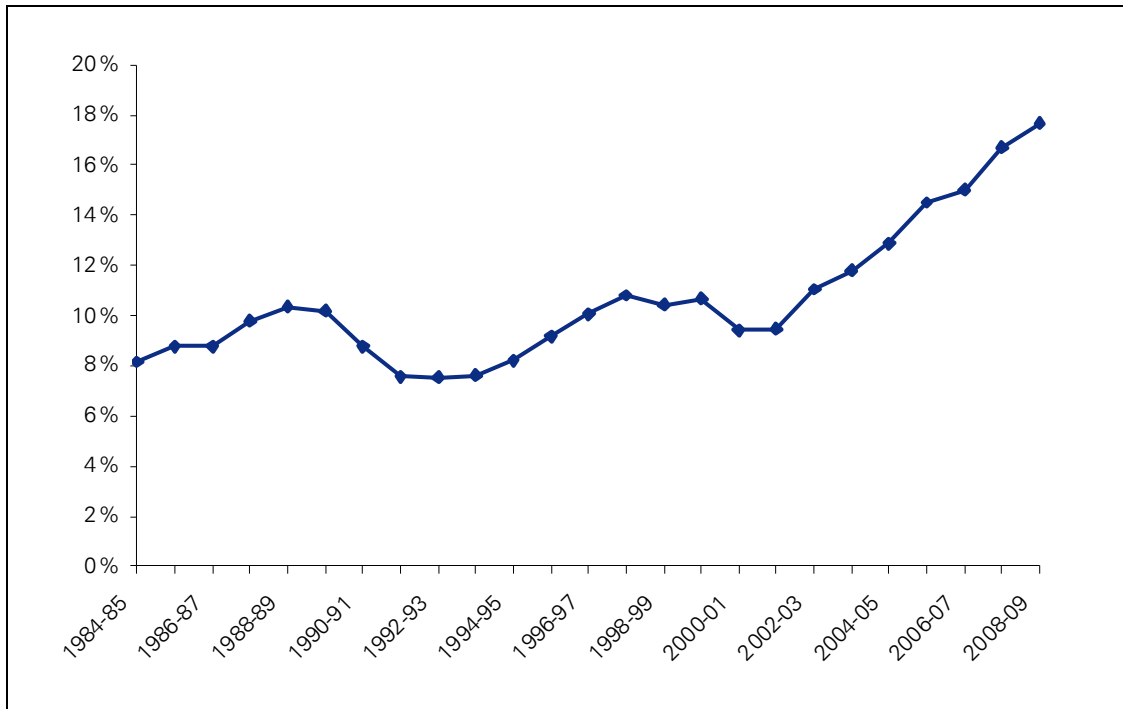
Source: MM2

Table 4.1
Average Annual Growth in EGWW Industry Labour Costs
Real Terms

	NSW	Australia
04/05-09/10	1.6%	1.3%
09/10-14/15	4.5%	4.2%

Source: LCM
Note: The history is calculated as the five years from 2004/05 to 2009/10. The forecast is calculated as the five years from 2009/10 to 2014/15.

Chart 4.2 shows the nominal year-on-year growth rates for labour costs in the NSW and Australian EGWW industry. It clearly shows that over the next three years, labour costs in the EGWW industry are forecast to be higher in NSW than the national economy. This is the period in which the NSW Government is set to roll out its infrastructure investment package, of which a large component is related to the electricity sector. This higher level of investment will boost labour costs in NSW compared to Australia as a whole. By 2012/13, labour cost growth rates in NSW and Australia are expected to be aligned.

Chart 4.2
Annual Labour Cost Growth in EGWW Industry: NSW and Australia
(nominal terms)
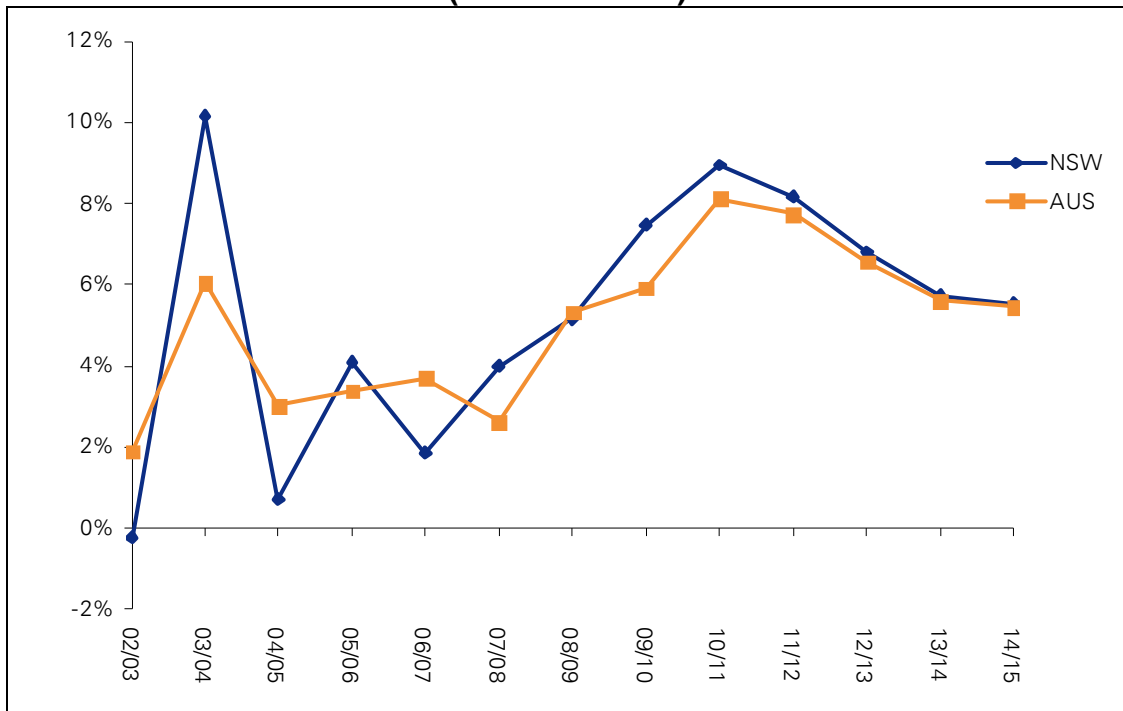
Source: LCM

4.2   NSW and Australia Labour Cost Forecasts

Since 2004/05, labour costs in NSW have been slow. Table 4.2 shows that over the last five years, labour costs in NSW have grown by a slow average annual rate of 1.1 per cent, whereas real average annual labour costs across Australia have grown by a slightly higher rate of 1.5 per cent. This is because economic growth (GDP) in the national economy has been faster than in the NSW economy.

Labour market conditions typically depend on general economic conditions. As shown in Table 4.3 below, real economic growth in NSW (measured by NSW GSP) has been significantly slower than national GDP over the last five years. While the national economy was growing solidly in 2006/07 and 2007/08 at nearly 4 per cent per annum, the NSW economy was growing at a more modest pace. When the effect of the GFC hit in 2008/09, the national economy fell back to a sluggish 1.1 per cent real GDP growth while NSW was at a standstill at 0.2 per cent. The consistently slower rate of economic growth in NSW compared to Australia has caused labour cost growth in NSW to be below the national level.

Table 4.2
Average Annual Growth in Labour Costs (All industries)
Real Terms

	NSW	Australia
04/05-09/10	1.1%	1.5%
09/10-14/15	3.0%	2.7%

Source: LCM
Note: The history is calculated as the five years from 2004/05 to 2009/10. The forecast is calculated as the five years from 2009/10 to 2014/15.

Table 4.3
Economic Growth (Real)

	NSW GSP	GDP	Difference (% points)
2004-2005	1.3%	2.8%	1.5%
2005-2006	1.1%	3.1%	2.0%
2006-2007	2.0%	3.8%	1.8%
2007-2008	2.8%	3.7%	0.9%
2008-2009	0.2%	1.1%	0.9%

sources:
5220.0 Australian National Accounts: State Accounts, Table 2, released 22 December 2009.
5204.0 Australian System of National Accounts, Table 2, released 8 December 2009.

Looking ahead, average annual labour costs in NSW and Australia are expected to pick up. Real average annual labour cost growth across NSW is expected to be 3.0 per cent, as NSW GSP is boosted by the infrastructure spending program. Meanwhile, labour costs across Australia are forecast to strengthen in light of the imminent economic recovery. As shown in Chart 4.3, labour costs in NSW and Australia are expected to be similar in the long term.

Chart 4.3
Annual Labour Cost Growth (All Industries): NSW and Australia
(nominal terms)
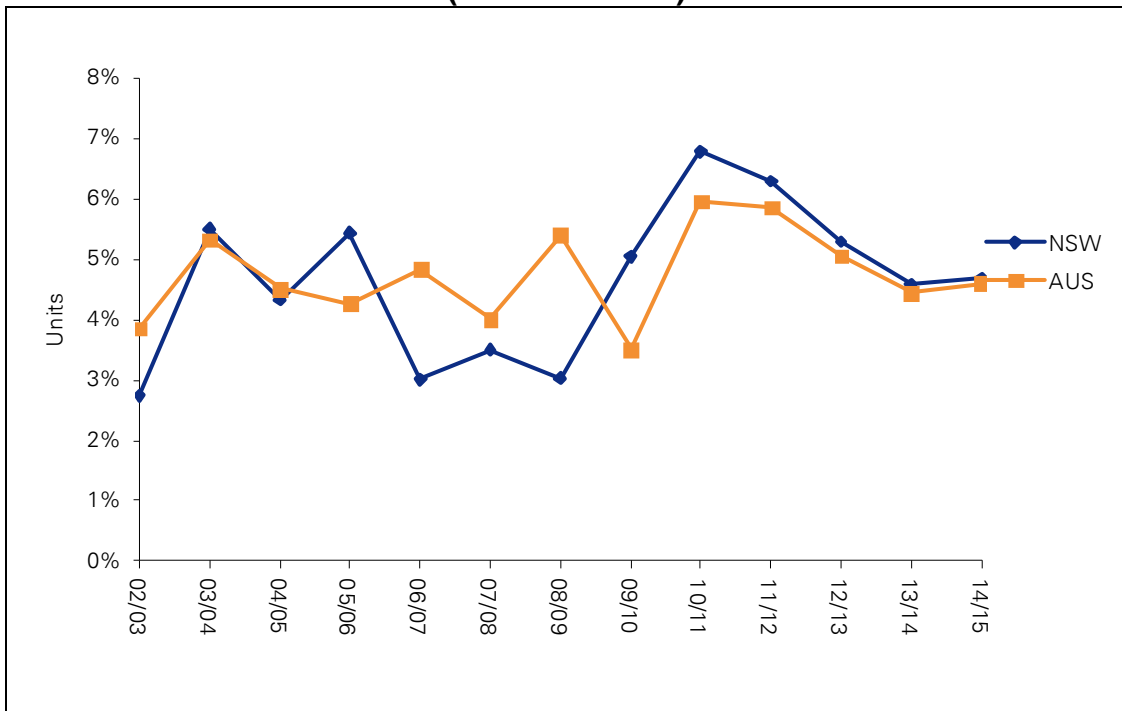
Source: LCM

4.3 Changes Since March 2009 Labour Cost Forecasts

KPMG Econtech's outlook for the economy has been revised upward since it provided its previous report to the AER in March 2009. It is now forecasting a recovery to occur earlier and be stronger than was previously expected.

The earlier and stronger economic recovery is expected to be caused by three factors. First, consumption growth has held up. Consumption has been boosted by the Government's stimulus package and the stronger-than-expected labour market. Consumer's use of these bonus payments and steady labour market conditions has kept consumption growth steady, rather than growing weakly as initially expected. Second, the Chinese economy has recovered more quickly than initially expected. Given that China is one of Australia's major trading partners, its quick recovery will support Australia's net exports. Third, the upturn in housing has occurred ahead of expectations. This has been driven by the Government's First Home Owners Boost. ABS Building Approvals data shows that the number of private sector houses was 27 per cent higher (seasonally adjusted) in the three months to November 2009, compared to the three months to November 2008[7].

As a consequence of the stronger economic outlook, the current labour cost growth projections are also stronger than expected in March 2009. Chart 4.4 shows that the projected real average annual labour cost growth for the EGWW industry in NSW has increased from 1.8 per cent to 4.5 per cent. Growth in the EGWW industry across Australia has also increased slightly, from 1.6 per cent to 4.2 per cent. These increases reflect the more optimistic view of the economy now, compared to March 2009. More generally, labour cost forecasts across all industries in NSW and Australia have increased, due to the current forecast of an earlier and stronger economic recovery.

There is also some difference in the forecasts as a result of the change in ANZSIC classifications, where the updated forecasts for the EGWW industry includes waste services.

---

[7] http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/8731.0Nov%202009?OpenDocument

Chart 4.4
Real Average Annual Labour Cost Growth Rates
(2009/10 to 2014/15)
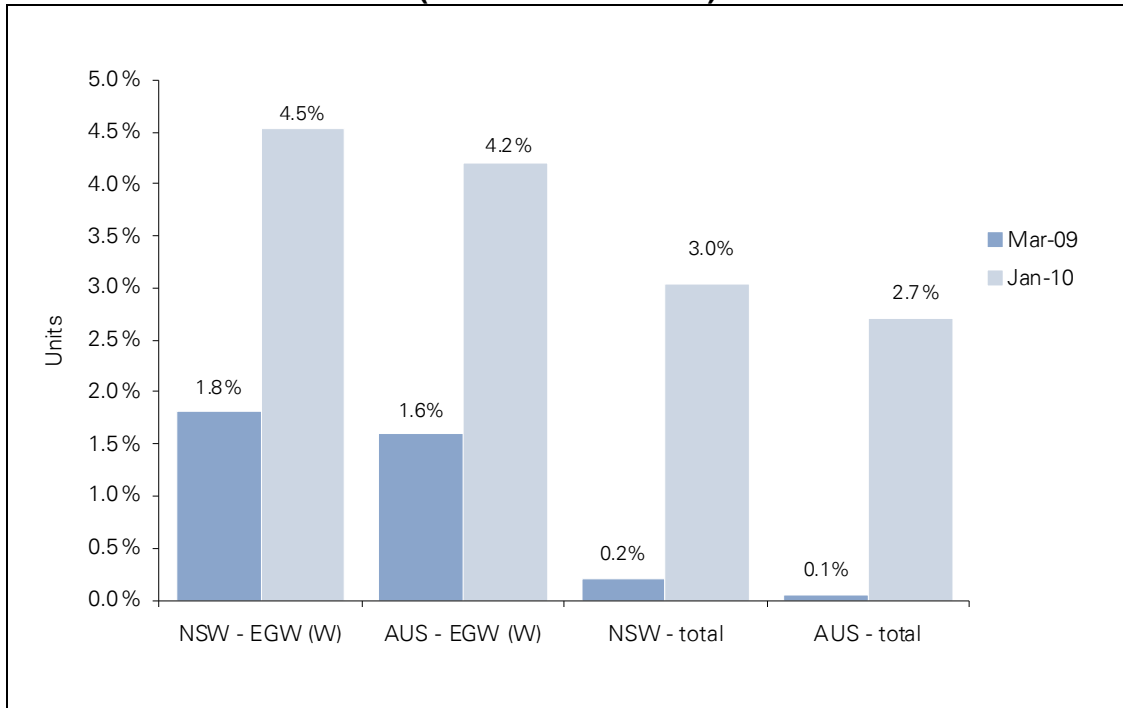
Source: LCM

Note: EGW stands for Electricity, Gas and Water Supply Industry. This refers to the ANZSIC 1993 industry classification that was used in March 2009. The January 2010 forecasts refer to the ANZSIC 2006 industry classification which refers to the Electricity, Gas, Water Supply and Waste Services Industry. The change in industry classification since March 2009 means that the forecast comparison is not comparing exactly the same industry structure. However, the structure is very close.

Attachment A – The Labour Cost Model (LCM)

Section 2 provides an overall perspective on the LCM model. This attachment to the report describes in more detail the modelling principles behind the LCM and the data sources used in the modelling.

There are four main steps in constructing a model such as the LCM. These steps are outlined below and then discussed in more detail in the following sections.

- The first step is to collect historical data on labour costs in the Australian economy.

- The second step is to forecast employees at both the state and industry level.

- The third step is to forecast wages at both the state and industry level.

- The fourth, and final step, is use the forecasts of employees and wages by state and by industry to produce detailed forecasts by state by industry.

LCM model

The Labour Costs Model (LCM) is made up of three excel workbooks: *regression models.xls*, *Wages_RAS.xls* and *LCM_results.xls* (as shown in Figure A.1).

Figure A.1
Structure of the Labour Cost Model
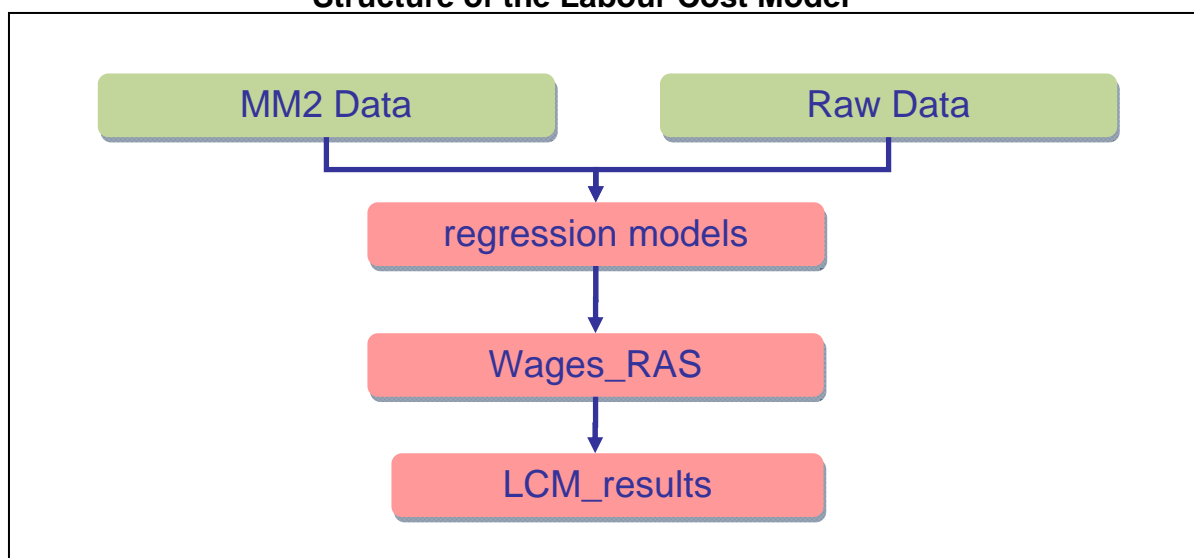
The role of each workbook is as follows:

- *regression models.xls* – read in raw ABS data and MM2 data; separately forecasts at the state and industry level, wages and employees.

- *Wages_RAS.xls* – converts the wages forecasts by state and by industry into detailed state by industry forecasts in the RAS.

- *LCM_results.xls* – uses the detailed wage forecasts to produce detailed forecasts of labour costs and growth rates by state by industry.

Data Sources

The first step involves collecting the appropriate data sources to forecast labour costs. The following data is used in the LCM.

- Average Weekly Earnings by State by Industry - Australian Bureau of Statistics, unpublished data from the *Average Weekly Earnings, Australia* publication (Catalogue no. 6302), November 2009.

- Employees by State by Industry - Australian Bureau of Statistics, *Labour Force, Australia, Detailed, Quarterly* (Catalogue no. 6291.0.55.003), November 2009, Data Cubes E06_nov84 and E06_aug94.

- Employed Persons by State by Industry - Australian Bureau of Statistics, *Labour Force, Australia, Detailed, Quarterly* (Catalogue no. 6291.0.55.003), November 2009.

- Forecasts of Employment by State and by Industry – KPMG Econtech, *MM2*, January 2010.

- Forecasts of Wages – KPMG Econtech, *MM2*, January 2010.

Data Conversion

First, average weekly earnings and employee figures are combined to obtain wages for employees. Second, the employment forecasts from the MM2 are converted to employee figures. This conversion is a technical issue because labour cost relates to employees, which exclude the self-employed.

The conversion from employment to employee figures is done by forecasting the share of employees in total employment. A logistic equation is used to estimate the share of employees in employment for each industry (or state). The logistic equation ensures that the forecast of shares of employees are between 0 per cent and 100 per cent. The logistic equation takes the form of

$$\ln\left(\frac{e_i}{1-e_i}\right)_t = \alpha_0 + \alpha_1 \ln\left(\frac{e_i}{1-e_i}\right)_{t-1} + \alpha_3 timetrend + \varepsilon$$
(1)

where e_i = the ratio of employee to total employment for industry *i* (or State *i*)

Subsequently, the number of employees is derived by multiplying the estimated shares above with the total employment forecasts from the MM2.

Forecasts Labour Cost by State and by Industry Separately

There are a few technical issues in directly modelling labour costs at the very detailed by state by industry level.

- First, the wage data by state by industry exhibits large volatility (most likely due to small sample sizes). In comparison, labour cost figures by state and by industry separately appear to be more stable.

- Second, modelling labour costs by state by industry would involve estimating 136 series in total, that is, 17 industries[8] in eight states/territories. This is a time consuming process.

- Third, and most importantly, separately estimating 136 labour cost series would potentially lead to inconsistencies in the estimates. As mentioned previously, it is important to ensure the total state and industry figures separately sum to the national figures.

To overcome these technical issues, KPMG Econtech has forecast labour costs by state and by industry separately. This is done by using historical state and industry wage data in combination with existing MM2 forecast of the national wage. These two data sources are used to forecast consistent wage relativities for each state and territory, and for each of the 17 ANZSIC broad industries, separately, using robust econometric analysis. The key driver of these forecasts is the tightness of the labour market in each state and in each industry.

The tightness in the labour market is indicated by the developments in labour demand and labour supply in each industry and in each state. These developments stem from Econtech's outlook for each state and industry. Notably, the labour demand by industry, and labour demand and labour supply by state are published in KPMG Econtech's *Australian, State and Industry Outlook (ANSIO)* publication.

Specifically, KPMG Econtech forecast the wage relativities between each industry and state. Wage relativity for industry *i* (or state *i*) is calculated as the product of industry *i* (or state *i*) average share of total employees and the industry *i* (or state *i*) wage ratio to the national wage.

$$
Wage\_relativity_i = \left(\frac{wage_i}{national\_wage} \right) \times average \left(\frac{employee_i}{total\_employee} \right)
$$
(2)

The wage relativities measure how wages in each industry (or state) compared with the national wages. For instance, a wage relativity that is higher than the average share of employees in that particular industry (or state), means that wages in that industry (or

---

[8] The LCM is based on the ANZSIC 1993 classification method which uses 17 broad industries. The forecasts for this report have been converted to the ANZSIC 2006 industry classification at the end of the modelling process, using calculated conversion factors.

state) are higher than the national wage, and vice versa. The feature of wages relativities is that the sum of the wage relativity of all industry (or state) will be one.

Next, regression equations are used to forecast industry and state wage relativities.

$$Wagerelativity_{i,t} = \beta_0 + \beta_1 timetrend + \alpha_1 Wagerelativity_{i,t-1} + \alpha_2 e_{i,t} + \alpha_3 e_{i,t-1} + \varepsilon$$

(3)

where e_i = industry i (or state i) share of total employees

Equation (3) contains two key elements of the LCM. First, wage relativities between industries are affected by industry employment demand as measured by an industry's share of national employment. An increase in the demand for labour in industry i would lead to an increase this industry share of employees. Consequently, wages relativity for this industry would increase as well.

Second, both industry and state wage relativities are modelled in a flexible dynamic framework that also allows for trend-related effects. Wage relativities in this period are expected to depend on the wage relativity in the previous period. At the same time, the wage relativities equation contains a time trend variable.

It is important to note that the wage relativity equations are the key equations in the LCM model.

After deriving the forecast of industry and state wage relativities, the next step is to forecast wages for each industry and state. This is done by first calculating the forecast of industry i (or state i) wage ratio to the national wage, which is the wage relativity of industry i (or state i) divided by its average share of total employees.

Essentially, rearranging Equation (2), we have the following equation

$$\left(\frac{wage_i}{national\_wage} \right) = Wage\_relativity_i / average\left(\frac{employee_i}{total\_employee} \right)$$

(2a)

Therefore, wages for each industry (or state) is obtained by multiplying the national wage by the wage relativity of industry i (or state i) divided by its average share of total employees.

$$Wage_i = National\_wage * Wage\_relativity_i / average\left(\frac{employee_i}{total\_employee} \right)$$

(2b)

Forecasting Labour Cost by State by Industry

The final step is to convert the forecasts of state wage relativities and industry wage relativities to forecasts of wage relativities by state by industry. A procedure known as the Residual Allocation System (RAS) is used.

The RAS procedure is applied to forecasts of wages to obtain the forecast by state by industry. The forecasts of wages are found in *Wages_RAS.xls*.

Wages and growth rates are then calculated in *LCM_results.xls*. Overall, this approach has the advantage that the final forecasts of wages by state by industry are fully consistent with the national wage forecasts supplied from MM2 in the first step.

Attachment B – Murphy Model 2 (MM2)

Econtech's forecasting tool, Murphy Model 2 (MM2), is Australia's leading national, industry and state forecasting model. It has a highly respected forecasting track record and is used by Federal and State Governments, industry associations, financial institutions and major companies. Subscriptions to forecasting reports and Windows-based forecasting software are available.

Development

The original Murphy Model was developed by Chris Murphy, after ten years of experience in macroeconometric modelling at the Australian Treasury, Economic Planning Advisory Council, and the Australian National University. In 1988, Chris published the first version of the Murphy Model in Australian Economic Papers, and it was soon recognised as Australia's leading national or macro model.

In 1994, the first major redevelopment of the model was undertaken to distinguish 12 industry sectors. This marked the introduction of the Murphy Model 2 (MM2), a fully integrated macro and industry model.

In 1995, under contract to two state treasuries, the MM2-States was developed as an extension to MM2. The MM2-States allocates a number of MM2's key outputs across the eight Australian States and Territories.

In the same year, the current version of MM2-Demographic was developed under contract to the Australian Bureau of Immigration Research. Using assumptions for fertility, mortality, overseas and interstate migration, it generates consistent state and national population scenarios.

In 1996, the MM2 was further developed to expand the sectoral detail from 12 sectors to the 18 sectors corresponding to the Australian and New Zealand Standard Industrial Classification (ANZSIC) industry divisions. The linkages between the three models are illustrated below.

```
┌─────────────────────────────────────────────────────────────────┐
│                   Demographic assumptions:                        │
│     fertility, net overseas migration, net interstate migration   │
└─────────────────────────────────────────────────────────────────┘
                               │
                               ▼
┌─────────────────────────────────────────────────────────────────┐
│                      MM2 Demographic                              │
└─────────────────────────────────────────────────────────────────┘
          │                                           │
          ▼                                           ▼
┌─────────────────────┐                     ┌─────────────────────┐
│ National population  │                     │  States population   │
│     projection       │                     │     projections      │
└─────────────────────┘                     └─────────────────────┘
          │                                           │
          ▼                                           ▼
┌─────────────────┐   ┌─────────────────┐   ┌─────────────────┐
│   MM2-core      │──▶│ National & industry│──▶│   MM2-States    │
│ & judgmental    │   │ economic projection│   │ & judgmental    │
│ adjustments     │   └─────────────────┘   │ adjustments     │
└─────────────────┘                         └─────────────────┘
          │                                           │
          ▼                                           ▼
┌─────────────────────┐                     ┌─────────────────────┐
│ Rest-of-world        │                     │ States economic      │
│ assumptions;         │                     │ projection           │
│ government policy    │                     │                      │
│ assumptions          │                     │                      │
└─────────────────────┘                     └─────────────────────┘
```

Features

MM2 is a state-of-the-art, fully-integrated macro-industry model with the following features:

- produces quarter-by-quarter nine-year-ahead forecasts;
- forward-looking financial sector for realism;
- Keynesian short-run for forecasting; and
- neoclassical long-run for policy analysis.

Documentation

Powell, A.A. and Murphy, C.W. (1997), *Inside a Modern Macroeconometric Model - A Guide to the Murphy Model, Springer*, Berlin, 2nd ed., 455pp.

Attachment C – Nominal Labour Costs

Table C1
Annual Nominal Labour Costs (Average Weekly Earnings, Original)

| | Electricity, Gas, Water and Waste Services | | Total | |
	NSW	Australia	NSW	Australia
2004-2005	1,316	1,275	775	737
2005-2006	1,370	1,318	817	768
2006-2007	1,395	1,367	841	805
2007-2008	1,451	1,402	871	837
2008-2009	1,488	1,434	892	855
2009-2010	1,540	1,476	899	857
2010-2011	1,614	1,540	923	876
2011-2012	1,716	1,632	964	912
2012-2013	1,822	1,729	1,009	953
2013-2014	1,908	1,808	1,045	985
2014-2015	1,979	1,873	1,074	1,012

Source: LCM

Table C2
Annual Nominal Labour Cost Growth (%)

| | Electricity, Gas, Water and Waste Services | | Total | |
	NSW	Australia	NSW	Australia
2004-2005	0.7%	3.0%	4.3%	4.5%
2005-2006	4.1%	3.4%	5.4%	4.2%
2006-2007	1.9%	3.7%	3.0%	4.8%
2007-2008	4.0%	2.6%	3.5%	4.0%
2008-2009	2.6%	2.2%	2.4%	2.1%
2009-2010	3.5%	3.0%	0.8%	0.2%
2010-2011	4.8%	4.3%	2.7%	2.2%
2011-2012	6.3%	6.0%	4.5%	4.1%
2012-2013	6.2%	5.9%	4.7%	4.4%
2013-2014	4.7%	4.6%	3.5%	3.4%
2014-2015	3.7%	3.6%	2.8%	2.7%

Source: LCM

Table C3
Quarterly Nominal Labour Costs (Average Weekly Earnings, Original)

	Electricity, Gas, Water and Waste Services		Total	
	NSW	Australia	NSW	Australia
Sep-05	1,353	1,302	803	755
Dec-05	1,367	1,312	814	763
Mar-06	1,376	1,324	822	772
Jun-06	1,383	1,336	828	781
Sep-06	1,382	1,350	832	792
Dec-06	1,388	1,362	838	801
Mar-07	1,398	1,373	845	810
Jun-07	1,412	1,382	852	818
Sep-07	1,432	1,390	861	827
Dec-07	1,446	1,398	868	835
Mar-08	1,458	1,407	875	842
Jun-08	1,467	1,415	880	846
Sep-08	1,472	1,421	886	851
Dec-08	1,482	1,428	891	855
Mar-09	1,493	1,438	895	858
Jun-09	1,506	1,448	896	858
Sep-09	1,518	1,458	894	854
Dec-09	1,531	1,468	896	855
Mar-10	1,547	1,482	900	857
Jun-10	1,565	1,498	906	862
Sep-10	1,583	1,513	912	867
Dec-10	1,601	1,529	918	872
Mar-11	1,623	1,548	926	879
Jun-11	1,649	1,571	936	888
Sep-11	1,677	1,597	948	898
Dec-11	1,703	1,620	958	907
Mar-12	1,729	1,644	969	917
Jun-12	1,755	1,668	981	927
Sep-12	1,785	1,695	993	939
Dec-12	1,811	1,719	1,005	949
Mar-13	1,835	1,741	1,015	958
Jun-13	1,857	1,761	1,024	966
Sep-13	1,878	1,780	1,032	974
Dec-13	1,899	1,800	1,041	982
Mar-14	1,919	1,818	1,049	989
Jun-14	1,937	1,834	1,057	996
Sep-14	1,951	1,847	1,062	1,001
Dec-14	1,969	1,863	1,070	1,007
Mar-15	1,988	1,881	1,078	1,015
Jun-15	2,009	1,900	1,088	1,024

Source: LCM

Table C4
Quarterly Nominal Labour Cost Growth (%)

	Electricity, Gas, Water and Waste Services		Total	
	NSW	Australia	NSW	Australia
Dec-05	1.0%	0.8%	1.3%	1.0%
Mar-06	0.7%	0.9%	1.0%	1.1%
Jun-06	0.5%	0.9%	0.7%	1.2%
Sep-06	-0.1%	1.1%	0.4%	1.4%
Dec-06	0.5%	0.9%	0.7%	1.2%
Mar-07	0.7%	0.8%	0.8%	1.1%
Jun-07	1.0%	0.7%	0.9%	1.0%
Sep-07	1.4%	0.6%	1.1%	1.1%
Dec-07	1.0%	0.6%	0.9%	1.0%
Mar-08	0.8%	0.6%	0.7%	0.8%
Jun-08	0.6%	0.6%	0.6%	0.5%
Sep-08	0.3%	0.4%	0.7%	0.6%
Dec-08	0.6%	0.6%	0.6%	0.5%
Mar-09	0.8%	0.6%	0.4%	0.3%
Jun-09	0.9%	0.7%	0.2%	0.0%
Sep-09	0.8%	0.6%	-0.3%	-0.4%
Dec-09	0.9%	0.7%	0.2%	0.0%
Mar-10	1.0%	0.9%	0.4%	0.3%
Jun-10	1.2%	1.1%	0.7%	0.6%
Sep-10	1.1%	1.0%	0.7%	0.6%
Dec-10	1.2%	1.1%	0.7%	0.6%
Mar-11	1.4%	1.3%	0.9%	0.8%
Jun-11	1.6%	1.5%	1.1%	1.0%
Sep-11	1.7%	1.6%	1.3%	1.2%
Dec-11	1.5%	1.4%	1.1%	1.0%
Mar-12	1.5%	1.5%	1.1%	1.1%
Jun-12	1.5%	1.5%	1.2%	1.1%
Sep-12	1.7%	1.6%	1.3%	1.3%
Dec-12	1.5%	1.4%	1.1%	1.1%
Mar-13	1.3%	1.3%	1.0%	1.0%
Jun-13	1.2%	1.1%	0.9%	0.8%
Sep-13	1.1%	1.1%	0.8%	0.8%
Dec-13	1.1%	1.1%	0.9%	0.8%
Mar-14	1.0%	1.0%	0.8%	0.8%
Jun-14	0.9%	0.9%	0.7%	0.7%
Sep-14	0.7%	0.7%	0.5%	0.5%
Dec-14	0.9%	0.9%	0.7%	0.7%
Mar-15	1.0%	1.0%	0.8%	0.8%
Jun-15	1.0%	1.0%	0.9%	0.9%

Source: LCM

Attachment D – Real Labour Cost Growth Rates

Table D1
Annual Real Labour Costs (Average Weekly Earnings, Original)

	Electricity, Gas, Water and Waste Services		Total	
	NSW	Australia	NSW	Australia
2004-2005	1,398	1,355	823	782
2005-2006	1,410	1,357	841	790
2006-2007	1,395	1,367	841	805
2007-2008	1,403	1,356	842	810
2008-2009	1,396	1,345	837	802
2009-2010	1,421	1,362	829	791
2010-2011	1,464	1,397	837	795
2011-2012	1,511	1,437	849	804
2012-2013	1,565	1,485	867	818
2013-2014	1,602	1,518	877	827
2014-2015	1,622	1,535	880	829

Source: LCM
Note: real costs based on 2006/07 prices

Table D2
Annual Real Labour Cost Growth (%)

	Electricity, Gas, Water and Waste Services		Total	
	NSW	Australia	NSW	Australia
2004-2005	-1.7%	0.6%	1.8%	2.0%
2005-2006	0.9%	0.2%	2.2%	1.0%
2006-2007	-1.0%	0.7%	0.1%	1.9%
2007-2008	0.6%	-0.8%	0.1%	0.6%
2008-2009	-0.6%	-0.9%	-0.7%	-1.0%
2009-2010	1.8%	1.3%	-0.9%	-1.4%
2010-2011	3.0%	2.6%	0.9%	0.5%
2011-2012	3.2%	2.9%	1.4%	1.1%
2012-2013	3.6%	3.3%	2.1%	1.8%
2013-2014	2.4%	2.2%	1.2%	1.0%
2014-2015	1.2%	1.1%	0.4%	0.3%

Source: LCM

Table D3
Quarterly Real Labour Costs (Average Weekly Earnings, Original)

	Electricity, Gas, Water and Waste Services		Total	
	NSW	Australia	NSW	Australia
Mar-05	1394	1,354	824	784
Jun-05	1399	1,358	830	787
Sep-05	1410	1,356	837	787
Dec-05	1416	1,360	843	791
Mar-06	1414	1,360	845	793
Jun-06	1399	1,351	838	790
Sep-06	1385	1,353	834	794
Dec-06	1393	1,367	841	804
Mar-07	1403	1,377	847	812
Jun-07	1400	1,369	844	810
Sep-07	1410	1,367	847	814
Dec-07	1410	1,363	846	814
Mar-08	1403	1,354	842	810
Jun-08	1391	1,341	834	802
Sep-08	1380	1,332	831	797
Dec-08	1393	1,343	838	804
Mar-09	1402	1,350	840	805
Jun-09	1407	1,354	838	802
Sep-09	1405	1,349	828	791
Dec-09	1416	1,358	828	790
Mar-10	1424	1,364	828	789
Jun-10	1439	1,377	833	793
Sep-10	1451	1,387	836	795
Dec-10	1458	1,392	836	794
Mar-11	1467	1,399	837	794
Jun-11	1479	1,410	840	796
Sep-11	1493	1,422	844	800
Dec-11	1505	1,432	847	802
Mar-12	1517	1,442	850	804
Jun-12	1530	1,454	855	808
Sep-12	1546	1,469	861	813
Dec-12	1560	1,481	865	817
Mar-13	1572	1,491	869	820
Jun-13	1581	1,499	872	823
Sep-13	1590	1,507	874	824
Dec-13	1599	1,515	877	827
Mar-14	1606	1,522	879	828
Jun-14	1612	1,526	879	829
Sep-14	1614	1,528	879	828
Dec-14	1618	1,532	879	828
Mar-15	1624	1,537	881	829
Jun-15	1630	1,542	883	831

Source: LCM
Note: real costs based on 2006/07 prices

Table D4
Quarterly Real Labour Cost Growth (%)

	Electricity, Gas, Water and Waste Services		Total	
	NSW	Australia	NSW	Australia
Sep-05	0.7%	-0.1%	0.8%	0.0%
Dec-05	0.5%	0.3%	0.8%	0.5%
Mar-06	-0.1%	0.0%	0.2%	0.3%
Jun-06	-1.1%	-0.7%	-0.8%	-0.4%
Sep-06	-1.0%	0.2%	-0.5%	0.5%
Dec-06	0.6%	1.0%	0.9%	1.3%
Mar-07	0.7%	0.7%	0.7%	1.0%
Jun-07	-0.2%	-0.6%	-0.3%	-0.2%
Sep-07	0.7%	-0.1%	0.4%	0.4%
Dec-07	0.0%	-0.3%	-0.1%	0.0%
Mar-08	-0.5%	-0.7%	-0.6%	-0.6%
Jun-08	-0.8%	-0.9%	-0.9%	-0.9%
Sep-08	-0.8%	-0.7%	-0.5%	-0.6%
Dec-08	0.9%	0.9%	0.9%	0.8%
Mar-09	0.6%	0.5%	0.3%	0.2%
Jun-09	0.4%	0.3%	-0.3%	-0.4%
Sep-09	-0.1%	-0.3%	-1.2%	-1.4%
Dec-09	0.8%	0.6%	0.1%	0.0%
Mar-10	0.6%	0.4%	0.0%	-0.2%
Jun-10	1.1%	1.0%	0.6%	0.4%
Sep-10	0.8%	0.7%	0.4%	0.3%
Dec-10	0.5%	0.4%	0.0%	-0.1%
Mar-11	0.6%	0.5%	0.1%	0.0%
Jun-11	0.8%	0.7%	0.4%	0.3%
Sep-11	0.9%	0.9%	0.5%	0.4%
Dec-11	0.8%	0.7%	0.4%	0.3%
Mar-12	0.8%	0.7%	0.4%	0.3%
Jun-12	0.9%	0.8%	0.5%	0.5%
Sep-12	1.1%	1.0%	0.7%	0.6%
Dec-12	0.9%	0.8%	0.5%	0.5%
Mar-13	0.7%	0.7%	0.4%	0.4%
Jun-13	0.6%	0.6%	0.3%	0.3%
Sep-13	0.6%	0.5%	0.3%	0.2%
Dec-13	0.6%	0.5%	0.3%	0.3%
Mar-14	0.5%	0.4%	0.2%	0.2%
Jun-14	0.3%	0.3%	0.1%	0.1%
Sep-14	0.1%	0.1%	-0.1%	-0.1%
Dec-14	0.3%	0.3%	0.1%	0.0%
Mar-15	0.3%	0.3%	0.1%	0.1%
Jun-15	0.4%	0.4%	0.2%	0.2%

Source: LCM