

Jemena Gas Networks (NSW) Ltd - Initial response to the draft decision

Appendix 11.1

NIEIR: Natural gas projections NSW Jemena Gas Networks to 2015 - March 2010

19 March 2010



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Natural gas projections NSW Jemena Gas Networks to 2015

**A report for
Jemena Gas Networks (NSW) Ltd**

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March 2010

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1. Introduction

Jemena Gas Networks (NSW) commissioned the National Institute of Economic and Industry Research (NIEIR) to develop forecasts of natural gas sales and customer numbers.

These forecasts were to be prepared on a financial year basis and to cover each major tariff group. The key staff at NIEIR involved in the forecasts are outlined in Appendix B.

This report summarises the economic outlook for Australia and New South Wales, outlines the methodologies employed and then summarises the forecasts of volumes by tariff group.

The background and scope for the study is reproduced below.

1.1 Background

JGN is currently engaged with the Australian Energy Regulator (AER) in a review of its Access Arrangement (AA). JGN submitted a revised AA in August 2009 which, if approved, will cover the period 2010/11-2014/15 (July to June financial years).

Under the National Gas Law (section 28), in making a decision on whether to approve JGN's AA proposal, the AER must have regard to the National Gas Objective (in section 23 of the National Gas Law), which is:

“to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas.”

The AER may also take into account the pricing principles in section 24(2) of the National Gas Law, and must do so when considering whether to approve a reference tariff:

“A service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs in –

- (a) providing reference services; and*
- (b) complying with a regulatory obligation or requirement or making a regulatory payment.”*

And Rule 74 of the National Gas Rules which applies to forecasts and estimates provides:

“(1) Information in the nature of a forecast or estimate must be supported by a statement of the basis of the forecast or estimate.

(2) A forecast or estimate:

- (a) must be arrived at on a reasonable basis; and*
- (b) must represent the best forecast or estimate possible in the circumstances.”*

With its proposed access arrangement dated 25 August 2009, JGN submitted gas demand forecasts prepared by NIEIR for JGN as Appendix 5.2 of its access arrangement information. JGN also summarised the NIEIR report and made slight additions to it in chapter 5 of JGN's access arrangement information.

On 10 February 2010 the AER published its draft decision on JGN's AA revision proposal. If JGN wishes to revise its proposal in response to the AER's draft decision, it must submit the revised proposal to the AER by 19 March 2010. Submissions on the AER's draft decision close on 28 April 2010, however, JGN is hopeful of submitting both any revised proposal as well as its response to the draft decision at the same time, by 19 March 2010.

AER draft decision

The AER considers JGN's demand forecasts in chapter 11 of the draft decision. The AER's Amendment 11.1 requires JGN to delete Table 5-11 in the access arrangement information and replace it with the table in the AER's draft decision (pages 252-253).

The AER commissioned ACIL Tasman to review the JGN forecast. The AER has rejected JGN's forecasts based on NIEIR's detailed econometric approach and replaced them with ACIL Tasman forecasts based on a five year historical trend. Over the regulatory period, the gas consumption forecasts prepared by ACIL Tasman increase above JGN/NIEIR's by 9.9 per cent (volume customers) and 5.7 per cent (demand customers). Customer numbers and demand MDQ are unchanged.

AER rejected the JGN/NIEIR forecast on the grounds that:

- JGN has not provided sufficient justification for the steepness of its proposed rate of decline in the average consumption per customer from the last year of the earlier access arrangement period to the first year of the access arrangement period and subsequently over the access arrangement period; and
- JGN's proposed forecasts for demand users for the access arrangement period are understated and therefore do not reflect forecasts arrived at on a reasonable basis that represent the best estimate possible in the circumstances.

Accordingly JGN engaged NIEIR to review and update the assumptions previously used in its April 2009 forecast supplied to JGN, and to the extent these assumptions are different to those used in the April 2009 forecast, re-run its forecasting model and update this forecast where necessary.

1.2 Scope of work – forecasts of demand for the services provided by JGN

The objectives of the project, as outlined in the study brief are that, a recognised independent expert is to develop the forecast JGN will use in preparing the volumes of gas to be transported for the period relating to revised access arrangement submission.

JGN required an opinion report detailing the quantitative incremental impacts (both positive and negative) of each of the following contributing factors during the period 2009-10 to 2014-15 upon:

1. annual gas consumption of JGN's existing residential, business and large industrial consumers;
2. annual gas consumption of JGN's new residential, business and large industrial consumers; and
3. hourly and daily demand for business and large industrial consumers using more than 10 terajoules per annum.

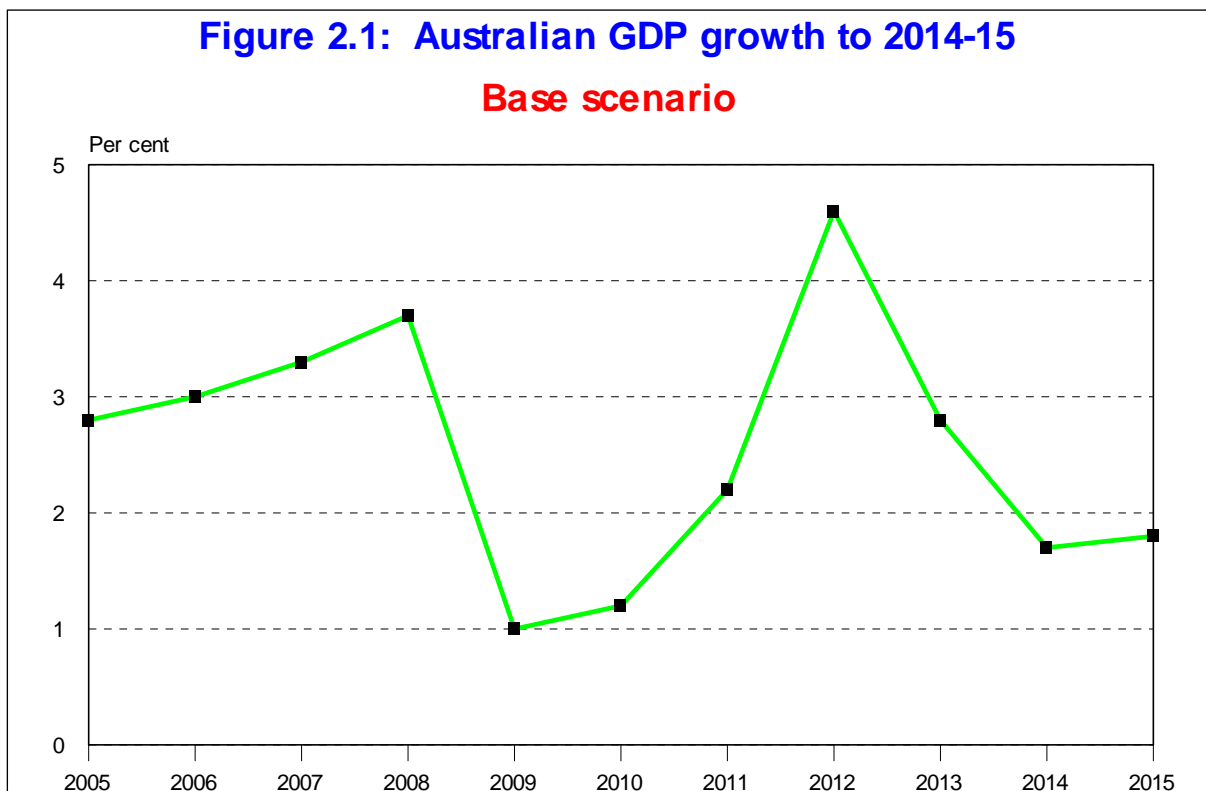
The contributing factors to be considered are:

- (a) market trends affecting the installation of existing gas appliances, including but not limited to, the impacts of installing alternative appliances such as reverse cycle air conditioning in lieu of gas heating, continuous flow gas systems in lieu of storage gas systems, solar or electrical systems, and the impacts of water conservation measures on the consumption of hot water;
- (b) government energy efficiency policies including but not limited to, minimum efficiency performance standards for gas hot water systems, energy efficiency home rating schemes, business energy efficiency reporting schemes and hot water rebate schemes for solar and heat pump hot water system replacements; and
- (c) implementation of the Government's Carbon Pollution Reduction Scheme including the impacts on fuel substitution, reduction in demand of increased cost of gas especially in the large industrial market, economics of small and large scale cogeneration and electricity production.

2. The economic outlook for Australia to 2014-15

2.1 Introduction

This section provides an outline of the economic outlook for Australia to 2014-15 for the base scenario. Figure 2.1 shows the outlook for Australian gross domestic product to 2014-15 by scenario. Table 2.1 shows the projected annual Australian GDP growth rates to 2014-15 for the base scenario. Part 2.2 of this section provides a more detailed outlook for the Australian economy to 2014-15 for the base scenario.



Note: Financial years ending June.

Table 2.1 Australian GDP growth 2004-05 to 2014-15 – base scenario

Base	
Per cent change	
2004	4.0
2005	2.8
2006	3.0
2007	3.3
2008	3.7
2009	1.0
2010	1.2
2011	2.2
2012	4.6
2013	2.8
2014	1.7
2015	1.8
Compound growth rate (per cent)	
2008-2010	1.1
2010-2015	2.6

Note: All growth rates refer to financial years ending June.

2.2 An overview of the medium-term outlook for the world and Australian economies

2.2.1 Introduction

The economic mood has shifted considerably since early in 2009. This lifting of mood is associated with the reality that economies are either growing again (mainly in Asia) or are approaching their trough level of economic activity. The factors leading to this outcome include one-off features associated with stimulatory packages, such as the “cash for clankers” program in the United States which has stimulated motor vehicle sales. How much underlying damage in balance sheets still remains, no-one can be sure. What can be drawn from this is the firm conclusion that the massive stimulus packages are working and economic stability has been achieved.

The great uncertainty is the speed and sustainability of the recovery. At this stage a conservative approach is required.

Once employment begins to grow strongly again (over 2012) housing can be expected to grow sharply given the underlying stock shortage. This is despite a return to more normal interest rates.

2.2.2 The world economy

Over the first few months of 2009 the world economy was in free fall and predictions of a decline in world GDP of around 3.0 per cent for 2009 were common. Governments put in place stimulatory packages which amounted to around A\$4 trillion, or 4.0 per cent of GDP. Moreover, governments, including the Australian Government, moved with unprecedented speed in delivering the fiscal support to businesses and households. As a result, by August 2009 it appeared the world recession is near bottom and the decline in world GDP for 2009 will be of the order of 1.4 to 2.0 per cent, or approximately half of what was originally predicted earlier in the year.

For the June quarter the rate of decline in the United States economy was reduced to 0.25 per cent or, as the Americans like to say, to a 1.0 per cent decline at annual rates. In July there was the first drop in the United States unemployment rate, from 9.5 per cent in June to 9.4 per cent in July. The US\$0.8 trillion stimulus is estimated to have lifted June quarter employment growth by 2.3 per cent compared to what otherwise would have been the case. That is, without the fiscal stimulus the quarterly decline would have been 2.5 per cent.

What has also stopped the recession from becoming a depression in the United States has been the public sector injection of equity, loans and loan guarantee coverage of the financial system.

The massive decline in inventories in the United States is now ending, simply because inventories have fallen to very low levels. Over the next nine months, inventories will have to be rebuilt, which will artificially inflate growth rates, not only in the United States but around the world. During the short term United States economic growth may approach 3.0 per cent at annual rates. However, this will fall as the inventory cycle peters out along with such stimulus measures as the “cash for clankers” incentives which gives up to US\$4,500 for an old car exchanged for a new one. This program runs out by year end.

China implemented a stimulus package that falls not all that far short of the United States effort. Also, there was a massive expansion in bank loans with the result that total loans for

the 2008-09 fiscal year exceeded the target by US\$1 trillion. Not surprisingly, given the level of stimulus, China's growth rate accelerated from 6.1 per cent in the first quarter to just under 8.0 per cent in the second quarter.

In terms of the other small number of countries for which second quarter GDP is available, South Korea rebounded strongly in the second quarter under the impact of very large fiscal stimulus and registered a growth rate of 2.5 per cent for the quarter. However, GDP is still 2.5 per cent down on the level of a year ago. Singapore registered a 5.0 per cent GDP growth for the June quarter but is still 4.0 per cent down for the year. The United Kingdom declined by 0.8 per cent for the June quarter and is 5.6 per cent down in terms of the GDP levels of a year earlier. Sweden is 6.0 per cent down in GDP mid-year to mid-year.

In terms of Europe, the economic profile is expected to resemble the United States. Indeed the Euro area seems to have just stabilised in the June quarter. For much of Asia, the economic profile is expected to be a more rapid recovery as has been exhibited so far by China, Korea and Singapore.

For the euro area the rate of decline in GDP is expected to be 3.0 to 3.5 per cent for 2009. For Japan the rate of decline in GDP is expected to be 4.0 to 5.0 per cent for 2009 compared to a 9.0 per cent decline to the March quarter.

The evidence is that the world economy has stabilised in 2009 and growth will be positive in 2010. The attached graph shows a 2.1 per cent projected growth rate for 2010 and 3.0 per cent for 2011. For 2010 the European and Northern American growth rates are projected to be in the 0.5 to 1.5 per cent range and 1.0 to 2.0 per cent for 2011. By 2011 Asia's growth rates are projected to be in the range of 3.0 to 4.0 per cent. China's growth rate for 2011 is projected to be in the vicinity of 9.0 per cent, increasing to 10.5 per cent in 2012. In 2012 most countries are expected to have growth rates resembling their 2004-2008 averages with world GDP growth approximately 5.0 per cent.



However, the 2012 growth rates are unlikely to be sustained. Firstly, there are the inflationary pressures from 2008 that have been swept under the carpet as a result of the current recession that will quickly re-emerge as a major constraint on growth. First and foremost of problems in this regard is the price of oil. The current low oil prices, world economic activity and low levels of supply of equity and loan capital will mean that the shortage of petroleum industry capacity that led to the high price of oil in 2008 will not be alleviated. With the recovery profile for the world economy, given in the attached figure, severe upward pressure on oil prices can be expected by 2012. The inflationary pressures that will result from this will place a brake on world growth post 2012 as world interest rates increase to contain inflationary pressures.

The next major constraint in world growth will come from fiscal policy. The attached table shows the large increase in public debt to GDP ratio required to stabilise the world economy and engineer the growth profile to 2012 discussed above. The table also shows the large increase in contractionary fiscal policy in 2014 required to stabilise debt to GDP ratio. Primary balance is the difference between government revenue and current expenditures. The table shows the increase in the primary balance to stabilise the debt to GDP ratio at 2014 levels for countries with a 2014 debt to GDP ratio of less than 60 per cent, while for countries with debt to GDP ratios above 60 per cent to reach the 60 per cent threshold by 2029.

The inference from the table is clear. The constraints on public sector finances to drive economic growth post 2014 will be severe.

Government intervention to stabilise the financial system to avoid collapse has succeeded. However, the focus of restoring the quality of financial sector balance sheets will take many years and will impose a de facto credit squeeze on many economies for a long time.

Finally, the costs of adjustment to adopting a low carbon future will mean resources will have to be directed from capacity expansion to capital deepening.

The world economy is regarded to be in recession if GDP growth is less than 3.0 per cent. At best the world economy for the post 2012 period will be performing as best as can be expected if economic growth is only marginally above recession levels. This is the outlook that is adopted here.

Table 2.2 Debt stabilisation and primary balance (in % of GDP)									
	Pre-crisis WEO projections				Current WEO projections				Debt stabilising PB or PB needed to bring debt to benchmark level (shaded)
	Debt		Primary balance		Debt		Primary balance		
	2009	2012	2009	2012	2009	2014	2009	2014	
Advanced countries									
Australia	7.8	6.0	0.9	0.6	13.7	25.9	-4.3	-0.4	0.3
Austria	56.8	51.5	2.2	2.0	70.0	83.7	-1.5	-1.2	2.3
Belgium	79.2	71.2	3.7	3.5	98.1	111.1	-0.5	-1.3	4.3
Canada	61.0	51.3	1.2	0.5	75.6	65.4	-3.5	-0.4	1.0
Denmark	16.1	6.6	3.5	2.3	26.1	30.0	-2.2	-0.7	0.3
Finland	29.6	26.8	3.2	1.8	40.6	54.4	-2.5	-3.0	0.5
France	63.0	60.5	-0.3	0.8	77.4	95.5	-5.3	-2.1	3.1
Germany	61.1	59.4	2.1	2.0	79.8	91.4	-2.3	1.9	2.8
Greece	75.0	70.1	1.5	1.7	108.8	133.7	-1.5	-3.1	5.9
Iceland	28.8	27.4	-1.6	-0.6	139.9	134.1	-7.7	7.6	5.9
Ireland	23.6	23.2	0.5	0.4	59.9	82.2	-10.3	1.6	2.2
Italy	104.1	102.0	2.5	2.6	117.3	132.2	-0.9	0.5	5.8
Japan	194.2	189.6	-1.8	-0.2	217.4	239.2	-9.0	-5.1	9.8
Korea	32.5	31.8	4.3	4.3	35.8	39.4	-1.6	3.8	0.4
Netherlands	42.4	33.1	2.8	2.9	66.2	80.9	-3.1	0.2	2.1
New Zealand	20.8	20.7	2.3	2.1	23.4	53.9	-2.1	-4.6	0.5
Norway	43.8	43.8	13.0	9.6	67.2	67.2	4.9	8.4	1.1
Portugal	63.6	57.0	1.3	2.1	73.3	87.5	-3.3	0.8	2.6
Spain	32.4	29.7	1.6	1.5	54.7	81.2	-8.5	-4.0	2.1
Sweden	33.6	21.1	2.1	2.7	43.5	49.4	-4.8	-0.6	0.5
United Kingdom	42.9	42.5	-0.5	0.2	68.6	99.7	-10.0	-3.8	3.4
United States	63.4	65.8	-0.8	-0.3	88.8	112.0	-12.3	0.3	4.3
PPP-weighted average	74.8	73.6	0.3	0.7	95.8	114.7	-8.0	-0.7	4.2
G-20	79.5	78.9	-0.1	0.5	100.6	119.7	-8.6	-0.6	4.5
High debt	79.4	78.4	0.1	0.5	101.8	121.7	-8.5	-0.9	4.5
Low debt	24.3	21.3	2.9	2.8	30.0	37.8	-2.8	1.1	0.4

Source: IMF, "The State of Public Finances: A Cross Country Fiscal Monitor", June 2009.

2.2.3 Australian economic outlook for forecast period

Because of the speed and scale of the government fiscal resources and because Australia had limited access to world manufacturing supply chains, the impact of the GFC on the economy has been blunted. Whether or not Australia has experienced a technical recession will depend on the revisions to the National Accounts. It will also depend on what happens to exports and, in particular, over the next 18 months, to the extent that Governments continue to support economic recovery.

Over the medium term the strength of economic growth will depend on:

- (i) the willingness of households to save and accumulate debt; and
- (ii) the willingness of foreign capital to finance the Australian economy.

The March quarter 2009 first cut Australian Bureau of Statistics' National Accounts was particularly inconsistent.

Demand GDP grew by 1.0 per cent in real terms and industry based GDP fell by 1.0 per cent in real terms. The high demand GDP reflected the growth in real exports, which appeared inconsistent with export volume (tonnage, etc.) data. The demand side GDP measure could well be revised downwards, giving a negative growth rate for the quarter and hence satisfying the formal definition of a recession.

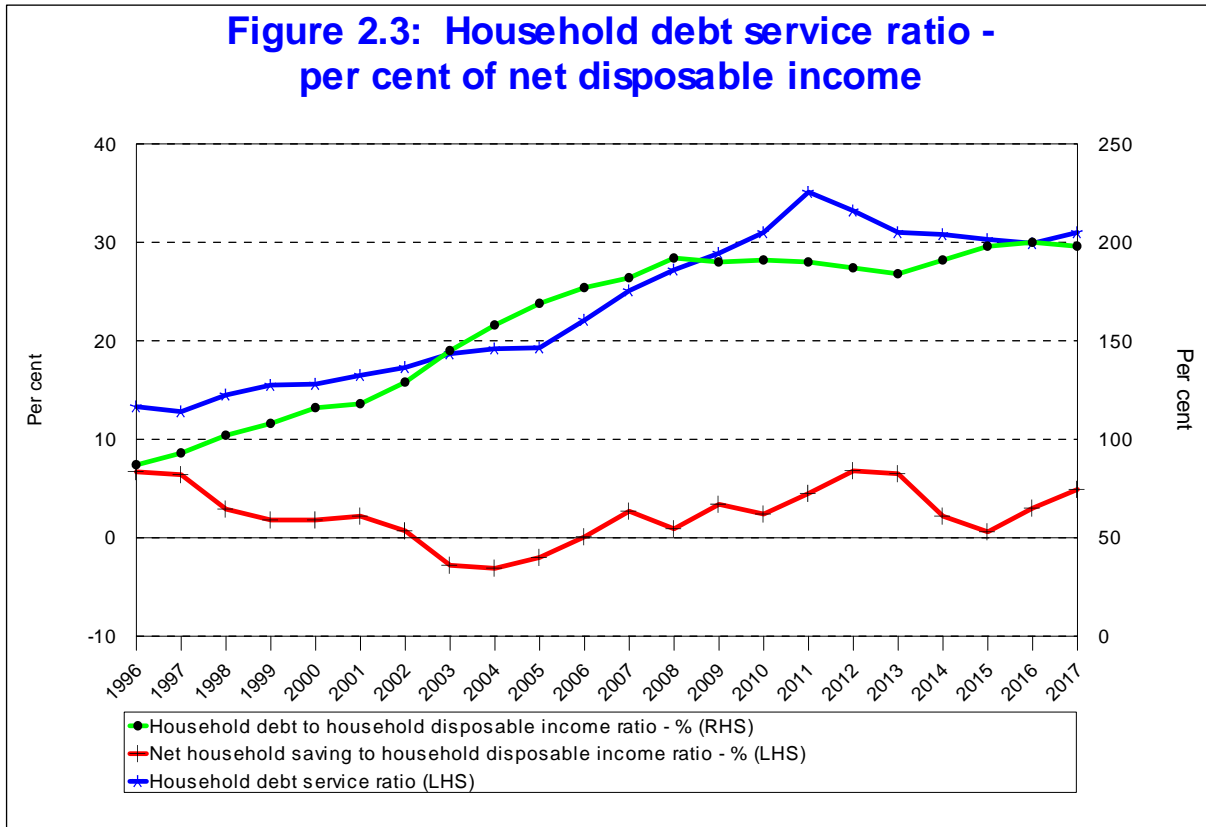
Nevertheless, export volumes have held up well considering the deep fall in world trade. However, this is partly due to China continuing to stockpile commodities on the grounds that current prices are low. Over the next 12 months, however, the Chinese could well decide to:

- (i) run down stocks; and
- (ii) direct demand away from Australia and towards Brazil, Africa, etc.

Over the 2001 to 2008 period private consumption expenditure contributed around 2.0 percentage points to Australia's GDP growth. This is unlikely to be repeated on any sustained basis. The reason for this can be seen from the following figure. Between 2001 and 2008 the ratio of net household debt to net household disposable income increased from 118 to 192 per cent while the average household savings ratio for the period has near zero. It can also be noted from the figure that the increase in debt and the increase in interest rates over the 2005 to 2008 period drove the household debt service ratio from 17 per cent of income to 27 per cent of income in 2008. This alone would have substantially slowed Australia's economic growth rate, irrespective of the GFC.

The focus is, however, on the future. The 2009 debt to income and debt service ratios in 2008 and 2009 probably represent near ceiling levels. This means that although on a sustained basis borrowing to drive consumption expenditure and the associated very low savings ratios have come to an end. In turn this means that the growth in consumption expenditure relative to income will be constrained to the outcomes which stabilise the average household savings ratio at around 4.0 to 6.0 per cent of income, the household debt to income ratio at around 190 to 200 per cent of income and the household debt service ratio at no more than a third of income.

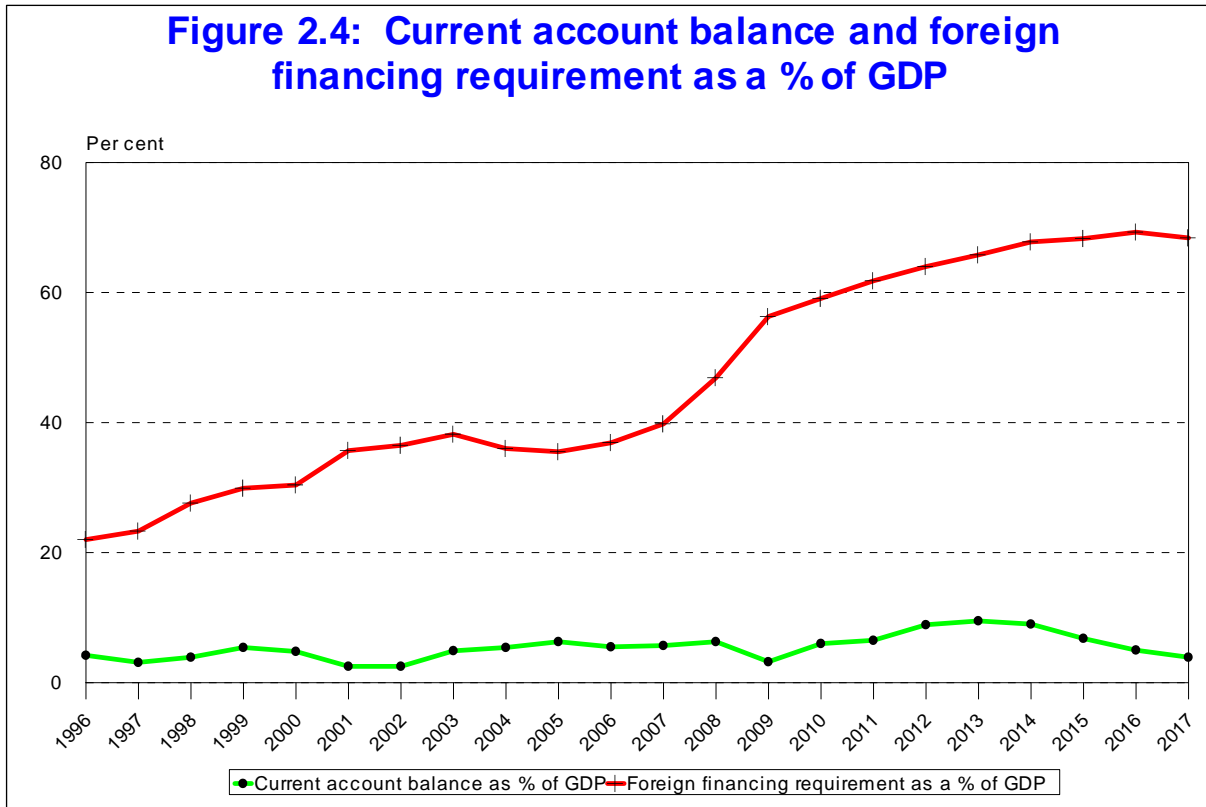
The following figure below shows that the projections for this study reflect this outcome. This also means that consumption expenditure growth will have to slow after 2012 as interest rates rise and the fiscal stimulus is withdrawn.



However, the most powerful factor which will determine Australia's economic growth is not household debt, but whether or not foreigners will be willing to lend to meet Australia's international financing requirements. With gross international debt to GDP ratio at approximately 100 per cent of GDP, and the amount of gross debt that has to be rolled over each year, Australia has to refinance half of its GDP plus the current account deficit for the year less Australia's international reserves. From the following figure, in 2009 the international financing ratio is around 55 per cent of GDP due to the falling terms of trade from the commodity price downturn. However, extra impetus will come from the recovery when capital expenditure increases and the real trade deficit expands quickly from imported capital equipment. As a result, by 2012 the international financing requirement reaches two thirds of GDP. This is very dangerous, well beyond the levels reached by Argentina and South Korea in their exchange rate-banking crisis of 2001 and 1997 respectively.

This means that as the recovery proceeds all focus will be on controlling the balance of payments outcomes. Thus, despite Australia having a very low public sector debt to GDP ratio, as seen above, the fiscal stimulus will be withdrawn in 2012, perhaps associated with a "horror" budget for the 2011-12 fiscal year.

This explains fully why the projection of the Australia's economic growth rate is low over the 2013 to 2015 period.



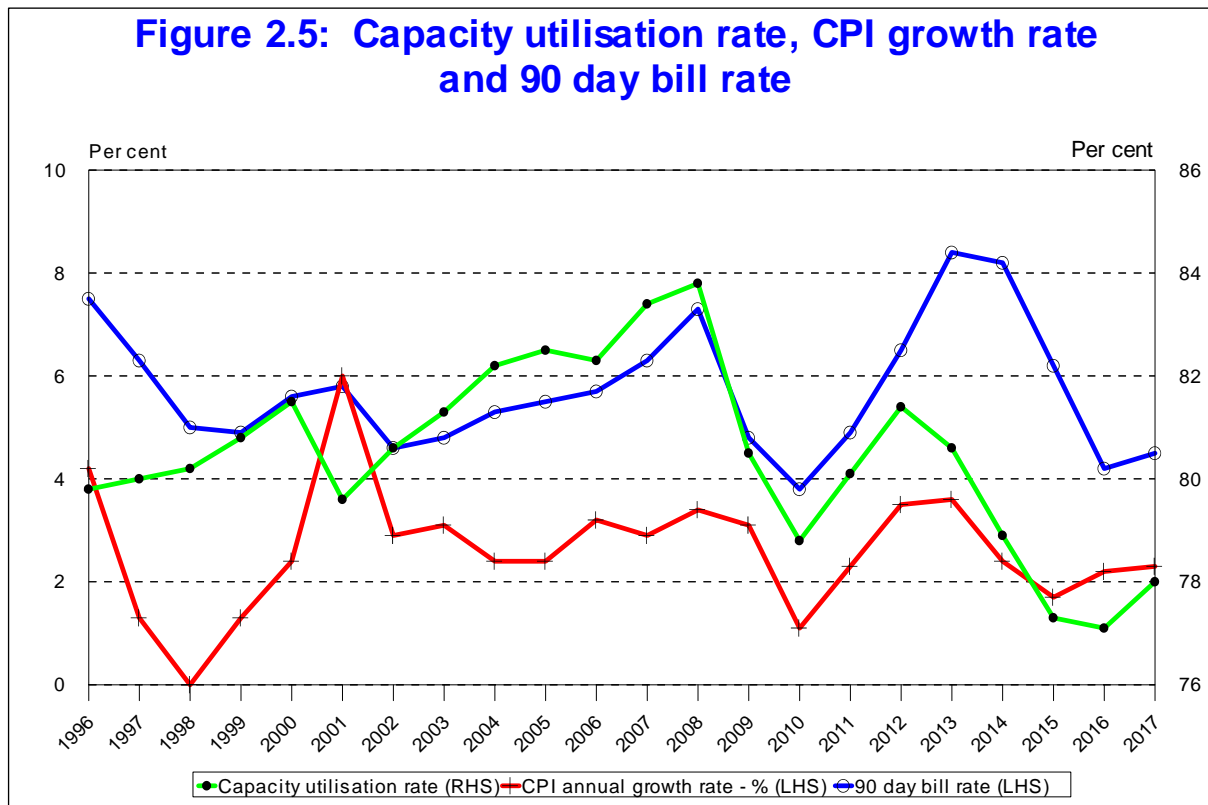
Interest rates

The interest rates are determined by the so-called Taylor Rule which relates interest rates to the rate of inflation, the excess of the inflation rate over the desired level and the level of excess capacity in the economy. This rule does well in explaining the movements in interest rates over the past decade. For Australia the current account deficit, above 6.0 per cent of GDP, is also added to the rule.

From the figure below, the 90 day bill rate increases steadily over the next 3 years due to:

- (i) increasing capacity utilisation with the recovery; and
- (ii) a deteriorating current account deficit, especially over the 2012-2013 period.

Inflation is projected to remain generally benign.



Inflation

The severity of the world recession and the sluggish nature of Australia's growth, both over the past and over the next 18 months to 2 years, will mean that inflation will not be a major issue. Indeed, the inflation rate is expected to remain within acceptable bounds for much of the projection period.

Future economic analysis of the current economic environment will conclude that given the inflationary build-up over 2007 and 2008 the current world recession is the recession that the world had to have to control inflation. Yes, financial meltdown was the catalyst for the downturn. However, if financial meltdown had not occurred over 2008, then it would have occurred later under the impact of sustained high interest rates. Therefore, irrespective of the long term damage inflicted on the world economy because of the recession, the world economy is unlikely to regain the high sustained growth rates of the 2004 to 2008 period simply because policy authorities will be unwilling to risk a return to inflationary pressures. In particular world oil prices are likely to be a core target of policy.

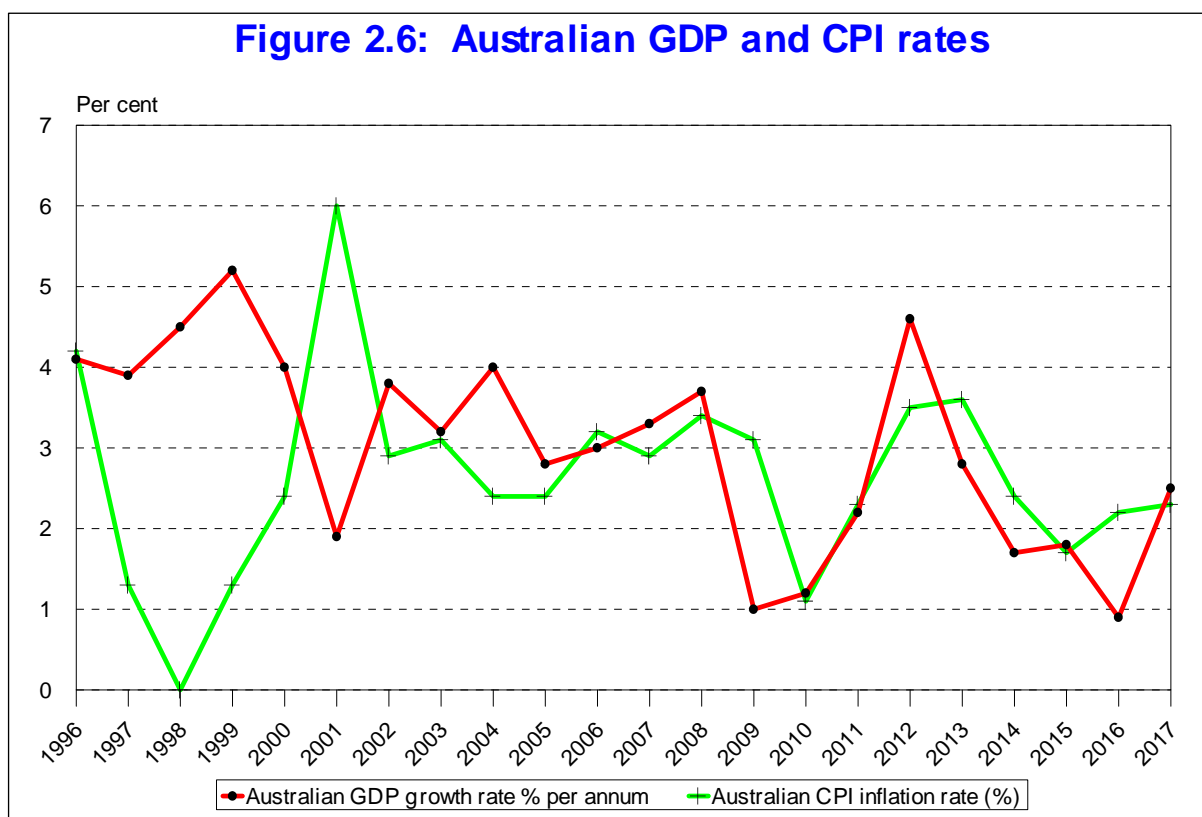
Formation of national GDP

Over the 2001 to 2012 period, public sector demand will add an average 1.3 per cent to the GDP growth rate, or about double the contribution from the average historical record. In addition to this, the stimulatory package also directly contributed to household consumption via \$15 billion of cash transfers and private housing.

Private consumption expenditure does not accelerate in its contribution until employment growth accelerates and this is not until the 2011-12 fiscal year, which flows into 2012-13. Accordingly the household savings ratio declines in 2012-13 and in 2013-14. The outcome is that the contribution of private consumption expenditure to national GDP growth is restored to its historical levels. However, this ends in 2014-15, for reasons outlined above, as the economy is constrained by the balance of payments constraint to growth.

The 2011-12 year is challenged by the recovery in private investment along with employment growth and the multiplier flow-on impacts of the stimulus packages.

After 2011, net trade resumes its traditional negative contribution to growth with imports increasing rapidly in line with the recovery in private investment expenditures. Export growth recovers to between 5.0 and 7.0 per cent per annum over the 2012 to 2015 period.



Wages and employment

A return to high employment growth is likely to be delayed until 2012. In part this is due to the sluggish growth profile over the short term, which is, in part, due to the high conversion of full time employment to part time employment that has occurred in response to the GFC. This will mean that the additional labour requirements for the recovery will be met by reconverting part time employment to full time employment and by additional overtime.

As a result of subdued labour market, wages growth is projected to be 3.0 per cent or less for the next 18 months to 2 years. By the end of 2012 wages growth is projected to be over 4.0 per cent. However, this level of wages growth is maintained for only a relatively brief period.

It should be noted that the unemployment rate is projected to be at 7.0 per cent by mid 2010. However, the recovery in employment growth will then push up the participation rate which will result in monthly unemployment rates above 8.0 per cent by 2011. The relatively slow build-up in the unemployment rate resembles the delayed response of the unemployment rate of the 1990-1991 recession.

The Average Weekly Ordinary Time Earnings were \$1,113 in 2007-08 and estimated at \$1,168 in 2008-09. It is projected to grow to \$1,198 in 2009-10 and to \$1,234 in 2010-11 when it will reach \$1,234.

**Table 2.3 Major Australian economic aggregates: calendar year averages
(annual per cent rate of change)**

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
International										
World GDP (fiscal year)	5.0	4.7	3.3	-1.80	2.1	3.0	4.6	3.6	2.9	3.2
Demand										
Private consumption	2.6	4.0	4.0	1.4	1.7	2.5	4.1	3.8	1.2	0.6
Business investment	17.4	6.7	15.2	6.3	-13.8	2.7	8.1	8.1	8.0	-5.1
Housing	-4.3	1.9	1.7	-1.9	-5.4	5.9	8.0	8.1	-0.7	5.7
Public expenditure	3.8	3.2	4.0	4.8	5.4	2.7	5.5	1.6	3.3	4.1
Total expenditure	3.8	4.3	5.8	1.2	0.7	2.5	5.5	4.1	2.3	0.7
GDP	3.0	3.3	3.7	1.0	1.2	2.2	4.6	2.8	1.7	1.8
External sector										
Current account deficit (\$B)	-52944	-59105	-72679	-38165	-60124	-66443	-95838	-130966	-129832	-87633
CAD as per cent of nominal GDP	5.5	5.7	6.4	3.2	5.0	5.3	7.1	9.1	8.6	5.5
Labour market										
Employment	2.9	2.9	2.6	1.1	-1.2	-0.2	1.2	2.5	1.4	0.5
Unemployment rate (%)	5.0	4.5	4.2	4.9	7.0	7.5	7.8	7.0	6.7	7.1
Participation rate(%)	64.6	65.0	65.4	65.4	65.0	64.4	64.6	64.9	64.7	64.3
Finance										
90 day bank bill (%)	5.7	6.3	7.3	4.8	3.8	4.9	6.5	8.4	8.2	6.2
10 year bond rate (%)	5.7	6.3	7.3	4.9	5.8	6.0	7.3	8.7	7.9	6.1
\$US/\$A	75.6	78.6	89.7	74.6	75.9	67.6	62.6	66.3	72.4	77.3
Trade weighted index	64.1	65.7	70.6	61.0	62.7	54.1	48.7	49.1	52.4	56.0
Wages and prices										
Wage cost Index	4.1	3.9	4.2	4.1	2.7	2.0	2.9	4.3	3.4	2.9
CPI	3.2	2.9	3.4	3.1	1.1	2.3	3.5	3.6	2.4	1.7

Figures 2.7 to 2.13 show graphically selected indicators for the base scenarios for the Australian economy over the medium term.

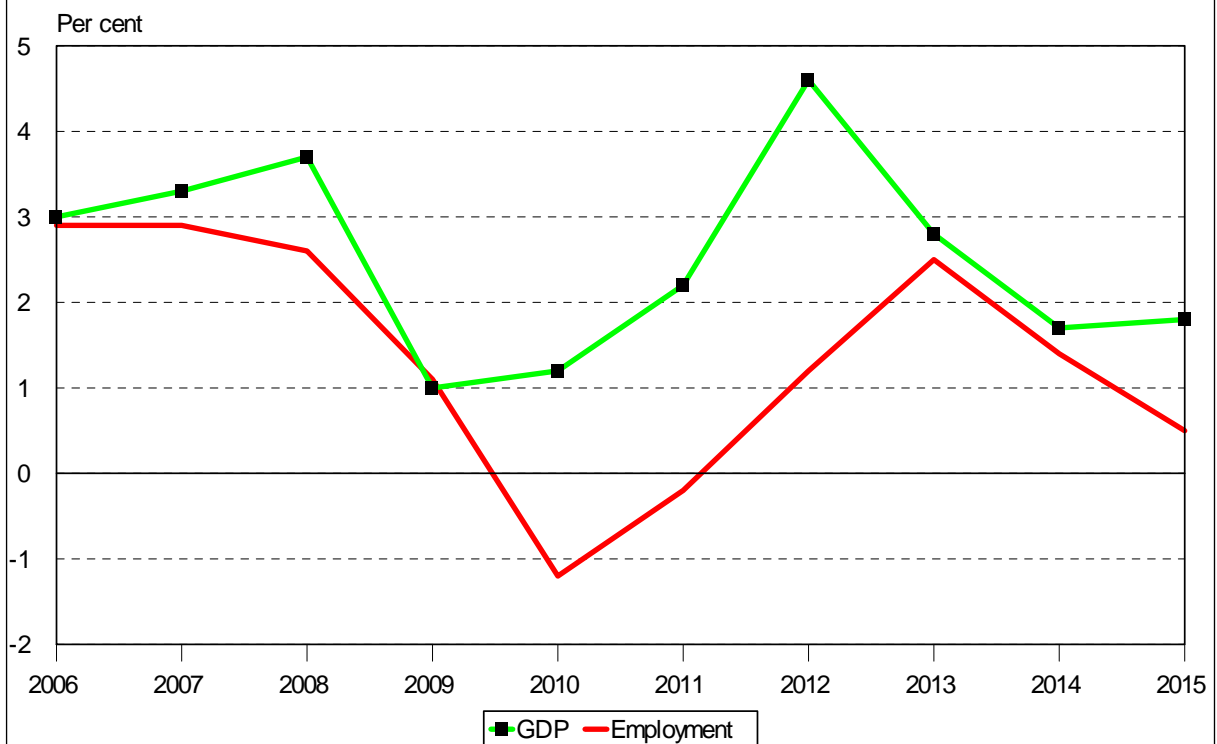
Figure 2.7: Consumer spending and GDP**Figure 2.8: GDP and employment**

Figure 2.9: Employment and unemployment

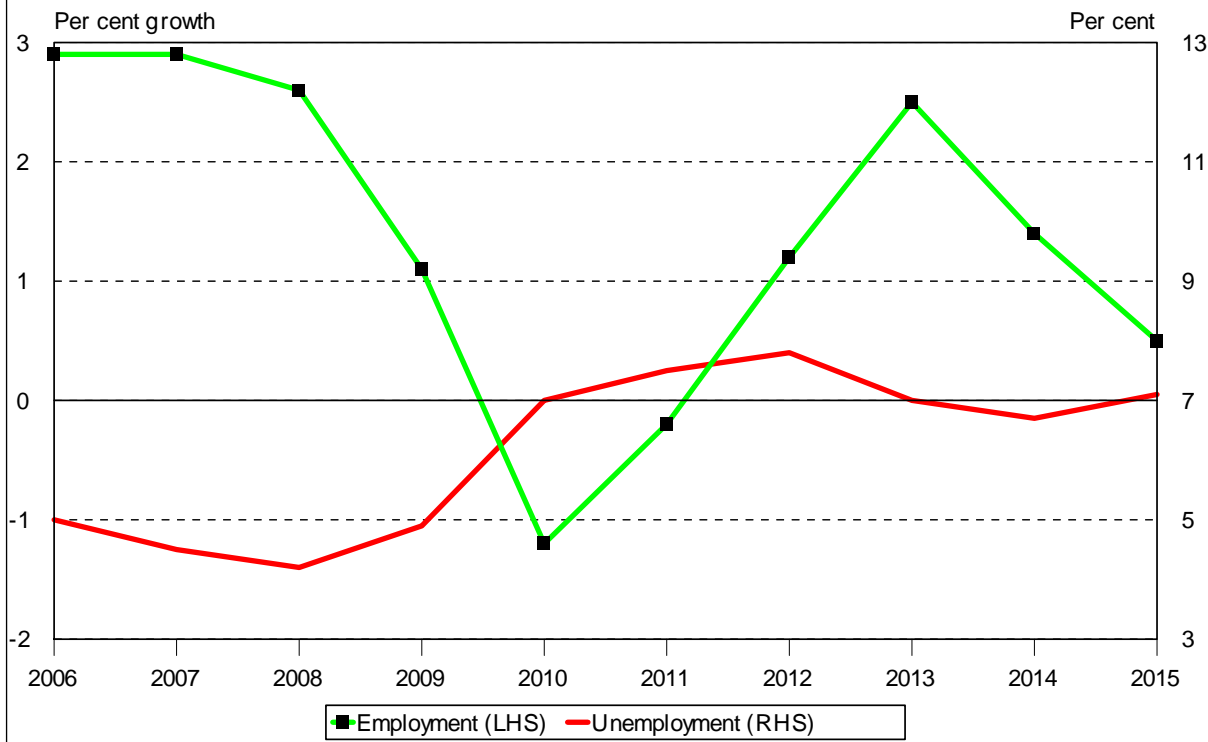


Figure 2.10: Consumer price index and wages



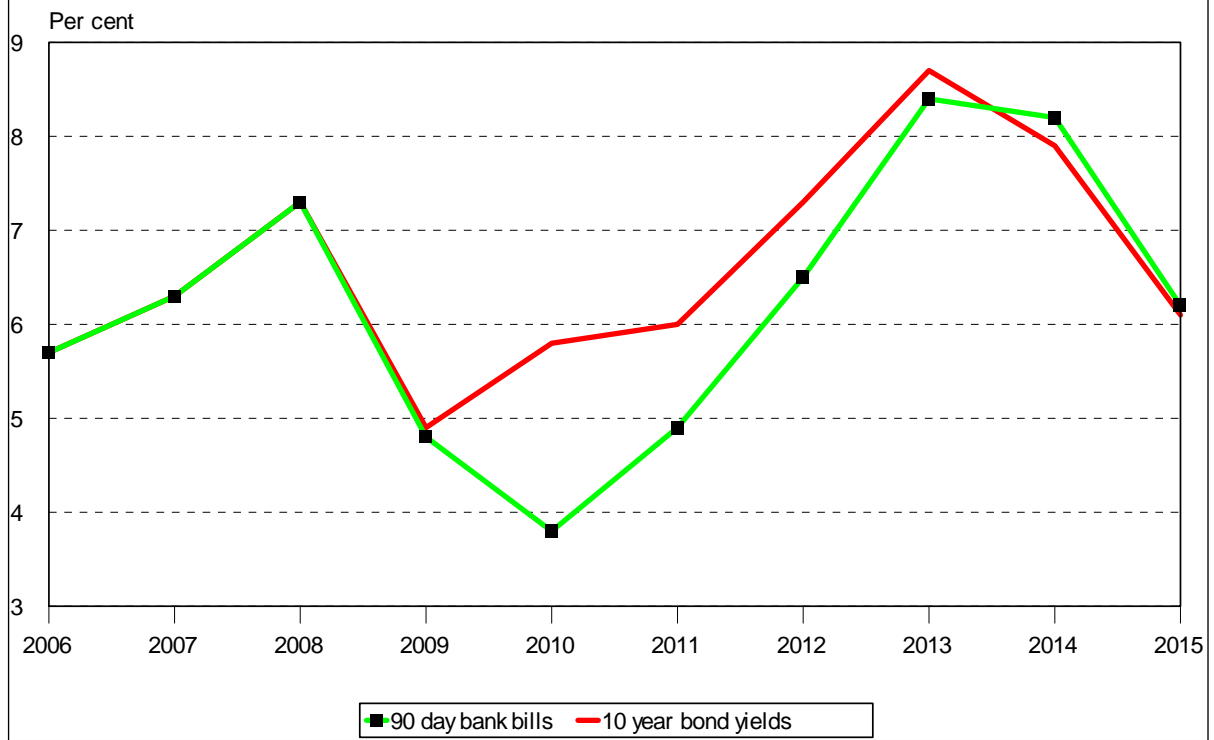
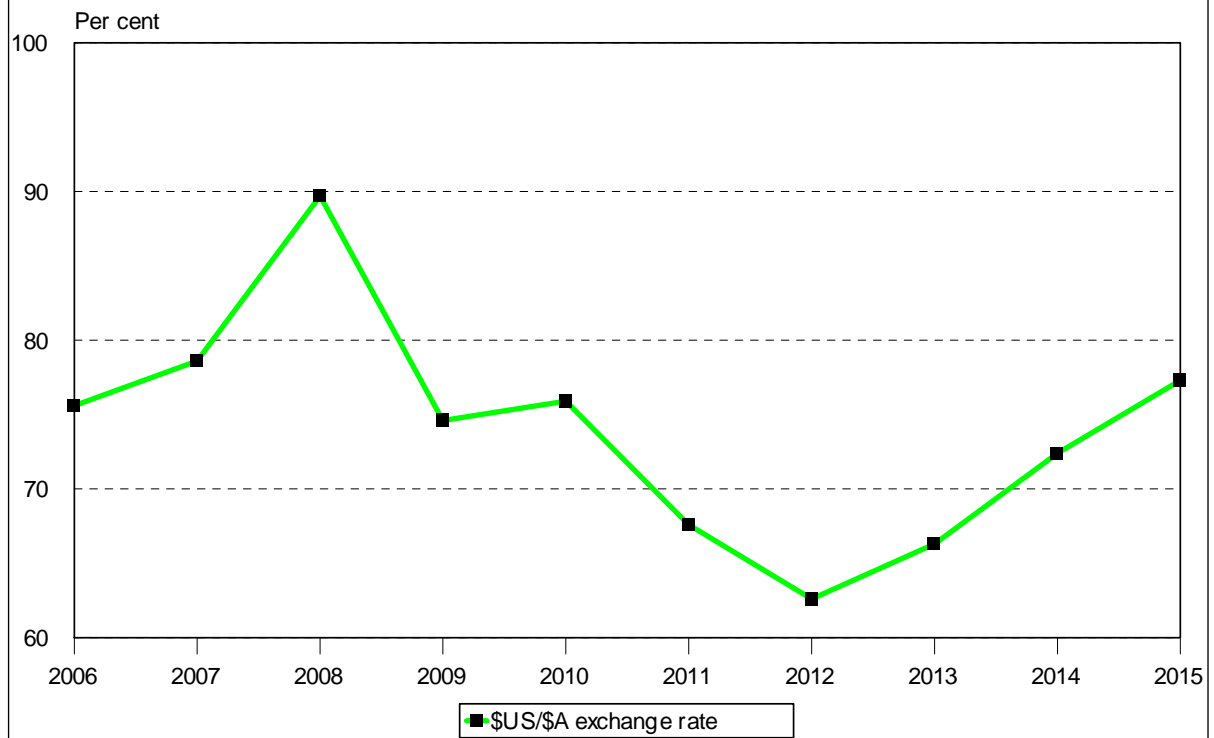
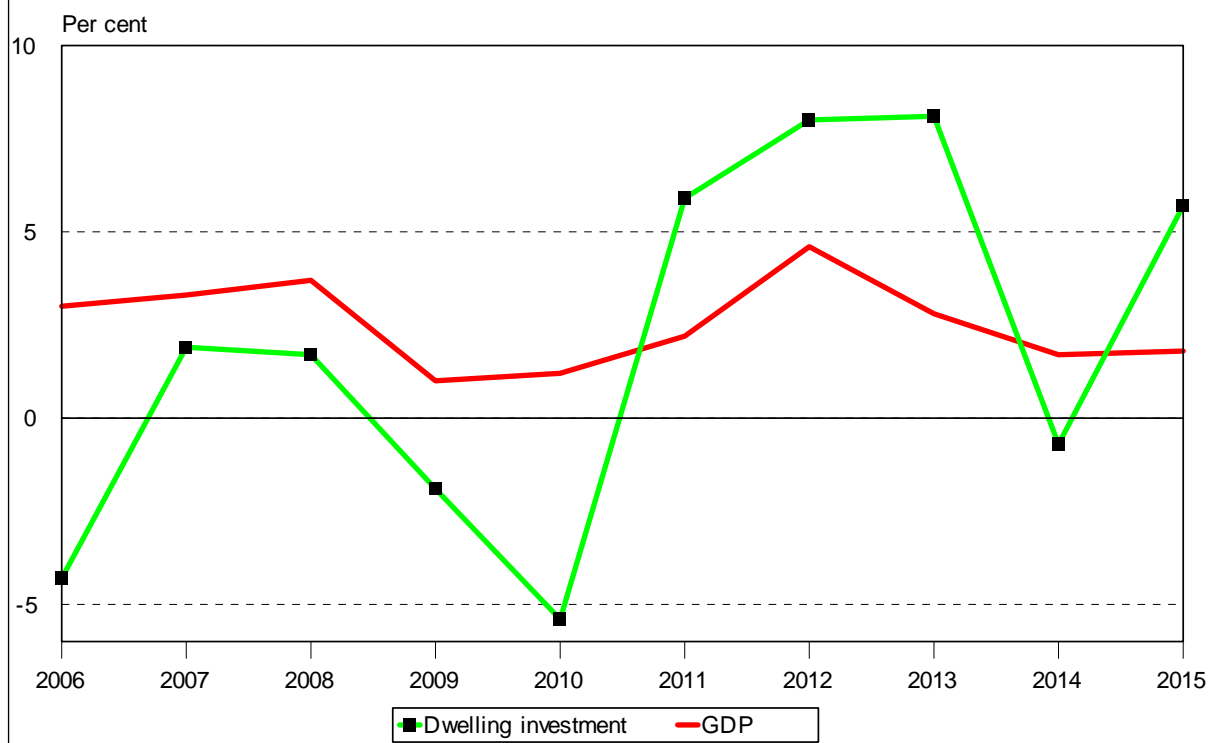
Figure 2.11: Domestic interest rates**Figure 2.12: Exchange rate**

Figure 2.13: Housing sector

3. The outlook for New South Wales to 2014-15

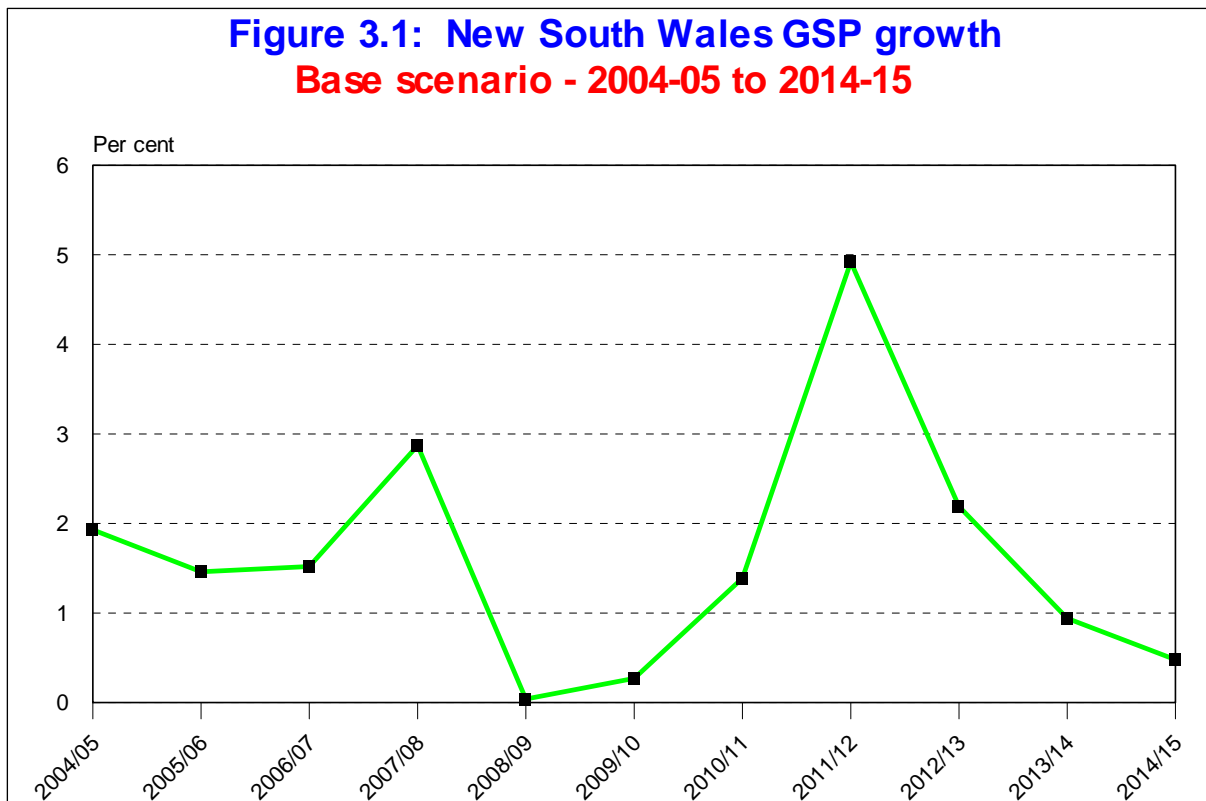
3.1 Introduction

This section outlines the economic outlook for New South Wales to 2014-15.

3.2 Summary

Figure 3.1 shows the outlook for New South Wales GSP growth over the period to 2014-15. Between 2009-10 and 2014-15, New South Wales Gross State Product (GSP) is projected to grow, on average, by 2.0 per cent per annum

Table 3.1 shows the projected annual growth rates in GSP for Australia and New South Wales for the period 2004-05 to 2014-15.



Note: Financial years ending June.

Table 3.1 Projected Australian and New South Wales GDP growth rate for the period 2004-05 to 2014-15

	Australia	New South Wales
	Base	Base
Per cent change		
2005	2.8	1.9
2006	3.0	1.5
2007	3.3	1.5
2008	3.7	2.8
2009	1.0	0.0
2010	1.2	0.3
2011	2.2	1.4
2012	4.6	4.9
2013	2.8	2.2
2014	1.7	0.9
2015	1.8	0.5
Compound growth rate (per cent)		
2004/05-2009/10	2.4	1.2
2009/10-2014/15	2.6	2.0

Note: All growth rates refer to financial years ending June.

3.3 The economic outlook for New South Wales to 2014-15

Table 3.2 presents selected economic aggregates for the New South Wales economy to 2014-15.

Table 3.2 Macroeconomic aggregates and selected indicators – New South Wales (per cent change)									
	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	Compound growth rate 2009-10 to 2014-15
Private consumption	3.1	0.4	1.2	1.8	3.5	2.9	0.5	0.1	1.8
Private business investment	15.6	-0.9	-16.8	4.0	15.7	9.8	5.4	-3.4	6.1
Private dwelling investment	-2.6	-4.4	1.0	10.6	19.5	-7.9	-7.3	-1.8	2.1
Government consumption	3.6	3.4	2.8	3.1	1.6	1.9	3.5	3.2	2.7
Government investment	-1.7	23.8	13.1	2.5	17.1	-2.1	1.7	6.3	4.9
State final demand	4.4	1.4	-0.6	2.7	5.2	3.7	3.1	1.1	3.2
Gross state product	2.8	0.04	0.3	1.4	4.9	2.2	0.9	0.5	2.0
Population	1.2	1.2	1.0	0.9	0.9	0.9	0.9	1.0	0.9
Employment	2.4	0.2	0.3	-0.2	2.2	2.4	1.0	-0.1	1.0

Source: NIEIR and ABS.

Gross state product

As was expected in our previous report¹, economic conditions in New South Wales during 2008-09 were tough. New South Wales gross state product grew by a meagre 0.04 per cent in 2008-09. However, the impact of the global economic recession on the New South Wales economy has not been as severe as was expected. In our previous report, New South Wales gross state product was predicted to contract by 0.9 per cent in 2008-09.

The better-than-expected outcome can be attributed to the quick actions of Australian fiscal and monetary policy makers in bolstering consumer confidence which had been on the verge of collapse in aftermath of the global financial crisis. Remarkably, household expenditure in New South Wales grew in 2008-09 and dwelling investment did not fall as sharply as was expected.

¹ The previous economic projections were prepared in March 2009 after the Commonwealth stimulus package had been announced but before the package of measures announced as part of the Commonwealth Budget in May 2009.

The better than expected outcome also can be attributed to a significant direct contribution to growth from Government sector spending. Increases in Government sector spending (notably investment expenditure) add 1.5 percentage points to growth in New South Wales gross state product.

While the main shocks of the global economic recession appear to be behind us, the New South Wales economy is not out of the woods yet. It is only expected to record a very modest improvement in growth in the current financial year. New South Wales gross state product is projected to grow by just 0.3 per cent in 2009-10 (albeit a substantial improvement on the 1.7 per cent contraction projected in our previous report).

The recovery in economic growth in New South Wales is expected to begin to pick up pace in 2010-11 before accelerating considerably in 2011-12. From 2011-12 onwards, the Commonwealth Government fiscal stimulus is expected to be unwound. Further, monetary policy is anticipated to move from an expansionary stance to a highly contractionary one during 2012 and 2013. These forces are expected to significantly slow economic growth in New South Wales during 2012-13 and again in 2013-14. It is possible that New South Wales will slip into a 'technical' recession during this period with economic growth not expected to recover again until after 2014-15.

Private consumption expenditure

Without the macroeconomic policy stimulus (notably the one-off household stimulus package – bonus payments), household consumption expenditure in New South Wales would have contracted in 2008-09. Private consumption expenditure grew by 0.4 per cent in 2008-09. In our previous report, household consumption expenditure was predicted to contract by 1.1 per cent. The strong than expected outcome in household expenditure ensured that gross state product in New South Wales did not contract in 2008-09.

In the current financial year, private consumption expenditure in New South Wales is anticipated to grow by 1.2 per cent. Growth is expected to pick up moderately in the next financial year (2010-11), before returning to more normal rates of growth in 2011-12 and 2012-13.

The reversal of fiscal policy stimulus and significant tightening of monetary policy during 2012 and 2013 is expected to cause a sharp slowdown in consumption growth in New South Wales in the post-2013 period. Private consumption expenditure is projected to grow by just 0.5 and 0.1 per cent in 2013-14 and 2014-15 respectively.

Private business investment

Given the lead times on some investments, private business investment tends to lag the economic cycle. Hence, the bulk impact of the global economic recession on business investment will be most reflected in the current financial year. Private business investment in New South Wales is projected to decline by almost 17 per cent in 2009-10.

Business investment is expected to increase modestly in 2011-12 before increasing much more strongly in 2012-13. This should help return push employment back into positive growth. However, rising interest rates and weakening economic conditions in New South Wales are expected to slow growth in business investment from 2012-13 onwards.

Dwellings investment

Before the global financial crisis hit in September 2008, dwelling investment in New South Wales was already significantly below its most recent peak. In the four years to 2007-08, private dwelling investment in New South Wales had fallen by 25 per cent. Rising mortgage rates, subdued house prices, and weak State employment, population and output growth had all put downward pressure on investment in new housing in the New South Wales.

Given the already subdued demand for dwelling investment in New South Wales, the impact of the global financial crisis on the housing sector may seem moderate. New South Wales private dwelling investment is estimated to have contracted by just 4.4 per cent in 2008-09. The sharp fall in official interest rates coupled with the other stimulus measures no doubt provide some support to investment in 2008-09.

Private dwelling investment is anticipated to rise by 1.0 per cent in the current financial year (2009-10). The upswing in the housing cycle is projected to accelerate in 2011-12 and furthermore in 2012-13 as employment growth begins to recover.

Rising mortgage rates through 2012 and 2013 is expected to again put downward pressure on dwelling investment. Private dwelling investment in New South Wales is projected to decline by 7.9 per cent and 7.3 per cent in 2012-13 and 2013-14 respectively.

Government expenditure

Government investment in New South Wales rose significantly in 2008-09 as a result of Commonwealth and State Government stimulus spending. Government investment spending alone contributed 0.9 percentage points to growth in gross state product. Coupled with growth in Government consumption expenditure, the government sector added 1.5 percentage points to growth in gross state product in 2008-09.

In the current financial year, government expenditure for both capital works and recurring consumption is anticipated to contribute another 1.1 percentage points to growth in gross state product. In 2010-11, the contribution to growth by government sector is expected to moderate somewhat with investment expenditure contributing just 0.1 percentage points and consumption expenditure contributing 0.5 percentage points.

Government investment is expected to increase sharply again in 2011-12 before contracting slightly in 2012-13 as the Government stimulus spending begins to unwind. Further forward, the government sector spending is expected to contribute to GSP growth but at more moderate rates.

Net exports

The Global Economic Recession led to a significant reduction in world trade in 2008-09. As a result, New South Wales net exports fall sharply. In 2008-09, net exports² subtracted around 1.3 percentage points from growth in gross state product.

Reflecting the turnaround in world trade in 2009-10, net exports are anticipated to add 0.9 percentage points to growth in gross state product.

² Plus statistical discrepancy.

The New South Wales international trade position is expected significantly deteriorate over the next few years. As a consequence, net exports are expected to deduct from economic growth in each year to 2014-15.

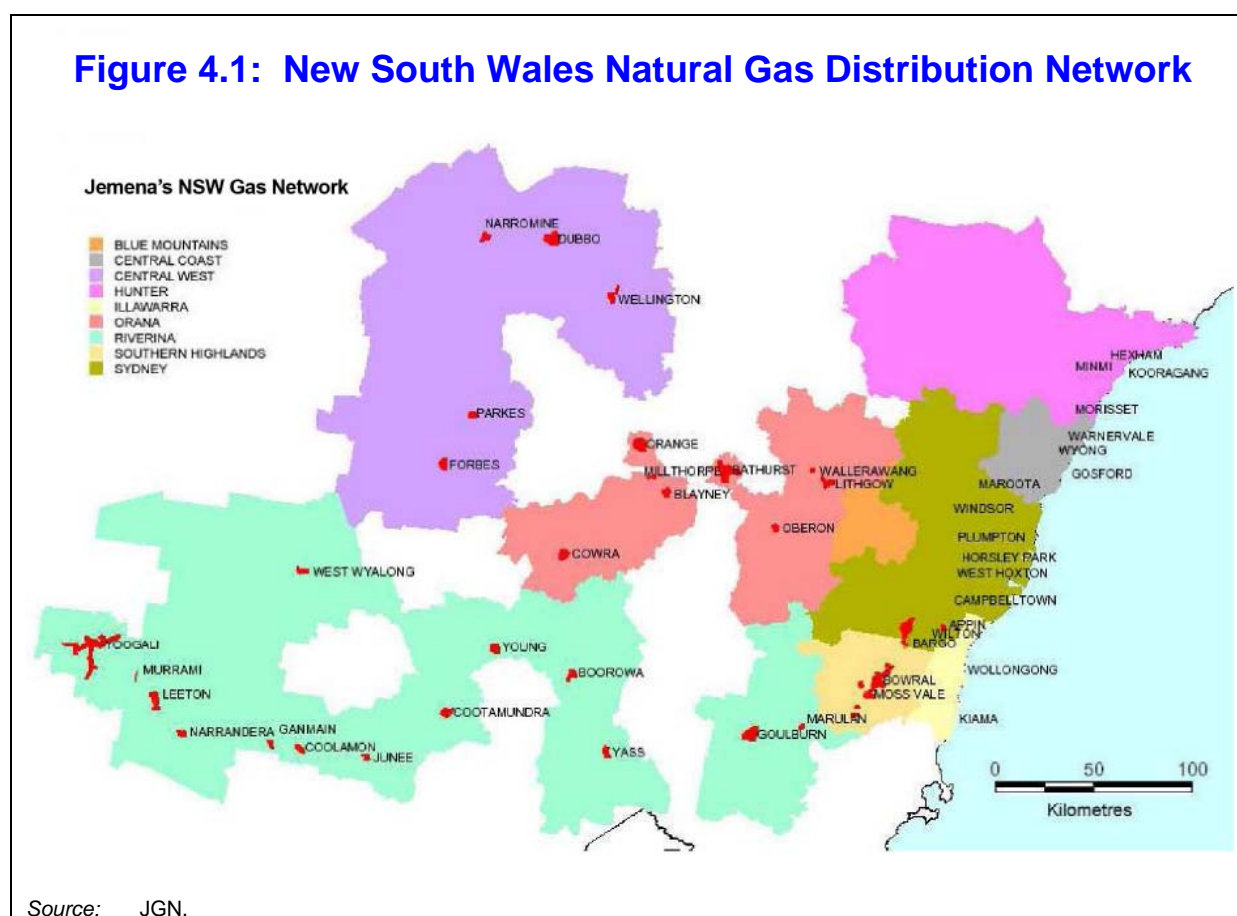
In 2010-11 and 2012-12, net exports are expected to subtract 1.3 and 1.6 percentage points, respectively. Furthermore in 2013-14, net exports are expected to deduct 2.6 percentage points from growth. The deterioration in the New South Wales international trade position is consistent with the deterioration expected in Australia's current account deficit.

4. Methodological approach

4.1 Introduction

This section outlines the key methodologies employed in developing the forecasts for NSW Jemena networks. Jemena Gas Networks (JGN) is the major gas distribution service provider in New South Wales (NSW). JGN owns 24,000 kilometres of natural gas distribution system, delivering approximately 100 petajoules of natural gas to over one million homes, businesses and large industrial consumers across NSW.

Figure 4.1: New South Wales Natural Gas Distribution Network



4.2 Information supplied by Jemena Gas Networks

Jemena Gas Networks (JGN) provided NIEIR with the following data:

- gas consumption data for the various markets (tariff and contract), and for various customer segment including new residential customers, electricity to gas customers (E to G) and business customers; and
- contract customers by individual customer including annual consumption and MDQ.

These data allowed NIEIR to develop a history of actual data for sales and customer growth for the JGN distribution area, extending back around 10 years.

The issue of weather and normalisation of the sales data is described later in this section.

4.3 Overall modelling approach

Forecasts of the NSW JGN area natural gas sales were developed within a regional economic model of the New South Wales (NSW) economy. This model takes NIEIR's State forecast of gross State product (by industry) and disaggregates it into statistical sub-divisions across NSW. Figure 4.2 illustrates the link between NIEIR's national economic models and regional natural gas sales.

The key benefit of this approach is that the gas sales forecasts can more accurately reflect the diversity of customer behaviour and usage across the customer classes. Sectoral-specific events or developments can be more precisely captured in the forecasts. These events and developments are often idiosyncratic and cannot be simply implied from historical trends. Only a disaggregated sales model with linkage to economic and policy drivers can fully capture these factors.

Forecasts of economic outlook

NIEIR's national and State economic models were used to generate economic forecasts to 2014-15. The regional economic model of NSW will separately imply how the economic scenario maps down to the Jemena NSW distribution area.

Key indicators at the regional level will be population, dwelling stock and gross regional product (by industry).

Projections of JGN annual gas usage were prepared for:

- tariff volumes (annual loads of less than 10 TJs); and
- contract volumes on an industry basis.

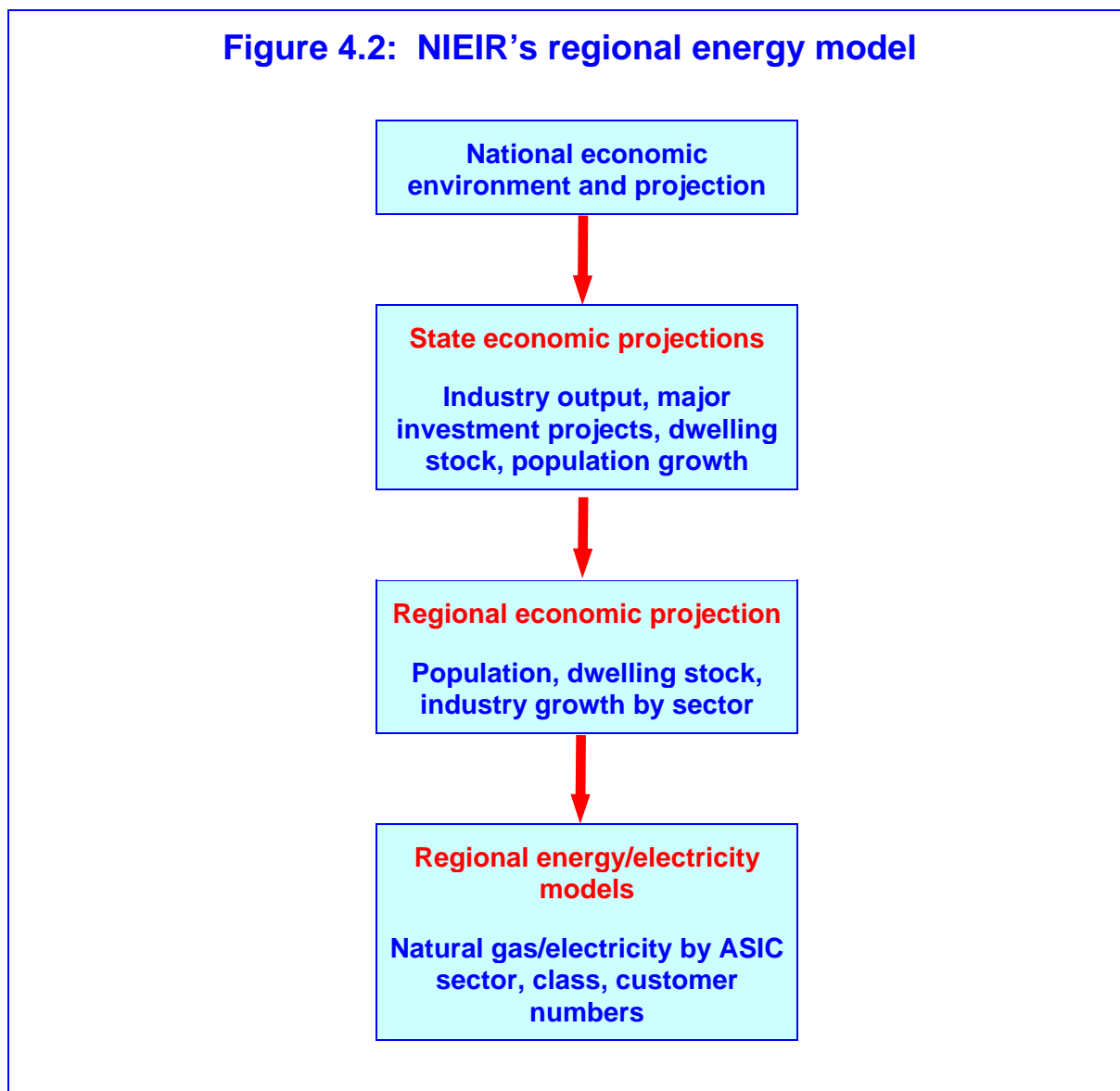
Tariff volumes were separated into residential and business. Residential were further disaggregated into existing, E to G and new estates and high rise.

The annual gas demand projections include the impact of Federal and State Government greenhouse and other energy policies.

Tariff customers and volumes

Residential gas usage dominates Tariff consumption. Residential gas usage is modelled using an end-use type model that disaggregates residential usage into new and established dwellings usage. Residential new usage was separated further to net new customers and E to G customers, the latter referring to new customers on the existing gas network. Actual data in the customer number and average usage by market segment were provided by JGN.

Figure 4.2: NIEIR's regional energy model



The residential forecasts are prepared on a weather normalised basis and incorporate the impact of real household disposable income and real gas prices.

Residential customer number forecasts are linked to NIEIR's projections of the dwelling stock.

The residential gas consumption forecast model also took account of Federal and State Energy and greenhouse policies included:

- BASIX for new NSW homes implemented in July 2006;
- the program to review and standardise energy labelling of gas appliances followed with the development of MEPS for new gas appliances;
- the increased penetration of energy efficient showerheads;
- the effective banning of electric resistance hot water appliances from 2012;
- the ongoing negative impact of high sales of reverse cycle air conditioning equipment;

- Commonwealth stimulus package with subsidies towards insulation; and
- Other new policies or developments, such as the new NEET policy of the NSW Government and the RET scheme.

Tariff business projections are derived using a regression model which takes account of commercial output growth and movements in real gas prices.

In summary, the residential sales forecast were developed by first determining an econometric forecast (where the key drivers are household incomes and prices) and then adjusting the forecast for the impact of new energy policies. In developing these impacts includes models for hot water were developed for the JGN by market segment (new, E to G and existing). These models are outlined later in this section.

Contract customers and volumes

Projections of gas volumes for contract customers were developed on an industry basis. JGN supplied NIEIR with around 8 years of contract customer gas usage and MDQ's by customers. NIEIR industry coded these data on a customer by customer basis.

Gas demand models have been parameterised using NIEIR's existing State gas forecasting model. Regional gas demand models were parameterised using NIEIR's existing State gas forecasting model. The structure of this model in terms of industry coverage is shown in Table 4.1.

The industry regression models specifically relate gas consumption to:

- the change in output for that industry within the gas distribution area; and
- the change in real gas prices for that industry (incorporating lags in real prices to proxy the long run response or price elasticity).

The output and price elasticities at the regional level were adjusted to reflect differences in the gas intensity between industries and regions. Forecasts of MDQ were also developed on an industry basis. The MDQ forecasts were determined from the energy growth by industry and an industry specific load factor.

Table 4.1 Reconciliation of major customer class categories with ASIC industries

Customer class category	ASIC
Residential	
Commercial	Water and sewerage Construction Wholesale and retail trade Transport and storage Communication Finance, property, business services Public administration and defence Community services Recreation, personal and other services
Industrial	Mining Food, beverages, tobacco manufacturing Textiles, clothing and footwear manufacturing Wood, wood products manufacturing Chemicals, petroleum, coal manufacturing Paper, paper products manufacturing Non-metallic minerals manufacturing Basic metal products manufacturing Fabricated metal products manufacturing Transport equipment manufacturing Other machinery and equipment manufacturing Miscellaneous manufacturing
Farm¹	Agriculture, forestry, fishing, hunting

Notes: ASIC refers to Australian Standard Industrial Classification.

1. The farm class which excludes residential farm is included in the industrial sector.

4.4 Weather normalisation of JGN gas data

Weather data was obtained from the Bureau of Meteorology for the Sydney weather station.

It is widely accepted that gas demand is a function of temperature expressed as heating degree days (HDD). HDD is defined as the difference between the average temperature for the day and 18 degrees Celsius except that HDD for a day is zero if the average temperature is greater than 18 degrees Celsius.

In order to make meaningful comparisons of consumption from year to year and to establish a datum from which to forecast future consumption, it is necessary to normalise observed consumption for the differences in HDD between years. The normalising adjustment is obtained by taking the difference between the observed number of HDD for the year and the standard number of HDD for a year and multiplying that difference – referred to here as “abnormal HDD” – by a temperature sensitivity coefficient for the relevant market segment (TJ/HDD). The coefficient is estimated by analysing historical market performance. In our analysis we have determined separate coefficients for the tariff and contract markets.

Table 4.2 shows temperature sensitivity coefficients, observed HDDs, standard HDDs and abnormal normalised volumes for the tariff and contract markets for the years 2004 to 2010.

There is a long term trend of declining annual HDD (of around 5.56 HDD per annum) and this trend has been factored into the estimation of the HDD standard.

Table 4.2 Weather normalisation parameters								
Tariff market	Unit	2004	2005	2006	2007	2008	2009	2010
Observed HDD	HDD	527	464	533	486	477	606	469
Standard HDD	HDD	523	518	512	507	501	496	490
Abnormal Weather	HDD	4	(54)	21	(21)	(24)	111	(21)
HDD Coefficient	TJ/HDD	15.7	16.6	16.9	17.1	16.5	16.7	
Temperature Sensitivity	TJ/HDD	16.2	16.4	16.5	16.6	16.8	16.9	17.0
Consumption due to Abnormal Weather	TJ	65	-877	349	-349	-400	1,866	-350
Contract market	Unit	2004	2005	2006	2007	2008	2009	2010
Observed HDD	HDD	527	464	533	486	477	606	469
Standard HDD	HDD	523	518	512	507	501	496	490
Abnormal Weather	HDD		(54)	21	(21)	(24)	111	(21)
HDD Coefficient	TJ/HDD		4.73	5.20	3.98	4.12	4.50	
Temperature Sensitivity	TJ/HDD		4.5	4.5	4.5	4.5	4.5	4.5
Consumption due to Abnormal Weather	TJ		-242	95	-95	-108	498	-93

4.5 Old/new residential customer usage – JGN Gas Networks NSW

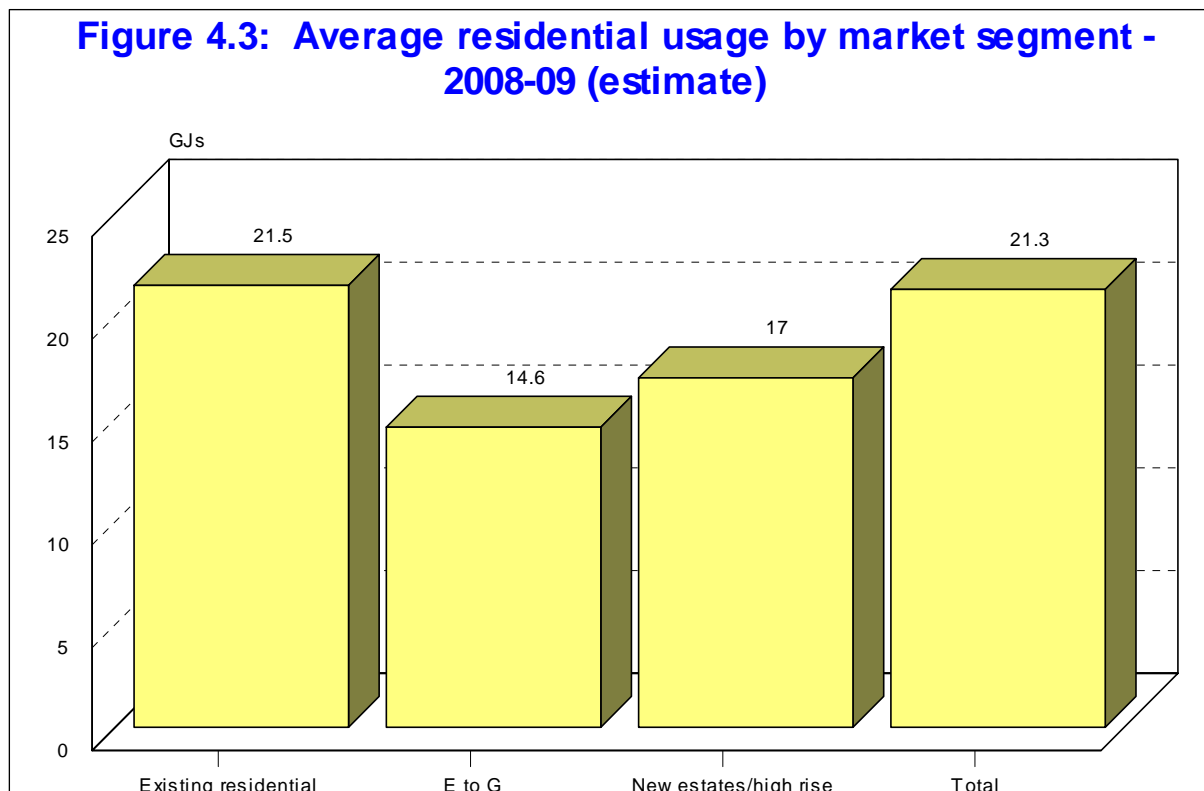
The rationale for looking at ‘old’ or existing customers and new customers was to assess how changes in government energy policies and building standards were affecting average consumption of natural gas by residential Tariff customers on JGN.

Table 4.3 Average residential customer usage – existing and new customers – JGN Gas Network NSW^(a) (GJs)	
	2009-10
Existing residential	21.5
Electricity to gas	14.6
New estates and high rise	17.0
Total	21.3

Note: (a) Weather normalised.

As indicated in Table 4.3, new residential customers consume on average around 4.5 GJ's less than existing customers. The result is not surprising and reflects a number of interacting factors, including:

- the efficiency of new versus existing water and space heating appliances;
- the fact that minimum energy performance standards for gas hot water appliances have not increased for a number of years; and
- The continued use of electric, solar-electric and heat pumps for hot water and the increased usage of reverse cycle air conditioners in New South Wales and the rest of Australia.



4.6 Gas usage in New South Wales

As part of the modelling process NIEIR looked at the effects that climate change policies will have on gas usage in New South Wales. The residential end-use assessment outlined in Section 4.8 used the trends and levels of gas use in New South Wales as described by the Australian Bureau of Statistics (ABS).

The ABS has, every three years since 1994, produced information relating to domestic energy use through the use of the monthly Labour Force Survey (LFS) and supplemented by the Energy Use and Conservation Survey (latest, March 2008).

The latter covers a range of issues including energy sources, appliances and energy saving measures used in households. As the ABS notes, the statistics are subject to normal sampling errors and may be biased by changes in the methodologies in collecting the data. Despite this, they provide a useful overall picture of gas usage by households in New South Wales.

Table 4.4 below shows the main energy source used in the four main end-uses for New South Wales in 2008. The four end-uses are:

- ovens;
- cook tops;
- space heating; and
- water heating

Natural gas is used in 15.8 per cent of ovens, 27.9 per cent of cook tops, 17.2 per cent of space heating appliances and 23.9 per cent of water heaters. Nearly all gas heaters in New South Wales are non-ducted. Also, 23.9 per cent of households do not use a heater.

Table 4.4 Appliance penetration in gas end-uses – New South Wales – 2008 (per cent)							
	Electricity	Mains gas	Electricity and gas combined	LP bottle gas	Solar	Wood	Other*
Main source of energy used							
Ovens	80.3	15.8	n.a.	3.6	n.p.	0.3	-
Cook tops	65.2	27.9	0.3	6.2	n.p.	n.p.	n.a.
Space heating	43.1	17.2	n.a.	4.0	n.a.	10.3	1.6
Water heating	58.1	23.9	n.a.	1.6	5.0	0.3	12.1

Notes: * Includes didn't know and oil.
n.a. Not applicable.
n.p. Not available for publications but included in the totals.
Source: ABS, Tables 3.6, 3.7, 3.8, 3.10, Catalogue 4602.0.55.001.

Water heating

A small percentage of hot water heating is solar in New South Wales, but of those that are solar, the majority is solar-electric. The 2008 values in Table 4.5 could reflect some sampling errors in the latest survey.

	Electric	Mains gas	LPG gas	Total gas	Other*
1999	90.2	n.a.	n.a.	1.0	8.8
2002	95.1	n.a.	n.a.	3.7	1.2
2005	93.9	n.a.	n.a.	n.a.	6.1
2008	77.0	6.7	n.p.	6.7	13.5

Note: * Other includes not boosted, did not know and wood.

Space heating

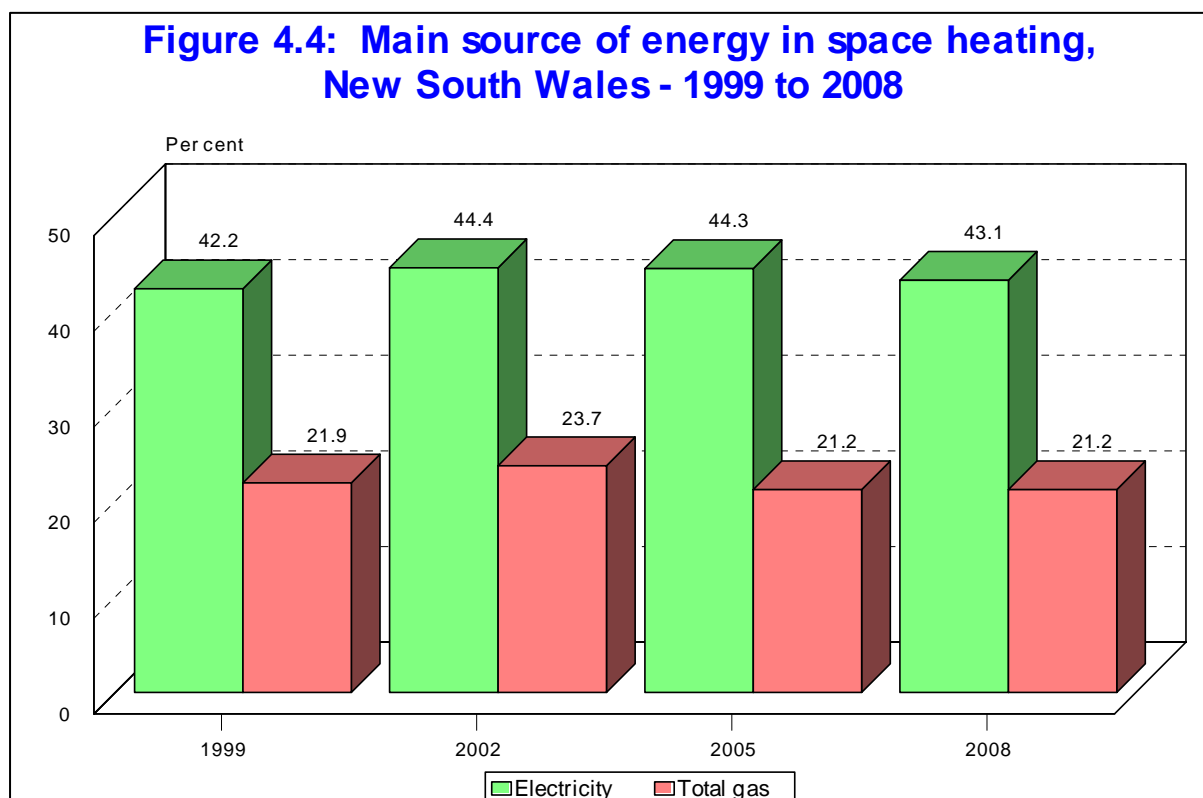
Table 4.6 below, shows the main energy source in space heating in New South Wales for 1999 to 2008 for selected years. The table highlights that:

- natural gas' share of the main energy source used in space heating decreased slightly from 21.9 per cent in 1999 to 21.2 per cent in 2008. The highest share was in 2002, with 23.7 per cent of heaters using gas. Wood heating is also on the decline, having lost more than 4 percentage points of its share at 10.3 per cent in 2008;
- electricity's share in space heating has been fairly steady since 1999, having risen by 0.9 per cent to a share of 43.1 per cent over the last nine years; and
- a notable trend is the increasing proportion of households with no heater. From 17.8 per cent in 1999 to 23.9 per cent in 2008. This trend could potentially reflect the increased use of air conditioners for room heating.

	Electricity	Mains gas	LPG	Total gas	Wood	Oil	No heater
1999	42.2	n.a	n.a	21.9	14.7	2.7	17.8
2002	44.4	n.a	n.a	23.7	11.8	1.6	18.2
2005	44.3	16.1	5.1	21.2	10.9	0.8	22.5
2008	43.1	17.2	4.0	21.2	10.3	0.3	23.9

Note: n.a. = Not applicable.

Source: ABS, Table 3.9, Catalogue 4602.0.55.001.



	Dwellings with insulation (000's)*	Dwellings with no insulation (000's)*	% of households with no insulation
New South Wales	1,728.4	978.5	36
Victoria	1,700.1	356.5	17
Queensland	943.9	671.3	42
South Australia	543.8	103.7	16
Western Australia	633.2	193.6	23
Tasmania	165.1	36.6	18
Northern Territory	38.8	22.2	36
Australian Capital Territory	110.9	17.6	14
Australia	5,863.9	2,379.8	29

Note: * Pro-rata distribution of 'did not know'.
Source: ABS, Table 2.12, Catalogue 4602.0.55.001.

Table 4.7 shows that 36 per cent of dwellings in New South Wales have no insulation. This is greater than the Australian average of 29 per cent of dwellings with no insulation. With the Commonwealth stimulus package announced in March 2009, Government aims to install insulation into 2.7 million Australian homes. According to the ABS publication approximately 2.4 million dwellings currently have no insulation.

Water heating

Table 4.8 shows the main energy source used in water heating in New South Wales for 1999 to 2008 for selected years. The table highlights that:

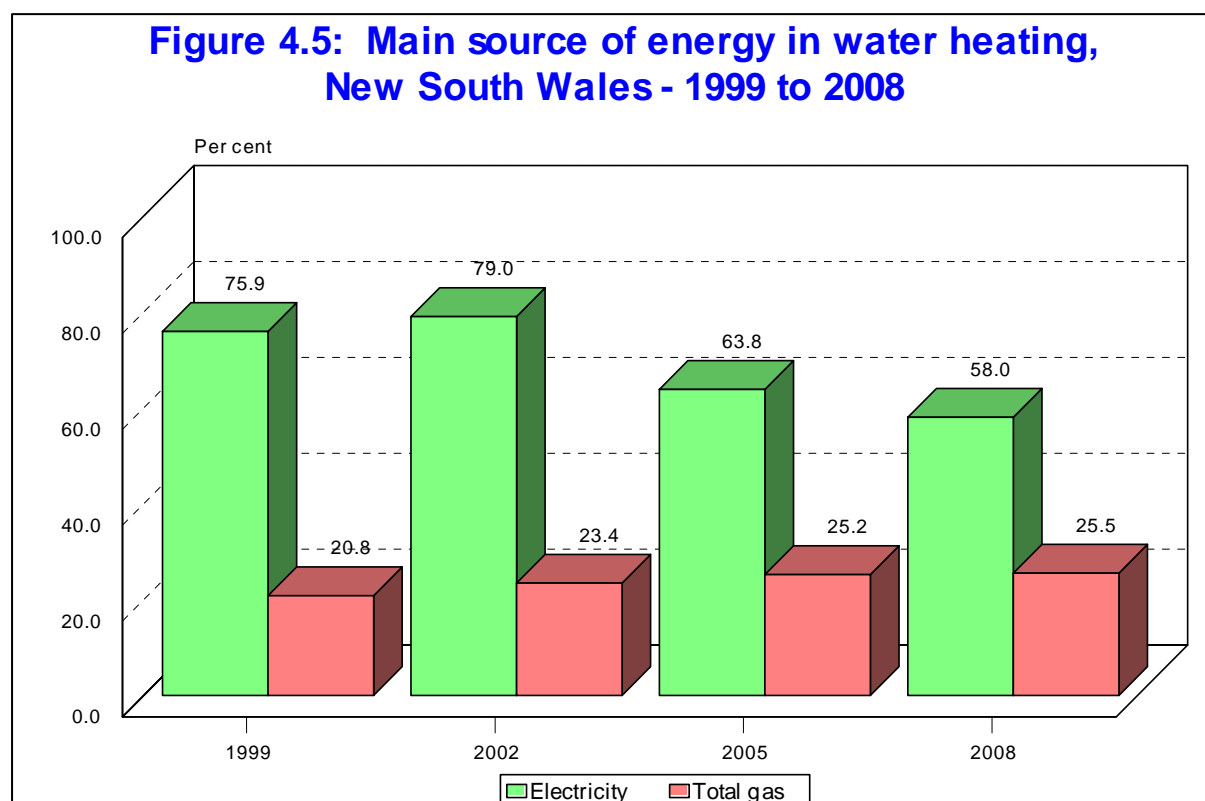
- natural gas's share of the main energy source used water heating increased from 20.8 per cent in 1999 to 25.5 per cent in 2008;
- electricity's share has been steadily declining having lost at least 17 per cent of its share as a main source of energy as households shift towards solar and gas;
- solar energy as a source for heating water has been increasing slowly, but is still only 5 per cent of the share of energy used in water heating; and
- the significant increase in other could reflect heat pump installations (which are really electric).

Table 4.8 Main source of energy used in water heating – New South Wales (per cent)							
	Electricity	Mains gas	LPG	Total gas	Wood	Solar	Other*
1999	75.9	n.a.	n.a.	20.8	0.7	2.7	1.0
2002	79.0	n.a.	n.a.	23.4	0.5	2.4	2.4
2005	63.8	23.9	1.3	25.2	0.6	2.5	8.6
2008	58.0	23.9	1.6	25.5	0.3	5.0	12.1

Notes: n.a. = Not applicable.

* Includes didn't know and oil.

Source: ABS, Table 3.11, Catalogue 4602.0.55.001.

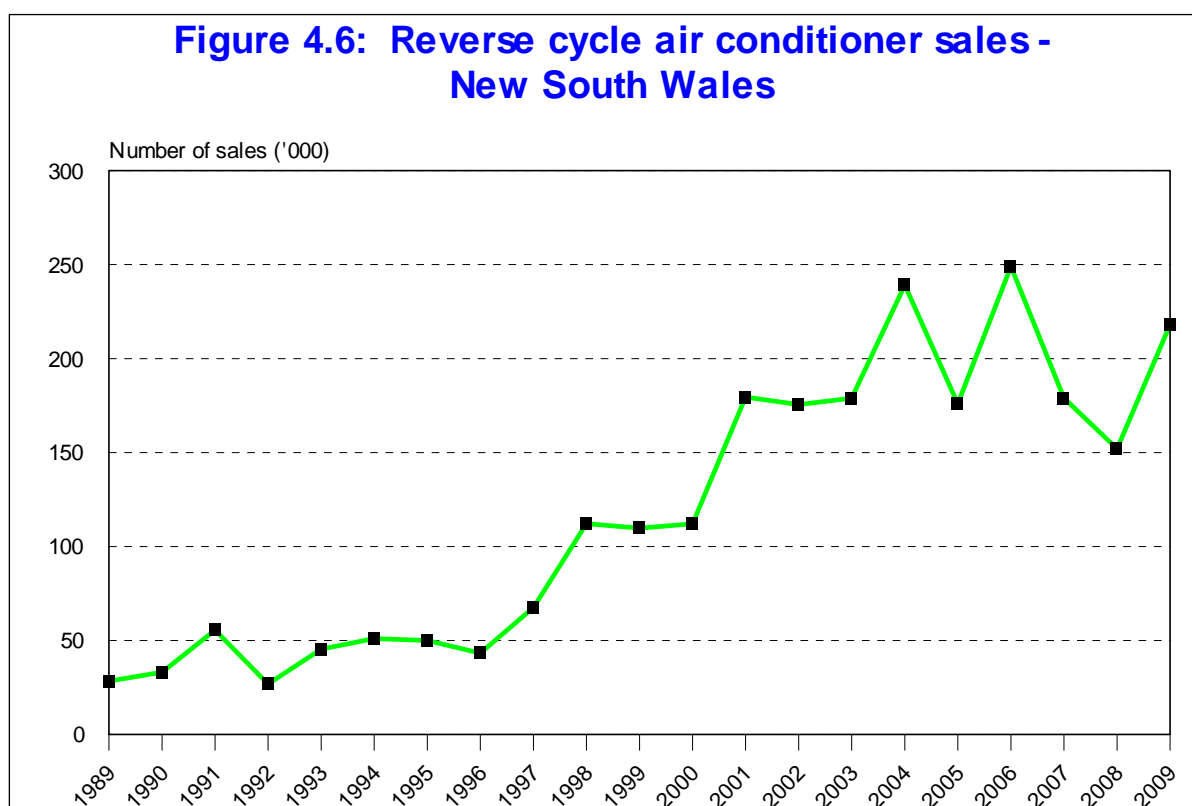


The number of dwelling with a cooler has been on an increasing trend in New South Wales, from 30.8 per cent of households in 1994, to 58.3 per cent of households in 2008, according to the ABS survey³. The types of coolers being purchased are presented in Table 4.9 below.

Table 4.9 Main cooler in dwelling – New South Wales (per cent)				
	Reverse cycle/ heat pump	Refrigerated	Evaporative	Don't know
1994	67.5	14.2	16.1	2.2
1999	59.4	16.6	20.8	3.1
2002	71.4	12.5	12.6	3.5
2005	78.0	7.6	12.7	1.7
2008	77.7	8.5	11.6	2.2

Source: ABS, Table 4.12, Catalogue 4602.0.55.001.

This data can be further supported by the New South Wales reverse cycle sales date, which shows that air conditioner sales have been on a steady increase since 1994 at an average growth of 14 per cent annually. There was an increase in sales in 1998 and again in 2004, as can be seen in Figure 4.6.



³ Source: ABS, Table 4.11 Catalogue 4602.0.55.001.

4.7 Gas prices and the CPRS

Greenhouse policy

At the time these projections were prepared, a number of Federal and State Government policies were impacting on gas prices.

On the 15 December 2008, the Australian government released the White Paper on the Carbon Pollution Reduction Scheme. This paper confirmed an emission trading scheme is to be introduced by 2010-11. The White Paper outlines the final design of the Carbon Pollution Reduction Scheme, and a target range for reducing carbon pollution. NIEIR's assessment of the White Paper and the implications for permit and gas prices is provided below.

Permit (CO₂e) prices and electricity prices (\$/MWh), 2010-2030

Over this period the CPRS will apply and lead to increases in gas prices. The quantitative impact will be determined by a range of factors: the CPRS caps set, the costs of reducing GHG emissions domestically (which will depend on the prices of black coal and natural gas, and GHGA technologies such as CCS and renewable), the price and availability of international permits (no restrictions on their use to meet domestic caps, but price in A\$ of supply is an issue) and other specific design features of the CPRs.

In our base (most likely) scenario out to 2030, we have assumed the Treasury CPRS-5 scenario applies out to 2015 (the caps to 2015 will be announced in early 2010), gradual change to the CPRS-15 scenario by 2025 (will largely depend on the global Copenhagen, December 2009 results), similar gas coal and renewable and CCS prices to Treasury and similar impacts (pass through) of permit prices on gas prices given in the White Paper.

We are reasonably confident that the magnitudes are reasonable out to 2015, but uncertainty increases past that point in the absence at this time of better information and data.

Caps – domestic permits and international permits

The interaction of these two (unrestricted) sources of eligible CPRS permits could have a significant impact on GHGA under the CPRS in Australia.

International permit prices in A\$ will determine their contribution to attainment of CPRS caps. Some Treasury scenarios have international permits contributing over 50 per cent of cap attainment.

The CPRS cap determines the number of carbon pollution permits that will be issued by the Government. Allowable emissions across the sources covered by the Scheme will be able to exceed the cap only if the excess is matched by the surrender of eligible international units, additional domestic permits issued as a result of forestry activities, additional permits issued under the price cap mechanism or, if allowed, Scheme offsets (see Chapter 6 of the White Paper).

In a system with little or no international linkage, the interaction between the cap and the demand for permits is the primary determinant of the carbon price: the more stringent the Scheme cap, the higher the price, all other things being equal. However, the Government has decided to allow unlimited imports of eligible international units from Scheme commencement and to review the scope for exporting permits over time (see Chapter 11 of the White Paper). This means, depending on the level of international prices and the longer term Scheme linking policy, the domestic Scheme cap may be a less significant determinant of domestic carbon prices. Over time, the domestic carbon price is expected to converge on the international price, which in turn will be determined by global abatement demand and supply conditions.

The Scheme cap-setting arrangements remain important, however, because the Scheme cap will reflect national emissions targets and Australia's international obligations. As the number of eligible international units that may need to be purchased will be determined by the ambition of national targets, targets will be the key to the overall cost to the Australian economy.

The projections for real New South Wales gas prices to 2014-15 is summarised in Table 4.10 below by major customer class.

Table 4.10 New South Wales gas prices – 2005-06 (\$ per GJ)			
	Residential	Business	Total
2005-06	21.8	8.5	10.9
2006-07	21.9	8.5	10.8
2007-08	22.1	8.5	10.9
2008-09	22.0	8.5	10.9
2009-10	21.7	8.5	10.8
2010-11	23.8	9.3	11.9
2011-12	26.8	10.8	13.7
2012-13	27.7	11.7	14.5
2013-14	27.7	11.7	14.6
2014-15	27.8	11.8	14.7

4.8 Policies relating to gas (and electricity) consumption in New South Wales

There are a number of policies and initiatives through federal and state government which consider the future gas emissions and climate change related to energy use and gas consumption. These policies cover construction of homes, alterations and extensions, and purchasing/replacement of household appliances. All of these have an impact on the future gas consumption in New South Wales.

The following sections look at the impacts from BASIX, introduction of MEPS for gas hot water heaters, the increased penetration of energy efficient shower heads as well as the newly announced Commonwealth stimulus package, which has a focus on mass scale dwelling insulation across Australia, plus some other initiatives related to energy and water use which may also influence consumer behaviours towards end uses of gas.

4.8.1 Building Sustainability Index (BASIX)

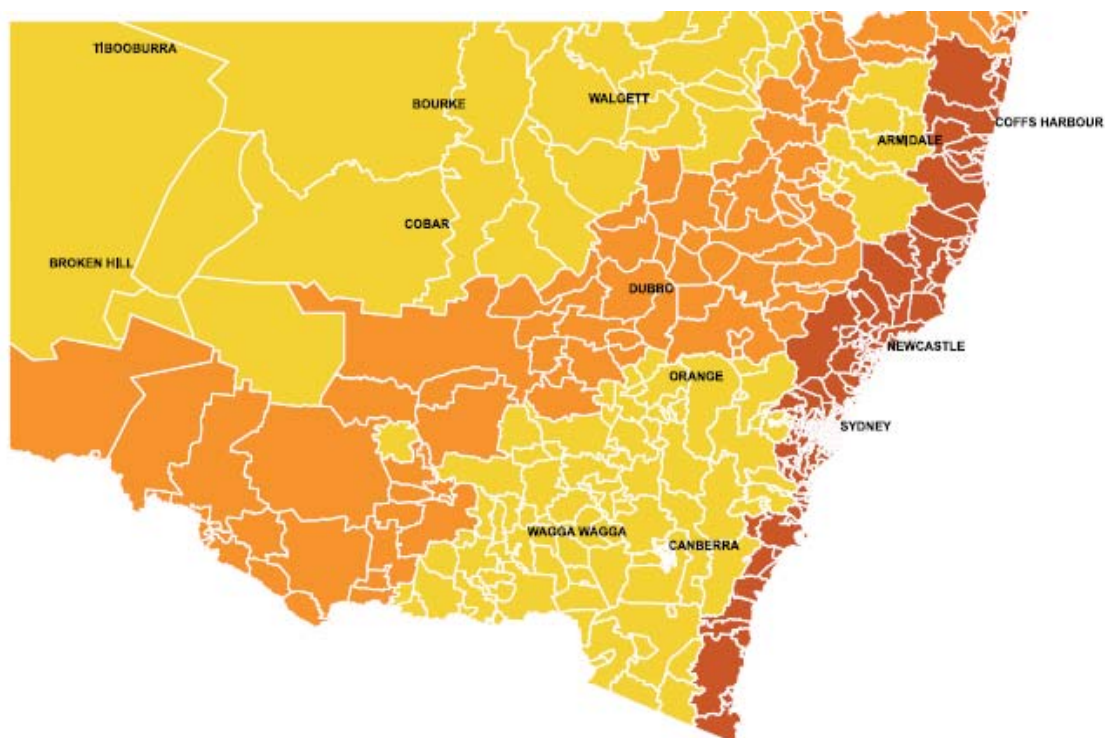
BASIX requires all new homes in New South Wales to use up to 40 per cent less potable water and produce up to 40 per cent fewer greenhouse gas emissions than the average home. BASIX will also apply to alterations and additions to existing homes worth \$50,000 or more.

The BASIX Energy target varies according to building type and location and the BASIX Water target incorporates regional variations such as soil type, climate, rainfall and evaporation rates.

Homes with some or all of the following features score well with BASIX:

- good solar orientation;
- cross ventilation;
- insulation;
- external shading;
- performance glazing for large glazed areas and/or poorly oriented areas;
- rainwater tanks, plumbed to toilet, garden and/or laundry*;
- efficient (3A-5A) showerheads, toilets, tap fittings;
- indigenous garden species;
- grey water system where appropriate;
- solar, heat pump or high efficiency gas hot water systems;
- ceiling fans, evaporative coolers, fixed flue gas heating or high efficiency air conditioning;
- energy efficient lighting;
- efficient pool heating and pumps; and
- alternative energy systems such as photovoltaics.

* BASIX for regional New South Wales recognises rainwater use for drinking or all household uses.

Figure 4.7: BASIX targets across New South Wales zones

Building type	Zone		
	1	2	3
Detached + semi-detached	40	35	25
3 storey units	35	30	20
4 and 5 storey units	30	25	15
6 storey units and higher	20	15	5

Table 18

Distribution of certificates by energy target zone				
energy target zone	2005-06*	2006-07	2007-08	Average
Zone 1	n/a	70.9%	72.0%	46.6%
Zone 2	n/a	10.5%	10.5%	7.0%
Zone 3	100.0%	18.6%	17.5%	46.4%

Note: * Zone 1 target of 25 per cent applied to all certificates in 2005-06.

Source: BASIX, 05-08.

Average gas consumption as a result of BASIX in new homes is expected to drop with the new standards in place. Programs such as GGAS and the Commonwealth stimulus package look at improving existing dwellings energy efficiency, whilst BASIX aims to regulate the development of new dwellings to reduce greenhouse gases, which at the same time reduces the average energy use of new dwellings. Average gas usage in new dwellings for heating is around 6.6 GJ, some 9 per cent less than for existing dwellings.

4.8.2 Mandatory Energy Performance Standards (MEPS)

Requirements for gas space heaters, gas water heaters and gas cookers

Energy labels can be found on gas space heaters and gas water heaters (both storage and instantaneous). The gas labelling program is currently an industry voluntary scheme. A review of the scheme is under way by the Gas Industry and Governments. In the meantime a 10 year strategy is in place called 'Switch on Gas'.

Strategy and work program for gas appliances

'Switch on Gas' is a ten year strategic plan intended to implement a nationally consistent regulation scheme for energy efficiency of gas appliances and equipment. This strategy is an important part of the package of measures being implemented by the MCE under the National Framework for Energy Efficiency (NFEI).

Switch on Gas will make a contribution to national efforts to reduce greenhouse gas emissions. Natural gas currently supplies about 30 per cent of total household energy in Australia. Within 20 years it is projected that Switch on Gas has the potential to reduce:

- the expenditure on natural gas of Australian consumers by up to \$115 million per annum; and
- consumption by over 5 per cent below business as usual.

Changes to the gas labelling and MEPS scheme for appliances

In November 2002, a joint government-industry working group comprising SEAV, OGS, AGO, AGA and the GAMAA formed a group to work on enhancing the effectiveness of the gas appliance efficiency scheme.

The proposed initiative of the MEPS for gas water heating requires the phasing out of all appliances below a 4.5 star rating. This will have a great impact on the overall consumption in New South Wales, as the consumption level from a 3 star hot water heater to a 5 star is a reduction of at least 15 per cent (see table below).

	Storage water heaters (MJ/year)	Instantaneous water heaters (MJ/year)
6 star	n.a.	17,837
5 Star	20,559	20,076
4 Star	22,466	23,325
3 Star	24,221	24,988
2 Star	25,601	n.a.
1 Star	27,599	n.a.

Note: The above average actual consumption figures are derived from test conditions and overstate average actual gas use by these appliances.

Source: AGA and NIEIR.

A hot water model was developed to estimate this saving, and looks at changing trends in replacing failed or scrapped units in existing dwellings and household preferences for purchasing HWS in new dwellings.

The hot water model

A representative hot water model was developed in order to assist in projecting hot water gas usage from new and existing customers. JGN assisted NIEIR in parameterising parts of the hot water model developed.

The hot water model covered the key three residential market segments:

- (i) existing customers (irrespective of whether they have gas hot water);
- (ii) new connections from new dwelling; and
- (iii) new connections from existing dwellings (known as E to G).

The hot water model segmented hot water systems into mains gas, solar gas, solar electric, heat pumps and electric storage.

The model in each market segment recognised that conventional electric resistance waters will be banned in all new and existing homes in gas reticulated areas from 2010. This policy extends to new flats and apartments in reticulated areas and established houses in non-gas reticulated areas from 2012.

New dwellings

For new dwellings, hot water is dominated by mains storage and instantaneous gas systems, although the banning of storage hot water leads to solar electric and heat pumps significantly increase their market share. By 2015, the share of has for new hot water systems in new dwellings falls to 67 per cent, the residual is solar electric and heat pumps.

Average gas usage for hot water in new dwellings is assumed to be 10.5 GJ per annum, and to improve by a further 1 per cent per annum out to 2018-19.

Existing dwellings

For existing dwellings, a failure or scrappage rate was assumed for each type of hot water system (i.e. mains gas, storage, electric, etc.). A fuel switching matrix was developed for each type of system. This matrix took into account the phasing out of storage electric systems between 2010 and 2012. For example for storage electric, it was assumed that by 2012, 43 per cent of replacements of resistance heaters were mains gas and 49.5 per cent were solar electric or heat pumps.

For existing customers, the increase in gas usage in hot water represented:

- the net decrease from pre-existing storage and instantaneous gas hot water heater customers replacing it with a more efficient has hot water unit; and
- the increase from previously electric hot water systems switching to storage gas and instantaneous gas hot water.

E to G dwellings

For E to G (or new gas connections from dwellings using electricity or other fuels) it was assumed 60 per cent switched to storage or instantaneous gas hot water in year 1. For the remainder of E to G customers (mainly still with resistance electric or hot water systems) a failure or scrappage rate was assumed similar to existing dwellings.

4.8.3 Energy efficient showerheads

There are various companies accredited under the NSW Greenhouse Gas Reduction Scheme (GGAS) who offer or install water efficient showerheads.

The Australian Government, in collaboration with state and territory governments, has introduced a Water Efficiency Labelling and Standards (WELS) Scheme.

The WELS scheme requires certain types of household water-using products to carry rating labels to reflect their relative water-use efficiency

The WELS Scheme applies to showers intended solely for personal bathing as specified in *AS/NZS 3662:2005 – Performance of showers for bathing*. Showers generate about 25 per cent of water savings under the WELS Scheme because:

- a standard showerhead uses about 15 to 25 litres of water per minute-a four star rated water efficient showerhead uses as little as 6 or 7 litres per minute.
- a standard showerhead uses at least 120 litres of water per eight-minute shower whereas a water efficient model uses less than 72 litres or 40 per cent less water
- installing a water-efficient showerhead saves about 14,500 litres per household each year *and*
- gas hot water costs for a standard showerhead are around \$1,500 over ten years whereas gas hot water costs for a water-efficient shower head are only \$790 over ten years or a 47 per cent reduction.

Under the WELS Scheme a rating is given to a showerhead and any additional component supplied with the head such as pivoting arm, flexible hose or flow controller. However, additional components cannot be rated separately from the head.

GGAS and WELS have an indirect impact on gas consumption in New South Wales. With a reduction in water consumption, those dwellings with gas hot water heaters will see a reduction in their gas consumption, depending on the energy efficiency of the water heater, gas savings will vary between dwellings, but a saving due to energy efficient shower heads is expected.

The penetration of low flow showerheads is assumed to rise by around 3 per cent per annum, consistent with historic trends. This leads to a very small reduction in gas usage by existing dwellings for hot water. On an annual basis it is 0.1 GJ per annum.

4.8.4 Insulation and heating

The Department of Environment and Climate Change NSW, is providing up to three hundred dollars in rebates for home owners in New South Wales, plus the federal government was giving up to \$1,600 rebates for home owners across the country to insulate their homes.

From 1 July 2009, the Rudd Government, as a part of Energy Efficient Homes, was aiming to install free ceiling insulation in around 2.7 million Australian homes. The Energy Efficient Homes investment was created to:

- install ceiling insulation in around 2.7 million Australian homes;
- cut around \$200 per year off the energy bills for households benefiting from these ceiling insulation programs;
- reduce greenhouse gas emissions by around 49.4 million tonnes by 2020, the equivalent of taking more than 1 million cars off the road.

The Rudd Government also doubled the rebate available under the Low Emissions Plan for Renters for landlords to install insulation in their rental properties – from \$500 to up to \$1,000. The Government estimated 500,000 rented homes will benefit from this program.

The New South Wales Government also provides a residential rebate. The rebate covers half the cost of installing ceiling insulation, up to a maximum of \$300.

It is available for any type of thermal insulation materials for ceilings, installed in residential properties in New South Wales. The ceiling insulation must:

- cover the entire ceiling area;
- comply with the Australian Standard for insulation – AS/NZS 4859.1:2002;
- be purchased in full, and installed between 1 October 2007 and 30 June 2009; and
- meet a minimum R-value in the local government area (approximately three across New South Wales).

Insulation installed to comply with BASIX (the Building Sustainability Index) for new homes or major renovations is not eligible for a rebate.

For existing dwellings, this scheme will provide a saving to those dwellings which use gas space heaters, so although most houses without insulation are expected to partake in this scheme (about 90 per cent of households without insulation), only those with gas space heaters will benefit in reduced gas consumption for the household.

Around 36 per cent of New South Wales homes are uninsulated. The Energy Efficient Homes Initiative, although it has been suspended, was forecast to have a 50 per cent take-up in 2009-10 in uninsulated gas heated dwellings. The annual take-up is set to decrease with the uncertainty in the future of the scheme and as backlog applications are completed. Usage for existing dwellings falls by around 0.3 GJ per annum over 2010, 2011 and 2012.

Substitution to electricity

The projections also allow for the substitution towards electricity for existing customers. The projections assume that as gas space heaters break down, 25 per cent of existing customers substitute to reverse cycle air conditioning. This leads to a small reduction in total usage for heating in existing dwellings of 0.1 GJ per annum.

4.8.5 RET – Renewable Energy Target

The Australian Government is committed to ensuring 20 per cent of Australia's electricity supply comes from renewable energy by 2020.

To deliver on this commitment, the Government is establishing an expanded national Renewable Energy Target (RET) scheme.

The national Renewable Energy Target scheme will:

- increase the existing Mandatory Renewable Energy Target (MRET) by more than four times to 45,000 gigawatt-hours in 2020;
- contribute to meeting Australia's targets for the reduction of greenhouse gas emissions;
- provide a market incentive to accelerate uptake of Australia's abundant renewable energy sources, which include solar, wind and geothermal energy; and
- reduce red tape by bringing existing state-based targets into a single, national scheme.

It is important to note that certificates under RET apply both to new and existing dwelling replacements of hot water systems.

4.8.6 NEET – New South Wales Energy Efficiency Target

The Government is setting a new target to increase energy efficiency activity under the NSW Greenhouse Gas Reduction Scheme (GGAS). Retailers will be required to pursue additional energy efficiency measures in households and businesses from July 2009.

A new class of tradeable certificate will be established to support the enhanced energy efficiency target, which will be designed to achieve an optimal level of energy efficiency in New South Wales. The remainder of GGAS will continue as it has in the past until it is replaced by the national emissions trading scheme. The existing targets in GGAS will also continue.

The revitalised energy efficiency scheme will substantially utilise the existing GGAS architecture and continue to be regulated and administered by the Independent Pricing and Regulatory Tribunal.

NEET is designed to bridge the potential gap in the incentive for energy efficiency projects which the introduction of a national emissions trading scheme (ETS) in 2010 will not address. It is proposed that the NEET Scheme would continue until a national energy efficiency trading scheme is established, or in the absence of this, until 2020.

It is currently proposed that, initially, the NEET will only cover electricity use. However, scheme coverage could be expanded later to include other sources of stationary energy including natural gas. From 1 July 2009 substitution of electric hot water systems with gas will no longer receive any credits under the NEET scheme.

4.8.7 Other rebates and incentives

- Sydney Water offers a \$150 to \$500 rebate for installing and connecting rainwater tanks. There's \$500 for connecting the tank to your toilet, another \$500 for a laundry hook-up, and \$150 for installing a water efficient washing machine.
- From January 2008, the NSW Government offers a \$1200 rebate for switching from electric to solar hot water, and \$300 for switching to gas hot water heaters with a 5 star or higher energy rating.
- By trading greenhouse gas savings via the NSW Greenhouse Gas Abatement Scheme (GGAS), some companies can offer free or cut-rate installation of compact fluorescent light bulbs, water efficient showerheads and home energy audits.
- NSW Rainwater Tank Rebate – The NSW Government is offering a rebate to help households who install a rainwater tank with a capacity larger than 2,000 litres. There is an additional rebate for connecting the tank to the toilet or washing machine. The offer is only for existing homes.
- NSW Washing Machine Rebate – If you install a 4.5 star WELS rated washing machine between 1 August 2008 and 30 June 2010 in New South Wales, you may be eligible for a \$150 rebate from the Department of Environment and Climate Change.

5. Natural gas sales and customer number forecasts to 2015 – New South Wales Natural Gas Distribution Network

5.1 Introduction

This section presents natural gas demand forecasts by class and tariff to 2015 for the New South Wales Natural Gas Distribution Network. Forecast numbers were prepared on a financial year basis to 2015.

Forecasts of natural gas sales, customer numbers and MDQ are presented for the following:

- tariff by class; and
- contract by class and industry.

5.2 Natural gas sales forecasts to 2015

Table 5.1 shows forecasts of natural gas sales by tariff and class on a financial year basis to 2015 for the New South Wales Natural Gas Distribution Network. The tariff forecasts are shown on a class basis, residential and business.

The data in Table 5.1 is presented on a weather normalised basis. This table shows volumes by class for tariff and contract by class and industry volumes.

Tariff

- Tariff volumes for the New South Wales Natural Gas Distribution Network represent around 35 per cent of total volumes. Total tariff volume growth is forecast to be 0.4 per cent per annum over the 2009 to 2015 period. The slow volume growth in the New South Wales Natural Gas Distribution Network price effects is associated with the CPRS and the impact of the Federal and State energy policies on residential volume growth. These policies were outlined in Section 4.8.

Residential volume growth on a weather normalised basis is 0.4 per cent per annum over the 2009 to 2015 period. Residential volumes for the New South Wales Natural Gas Distribution Network represent around 23 per cent of total gas sales.

Table 5.2 shows the formation of the forecasts for residential tariff gas volumes. This table separates out existing and new residential customers. Existing customer gas usage is expected to remain relatively stable, but decline slightly in average usage terms. New customers are separated into E to G and new estates and high rise.

Average usage by new customers, however, reflects the impact of Commonwealth and State policy measures identified in Chapter 4 of this report (e.g. BASIX, resistance hot water phase-out). Average usage by new customers (excluding E to G) falls to around 16.5 GJs per annum in 2010 (excluding losses) and 15.3 GJ per annum by 2015.

Figure 5.1 shows the percentage growth in volumes by class and tariff over the 2009 to 2015 period for the New South Wales Natural Gas Distribution Network. Figure 5.2 shows total volume growth by class and tariff over the same period.

- Business tariff gas consumption represents around 12 per cent of total New South Wales Natural Gas Distribution Network sales volumes. Forecast growth over the 2009 to 2015 period is around 240 TJs, or 0.3 per cent per annum.

Contract

- Industrial contract natural gas consumption from the New South Wales Natural Gas Distribution Network falls by 1.2 per cent per year. Increasing downside risks to New South Wales manufacturing may suggest the forecasts for contract are too optimistic. There have been a number of major customer losses over recent years in New South Wales. Many manufacturers have either closed their New South Wales' production facilities altogether, or shifted their operations overseas, to countries like China.

Projections of contract volumes, customer numbers and maximum daily quantities are presented in Tables 5.1, 5.3 and 5.4.

The projections for contract to 2015 reflect a number of alternative sources of information:

- the impact of price increases associated with the proposed Emissions Trading Scheme; and
- the economic prospects for each sector, in terms of overall real output growth projections to 2015. These are produced as part of NIEIR's economic forecast.

On the balance of probabilities, the NIEIR volume forecast for contract may prove far too optimistic. This is particularly the case for the region which includes a large share of older manufacturing establishments.

Figure 5.1: Natural gas sales by tariff and class - 2009 to 2015
(Average annual percentage growth)

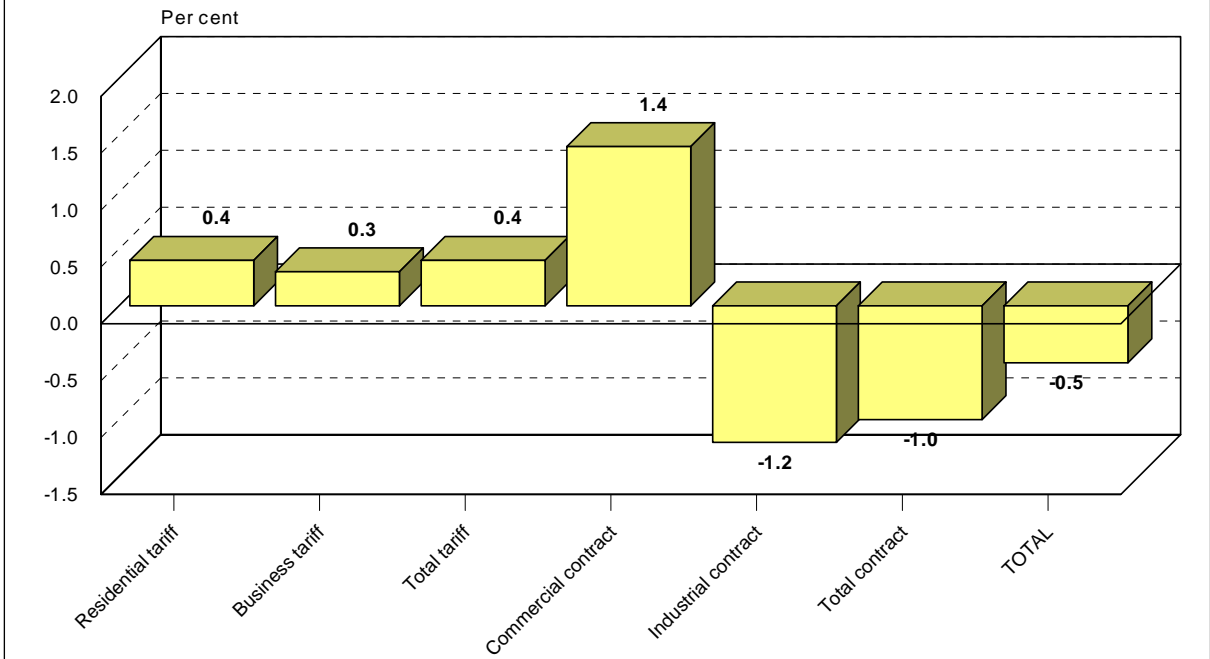


Figure 5.2: Natural gas sales by tariff and class - Volume growth - 2009 to 2015 (TJs)

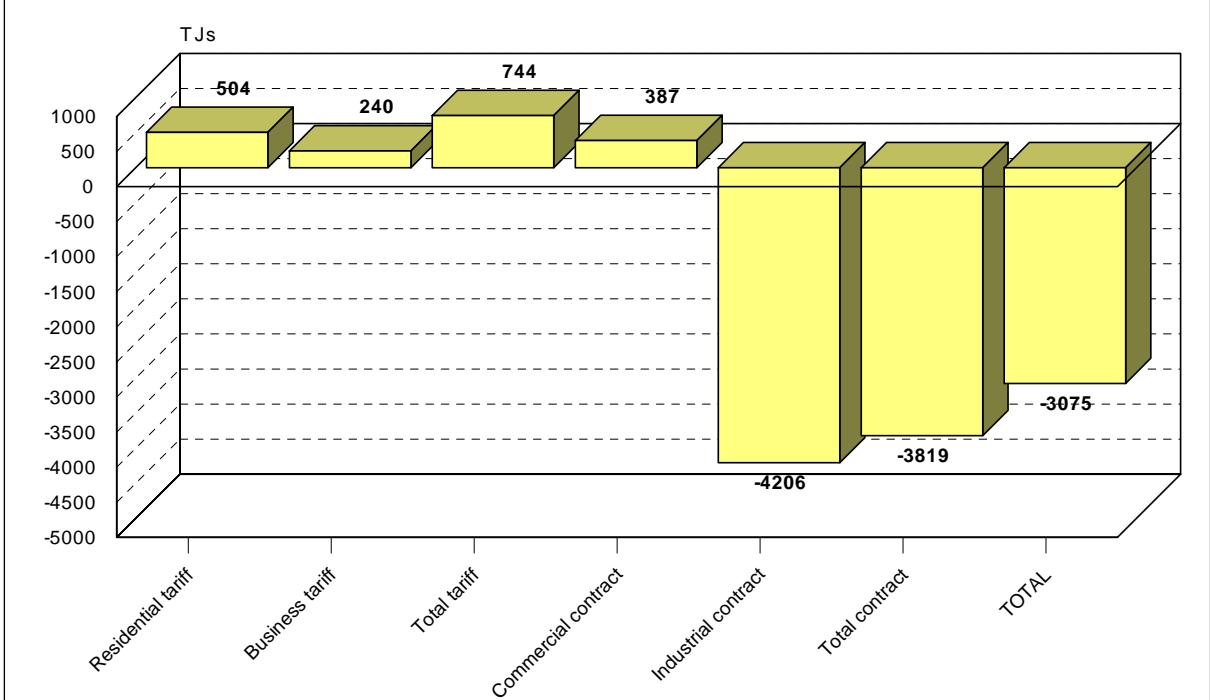


Table 5.1 Natural gas sales projections to 2014-15 by class and industry – New South Wales Gas Distribution Network (TJs)

	2008	2009	2010	2011	2012	2013	2014	2015
System Total	99,430	97,631	97,940	100,237	101,358	98,476	96,292	94,556
Tariff	33,884	33,063	34,497	34,520	34,394	33,931	33,570	33,806
Residential Tariff	21,640	21,310	22,458	22,373	22,035	21,634	21,565	21,814
Existing customers	21,640	21,310	21,965	21,374	20,509	19,613	18,958	18,578
New customers	–	–	494	999	1,526	2,022	2,607	3,236
Business Tariff	12,245	11,753	12,039	12,148	12,359	12,296	12,004	11,992
Contract	65,545	64,568	63,443	65,716	66,963	64,545	62,722	60,749
Commercial Contract	4,834	4,414	4,927	5,005	4,995	4,887	4,806	4,801
Electricity, gas and water (ex GPG)	623	622	734	730	728	713	697	688
Wholesale trade and retail trade	11	1	1	1	1	1	1	1
Transport and storage and communication services	823	886	949	966	985	977	965	961
Finance insurance property and business services plus distributed cogeneration assumption	40	5	38	38	38	37	36	35
Government administration, defence, education, health and community services	2,117	1,727	1,951	1,987	1,943	1,875	1,840	1,838
Accommodation, cafes, restaurants, cultural and recreational services, personal and other services	1,220	1,173	1,254	1,283	1,299	1,285	1,266	1,277
Industrial Contract	60,711	60,154	58,516	60,711	61,968	59,658	57,916	55,949
Agriculture	388	396	377	425	423	407	397	396
Mining	110	131	125	127	128	126	126	126
Food, beverages, tobacco manufacturing	6,178	5,875	5,811	6,253	6,504	6,179	6,079	5,967
Textiles, clothing and footwear manufacturing	384	286	272	268	253	226	207	190
Wood and paper, wood products and paper product manufacturing	3,423	3,270	3,111	3,154	3,119	3,004	2,935	2,911
Chemicals, petroleum, coal manufacturing	25,504	26,566	25,898	26,648	25,987	25,661	25,027	24,356
Non-metallic minerals manufacturing	10,861	9,889	9,410	10,152	10,829	10,166	10,122	9,784
Basic and fabricated metal products manufacturing	13,404	12,836	12,651	12,799	13,849	13,076	12,248	11,475
Transport and other machinery equipment manufacturing	404	421	401	402	386	348	322	297
Miscellaneous manufacturing	56	483	460	484	490	466	455	446

Table 5.2 Residential gas sales by customer type to 2014-15 – New South Wales Gas Distribution Network

	2008	2009	2010	2011	2012	2013	2014	2015
Customer numbers								
Total residential meters	995,074	1,022,084	1,052,085	1,082,658	1,115,918	1,148,907	1,189,233	1,233,758
Existing customer meters	995,074	1,022,084	1,022,084	1,022,084	1,022,084	1,022,084	1,022,084	1,022,084
New customer meters								
Electricity to gas (E to G)	6067	6332	7056	6267	7193	6973	6772	6568
New estates and high rise	17142	18197	22945	24306	26067	26016	33554	37956
Total new	23209	24529	30001	30573	33260	32989	40326	44524
Average usage (GJ per year) – on weather normalised basis								
Tariff								
Residential tariff								
Existing customers	21.75	20.44	21.49	20.91	20.07	19.19	18.55	18.18
Electricity to gas(E to G)	14.60	14.600	14.60	15.675	14.818	14.066	13.587	13.348
New estates and high rise		17.353	17.03	16.733	16.123	15.305	14.682	14.275
Volumes								
Existing customers	21,640	21,310	21,965	21,374	20,509	19,613	18,958	18,578
Electricity to gas (E to G)			103	201	308	406	498	586
New estates and high rise			391	798	1,218	1,616	2,109	2,650
Total	21,640	21,310	22,458	22,373	22,035	21,634	21,565	21,814
Average usage – overall residential	21.7	20.8	21.3	20.7	19.7	18.8	18.1	17.7

Table 5.3 MDQ projections to 2014-15 by class and industry – New South Wales Gas Distribution Network

	2008	2009	2010	2011	2012	2013	2014	2015
Tariff D	293,310	287,630	274,992	283,180	288,295	279,257	272,677	265,414
Commercial tariff D	25,042	25,353	26,459	26,758	26,732	26,322	26,012	25,986
Electricity, gas & water (ex GPG)	4,348	2,560	2,579	2,568	2,565	2,527	2,487	2,464
Wholesale trade and retail trade	79			-	-	-	-	-
Transport & storage and communication services	4,306	5,760	5,971	6,047	6,131	6,093	6,045	6,026
Finance insurance property & business services plus distributed cogeneration assumption	203	205	1,255	1,252	1,255	1,230	1,201	1,190
Government administration, defence, education, health & community services	10,695	10,695	10,496	10,632	10,468	10,208	10,077	10,068
Accommodation, cafes, restaurants, cultural & recreational services, personal & other services	6,295	6,133	6,158	6,259	6,313	6,264	6,201	6,237
Industrial Tariff D	268,268	262,277	248,533	256,422	261,563	252,936	246,665	239,428
Agriculture	2,084	2,042	2,026	2,026	2,026	2,026	2,026	2,026
Mining	925	925	550	550	550	550	550	550
Food, beverages, tobacco manufacturing	29,473	28,596	29,478	31,256	32,259	30,959	30,557	30,108
Textiles, clothing and footwear manufacturing	2,105	1,483	1,524	1,508	1,450	1,339	1,259	1,188
Wood and paper, wood products and paper product manufacturing	13,827	13,634	13,223	13,377	13,252	12,834	12,583	12,496
Chemicals, petroleum, coal manufacturing	94,593	96,144	94,230	96,652	94,516	93,463	91,402	89,220
Non-metallic minerals manufacturing	42,415	39,317	40,001	42,896	45,520	42,949	42,777	41,461
Basic & fabricated metal products manufacturing	76,875	74,190	61,794	62,350	66,250	63,384	60,271	57,321
Transport and other machinery equipment manufacturing	2,894	3,290	2,992	3,000	2,909	2,693	2,543	2,395
Miscellaneous manufacturing	2,878	2,656	2,715	2,807	2,832	2,738	2,697	2,663

Table 5.4 Customer number projections to 2014-15 by class and industry – New South Wales Gas Distribution Network

	2008	2009	2010	2011	2012	2013	2014	2015
System Total	1026373	1052248	1082706	1113567	1147291	1180399	1220553	1265211
Tariff V	1025943	1051834	1082295	1113154	1146879	1179989	1220144	1264802
Residential Tariff V	995074	1022084	1052085	1082658	1115918	1148907	1189233	1233758
Existing customers	995074	1022084	1022084	1022084	1022084	1022084	1022084	1022084
New customers			30001	30573	33260	32989	40326	44524
Business Tariff V	30869	29750	30210	30496	30961	31082	30911	31045
Tariff D	430	414	411	412	412	410	409	409
Commercial Tariff D	132	126	128	129	129	127	126	126
Electricity, gas & water (ex GPG)	4	3	3	3	3	3	3	3
Wholesale trade and retail trade	1	0	0	0	0	0	0	0
Transport & storage and communication services	13	13	13	13	13	13	13	13
Finance insurance property & business services plus distributed cogeneration assumption	2	2	6	6	6	6	6	6
Government administration, defence, education, health & community services	63	64	63	63	62	61	60	60
Accommodation, cafes, restaurants, cultural & recreational services, personal & other services	48	44	44	44	44	44	44	44
Industrial Tariff D	298	288	283	283	283	283	283	283
Agriculture	9	9	9	9	9	9	9	9
Mining	1	1	1	1	1	1	1	1
Food, beverages, tobacco manufacturing	89	88	87	91	92	90	89	89
Textiles, clothing and footwear manufacturing	9	6	6	6	6	5	5	5
Wood and paper, wood products and paper product manufacturing	20	20	21	21	21	20	20	20
Chemicals, petroleum, coal manufacturing	41	39	39	39	39	39	38	38
Non-metallic minerals manufacturing	46	44	43	44	46	44	44	44
Basic & fabricated metal products manufacturing	50	48	46	46	48	46	45	43
Transport and other machinery equipment manufacturing	13	15	13	13	13	12	12	11
Miscellaneous manufacturing	19	18	19	19	19	19	19	19

5.3 Customer number and MDQ forecasts to 2015

Table 5.4 presents customer number forecasts by tariff and class to 2015, as well as contract maximum daily quantity projections.

Figure 5.3 shows customer growth by tariff and class over the 2009 to 2015 period for the New South Wales Natural Gas Distribution Network region. Figure 5.4 shows the average annual percentage change for contract between 2009 and 2015 in total volumes, total customers and total MDQs.

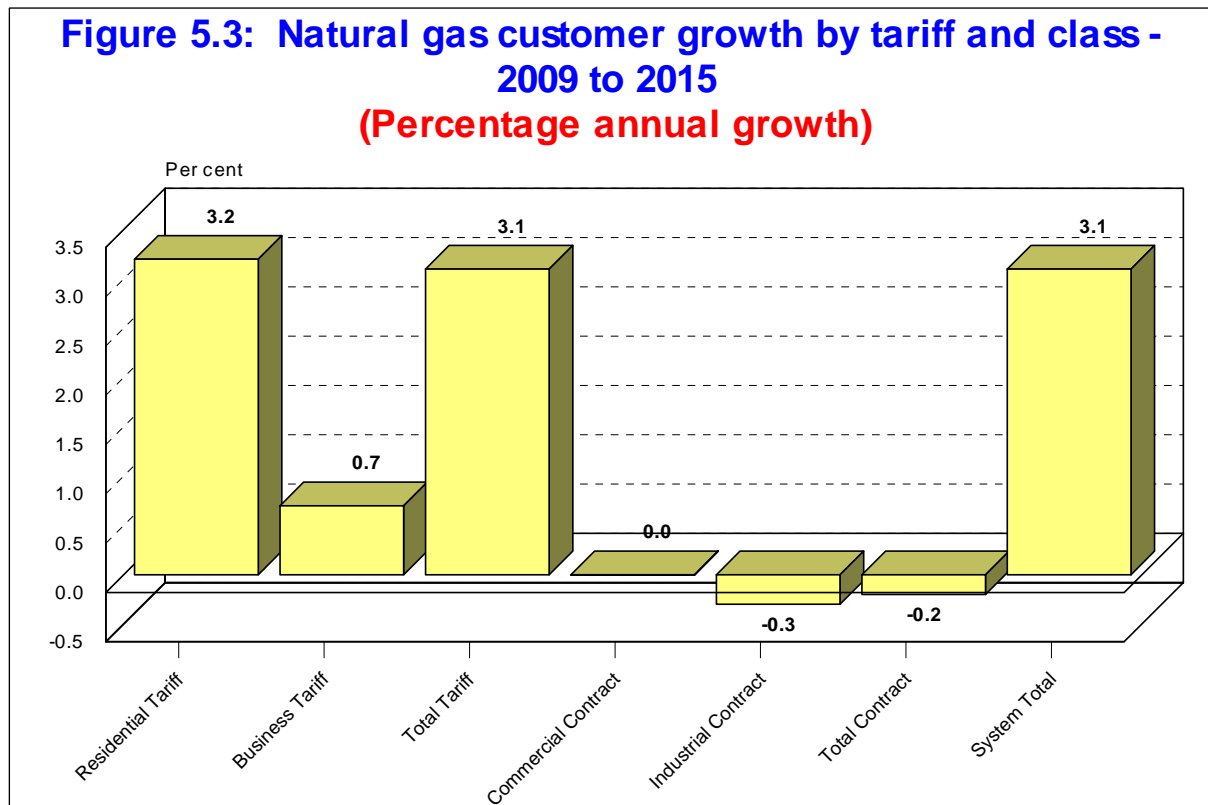


Figure 5.4: Contract volume, customer and MDQ growth - 2009 to 2015
(Average percentage change)

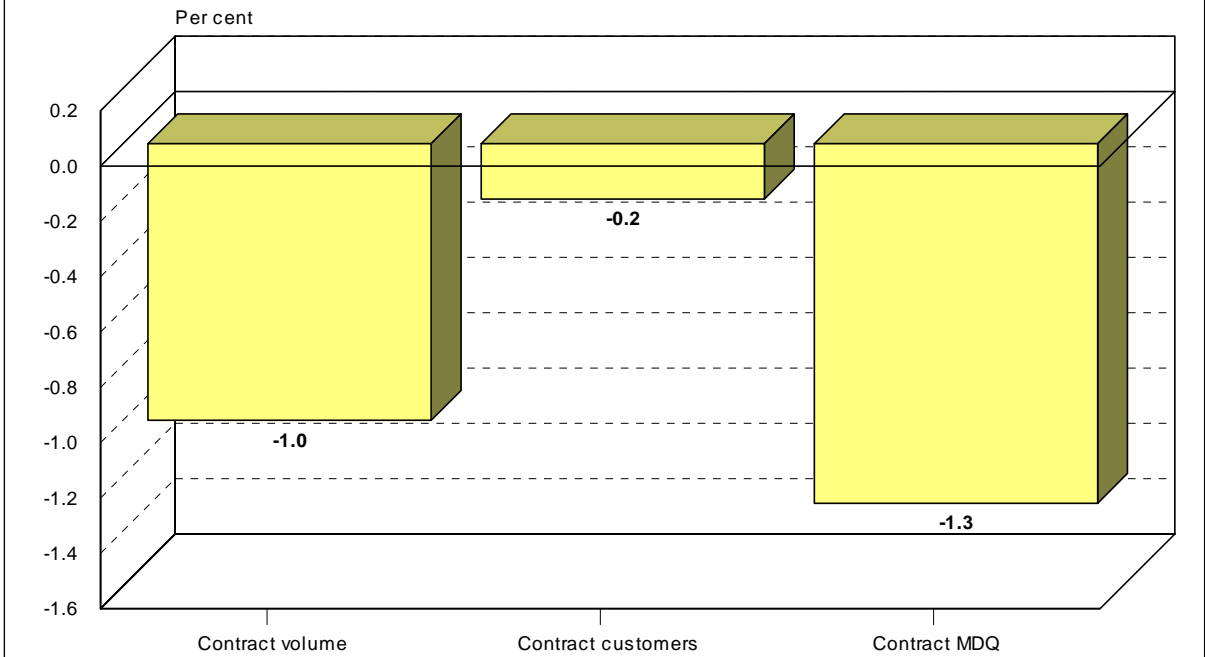
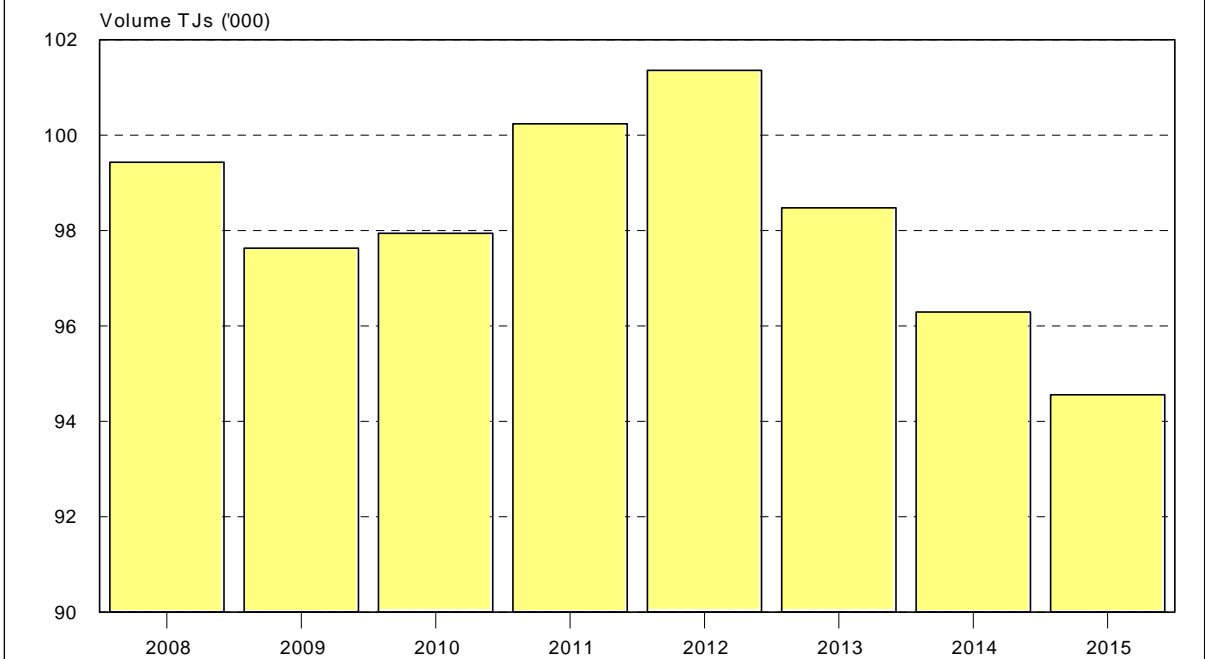
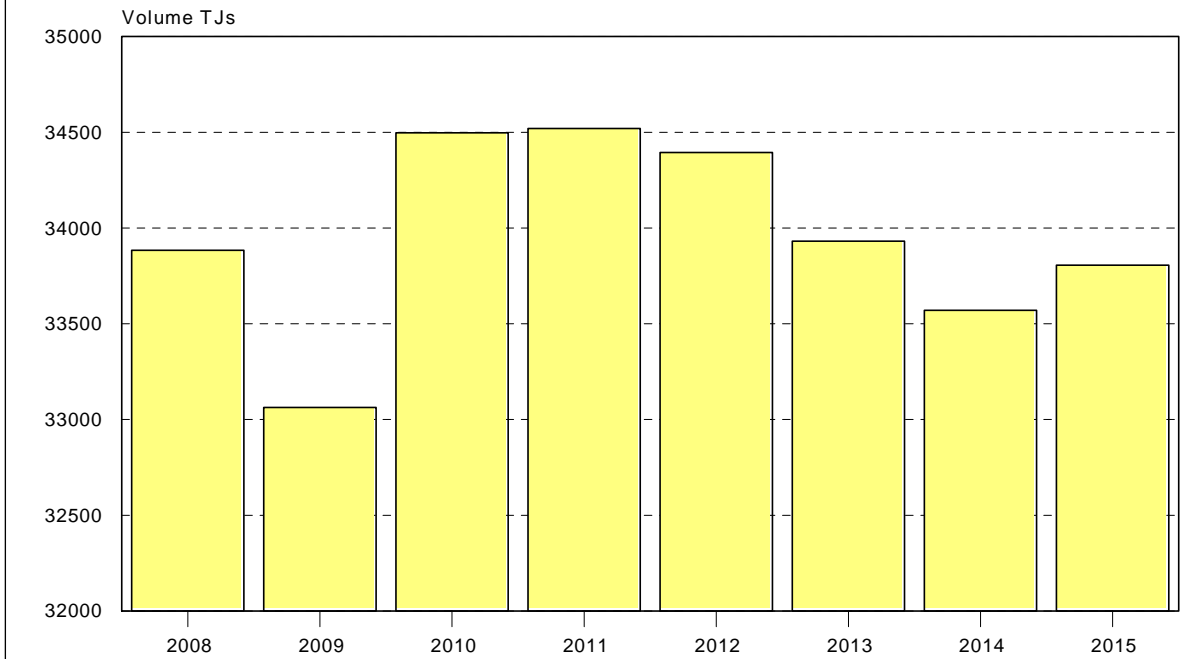


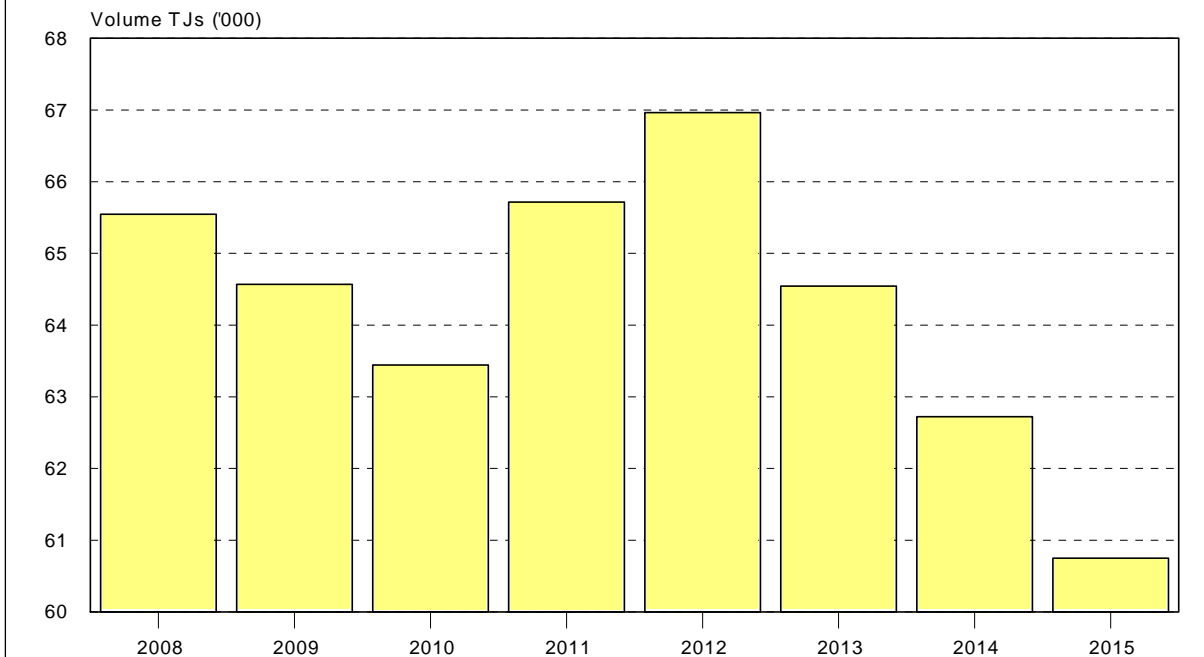
Figure 5.5: Natural gas sales - System total - 2008 to 2015



**Figure 5.6: Natural gas sales - Tariff -
2008 to 2015**



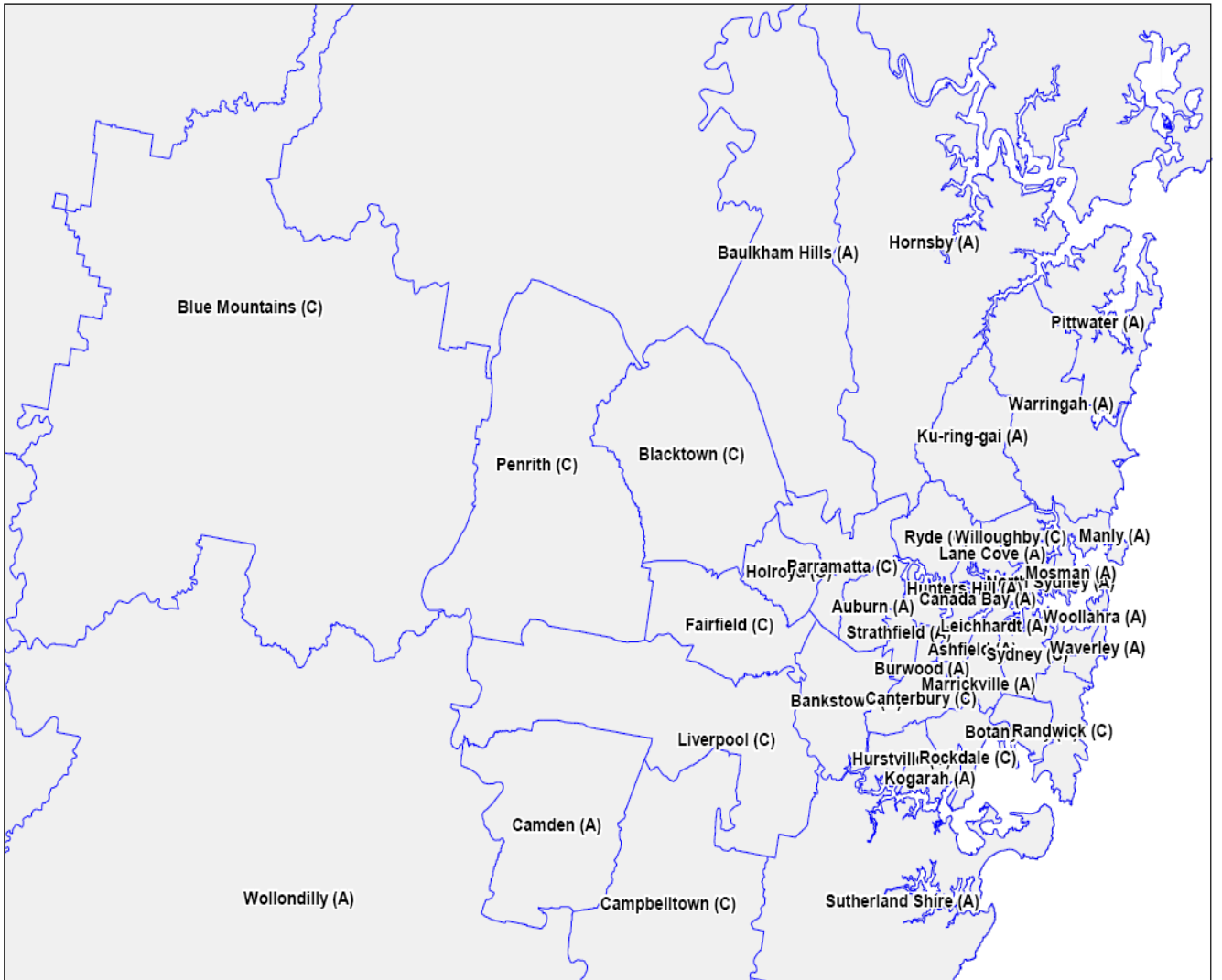
**Figure 5.7: Natural gas sales - Contract -
2008 to 2015**



Appendix A: Jemena Gas Network defined by ABS LGAs

The maps below are a concordance of ABS Local Government Areas with the Jemena Gas Network (JGN) map.





LGA No.	Comment	LGA Name	Population 1996	Population 2001	Population 2006	Dwellings 1996	Dwellings 2001	Dwellings 2006
10150		Ashfield (A)	40077	39494	40115	14801	14439	14920
10200		Auburn (A)	50959	56379	65604	15698	16380	19054
10350		Bankstown (C)	157735	165604	170617	51412	53395	54864
10500		Baulkham Hills (A)	119545	139404	158734	36255	43009	49818
10750		Blacktown (C)	232219	256364	272328	72584	79769	85605
10900		Blue Mountains (C)	72506	74317	73711	25445	26834	27251
11100		Botany Bay (C)	34702	35897	36457	12269	12463	13146
11300		Burwood (A)	28579	29960	31438	9591	9934	10218
11450		Camden (A)	32109	43945	49350	10214	13984	15724
11500		Campbelltown (C)	143773	145860	142841	43486	45199	45746
11520		Canada Bay (A)	53908	59845	65931	20135	22195	24414
11550		Canterbury (C)	132360	130947	130426	44479	43455	44258
11720		Cessnock (C)	44362	45204	46141	15601	15947	16664
12850		Fairfield (C)	181785	181936	179928	52262	53337	53909
13100		Gosford (C)	144840	154654	155957	53825	57922	58593
13800		Hawkesbury (C)	57381	61073	60924	18616	19885	19998
13950		Holroyd (C)	80470	85760	89874	27603	29346	30784
14000		Hornsby (A)	136746	145968	150376	45217	48312	50838
14100		Hunters Hill (A)	11969	12692	13228	3933	4105	4294
14150		Hurstville (C)	65392	70642	73750	23495	25052	26102
14450		Kogarah (A)	47618	50340	53197	16834	17441	18350
14500		Ku-ring-gai (A)	99032	101346	100460	32371	32830	32993
14650		Lake Macquarie (C)	170495	177619	180126	61164	65727	67442
14700		Lane Cove (A)	30107	30756	30530	11434	11445	11441
10150		Ashfield (A)	40077	39494	40115	14801	14439	14920
10200		Auburn (A)	50959	56379	65604	15698	16380	19054
10350		Bankstown (C)	157735	165604	170617	51412	53395	54864
10500		Baulkham Hills (A)	119545	139404	158734	36255	43009	49818
10750		Blacktown (C)	232219	256364	272328	72584	79769	85605
10800		Bland (A)	6681	6439	6273	2380	2319	2310
10850		Blayney (A)	6025	6141	6364	2174	2218	2402
10900		Blue Mountains (C)	72506	74317	73711	25445	26834	27251
11050		Boorowa (A)	2376	2333	2253	901	899	921
11100		Botany Bay (C)	34702	35897	36457	12269	12463	13146
11300		Burwood (A)	28579	29960	31438	9591	9934	10218
11450		Camden (A)	32109	43945	49350	10214	13984	15724
11500		Campbelltown (C)	143773	145860	142841	43486	45199	45746
11520		Canada Bay (A)	53908	59845	65931	20135	22195	24414
11550		Canterbury (C)	132360	130947	130426	44479	43455	44258
11720		Cessnock (C)	44362	45204	46141	15601	15947	16664
12000		Coolamon (A)	3849	3911	3916	1396	1418	1471
12200		Cootamundra (A)	7457	7132	7140	2823	2813	2887
12350		Cowra (A)	12146	12462	12357	4475	4646	4766
12600		Dubbo (C)	36701	37659	37950	12174	12960	13076
12850		Fairfield (C)	181785	181936	179928	52262	53337	53909
12900		Forbes (A)	10138	9707	9329	3598	3581	3548
13100		Gosford (C)	144840	154654	155957	53825	57922	58593
13310		Goulburn Mulwaree (A)	25779	26558	26962	8941	9280	9720

LGA No.	Comment	LGA Name	Population	Population	Population	Dwellings	Dwellings	Dwellings
			1996	2001	2006	1996	2001	2006
13450		Griffith (C)	21594	23805	23798	7400	8055	8098
13800		Hawkesbury (C)	57381	61073	60924	18616	19885	19998
13950		Holroyd (C)	80470	85760	89874	27603	29346	30784
14000		Hornsby (A)	136746	145968	150376	45217	48312	50838
14100		Hunters Hill (A)	11969	12692	13228	3933	4105	4294
14150		Hurstville (C)	65392	70642	73750	23495	25052	26102
14300		Junee (A)	5755	5585	5766	1804	1794	1821
14400		Kiama (A)	17706	18827	18596	6225	6707	6818
14450		Kogarah (A)	47618	50340	53197	16834	17441	18350
14500		Ku-ring-gai (A)	99032	101346	100460	32371	32830	32993
14650		Lake Macquarie (C)	170495	177619	180126	61164	65727	67442
14700		Lane Cove (A)	30107	30756	30530	11434	11445	11441
14750		Leeton (A)	11031	11469	11213	3743	3925	3852
14800		Leichhardt (A)	44395	48705	48698	18724	20279	20156
14870	small part not included	Lithgow (C)	19558	19550	19399	6981	7226	7440
14900		Liverpool (C)	120197	154287	164964	37702	46808	49249
15150		Manly (A)	36265	37587	37378	14471	14154	14029
15200		Marrickville (A)	76017	73431	71966	28391	27941	28086
15350		Mosman (A)	25468	25889	26082	10601	10627	10436
15650		Muswellbrook (A)	15562	14796	15419	5125	5089	5302
15800		Narrandera (A)	7141	6486	6039	2444	2320	2307
15850		Narromine (A)	6523	6621	6406	2362	2443	2400
15900		Newcastle (C)	133686	137307	141868	53232	54901	55991
15950		North Sydney (A)	53790	56547	59673	24739	25761	26606
16100		Oberon (A)	4937	5132	5077	1619	1679	1806
16150		Orange (C)	33964	35521	34969	11873	12663	12886
16200		Parkes (A)	15098	14455	14272	5370	5308	5381
16250		Parramatta (C)	139157	144490	151300	47914	48599	51206
16350		Penrith (C)	163122	172397	172102	51658	55363	56931
16370		Pittwater (A)	51450	52804	53098	18349	18596	18664
16550		Randwick (C)	118905	121497	122176	44351	44501	44848
16650		Rockdale (C)	84847	88523	92621	30912	31304	32873
16700		Ryde (C)	92675	95744	98519	34204	35310	35666
16900		Shellharbour (C)	52080	57071	59634	17462	19507	20832
17000		Singleton (A)	20133	20384	22071	6421	6642	7287
17100		Strathfield (A)	26044	28206	32360	8480	9033	10364
17150		Sutherland Shire (A)	194105	203089	203124	66969	71472	72883
17200		Sydney (C)	121752	153200	180474	44386	52548	59671
17640	only about half included	Upper Lachlan Shire (A)	6653	6749	6840	2464	2532	2636
18000		Warringah (A)	124299	128839	133494	45111	46707	48437
18050		Waverley (A)	62357	61332	61690	25533	24010	22809
18150		Wellington (A)	8648	8239	8173	3140	3084	3045
18250		Willoughby (C)	53735	59354	64856	19925	21614	23540
18350		Wingecarribee (A)	36777	40840	41868	12812	14545	15566
18400		Wollondilly (A)	33413	37123	40039	10564	11791	12887
18450		Wollongong (C)	177009	181612	183634	63976	66530	68332
18500		Woollahra (A)	49486	50240	50420	20545	19878	19560
18550		Wyong (A)	115999	130854	137755	43919	49314	52313
18710		Yass Valley (A)	10708	11380	13166	3809	4099	4657
18750		Young (A)	11046	11300	11774	4118	4191	4455
Total Jemena Gas Network			6851577	7265621	7509401	2346138	2483794	2586079

Appendix B: Curriculum vitae of key personnel

NAME: Peter J. **BRAIN** **DATE OF BIRTH:** 1947
EDUCATION: Ph.D (NSW), Economics; B.Comm. (NSW)

Summary and specific expertise:

Dr Brain is one of Australia's best known economists in the development and application of macroeconomic models. Since co-founding NIEIR in 1984, Dr Brain has participated in over 200 economic consulting projects, most of which he has directed or co-directed. This includes past and on-going projects in South Africa, Australia and New Zealand. Dr Brain was one of the few economists to forecast the current economic crisis throughout the Asian region, and participates widely in debate on issues of general economic interest.

His expertise covers:

- Macroeconomic analysis and model construction of national, State and regional economies along with detailed models of key Australian institutions including Telstra Corporation, Australia Post, OneSteel, and the State Electricity Authorities. For 25 years, the preparation of detailed short, medium and long term projections of all aspects of the Australian economy.
- Responsible for the annual NIEIR/ALGA *State of the Regions* reports since 1998. This report documents the latest trends in economic performance across all Australian LGAs aggregated into 62 regions. The reports also monitor the latest developments in regional policy analysis.
- Australian representative to the United Nations' Link Forecasting Group which prepares semi annual forecasts of all major economies.
- NIEIR's Director of the Council of Australian Ministers. Energy economic security scenario development project.
- Director of a number of large scale regional assessment projects assessing infrastructure requirements for major Australian cities and regions, including South East Queensland, Sydney and Melbourne.
- Numerous studies on cost-benefit of physical infrastructure expansion including power stations, transport (roads, railways) infrastructure, community infrastructure (three evaluations of the Building Better Cities Program), and airports.
- Many studies into the economic feasibility of industrial investments including paper mills, steel mills, aluminium plants, casinos, hotels, gas pipelines etc.
- Directed a major project into the development of strategies for the South Australian manufacturing sector and the development of analytical tools and models to be used by the South Australian industry assistance agencies for cost-benefit assessment of private sector investment proposals.

- Developer of a multi-sector model of South Africa. This was applied to develop a development plan for South Africa covering physical and human capital infrastructure requirements, labour market programs, and industry performance potential.
- Worked with South African Government Agencies in developing the Central Government budget for 1994-95 and in the capacity of Chairman of the RDP Drafting Committee for the Department of State President, drafted a technical version of the RDP plan covering most aspects of the public sector to 2010.
- Developed a multi-sector model of New Zealand for analysing impact of changes in tariffs for the motor vehicle industry.
- Numerous studies into industry policy issues including the effects of tariffs, reform of public enterprises, reform of the tax system, export incentive schemes.

Work experience:

1984-Present, Executive Director, National Institute of Economic and Industry Research

Project Director, economic analysis of the Republic of South Africa's (RSA) Reconstruction and development (RDP) program.

Project Director, Strategic impact replacement in South Australia.

Project Director, study of New Zealand Automotive Industry Policy

Other projects include those for government departments (State, federal) electrical authorities, and a range of private corporations (e.g. BHP); he provides most of the macroeconomic modelling and analysis to NIEIR projects requiring macroeconomic analysis, for example recent work on greenhouse policy options.

Dr Brain has been, and continues to be on a regular basis, involved in:

- the preparation of detailed international, national, state and regional projections; and
- the preparation of reports for some of Australia's largest organisations to assist in their corporate planning functions.

Currently, on an on-going basis, Dr Brain serves as:

Corporate Planning Advisor to OneSteel.

This involves projecting Australia's physical infrastructure, dwelling and non-dwelling construction requirements for Australia over a ten year horizon. This is related back to estimates of steel demand taking into account the efforts of technological change and relative costs on inter-material substitution.

Corporate Planning Advisor to Telstra Corporation.

This involves analysing the impact of the evolution of the indicators driving the demand for telecommunication services over a five to ten year period.

1974-1984, Director, IMP model project, and Deputy Director of the Institute of Applied Economic and Social Research, University of Melbourne

Initial development and application of the IMP (Institute Multi-Purpose) Model of the Australian economy.

Publications authored or co-authored by Dr Brain include the following:

- Population Immigration and the Australian Economy, Brain, Smith and Schuyers (1979), Croon Helm.
- Energy and the Australian Economy, Brain and Schuyers (1981), Longman Cheshire.
- Brain, Peter J., *The Macroeconomic Structure of the Australian Economy*. Longman Cheshire, Melbourne, 1987.
- Brain, Peter J., *Beyond Meltdown – the global battle for sustained growth*. Scribe Publications, Melbourne, 1999. This book deals with the causes and effects of the Asian economic meltdown, and possible strategies for dealing with the fallout from this crisis.

NAME: Antony J. O'DWYER **DATE OF BIRTH:** 1960
EDUCATION: Bachelor of Economics (Hons.) 1978-1982
 Master of Economics (Economic Statistics) 1985-1987
Thesis: A model of the dwelling construction industry in Australia and in each state.

Work experience:

1986 - present - National Institute of Economic and Industry Research, Director/Senior Consultant.

Responsible for the development, maintenance and application of NIEIR's state model. Associated with this is the preparation of material including forecasts of GDP and its components and employment.

Tony has 20 years experience in modelling, forecasting and policy analysis in the Australian energy sector. Responsible for the development, maintenance and application of NIEIR's integrated (with NIEIR macro models) energy model. Responsible for producing forecasts of energy demand and supply at the national, state, regional and corporation levels.

Specific projects undertaken at the Institute include:

1. Responsibility for the preparation of economic and energy forecasts for the electricity and gas sectors (at the state, national and corporate levels). The electricity forecasts are used in the load planning by NEMMCO and each of the four Transmission Network Service providers in each state (e.g. Transgrid, Powerlink, VENCORP).
2. Responsibility for maintaining and preparing state economic projections, and for evaluating the impact of major investment projects such as the proposed Lithgow aluminium smelter and an APPM pulp mill in Tasmania. The state model's input-output structure allows the multiplier effects of the investment and production phases to be assessed.
3. Development of energy-related greenhouse models at the state and national level. Preparation of end-use energy forecasts at the state level and tabulation of greenhouse gas emissions by state for clients including the ESAA, Victorian Department of Treasury and Finance and the Australian Greenhouse Office (AGO).
4. Conduct of various economic studies covering the areas of public finance, private investment, public infrastructure projects (e.g. Grants Commission methodologies, the Boyne Island smelter, and the Tully-Millstream, a Queensland hydro project) and regional immigration.
5. Development of regional electricity models for various regions of Australia including all five Victorian distribution businesses.

1985 - 1986 - Department of Water Resources, Victoria, Economic and Financial Evaluation Division.

Employed as economist and was principally involved in developing an economic model of the Victorian Water Industry. Developed a model for the South-West Region of Victoria embracing the financial, economic and physical aspects of the system. Runs of this model were used by Department of Water Resources in its submission to the Natural Resources and Environment Committee (NREC) on alternative investment options in the region.

1984 - 1985 - Department of Management and Budget, Policy and Planning Division, Economic Statistics.

Employed as economic statistician. Duties included economic forecasting and financial and applied economic analysis, preparation of speech notes; budget papers and other background papers for public release on the structure and trends in macroeconomic aggregates in Australia and in the Victorian State economy; specialised in the analysis of the labour market and in particular the youth labour market.

1984 - Monash University, Department of Econometrics and Operations Research, Tutor (part time) Economic Statistics.

Tutor in economic statistics for undergraduate students (1st year).

November 1983 - January 1984 - Health Commission of Victoria, Hospital's Division, Management Review Unit, Personal Assistant to Secretary (on secondment).

Employed as personal assistant to Secretary of the Hospital Division. Involved in administering budget cuts across the hospital system in Victoria in 1983-84; special project - preparation of report on trends in hospital services in Victoria and Australia and changes in the structure of funding arrangements

1983 - Department of Management and Budget, Victorian Government - Policy and Planning Division, Economic Statistics.

Recent projects directed/undertaken:

Electricity projections for Powercor Australia to 2018,
Powercor Australia Limited, June 2008

Electricity consumption and maximum demand projections for the South West Interconnected System to 2017-18,
IMO, June 2008

Maximum demand forecasts for the United Energy region to 2018,
Alinta Networks, June 2008

Factors affecting electricity demand in the National Electricity Market,
National Electricity Market Management Company Limited, June 2008

Electricity consumption and maximum demand forecasts for Tasmania to 2022,
Transend Networks, May 2008

Long run economic and electricity load forecasts to 2017-18,
Network Service Planning,
Powerlink Queensland, December 2007

Natural gas consumption and peak day forecasts for Victoria to 2022,
VENCorp, December 2007

*Natural gas projections and customer number projections for AlintaGas to 2015 – the coastal
distribution region,*
AlintaGas, September 2007

Electrical energy and maximum demand projections for South Australia to 2020-21,
Electricity Supply Industry Planning Council, June 2006

Natural gas consumption in Australia to 2015 – prospects by state, industry and sector,
The Australian Gas Association, September 1999

NAME: Stephen C. **McCALMAN** **DATE OF BIRTH:** 1973
EDUCATION: Bachelor of Economics, La Trobe University (Hons.) 1992-1995
Master of Economics, Australian National University 1999-2000

Summary:

Stephen McCalman is a senior economist with NIEIR. He has extensive experience in economic analysis and forecasting, specialising in the analysis of energy markets and the environment. Stephen has highly developed mathematical and statistical modelling skills and a good understanding of Australian economic, energy, and environmental statistics.

In his time with the NIEIR, Stephen has contributed to a wide range of projects including studies into electricity demand forecasting, gas demand forecasting, weather normalisation of energy consumption, greenhouse gas emissions intensity of industry, upstream gas supply industry developments, embedded generation developments, regional economic development in Australia and United States.

Prior to joining the NIEIR in 2003, Stephen worked for Cambridge Econometrics, an economic research and forecasting consultancy in the United Kingdom. Stephen has also worked as an economic analyst at the Reserve Bank of Australia and the Australian Bureau of Agricultural and Resource Economics. Stephen has completed a Bachelor of Economics (Honours) at La Trobe University and a Master of Economics at the Australian National University.

Work experience:

Senior Economist

Energy and Environment, **National Institute of Economic and Industry Research**,
July 2003 – present

Economist

UK Energy and Environment Service, **Cambridge Econometrics (CE)**,
October 2001 – September 2002

Economic Analyst

Economic Group, **Reserve Bank of Australia (RBA)**
October 1996 – August 2001

Economist (Graduate)

Australian Bureau of Agricultural and Resource Economics (ABARE)
January 1996 – September 1996

NAME: Rimma **MITELMAN** **DATE OF BIRTH:** 1984

EDUCATION: Bachelor of Commerce, Monash University – 2002-2006
Econometrics – major
Finance – minor

Summary:

Rimma has recently joined the National Institute as an economist in the energy and environment field. She is an econometrician with skills in research and analysis, and has experience in the areas of financial modelling, econometric modelling and analysis, forecast analysis, feasibility study, simulation and cost-benefit analysis, as well as economic impact assessment.

Prior to joining the National Institute, Rimma worked as a consultant for SGS Economics and Planning, where she was involved in assessing the economic profile and industrial demand, residential demand and population forecasting for a number of development sites in Melbourne's growth areas.

Rimma also has experience with using econometric models, such as the input-output based model, and has assisted in the development of an employment land use model used for forecasting the number of jobs by industry and land value bands.

Since joining the National Institute Rimma has been involved in research of climate change, energy efficiency measures and other policy likely to impact on the energy sector.

Work experience:

Applied Research Analyst

Energy and Environment, **National Institute of Economic and Industry Research**
January 2009 – present

Consultant

SAS Economics and Planning
June 2006 – January 2009

NAME:	Graham T. ARMSTRONG	DATE OF BIRTH:	1937
EDUCATION:	B.Commerce (Melbourne), Economics; M.A. (Economics) Dalhousie, Canada, ARMTC (Metallurgy)		
CURRENT BUSINESS AFFILIATIONS:	Principal, GHDA Consulting Director/Manager, Economic Information Resources Consulting P/L Director, Resources and Environment, National Institute of Economic and Industry Research		

Summary of specific expertise:

Mr Armstrong is an economist with a technical background who has worked, in the private and public sectors, and in the teaching field, on projects and issues in a range of countries. Most of his work has been in the natural resource (energy, minerals, forestry, water, etc.), environmental and urban/regional fields, in developed and developing economies. The work has included the following areas.

- Economic analysis of projects and sectors, particularly the resource sectors, in a wide range of countries and institutional settings. This work has been mainly, but not solely, in the energy sector (electricity, gas, oil, renewables).
- Policy analysis and advice to government agencies and the private sector, particularly in the energy, other resource (fisheries, water, forestry, etc.) areas and environmental fields.
- Analysis of and advice on energy efficiency policies, measures including standards and codes, for example building insulation, fenestration (windows) and air tightness (member of Energy Conservation Sub-Committee of Canada's National Building Code, 1979-1987), minimum energy performance standards (Canada, Australia) and most recently advice and analysis for the National Framework on Energy Efficiency (NFEE), the Victorian (State) Energy Efficiency Strategy (VEES) and the Victorian Energy Efficiency Target (VEET).
- Evaluation of programs in Canada, Australia, New Zealand and developing countries, using evaluation frameworks appropriate to the particular evaluation task.
- Analysis of and advice on environmental issues. Directed and participated in studies of environmental issues covering analyses of factors leading to environmental disruption, the valuation of environmental impacts, pricing and other policy instruments/concerns in the natural resources, greenhouse/global warming and other fields. Most recently advice on the development, by the Australian States and Territories, of a National Emissions Trading System (NETS).
- Negotiation of policy and program agreements with governments, firms, organisations (peak bodies, ngos) and individuals.
- Training, particularly of economists and planners in the public service, in universities and in private consulting practice.
- Direction, leadership of inter-disciplinary teams in policy, analysis, program implementation and evaluation.

- Preparation, presentation and editing of reports for a range of audiences.
- Implementation of government programs. Directed development and implementation of a range of Canadian energy efficiency programs (1975-1987); currently providing analysis and advice on development of a Victorian Energy Efficiency Target (VEET), a “white” certificate program.
- Analysis and development of energy R&D programs. Directed, served as committee member and participated in analysis and development of Canadian energy R&D programs (1975-1993), reviewed Australian energy R&D programs (1994). Provided advice and analysis (2001-2002) which resulted in the establishment of the Victorian Centre for Energy and Greenhouse Technologies in 2003 and most recently (2003-05) on the Victorian Energy Technology Innovation Strategy.

Graham Armstrong is an experienced consultant, who, utilising a technical (metallurgy) and economics background, has worked on a range of projects, mainly in the energy and environmental fields in Canada, Australia and other countries.

Work experience:

December 1987-Present, Private economic consultant and policy advisor in Canada (federal) and Australia (federal, State)

Energy and environmental analysis and policy advisor, Greenhouse Policy Unit (GPU) and Energy and Minerals Division, Department of Natural Resources and Environment (DNRE), GPU in the Department of Sustainability and Environment (DSE) and the Energy Security Division (ESD), Department of Infrastructure, Victoria (ongoing). This work entails advice on energy (electricity, gas, energy efficiency and renewable energy) and overall environmental (mainly greenhouse) and sustainable energy issues of concern to the Victorian electricity, gas and associated sectors which are operating in a competitive policy framework. A major part of this work was the development of an energy/environment strategy to operate in this framework including analysis of sectoral greenhouse gas abatement (GHGA) initiatives, carbon taxes and emissions trading for specific policy issues and the Victorian Greenhouse Strategy (released June, 2002). In February 2000 he completed an assignment to manage a major emissions trading project for the Department of Premier and Cabinet, Victoria, and in 2000-02 contributed to development of the **Victorian Greenhouse Strategy** (released June 2002). In 2002 provided analysis, coordination and advice for the development of **Energy for Victoria** (released by the Minister for Energy and Ports, Hon. Candy Broad in October 2002). Over 2003-04 provided analysis and advice on development of a Victorian energy and greenhouse policy: this policy development process entitled **The Greenhouse Challenge for Energy** (GHC₄E) covered all aspects of greenhouse and energy relationships in the Victorian stationary energy sector.

Over 2003-04, through the Sustainable Energy Authority of Victoria (SEAV), worked on the development of the **National Framework for Energy Efficiency**, focusing on the potential (technical, economic, market) for energy efficiency improvement (EEI) in Australia.

Over 2005 and to date in 2008 provided analysis and advice on the implementation of GHC₄E initiatives in energy efficiency renewables and emissions trading. Also in this period has provided analysis and advice on aluminium and gas industry issues.

Over 2004-07 has provided advice and analysis on a National Emissions Trading System, a Victorian Renewable Energy Target (VRET), a Victorian Energy Efficiency Target (VEET) and the development of a voluntary carbon credits market in Australia.

The **VEET** places an obligation on electricity and gas retailers to reduce greenhouse gas emissions attributable to the Victorian (State) residential sector. VEET will be implemented, commencing in 2009, through the creation and trade of “white” certificates denominated in tCO₂e. We (Saturn Corporate Resources in conjunction with Carbon Market Economics) are now (April 2008) completing a major project on the certificate levels applicable to eligible VEET activities. These activities include replacement of electric resistance water heaters with gas and/or solar systems and heat pumps, addition of insulation to residential envelopes, installation of high efficiency space heating equipment and lighting and the purchase of high efficiency refrigerators.

Advisor (1996-2002) to the Department of Primary Industries and Energy, Australia on the establishment of energy end-use analysis centres, and in the development of strategies to achieve best practice in energy efficiency in Australian energy end-use sectors.

Advisor to the electricity supply industry and firms developing renewable energy projects and in acquiring renewable electricity certificates for the Mandatory Renewable Electricity Target (MRET) and Green Power. Directed and provided the substantial part of analysis and report preparation of a study for Victorian Department of Premier and Cabinet on Renewable Electricity Scenarios for Victoria.

Direction, preparation and presentation of papers, at the National Institute of Economic and Industry Research’s (NIEIR) energy and other conferences for subscribing clients (government agencies, energy utilities, and private firms) since 1985. Papers have included energy profiles of Malaysia, Singapore, South Africa, New Zealand and Canada, and papers on oil, gas, coal, uranium, electricity, efficiency and demand side management, renewable, R&D, and energy/environment issues and trends in both the Australian and international contexts. Graham Armstrong participated in a range of energy, environmental and general economic projects of NIEIR over the 1987-2004 period.

Contribution to NIEIR projects in the electricity and gas areas, particularly projects concerning participants (generators, distributors, retailers and transmission companies) operating in the National Electricity Market. Over 1998-2008 clients included NEMMCO, VENCORP and the Australian Gas Association.

Other specific studies include the following.

Over 2005-08 undertook, in association with the National Institute of Economic and Industry Research (NIEIR), several greenhouse (climate change) studies for the National Electricity Management Company (NEMMCO), and several State energy agencies.

In 2004 prepared a report for Basell Australia on the current and potential impacts of greenhouse policies on the company’s Australian operations.

Over 2000-02 directed and produced substantial parts of the analysis and reports on economic depreciation (effective lives) of transmission assets for the Electricity Supply Association of Australia and GasNet Ltd.

Project director, 1996-97, of an NIEIR led study for National (Australian) Greenhouse Strategy (NGS) Committee; the study analysed, estimated and reviewed the likely costs, participation rates and environmental impacts (mainly greenhouse) of 48 proposed measures in the energy area for Australia’s 1997 NGS.

Project director and/or senior consultant to a range of energy reviews, analyses and status reports to, for example in 1995-97, the Gas Industry Reform Unit, Government of Victoria, New South Wales Department of Energy, Boral Energy, North Ltd, BHP Petroleum, West Coast Energy, BP Australia, the federal Department of Primary Industry and Energy, and Ontario Hydro (Canada).

Evaluation of programs/projects: evaluation of programs, New Zealand Energy Efficiency and Conservation Authority, 1996-97; evaluation of socioeconomic impacts of Kutubu pipeline project, Papua-New Guinea, 1995; evaluation of federal and state energy/greenhouse programs (MRET, Generator Efficiency Standards, etc.) in 2002.

Project director (1996-97) of a study for Victorian Fisheries which examined and analysed alternative adjustment schemes for the rock lobster industry in the Portland region, Victoria; currently participating in a similar study on the abalone fishery.

Project director (1994-96) of major study for the Department of Environment, Sport and Territories. This study examined subsidies to key Australian resource industries (energy, water, agriculture, forestry, fisheries, natural attractions, solid waste), including analysis financial and environmental management arrangements which tend to promote environmental disruption. The study also analysed means and costs of improving these arrangements so as to reduce negative environmental impacts (i.e. reduce negative externalities).

Project director of review of Australia's petroleum taxation regime (for BHPP) a study which examined Australia's petroleum taxation regime in 1990; analysed options for change, and recommended changes which were similar to those adopted by the Australian government.

Project director (1995) of study examining external effects of road and rail sectors in the state of New South Wales (Australia).

In the period August 1990 to December 1993, Graham Armstrong returned to Canada to act as Director, Energy Policy Review, with the Government of Canada, with responsibility for conducting a review and evaluation of Canadian energy policy. This work led to the presentation of options for future energy policy directions to the incoming Chretien government in September 1993.

Greenhouse analysis and modelling work, particularly in the energy supply and use sectors, extends from 1988. This work includes direction and/or participation in NIEIR greenhouse (global warming) projects for the Victorian Solar Energy Council (1988-90), and the Electricity Supply Association of Australia (1992-1996); the latter study modelled and analysed 15 greenhouse policy scenarios; the results of this work were influential in shaping Australia's response to the enhanced greenhouse effect. In 1996 Graham Armstrong undertook a study of abatement options for the Gorgon LNG project (Wapet Pty Ltd), acted as advisor (1995) to the federal government of Australia on the design and establishment of the Greenhouse Challenge Voluntary Program; in late 1996 – early 1996 directed a review of proposed energy sector measures to abate greenhouse gas emissions in the 1997 National Greenhouse Strategy; over 1996-98 analysed energy and greenhouse impacts of optional strategies for the Scoresby Transport Corridor. Over 2001-04 worked on development of response strategies, following the Kyoto Protocol development and Commonwealth initiatives, for the Greenhouse Policy Unit and on Victorian long term energy strategies for the Energy and Minerals Division, Victorian Department of Natural Resources and Environment.

Over 1998-2004 was a member of EnviroNics International (Toronto, Canada) experts advisory panel for strategic advice and evaluation of environmental issues.

1975-1987, Director of several groups involved in policy analysis, coordination and implementation in the energy efficiency, renewable energy and other energy fields, Energy, Mines and Resources (now Natural Resources Canada), Ottawa, Canada

Directed policy research and analysis, formulated policy advice, directed program development and evaluation, and prepared the required reports, briefs, etc. to the Federal Government, regarding the application of energy conservation, oil substitution and alternative energy technologies and approaches; directed the review and evaluation of energy conservation, oil substitution and alternative energy programs and policies; directed the management of new initiatives, e.g. demonstration programs, savings financing.

Specific responsibilities included:

- Evaluation and subsequent direction of policy changes, of federal energy conservation and alternative energy programs 1983-87.
- Directed evaluation, using Treasury Board of Canada methodology and guidelines, of programs for example the Canadian Home Insulation Program, probably the most extensive program evaluation yet undertaken by governments.
- Presented, discussed, interpreted and negotiated stakeholder involvement in federal energy policy, particularly in the energy conservation, oil substitution and alternative energy fields, to other government agencies and to a wide variety of private sector groups.
- Represented Canada at Federal-Provincial meetings, on committees dealing with energy conservation, oil substitution and alternative energy policies and programs (national building code, electrical energy R&D) and at international meetings (e.g. UN, OECD, IEA).
- Represented Canada on the Energy Conservation Sub-Group of the International Energy Agency (IEA); in 1977-78 acted as reviewer of national energy policies for IEA.
- In October 1977 acted as delegation leader energy advisor to the Canadian Delegation to the *UN-ECE Seminar on Energy in Human Settlements*, Ottawa.
- In 1978 and 1981 acted as Energy Advisor for Canadian Trade Missions to Sweden.
- In March 1979, led Canadian Delegation and acted as Vice-Chairman to the *UN-ECE Ad Hoc Group of Experts on the Impact of Energy Considerations on Human Settlements*, Moscow, USSR.
- In August 1979, acted as expert policy and program advisor to *Symposium on Energy Policy in an Asian Context*, organised by the Asian Productivity Organisation, and held in Bangkok, Thailand.
- In July 1983, presented a paper and advised on policies, programs and evaluation at the *Lima Seminar on International Cooperation for Rational Use of Energy in Industry*, Lima, Peru, held under the auspices of the IEA/OECD and OLADE.
- In May 1984 participated in the technical seminars and acted as energy advisor to *Techno-Canada 1984*, Medellin, Colombia, held under the auspices of CIDA.
- Managerial responsibilities included responsibility for overall direction, policy advice, program design, implementation and evaluation, budget allocation and control, personnel management (organisation, training, performance reviews) of a multi-disciplinary group of professionals and support staff.

July 1973 - April 1975, Head, Resources Section, Northern Program Planning Division, Northern Policy and Program Planning Branch, Department of Indian and Northern Affairs, Ottawa

Economic analysis of resource projects in Northern Canada: a major task was the economic and social analysis and negotiation of public, private and indigenous interests in a lead-zinc mining project (Nanisivik) on Northern Baffin Island, a project with significant indigenous (Innu) participation.

The analysis included development of a discounted cash flow (DCF) model integrated with a socio-economic benefit-cost model framework.

October 1969 - July 1973, Lecturer, Department of Economics, Monash University, Victoria, Australia

Responsible for 3rd year economics courses in Public Finance and Urban Studies; leader of 4th and 5th year seminars in similar areas, supervision of graduate students. Undertook research on regional development, natural resource economics and national parks.

August 1967 - October 1969, Economist, Economic Staff Group, Department of Indian Affairs and Northern Development, Ottawa, Ontario, Canada. From 5 January 1969, Acting Head, Resources Section

Economic analysis of resource projects in northern Canada; the major task was the cost/benefit analysis and evaluation of a proposed lead-zinc smelter project at Pine Point, N.W.T., a project planned to have significant indigenous (Indian) participation.

June 1966 - August 1967, Graduate Student, Dalhousie University, Halifax, Nova Scotia, Canada

M.A. in economics, majoring in economic theory, public finance and regional economics.

May 1961 - June 1966, Lecturer, Department of Metallurgy, Royal Melbourne Institute of Technology (former R.M.T.C.), Melbourne, Victoria, Australia

Responsible for courses in ferrous metallurgy, metallography and mineral dressing.

March 1959 to May 1961, Metallurgist, General Motors-Holden (Aust.) Pty Ltd, Melbourne, Victoria, Australia

Experience included metallurgical testing of automotive components, and supervision of processes such as gas carburising, induction hardening and annealing.

January 1958 - March 1959, Technical Trainee, Commonwealth Industrial Gases (Vic.) Pty Ltd, Melbourne, Victoria, Australia

Experience included technical advice on gas and arc welding, flame hardening and degassification of molten metals.

Graham Armstrong has authored a wide range of publications associated with his professional career and is a regular contributor to the *National Economic Review*.