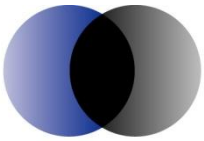
Review of Demand Forecasts for Jemena Gas Networks NSW

For the Access Arrangement period commencing 1 July 2010

Prepared for the Australian Energy Regulator

2 February 2010



ACIL Tasman

Economics Policy Strategy

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1 Background

The Australian Energy Regulator (AER) engaged ACIL Tasman to review the adequacy and appropriateness of the methodology used by Jemena to develop forecasts of demand in its New South Wales gas distribution networks for the access arrangement period commencing 1 July 2010, as set out in the proposed access arrangement information submitted by Jemena.

Under the *National Gas Law*, which commenced on 1 July 2008, the AER took over responsibility for the economic regulation of covered gas transmission and distribution pipelines from the relevant regulators in all states and territories except Western Australia. The AER's responsibilities include approval of access arrangements required to be submitted by service providers under the *National Gas Law* and *National Gas Rules*.

The *National Gas Rules* (NGR 72(1)(a)(iii)) require the access arrangement information provided by the service provider to include usage of the pipeline over the earlier access arrangement period showing:

- minimum, maximum and average demand
- customer numbers in total and by tariff class.

In making a decision whether to approve or not to approve an access arrangement proposal, the AER is required under rule 74 of the NGR to be satisfied that forecasts required in setting reference tariff(s) are arrived at on a reasonable basis and represent the best forecast or estimate possible in the circumstances.

The process followed by the AER for assessing proposed access arrangements and access arrangement revisions is set out in the Final Access Arrangement Guideline published in March 2009 (AER, 2009).

1.1 Demand forecasts

A key part of the information submitted by a service provider in support of a proposed access arrangement is a forecast of the level of demand for the reference services provided, over the course of the access arrangement period. This typically involves forecasting demand for services for a period of five years from the commencement date of the new access arrangement. It is important to ensure that the forecasts represent best estimates arrived at on a reasonable basis because:

- Demand forecasts may impact the forecast capital expenditure required to meet the new demand of prospective users or the increased demand of existing users and may therefore influence forecast revenue.

- Demand forecasts influence the tariffs set to meet forecast revenue in each year of the access arrangement period, and how this revenue is to be allocated between tariff classes for different reference services.

Jemena's demand forecasts are set out in Chapter 5 of the document titled "Jemena Gas Networks (NSW) Ltd Access Arrangement Information (Commercial-in-Confidence" dated 25 August 2009 (Jemena, 2009)[1].

ACIL Tasman was engaged by the AER to advise on whether the demand forecasts proposed by Jemena are reasonable. As part of this process we have assessed the appropriateness of the methodology and the assumptions used to determine demand forecasts, and considered whether they provide a reasonable basis to assist the AER in assessing the building block revenue components and tariffs which utilise these forecasts. We have also considered the reasonableness of demand forecasts in the previous access arrangement period in the light of actual demand outcomes.

This report documents ACIL Tasman findings.

1.2 Approach to the review

In undertaking this review, ACIL Tasman addressed the following issues:

1. the adequacy of the overall approach and methodology
2. the reasonableness of the assumptions
3. the currency and accuracy of the data used
4. the account taken of key drivers
5. whether the methodology was properly applied.

The review was undertaken as desktop analysis into the methodology, data and parameters, and assumptions used to develop the demand forecasts. ACIL Tasman used its own knowledge of Australian gas markets to test assumptions. In the course of the work we also sought and received clarification on certain matters relevant to the approach and assumptions used by Jemena and NIEIR in developing the market forecasts.

The review process to the current (draft report) stage has involved the following steps:

- Jemena provided its forecasts and accompanying information in the Access Arrangement Information. Jemena also provided copies of the following relevant documents:

[1] A public version of the Access Arrangement Information which excludes certain information of a commercially sensitive nature also provides information on the demand forecasts.

  - a study by NIEIR entitled: "Natural gas projections NSW Jemena Gas Networks to 2019 (NIEIR, 2009) which is presented as Appendix 5.2 of the Access Arrangement Information
  - a commercially-confidential report by Jemena entitled: "NIEIR demand forecast adapted for reference tariffs", dated 26 August 2009. This report explains how Jemena has translated the results of the NIEIR projections (as set out in Appendix 5.2) into forecasts at a disaggregated level from 2011-15, which align with Jemena's proposed tariff classes and charging parameters.
- ACIL Tasman reviewed the information provided and formulated a list of questions and comments on the demand forecasts. These were consolidated by the AER into a list of questions covering the full scope of the access arrangement information, including demand forecasts, and sent by AER to Jemena.
- The responses were supplied to ACIL Tasman in the form of documents in which Jemena provided answers and/or undertakings to provide further information in relation to each of the questions.

ACIL Tasman's report on Jemena's proposed access arrangement sets out our initial conclusions regarding the demand forecasting methodology, assumptions, data and conclusions reached by Jemena.

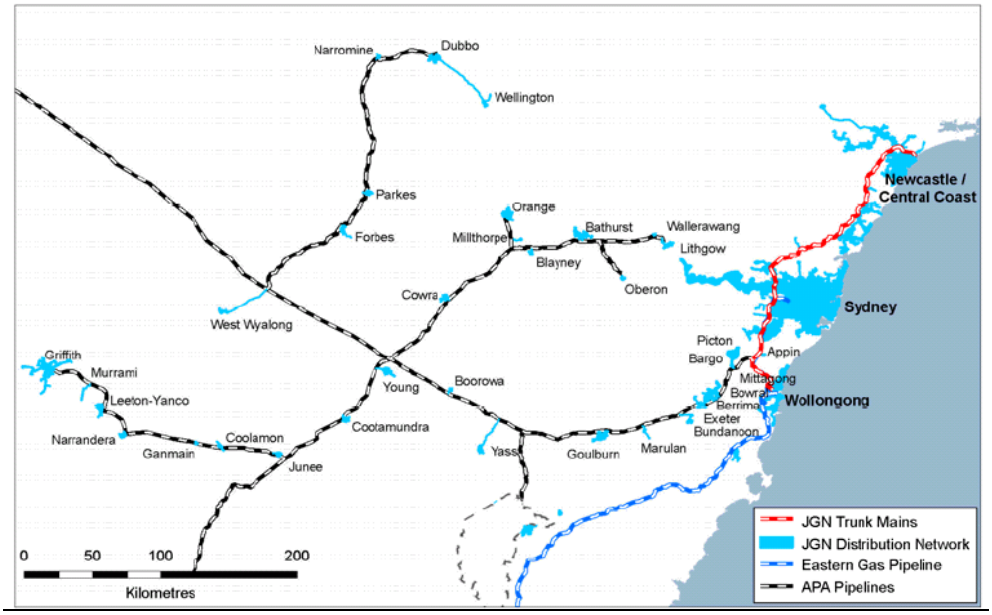
2 Scope of Jemena operations

Jemena Gas Networks (NSW) Ltd ("Jemena") is the owner, controller and operator of gas distribution networks in New South Wales, including:

- the NSW distribution system servicing the Sydney region
- the Central West distribution system
- the Wilton to Newcastle distribution pipeline
- the Wilton to Wollongong distribution pipeline.

The location of the operations is shown in Figure 1.

Figure 1 **Jemena gas distribution network overview map**



Data source: Jemena Access Arrangement Information Figure 2-1, p.11

The Jemena network provides gas to more than one million customers across Sydney, Newcastle, the NSW Central Coast and Wollongong, as well as over 20 country centres including those within the Central Tablelands, Central West, Southern Tablelands and Riverina districts.

2.1 Historical gas demand

The historical customer numbers for the Jemena distribution network are shown in Table 1.

Table 1 **Jemena NSW gas networks — historical customer numbers, by class**

Year ended 30 June	2001	2002	2003	2004	2005	2006	2007	2008	2009
Residential	802,361	834,719	866,131	899,400	932,707	945,257	965,653	995,074	1,021,412
Small business	24,815	25,816	26,788	27,816	28,847	29,293	30,683	30,869	31,198
Volume Customer Total	**827,176**	**860,535**	**892,919**	**927,216**	**961,554**	**974,550**	**996,336**	**1,025,943**	**1,052,610**
Demand Customers	n/a	n/a	n/a	n/a	n/a	483	444	430	414
Total customers	**827,176**	**860,535**	**892,919**	**927,216**	**961,554**	**975,033**	**996,780**	**1,026,373**	**1,053,024**

Data source: Jemena Access Arrangement Information; data for 2004, 2005 were forecasts from the previous Access Arrangement Information; actual demand for year ended June 2009 from Jemena response to AER questions, document dated 20 October 2009.

Customer numbers across all classes grew by an average 3.1 per cent over the period 2001 to 2009. From 2001 to 2005 the growth rate was somewhat stronger at 3.8 per cent or about 33,600 customers per year. The rate of growth declined to an average 2.2 per cent (21,600 customers per year) from 2006 to 2008.

Historical gas demand, by customer class, is summarised in Table 2.

Table 2 **Jemena NSW gas networks — historical customer demand (TJ), by class**

Year ended 30 June	2001	2002	2003	2004	2005	2006	2007	2008	2009
Residential	18,606	18,903	19,381	20,269	20,799	20,010	20,649	21,327	23,041
Small business	10,927	11,101	11,383	11,904	12,215	11,790	11,843	12,210	11,946
Volume Customer Total	**29,533**	**30,004**	**30,764**	**32,173**	**33,014**	**31,800**	**32,492**	**33,537**	**34,987**
Demand Customers	69,730	66,728	66,363	65,914	65,656	62,988	64,857	65,452	65,618
Total customers	**99,263**	**96,732**	**97,127**	**98,087**	**98,670**	**94,788**	**97,349**	**98,989**	**100,605**

Data source: Jemena Access Arrangement Information; data for 2004, 2005 were forecasts from the previous Access Arrangement Information; actual demand for year ended June 2009 from Jemena response to AER questions, document dated 20 October 2009.

The total volume of gas supplied through the network grew at an average rate of only 0.2 per cent per year from 2001 to 2009. In the small (volume) customer sector the demand growth rate was 2.1 per cent per year over the period—significantly below the rate of growth of customer numbers, reflecting a declining average gas demand per customer. However in the large (demand) customer sector gas demand actually fell over the period at an average of minus 0.8 per cent per year.

Focusing on the current access arrangement period, between 2006 and 2009 overall demand grew at 2.0 per cent per year with the volume sector growing at an average 3.2 per cent and the demand sector growing at an average 1.4 per cent.

The large (demand) customer class represents less than 0.1 per cent of customer numbers, but accounts for around two-thirds of total gas demand on the system.

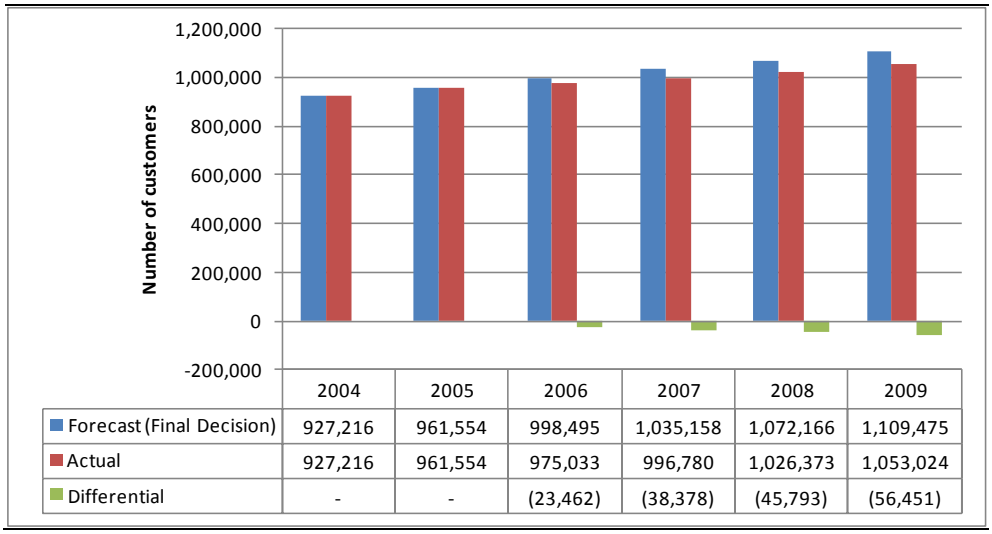
3 Review of performance in the current access arrangement period

3.1 Actual v forecast performance in the current access arrangement

3.1.1 Customer numbers

Figure 2 compares actual customer numbers with the forecasts numbers as per the final decision for the current access arrangement period. No actual data on customer numbers has been provided for 2004 or 2005, so the estimated actual numbers for these years is the same as the final forecast numbers.

Figure 2 **Current access arrangement period, forecast vs actual customer numbers**



	2004	2005	2006	2007	2008	2009
Forecast (Final Decision)	927,216	961,554	998,495	1,035,158	1,072,166	1,109,475
Actual	927,216	961,554	975,033	996,780	1,026,373	1,053,024
Differential	-	-	(23,462)	(38,378)	(45,793)	(56,451)

Data source: Jemena current Access Arrangement Information, proposed new Access Arrangement Information, actual data for year ended June 2009 from Jemena response to AER questions, document dated 20 October 2009.

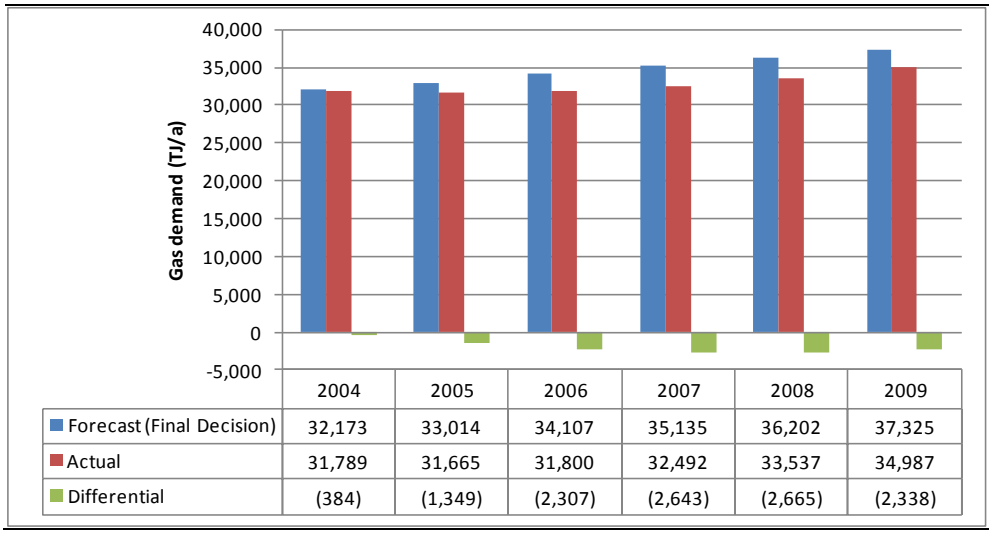
The comparison shows that the actual numbers have fallen short of the forecast numbers in each year since 2006, and the size of the shortfall has grown over time. In 2006 the actual customer numbers were 23,462 or about 2.3 per cent below forecast. The gap has grown steadily, so that in the year ended June 2009 actual customer numbers were 56,451 or about 6.3 per cent below forecast.

3.1.2 Volume market—annual gas demand (GJ)

Figure 3 compares actual gas demand in the small customer (volume sector) with the forecasts numbers as per the final decision for the current access arrangement period.

The comparison shows that the actual demand in the volume market has fallen well short of the forecast demand in each year since 2006. The size of the shortfall has been relatively stable over the past five years, ranging between 4.1 per cent and 7.5 per cent of the forecast demand level. This is a significant deficiency, given that the volume market accounts for the majority of the revenue for the Jemena NSW distribution business. A number of factors may have contributed to the shortfall in actual versus forecast demand in this sector, including the lower-than-forecast customer numbers, decreasing gas demand per customer and temperature effects with generally milder winters resulting in lower demand.

Figure 3 **Current access arrangement period, forecast vs actual small customer (volume market) demand**



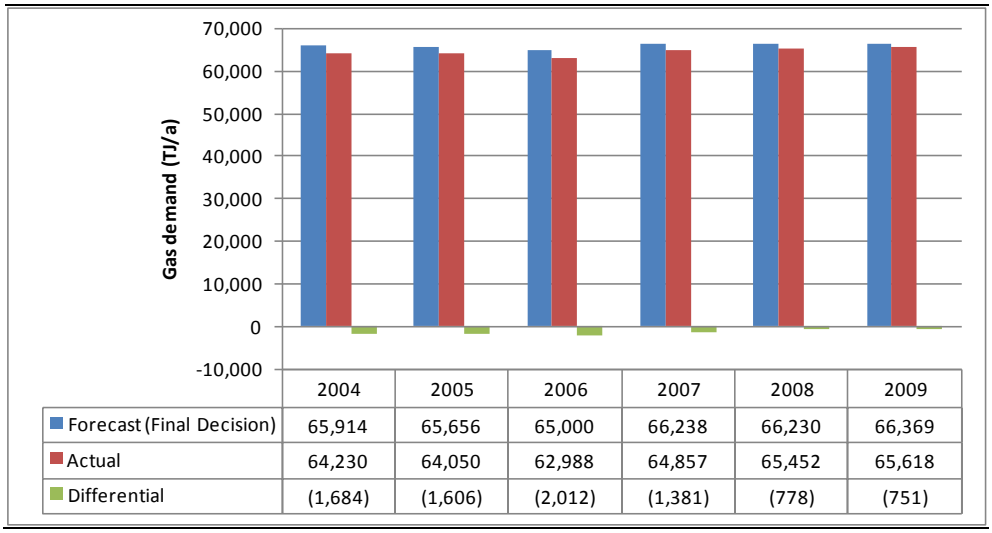
	2004	2005	2006	2007	2008	2009
Forecast (Final Decision)	32,173	33,014	34,107	35,135	36,202	37,325
Actual	31,789	31,665	31,800	32,492	33,537	34,987
Differential	(384)	(1,349)	(2,307)	(2,643)	(2,665)	(2,338)

Data source: Jemena current Access Arrangement Information, proposed new Access Arrangement Information, actual data for year ended June 2009 from Jemena response to AER questions, document dated 20 October 2009.

3.1.3 Demand market—annual gas demand (GJ)

Figure 4 compares actual gas demand in the large customer (demand sector) with the forecasts numbers as per the final decision for the current access arrangement period.

Figure 4 **Current access arrangement period, forecast vs actual large customer (demand market) demand**



	2004	2005	2006	2007	2008	2009
Forecast (Final Decision)	65,914	65,656	65,000	66,238	66,230	66,369
Actual	64,230	64,050	62,988	64,857	65,452	65,618
Differential	(1,684)	(1,606)	(2,012)	(1,381)	(778)	(751)

Data source: Jemena current Access Arrangement Information, proposed new Access Arrangement Information, actual data for year ended June 2009 from Jemena response to AER questions, document dated 20 October 2009.

The comparison shows that the actual demand in the large customer (demand) sector of the market has fallen short of forecast demand in each year since

2004. The size of the shortfall has diminished over time, from about 2.0 PJ (minus 3.1 per cent) in 2006 down to 0.8 PJ (minus 1.1 per cent) in 2009.

These results suggest that demand in this sector is less affected by temperature, and has remained reasonably close to forecast despite the significant fall in customer numbers from 483 in 2006 to 414 in 2009.

4 Market forecasts for the 2010 access arrangement

4.1 Forecast methodology for the 2010 access arrangement

The market forecasts for the 2010 access arrangement were developed initially by the National Institute of Economic and Industry Research (NIEIR) based on the methodology described below. The NIEIR forecasts covered a period from 2009 to 2019 and were based on a combination of historical load, and economic, climate and government policy factors. The forecast was produced in early 2009 based on available data as at 31 December 2008.

The NIEIR forecasting methodology is described in detail, together with the forecast results, in the document "NIEIR: Natural gas projections NSW Jemena Gas Networks to 2019", dated 26 August 2009 and presented as Appendix 5.2 of Jemena's proposed Access Arrangement Information.

For the purpose of developing reference tariffs it was necessary for Jemena to modify the NIEIR forecasts, disaggregating them to align with the proposed tariff classes and charging parameters. So, for example, where NIEIR has forecast total consumption per year for Volume Customers, Jemena has disaggregated these forecasts into the relevant item tariff classes ("coastal" and "country") and applicable consumption blocks to which different rates of network throughput charges apply. Jemena has also adjusted the NIEIR forecasts to take into account the expected impact of a proposed marketing strategy on Volume Customer load, and also to reflect the demand associated with a new major customer that has connected since the NIEIR forecasts were prepared. The methodology used by Jemena to adjust the NIEIR forecasts is described in the document "NIEIR demand forecasts adapted for reference tariffs", dated 26 August and presented as Appendix 15.2 of Jemena's proposed Access Arrangement Information.

4.1.1 Methodology for the NIEIR projections

The NIEIR report first provides a medium term outlook for the world and Australian economies, together with a base economic outlook for New South

Wales over the period to 2018-19. This provides the macro-economic and policy framework within which the projections of gas demand are developed.

NIEIR's regional economic model of NSW was used to generate forecasts of key drivers of gas demand including population, dwelling stock and gross regional product (by industry).

On this basis, NIEIR prepared projections of Jemena's annual gas usage for:

- the Volume sector of the market (referred to by NIEIR as the Tariff sector), comprising those loads less than 10 TJ/a, and
- the Demand sector of the market (referred to by NIEIR as the Contract sector), comprising those loads greater than 10 TJ/a, on an industry basis.

Volume (Tariff) customers and volumes

Residential gas usage dominates consumption in the Volume sector. NIEIR modeled the residential gas demand by disaggregating users into new and established customers. New customers were separated into net new customers from new dwellings and new customers in existing dwellings (electricity to gas or "E-to-G" customers).

Historical residential gas demand was normalized for differences in Heating Degree Days (HDD). The residential forecasts were prepared on a weather normalised basis and incorporated the impact of real household disposable income and real gas prices. Residential customer number forecasts were linked to NIEIR's projections of dwelling stock.

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

- the Building Sustainability Index (BASIX) certification scheme for new NSW homes, implemented in July 2006
- the program to review and standardise energy labeling of gas appliances followed with the development of Minimum Energy Performance Standards (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
- the Commonwealth stimulus package with subsidies for home insulation
- other new policies or developments, such as the NSW Government's NSW Energy Efficiency Trading (NEET) scheme and the Commonwealth's Renewable Energy Target (RET) scheme.

Projections for the business component of the Volume sector were derived using a regression model which took account of commercial output growth and movements in real gas prices.

Demand (Contract) customers and volumes

The gas demand forecast for Demand Customers was developed on an industry basis. Jemena supplied NIEIR with around eight years of data on customer gas usage and MDQ's of individual customers. NIEIR industry coded these data on a customer by customer basis.

Gas demand models were parameterised using NIEIR's existing State gas forecasting model. The industry regression models specifically relate gas consumption to the change in output for that industry within the gas distribution area as well as the change in real gas prices for that industry.

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.

Weather normalization

There is a well-established relationship between residential and commercial gas demand and temperature—gas demand is highest in the winter months, and increases as temperature decreases because of increased need for space heating. 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 average temperature between years. This is usually done on the basis of HDD calculated from meteorological data as the sum, over a year, of the negative differences between the average temperature on each day and 18^{o} Celsius.

NIEIR has used a recognised method to normalize historical gas demand to take account of weather variations, using data obtained from the Bureau of Meteorology for the Sydney weather station.

The normalising adjustment was 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 by NIEIR as "abnormal HDD" – by a temperature sensitivity coefficient for the relevant market (TJ/HDD).

The coefficient has been estimated by analysing historical market performance. In the analysis NIEIR determined separate coefficients for the Volume and

Demand markets. This is appropriate because some of the large Demand market loads are not sensitive to changes in temperature (for example, gas used as a feedstock in industrial processes) and so the Demand market overall tends to be less affected by seasonal changes in temperature.

"Old" vs "New" residential customers

NIEIR has considered the average annual rate of gas consumption for "old" or existing customers and for "new" customers to assess how changes in government energy policies and building standards are affecting average consumption of natural gas by residential Volume Customers on the Jemena gas network.

The data show that, as a result of various energy efficiency improvements, "new" estate and high rise customers consume around 2 GJ/a less than "old" established customers, averaging 18.9 GJ/a compared to 20.8 GJ/a for the "old" customers. Electricity-to-gas (E to G) conversion customers show an even lower average consumption rate of 14.6 GJ/a, reflecting the fact that some of these customers may convert only one electric appliance (for example, a cook top) to gas while maintaining other electric appliances or installing non-gas facilities such as solar-electric hot water heating.

Gas usage in NSW

The NIEIR gas demand projections take into account the purposes for which gas is used in NSW and trends that may be apparent in relation to those end-use sectors. Using ABS data, NIEIR has established that, in 2008, the proportions of end-user appliances in NSW using natural gas were as follows:

- ovens – 15.8 per cent
- cook tops – 27.9 per cent
- spacing heating – 17.2 per cent (with 23.9 per cent of households not using a heater)
- water heating – 23.9 per cent.

Substitution to electricity

The NIEIR projections allow for conversion of some existing gas consumers to electricity. The projections assume that as gas space heaters break down, 25 per cent of existing customers will convert to reverse cycle air conditioning. This leads to a small reduction in total gas use for heating in existing dwellings of 0.1 GJ/a per household.

4.1.2 Impacts of government policies

The NIEIR projections take into account a range of New South Wales and Australian government policy initiatives that have implications for gas demand.

Carbon Pollution Reduction Scheme (CPRS)

The NIEIR report discusses the implications of the Carbon Pollution Reduction Scheme (CPRS) which is expected to come into force during the access arrangement period, and incorporates effects of the CPRS into the forecast methodology.

The effects of the CPRS on retail gas demand will be determined by a number of factors including the cost of reducing emissions domestically, the price and availability of international permits, and other design features of the CPRS including compensation to households and certain industry sectors.

The base scenario of NIEIR adopts the Treasury CPRS-5 scenario until 2015 with a transitional shift to the CPRS-15 scenario by 2025, as well as the gas, coal and renewable energy and permit prices outlined in the Treasury White Paper.

The principal way in which NIEIR accounts for the impact of the CPRS is through price and income effects that influence overall demand. In terms of retail gas prices, NIEIR has assumed a one off step change of about 6.6 per cent in the Volume market and 17 per cent in the Demand market in 2010 –11 as a result of introduction of CPRS. NIEIR has also factored in, in a simplified way, substitution effects such as reduced rates of replacement of appliances or visits to restaurants. However a precise analysis of the effect of CPRS was beyond the scope of the NIEIR analysis.

ACIL Tasman considers NIEIR's treatment of the impacts of CPRS on the gas demand forecast to be reasonable.

Expanded Renewable Energy Target

The expanded RET is a key component of the Australian government's strategy for increasing the proportion of Australia's electricity generated from renewable sources to 20 per cent by 2020.

The expanded RET scheme will, all else being equal, reduce the requirement for conventional electricity generation in the National Electricity Market (NEM) and will therefore result in less growth in demand for gas for power generation than would be expected in the absence of the RET scheme. Because the RET scheme is aimed at altering the mix of electricity generation technologies, it will have relatively little effect from the point of view of retail

gas demand (and hence demand for gas distribution services). However, it may result in some indirect reduction in retail gas demand because the ability to generate Renewable Energy Certificates will create a financial incentive for conversion to renewable technologies such as solar hot water systems.

NIEIR has not stated what, if any, adjustment to the demand forecast has been made to take account of the expanded RET scheme—we would expect any such adjustment to be small.

Other energy policies

Other energy policies that NIEIR considers will result in lower gas demand include:

- the Building Sustainability Index (BASIX) certification system for new NSW homes
- 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
- the Commonwealth stimulus package with subsidies towards home insulation
- other new policies or developments, such as the new NEET policy of the NSW Government and the RET scheme.

Building Sustainability Index (BASIX)

The BASIX certification system for new NSW homes and major extensions and alterations was implemented in July 2006. BASIX requires all new homes in New South Wales to use up to 40 per cent less potable water and to produce up to 40 per cent less greenhouse gas emissions than the average home. Targets vary depending on building type, location and regional variations such as soil type, climate, rainfall and evaporation rates. According to NIEIR, average gas consumption will decrease as a result of BASIX in new homes. This is because 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 per year, some 9 per cent lower than for existing dwellings.

Mandatory Energy Performance Standards (MEPS)

MEPS includes a proposed initiative under which gas water heaters with an efficiency rating less than 4.5 star would be phased out, together with a

(currently) voluntary efficiency labeling program for gas appliances and a ten-year strategic plan ("Switch on Gas") intended to implement a nationally-consistent regulation scheme for energy efficiency of gas appliances. NIEIR has developed a "Hot Water Model" to assist in projecting hot water gas usage from new and existing customers. The model takes into account the improved efficiency standards for gas hot water appliances, as well as the fact that conventional electric resistance waters will be banned in all new and existing homes in gas reticulated areas from 2010, and will be extended to new flats and apartments in reticulated areas and established houses in non-gas reticulated areas from 2012. The model identifies the following trends:

- average gas use for *hot water in new dwellings* of 10.5 GJ/a, declining 1 per cent per year over the projection period
- for existing dwellings, failure or scrappage rates for each type of hot water system with gas accounting for 43 per cent of replacement of electric resistance heaters by 2012 (solar electric and heat pumps together account for 49.5 per cent)
- for E to G conversions, 60 per cent switch to gas hot water in year 1, with the remainder converting in accordance with the failure or scrappage rates set out above.

Energy efficient shower heads

Both the NSW Greenhouse Gas Abatement Scheme (GGAS) and the Australian Government Water Efficiency Labelling Scheme (WELS) promote the use of more efficient shower heads to reduce water consumption. These schemes will indirectly reduce gas demand for hot water heating because they will reduce average consumption of hot water. The effect is expected by NIEIR to be small, resulting in a reduction of annual average gas consumption for existing dwellings of around 0.1GJ/a per household.

Insulation and heating

Both the NSW and Australian governments have schemes in place to subsidise home insulation. NIEIR estimates that increased uptake of home insulation will result in an average reduction of gas demand of 0.4 GJ/a per household.

4.1.3 Jemena forecast adjustment methodology

Jemena modified the NIEIR forecasts to align them with the tariff classes and charging parameters proposed by Jemena for the new access arrangement. Jemena also adjusted the NIEIR forecasts to take into account the expected impact of a proposed marketing strategy on Volume Customer load, and to reflect the demand associated with a new major customer that has connected since the NIEIR forecasts were prepared.

The methodology used by Jemena to adjust the NIEIR forecasts is summarized below.

Volume Customers

Volume Customer delivery points

Jemena used the NIEIR projections of Volume Customer numbers, expressed on a calendar year basis to calculate the *average* number of customers over the calendar year (the NIEIR projections show the numbers *at the end* of each calendar year).

Jemena then split the customer numbers into coastal zone and country zone customers, using billing data for the year ended 31 December 2008 to determine the split ratio.

Gas marketing strategy

Jemena further adjusted the NIEIR forecasts to allow for the impact of a gas marketing strategy aimed at increasing awareness of gas as an environmentally friendly energy source, together with targeted incentives to installers to encourage the uptake of natural gas appliances where upfront capital costs may otherwise discourage the purchase of gas appliances. Additional gas sales attributable to the impact of the marketing strategy were included for each year of the forecast.

This is an estimate made by Jemena based on its commercial experience. While there is no further explanation of the basis of the estimates, the increase is modest relative to total demand (around 0.5 per cent per year) and therefore not material in terms of the acceptability of the forecasts.

Block split

The tariffs for Volume Customers vary depending on the individual customer's total gas consumption. There are six tariff "blocks", with the highest unit tariffs applying to the customers with lowest annual usage and vice versa. This structure reflects the fact that there are significant fixed and semi-variable costs involved in providing services to each customer.

Jemena split the Volume Customer demand into the six tariff blocks, based on the actual block splits for the 2008 calendar year.

Jemena then split each of the six tariff blocks into coastal and country components, based on 2008 actual data.

Metering fees

Delivery points with meters that have capacity less than $6m^3/hr$ pay a fixed fee for the meter provision charge component. However, delivery points with meter capacity greater than $6m^3/hr$ pay a fee based on their throughput. Jemena used 2008 base data to divide both the country and coastal customer groups into those paying the fixed fee and those paying a metering fee based on throughput.

Jemena also used the 2008 base data to calculate the split between Volume Customers with meters read monthly and those meters read quarterly.

Demand Customers

Demand (or Contract) customers consuming over 10 TJ/a account for the majority of the gas transported through Jemena's distribution network, but represent only about 10 per cent of the total revenue base.

The proposed Demand Customer tariff structure for the new Access Arrangement period proposes two tariff classes for Volume Customers:

- V-Coastal tariff – Applicable to Volume Customer delivery points located in the Wilton network section, which is supplied from the JGN northern and southern trunks
- V-Country tariff – Applicable to Volume Customer delivery points located in country network sections that do not utilise JGN trunk mains.

Jemena currently charges for services to Demand Customer delivery points on a zonal basis that reflects the customer's location within the local network. Jemena proposes to retain this approach, as a result of which there will be 12 location-based demand tariff classes (11 in the coastal zone and a single, uniform country zone). Jemena is also proposing an additional set of location-based capacity charge tariffs for very large customers who agree to participate as "first response" respondents in network load shedding events. In effect this means that Jemena proposes to establish 24 demand tariff classes in the 2010 Access Arrangement. With the exception of the demand throughput tariff class, there are five volume tranches within each demand tariff class.

The information set out in both the NIEIR report (Attachment 5.2) and the Jemena report on adjustments to the NIEIR forecasts (Attachment 15.2) is provided on an aggregated basis across all zones and tariff classes. It does not provide a basis for understanding the level of demand in each geographic zone or volume tranche.

To rebalance the NIEIR forecast for expected deletions and additions to the customer base, Jemena generated a list of 413 Demand Customers connected at 31 December 2008, then adjusted this customer list to:

- remove a number of customers that were considered unlikely to be large customers as at 1 July 2010
- add a number of customers that were considered likely to connect before 1 July 2010.

These adjustments resulted in a list of 401 customers. The consumption for the year to 31 December 2008 associated with the 401 Demand Customers was the actual demand for that period. In order to balance the NIEIR forecast to these actual customers and retain their relative shares of total consumption, Jemena had to scale the recorded consumption of customers on the list, thereby enabling Jemena to ensure that the translated forecasts balanced back to the NIEIR forecast (excluding a new major customer subsequently added—see below).

The scaling method involved dividing the actual 2008 consumption by the NIEIR total demand for each year to derive scaling factors. The adjustments required were small—less than 3 per cent in all cases. This approach ensured that the NIEIR forecasts were translated in a manner that maintained the existing customer shares of total consumption.

New Demand Customer

Jemena adjusted the NIEIR forecast for Demand Customers to take into account a large new customer load that was not included in the NIEIR data.

Forecast Demand Customer MDQ

As well as forecasting annual consumption, NIEIR also forecast contracted MDQ over the access arrangement period. Again, the NIEIR forecast was rebalanced to take account of the deletions and additions to the Demand Customer base. Jemena determined scaling factors by dividing the NIEIR forecast MDQ for each year by the 2008 value. Again the adjustments required were quite small—less than 1.5 per cent in all cases.

Chargeable demand

For the forthcoming access arrangement period, Jemena is proposing a different charging structure for Demand Customers. Currently, Demand Customers are charged on the basis of their contracted MDQ. For the next Access Arrangement period, Jemena proposes to use a "chargeable demand" approach which is based on the consumption characteristics of the end-user customer, rather than the contract management and optimization practices adopted by the retailers. Under the proposed new access arrangement, chargeable demand will be directly related to the *ninth highest withdrawal of an end customer*, irrespective of their retailer's approach to contract management.

JGN made the decision to adopt this pricing approach after NIEIR had provided their forecast. The logic behind the ninth highest MDQ is that contract periods for each Demand Customer will no longer exist. Under current practice, customers are permitted nine overruns per year before they incur annual overrun charges. The transition to a rolling customer contract and mechanical chargeable demand billing leads to a requirement that all customers' chargeable demand on 1 July 2010 needs to be based on their ninth highest usage in the prior 12 month period. The ninth highest daily usage values for each customer were determined (proxies were used where there was less than 12 months of history for a particular customer). The aggregate MDQ based on ninth-highest MDQ was determined for the 2008 Base Year, and the scaling factors previously calculated were then applied to adjust the MDQ forecasts for the forecast years.

4.2 Key forecast assumptions

4.2.1 Economic growth

The NIEIR report for Jemena is based on the NIEIR's economic outlook for Australia and its breakdown to New South Wales. This report was produced in early 2009, based on available data as at 31 December 2008. At this time, the effects of the global financial crisis (GFC) had reached close to their peak.

In December 2008, the ultimate effects of the GFC in Australia were uncertain and NIEIR considered a relatively pessimistic scenario. In the first three months of 2009, the Australian government implemented a series of additional medium term measures to counteract the impact of the GFC on the Australian economy. The effects of these measures, plus new areas of expenditure from the 2009 budget, appear to have mitigated the impact of the GFC in Australia. As a result, ACIL Tasman considers that the Australian economy is likely to recover more quickly than assumed by NIEIR in terms of GDP and employment growth, and it is likely that there will be less impact on economic growth over the access arrangement period.

NIEIR based the economic outlook for the NSW on the overall Australian economic outlook together with key indicators at regional level that included growth in population, dwelling stock and gross regional product. We consider this general approach to be appropriate for the purpose of developing the demand forecasts.

The macroeconomic aggregates and selected indicators for NSW are in line with the Australian economy. Table 3.2 of the NIEIR report suggests a sharp reduction in investment by business and to a lesser extent government in NSW from 2008–09 to 2010–11, and a steep contraction in private dwelling investment from 2008–09.

In light of the performance of the Australian economy during 2009 and the apparent efficacy of the government stimulus measures, the macroeconomic indicators for Australia and for NSW in particular may well prove more favorable than assumed in the NIEIR report.

4.2.2 Energy efficiency

There are a number of federal and State policies regarding energy efficiency that are expected to influence overall energy demand as well as consumer choice with regard to different forms of energy in NSW. As discussed previously NIEIR has provided a detailed account of the effects of such policies upon gas demand in NSW.

4.3 Conclusions regarding key forecast assumptions

Critical factors underlying the gas demand forecasts include the overall economic outlook, policy induced energy efficiency measures and the impact of climate change policies.

The price and income effects from the economic modeling undertaken by NIEIR are appropriate drivers of economic growth forecasts for the NSW and regional economy.

The impact of energy efficiency measures and policies are considered in an appropriate way in the NIEIR report. Translating the impact of these measures into consumer responses has been considered in detail. The findings have been translated into the forecasts in an acceptable manner.

The impact of the CPRS is subject to some uncertainty, and the NIEIR forecast was prepared prior to the announcement of the deferral of scheme commencement from mid 2010 to mid 2011, and the capping of CO_2 prices at A$10/t CO_2e for the first year of the scheme operation. On this basis, the step change in business and residential gas prices of around $1.50/GJ shown to occur between 2009–10 and 2010–11 (NIEIR report, Table 4.10) may now be deferred for a year and the increase in gas prices may occur somewhat more gradually. However these represent relatively minor adjustments through the operation of the demand elasticity assumptions in the NIEIR model, and do not in our view act to invalidate the forecasts.

Overall we conclude that, in developing the demand forecasts, appropriate consideration has been given to the key drivers affecting future gas demand. Account has been taken of factors that may cause future gas demand growth to follow a different growth trajectory when compared to past experience. However the assumptions regarding impacts of the GFC on the NSW

economy appear to have been overly pessimistic in light of actual economic performance during 2009, and accordingly the forecast reductions in gas demand particularly in 2009–10 are likely to be overstated. This conclusion is supported by data on recent actual gas consumption provided by Jemena. These data show that consumption during the second half of 2009 was stronger than the NIEIR forecasts—for further discussion on this point see sections 5.1 and 5.2.2.

4.4 Application of the methodology

ACIL Tasman considers that the methodological approach of NIEIR is appropriate. The econometric estimation of a demand function using income and prices as primary input, plus other exogenous variables and policies, is sound.

Jemena has adapted the NIEIR forecast in order to map it across to the zonal (coastal/country) and volume tranche tariff structure that it proposes to use in the forthcoming access arrangement period. Jemena also adjusted the NIEIR forecasts to take into account the expected impact of a proposed marketing strategy on Volume Customer load, and to reflect the demand associated with a new major customer that has connected since the NIEIR forecasts were prepared. Finally, Jemena adapted the NIEIR forecast to reflect a proposed new "chargeable demand" approach for Demand Customers.

NIEIR reviewed the Jemena adjustment methodology and expressed the following opinion with regard to the reasonableness of the approach adopted by Jemena:

> "NIEIR is of the opinion that the forecasts are traceable to and consistent with the aggregate NIEIR forecasts and that the methodologies described represent reasonable applications of the NIEIR forecast. The use of the NIEIR forecast in this manner does not invalidate any assumptions or expert opinions made or held by NIEIR."[2]

We note that the adjustment methodology used by Jemena has been described in detail in the documentation accompanying the access arrangement information, and we consider the approach adopted to be a sound and appropriate method of translating the NIEIR projections to the specific circumstances of the service parameters proposed by Jemena.

Specific comments on the application of the methodology follow.

[2] Letter from NIEIR (Mr A O'Dwyer) dated 21 October 2009 to Mr P Harcus, Manager Gas Network Development, Jemena.

4.4.1 Historical data and discussion of previous access arrangement period

The historical data, assumptions and discussion of future factors that can affect the Volume and Demand gas volumes are used effectively in developing the forecasts. The Access Arrangement Information provides information on usage of the distribution network over the current access arrangement period showing minimum, maximum and average demand, and also the customer numbers in total and by tariff class.

The report outlines the historical trends in the Volume and Demand markets and in total demand. The report points out that market growth over the current access arrangement period (in terms of both customer numbers and volume transported) has not been as strong as forecast by the regulator in 2005, and as a result Jemena has under-recovered revenue over the current period (see section 3.1). The shortfall in actual versus forecast performance was particularly marked in the Volume Customer sector, where the majority of Jemena's revenue is generated.

Jemena has pointed to a number of factors that have contributed to this shortfall, including:

- lower than expected new connections
- competition from alternative energy applications, particularly reverse cycle air conditioning and solar/heat pump hot water systems
- improved energy efficiency for residential gas appliances
- improved insulation standards for new developments, and programs to encourage insulation of existing dwellings.

4.4.2 Weather normalization

Jemena has taken into account in its forecast the weather normalization assumptions proposed in the NIEIR report. This normalization is required in order to make sensible comparisons between years taking into account the effects of abnormally warm or cold temperatures that directly affect gas demand.

NIEIR estimated the HDD standard for 2009 as 489 HDD based on the long-run trend of HDD between 1984–85 and 2007–08. The forecasts for the new access arrangement period have incorporated an assumed decline of 3 HDD per year. NIEIR has advised that this somewhat understates the underlying rate of decline observed from the historical data.

ACIL Tasman has reviewed the data and assumptions on which the NIEIR weather normalization was undertaken. We have independently examined Sydney (Observatory Hill) weather data for the period 1859 to 2008 and

observed an average decline of approximately 2.3 HDD per year over that extended period, with a steeper decline of around 5.5 HDD per year over the period since 1990. On this basis the NIEIR assumption in relation to HDD decline appears to be reasonable.

Table 3 compares the raw and weather-adjusted consumption data for the Volume and Demand markets, using the Standard HDD, actual HDD and temperature sensitivity values determined by NIEIR.

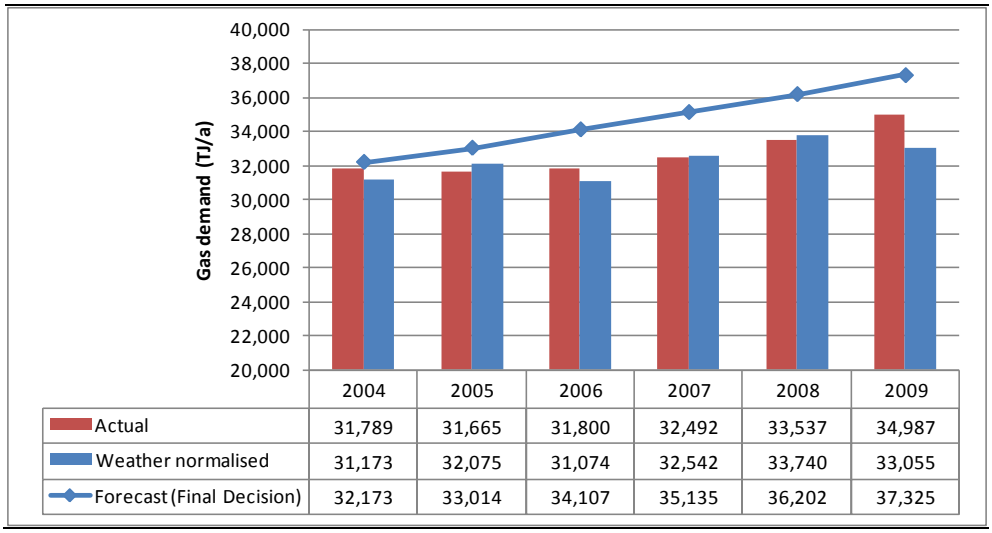
Table 3 **Weather adjustment of historical consumption data**

	2004	2005	2006	2007	2008	2009
"Standard HDD"	489	489	489	489	489	489
Temperature sensitivity (TJ/HDD)						
Volume market	16.2	16.4	16.5	16.7	16.9	17.1
Demand market	4.51	4.51	4.51	4.51	4.51	4.51
Actual HDD	527	464	533	486	477	602
HDD difference	38	-25	44	-3	-12	113
Volume demand - actual	31,789	31,665	31,800	32,492	33,537	34,987
Demand sector demand - actual	64,230	64,050	62,988	64,857	65,452	65,618
Volume demand - weather adjusted	31,173	32,075	31,074	32,542	33,740	33,055
Demand sector demand - weather adjusted	64,059	64,163	62,790	64,871	65,506	65,108
TOTAL - actual	96,019	95,715	94,788	97,349	98,989	100,605
TOTAL - weather adjusted	95,232	96,238	93,864	97,413	99,246	98,163

Data source: Jemena Access Arrangement Information, NIEIR; ACIL Tasman analysis

Figure 5 and Figure 6 summarise the raw and weather-normalised historical consumption for the Volume and Demand Customer classes respectively, compared to the forecast levels under the final decision for the current access arrangement period. The significant shortfall in actual consumption compared to forecast consumption, particularly in the Volume Customer group, is apparent.

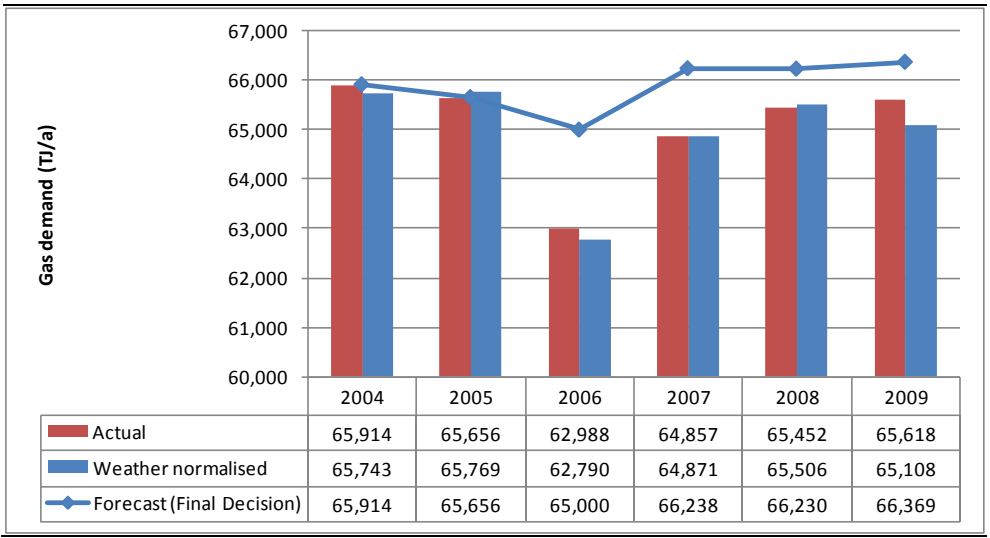
Figure 5 **Raw and weather-normalised consumption vs forecast: Volume Customers**



	2004	2005	2006	2007	2008	2009
Actual	31,789	31,665	31,800	32,492	33,537	34,987
Weather normalised	31,173	32,075	31,074	32,542	33,740	33,055
Forecast (Final Decision)	32,173	33,014	34,107	35,135	36,202	37,325

Data source: Jemena Access Arrangement Information, NIEIR; ACIL Tasman analysis

Figure 6 **Raw and weather-normalised consumption vs forecast: Demand Customers**



	2004	2005	2006	2007	2008	2009
Actual	65,914	65,656	62,988	64,857	65,452	65,618
Weather normalised	65,743	65,769	62,790	64,871	65,506	65,108
Forecast (Final Decision)	65,914	65,656	65,000	66,238	66,230	66,369

Data source: Jemena Access Arrangement Information , NIEIR; ACIL Tasman analysis

In its comments on the Access Arrangement Information, AGL[3] noted that the NIEIR reported HDD standard of 489 was inconsistent with Sydney weather data that AGL had analysed, which suggested a 560 HDD average for 2003-2008. AGL subsequently provided[4] daily weather data from 1 January

[3] AGL submission to AER on JGN Access Arrangement, dated 10 November 2009.

[4] Email from AGL to AER dated 30 November 2009, with accompanying spreadsheet data file.

2003 together with accompanying calculations that confirmed the 560 HDD calculation.

ACIL Tasman reviewed the data sets provided by NIEIR and AGL, and determined that the reasons for the difference between AGL's and NIEIR's calculations of average HDD were as follows:

- The AGL data came from the Bureau of Meteorology (BOM) Weather Station 66037 (Sydney Airport). The NIEIR data came from BOM Weather Station 66062 (Sydney Observatory Hill).
  - Analysis of the two data sets shows that Sydney Airport is typically between 35 and 75 HDD per year higher than Sydney Observatory Hill, averaging 51 HDD higher over the calendar years 2003 to 2008, and 54 HDD higher over the financial years 2002–03 to 2007–08.
- The NIEIR analysis set out in Appendix 5.2 to the Access Arrangement was undertaken on a financial year basis. The calculated average HDD for the period 2003 to 2008 therefore relates to the period 1 July 2002 to 30 June 2008.
- The AGL analysis was undertaken on a calendar year basis. The calculated average HDD for the period 2003 to 2008 therefore relates to the period 1 January 2003 to 31 December 2008.

Taking the above into account, ACIL Tasman has calculated HDD for both financial and calendar years, using the NIEIR and AGL data sets, and has confirmed that the calculations by both AGL and NIEIR are correct: the differences stem primarily from the use of data from different weather stations and are also affected by use of time periods that are offset by 6 months.

Table 4 provides a detailed reconciliation of the results reported by NIEIR and AGL with the recalculations by ACIL Tasman based on the data sets provided.

Table 4 **Reconciliation of AGL and NIEIR HDD calculations**

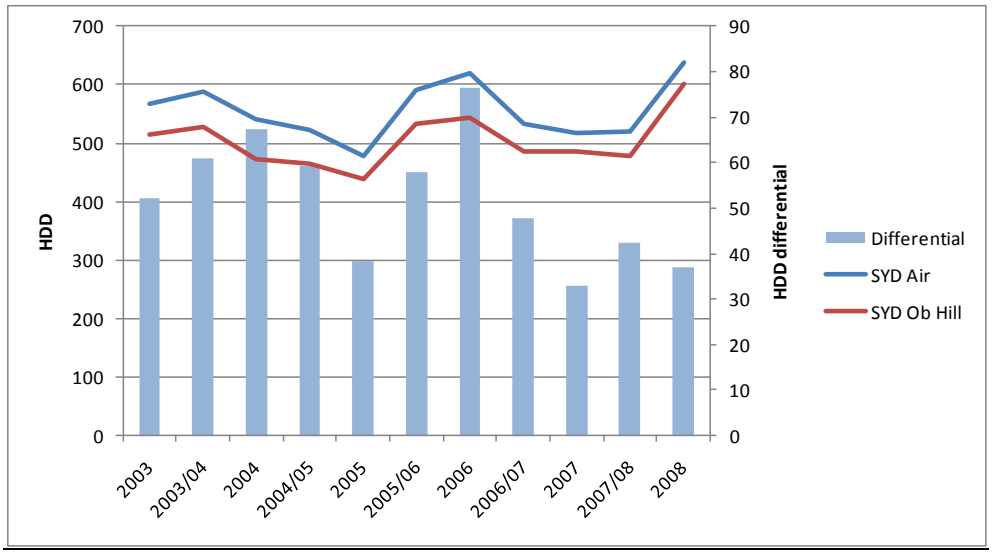
	AGL	NIEIR		AGL	NIEIR
	ACIL calc	ACIL calc		Reported	Reported
	66037 SYD Air	66062 SYD Ob Hill	Differential		
2002–03		448			448
2003	568	516	52	568	
2003–04	588	527	61		527
2004	541	473	67	541	
2004–05	524	464	59		464
2005	478	440	38	478	
2005–06	591	533	58		533
2006	619	542	76	619	

2006–07	533	486	48		486
2007	518	485	33	518	
2007–08	520	477	42		477
2008	639	602	37	639	
CY average	**560**	**510**	**51**		
FY average	**551**	**489**	**54**		

Data source: ACIL Tasman analysis of BOM data for Weather Stations SYD Airport (66037) and Sydney Observatory Hill (66062)

Figure 7 provides a graphical comparison of the results from the two data sets.

Figure 7 **Comparison of HDD data for SYD Airport and Observatory Hill data**

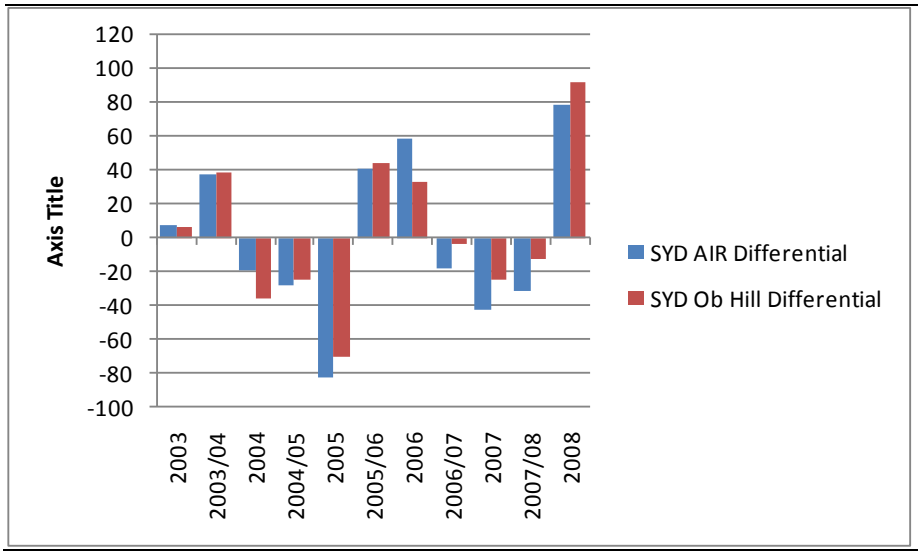


Data source: ACIL Tasman analysis of BOM data for Weather Stations SYD Airport (66037) and Sydney Observatory Hill (66062)

The question which then arises is whether the choice of weather station for the normalisation process significantly affects the forecasts.

For the weather normalisation process, what matters is the annual difference from the underlying average—in other words how much colder or hotter the period was than expected on the basis of the average at that location—rather than the absolute number of HDD. As shown in Figure 8 the deviations from average are very similar for the two stations. On this basis, we conclude that the choice of weather station in the Sydney region does not materially affect the results of the weather normalisation process. While the historical average would have been around 50 HDD higher had NIEIR used the Sydney Airport data, the weather normalisation adjustments to the historic consumption data would have been similar.

Figure 8 **Comparison of HDD variations from average for two Sydney weather stations**



Data source: ACIL Tasman analysis of BOM data for Weather Stations SYD Airport (66037) and Sydney Observatory Hill (66062)

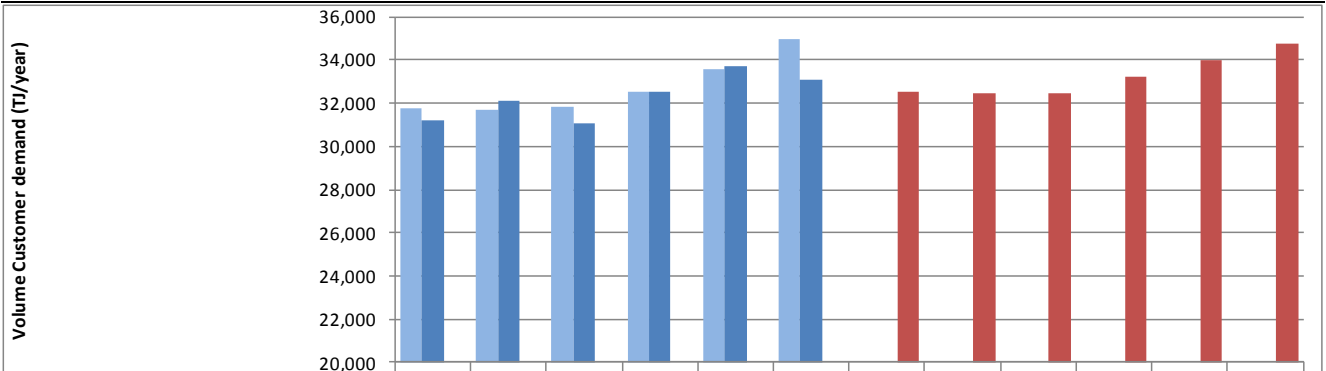
5 The forecasts

As discussed in section 4, ACIL Tasman considers that the historical review, assumptions and methodological approach for the forecasts prepared by NIEIR, and adapted by Jemena, are acceptable for the purposes of preparing these forecasts. In this chapter we review the forecasts themselves, to consider whether the application of the methodologies used by NIEIR and Jemena has produced forecast results that are reasonable in light of historical patterns of demand as well as current and anticipated influences on retail gas demand in New South Wales. We consider separately the forecasts for the Volume and Demand sectors of the market.

5.1 Volume Customer forecasts

The forecast gas demand for the Volume Customer sector is summarised and compared with historical actual consumption (raw and weather adjusted) in Figure 9.

Figure 9 **Historical and forecast consumption—Volume Customer sector**



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Volume customer consumption - actual	31,789	31,665	31,800	32,492	33,537	34,987						
Volume customer consumption - weather adjusted	31,173	32,075	31,074	32,542	33,740	33,055						
Volume forecast							32,510	32,436	32,479	33,187	34,009	34,769

Data source: Jemena Access Arrangement Information, NIEIR; ACIL Tasman analysis

As shown, the forecast Volume Customer demand in 2009–10 and in the first two years of the new access arrangement period (2010–11 and 2011–12) is slightly below the actual weather-normalised consumption for 2008–09, by around 0.6 PJ/a, but then begins to grow at about 0.8 PJ/a—a rate of between 2.0 per cent and 2.5 per cent per year.

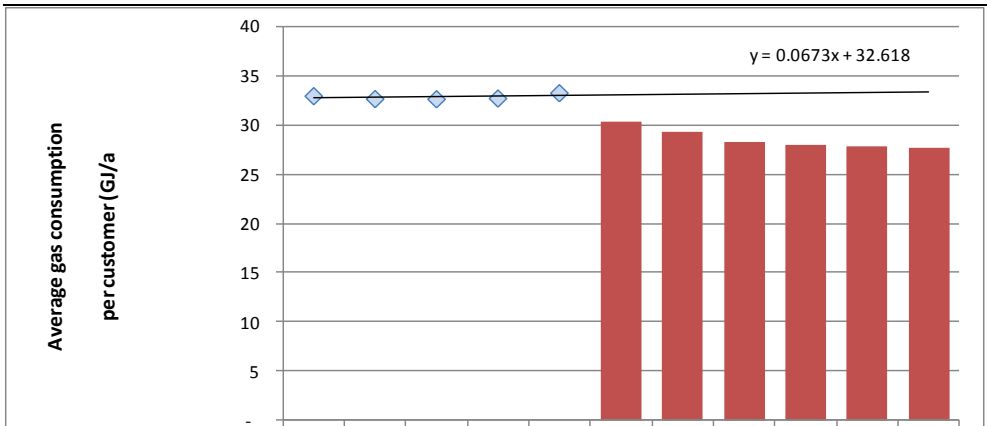
In its submission on the proposed Access Arrangement Information, AGL commented that:

> "Jemena's volume market demand forecast is characterised by a projected growth in customer numbers, but offset by a significant decline in gas usage per customer. The forecast of customer growth or new connections appears reasonable, but their assumptions about future loads per customer seem extremely low. Forecast tariff loads per customer are well down on recent actual loads ..." (AGL submission to AER on JGN Access Arrangement, dated 10 November 2009)

The raw data suggests that AGL's point has merit. As shown in Figure 10, the actual gas consumption per customer has trended slightly upward at an average rate of around 0.07 GJ/a over the period 2005 to 2009. If this trend was to be maintained over the forthcoming access arrangement period, then average gas use per customer would be between 2.7 and 5.4 GJ/a higher than forecast by Jemena. The Jemena forecasts are on average between 8 per cent and 16 per cent below the trend for the last five years.

However, in order to assess the Jemena forecast properly, it is necessary first to normalise the Volume Customer consumption data for weather. The results are shown in Figure 11.

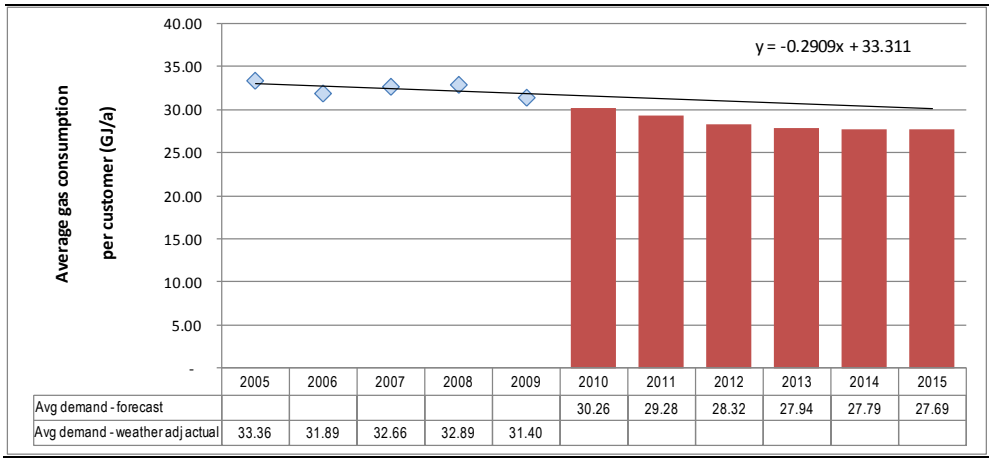
Figure 10 **Actual vs forecast average gas consumption per Volume Customer, BEFORE weather normalisation**



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Volume avg/customer forecast (GJ/a)						30.26	29.28	28.32	27.94	27.79	27.69
Volume avg/customer actual (GJ/a)	32.93	32.63	32.61	32.69	33.24						

Data source: ACIL Tasman analysis of Jemena, NIEIR data

Figure 11 **Actual vs forecast average gas consumption per Volume Customer, AFTER weather normalisation**



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Avg demand - forecast						30.26	29.28	28.32	27.94	27.79	27.69
Avg demand - weather adj actual	33.36	31.89	32.66	32.89	31.40						

Data source: ACIL Tasman analysis of Jemena, NIEIR data

The weather normalised data shows a decline in average customer utilisation of around 0.29 GJ/a. The differential between the Jemena forecast and the weather-adjusted historical trend reduces to between 1.6 and 3.0 GJ/a, or between 5 per cent and 10 per cent on average below the trend over the past five years.

The differential is still significant and requires further explanation. Specifically, it is necessary to consider whether the net effect of the various demand drivers canvassed in the NIEIR study could reasonably be expected to result in a decrease in average gas use of this magnitude. This goes to a number of the specific points discussed below.

5.1.1 Increase in efficiency in hot water usage for new dwellings

NIEIR states that:

> "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." (NIEIR, p.41 [emphasis added])

It seems reasonable to expect that there will be some ongoing improvement in the efficiency of gas hot water heaters: the question is whether it will be as much as 1% per year for new units. It is, in our view, questionable whether the potential impact of the assumption is material. Based on a new dwelling construction rate of 31,000 in 2007-08 (NIEIR, p.23) attributed entirely to the Jemena distribution area, gas hot water penetration of new dwellings of 73 per cent to 67 per cent and a rate of use of gas for hot water in new dwellings of 10.5 GJ/a in 2009 (NIEIR, p.41), the difference in forecast gas consumption over the five year access arrangement period as a result of the 1 per cent efficiency improvement assumption is equal to 149 TJ (compared to a case where there is no efficiency improvement). This amounts to **0.09 per cent of**

the total forecast consumption of 164,621 TJ in the Volume/tariff sector over the 5-year period.

5.1.2 Replacement of existing electric hot water heaters

NIEIR (p41) states an assumption that 43 per cent of existing electric hot water heaters when replaced will be replaced by gas service. NIEIR explains that it developed a "hot water model" and that "JGN assisted NIEIR in parameterising parts of the hot water model developed". NIEIR goes on to explain that:

> "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." (NIEIR, p.41)

5.1.3 Impact of low-flow shower heads

NIEIR (p42) assumed a 3% per year increase in penetration of low flow showerheads, 'consistent with historic trends'. The question is whether it is realistic to assume that this rate of change will continue. NIEIR states that:

> "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." (NIEIR, p.42)

There is good reason to expect that there will be continuing uptake of low flow showerheads: governments continue to promote strongly measures to reduce water consumption, and public awareness of water conservation issues appears to be high and growing. The question therefore is not whether there will be a reduction in gas use associated with increased uptake of low-flow showers, but whether the assumed rate of penetration is too high and unsustainable. However the question of materiality again arises. Based on NIEIR's statement that the current assumption leads to a very small reduction in gas use for existing dwellings of 0.1 GJ/a each year, then *completely eliminating* the assumed impact of reduced flow showerheads would see a reduction in overall Volume/Tariff customer demand of 100 TJ/a or 0.3 per cent of forecast demand. Reducing the assumed rate of penetration from 3 per cent to, say, 1.5 per cent would therefore result in an adjustment to the demand forecast of only 50 TJ/d or 0.15 per cent of current forecast demand.

5.1.4 Trend to reverse cycle air conditioning

NIEIR has assumed (NIEIR p43) that as gas space heaters break down, 25 per cent of existing customers convert to reverse cycle air conditioning (RCAC). There is a well-established trend to increasing penetration of reverse cycle air conditioning and on this basis it is reasonable to expect that some existing gas space heaters will, when no longer serviceable, be replaced by electric RCAC rather than new gas. The questions to be posed are therefore a) how the 25 per cent conversion figure was arrived at and why it is consider appropriate, and b) what impact the assumption has on customer numbers and overall Volume/Tariff demand. We see this as an area where the assumption potentially overstates the medium term reduction in Volume Customer average demand.

5.1.5 Conclusions regarding Volume Customer forecasts

Overall we see it as reasonable to expect that average consumption per Volume Customer will continue to decline in light of government policies and public opinion that support improved energy efficiency, reduced hot water consumption, increased use of renewable sources such as solar electric and so forth. However, these are not new trends: government policies relating to energy efficiency and more stringent building standards have been in place for some time and their effects on average gas consumption (particularly for new customers and new dwellings) are evident in the historical trends. We do not consider that any persuasive evidence has been put forward to support the step change in average customer consumption that is implicit in the Volume Customer forecast proposed by Jemena (and which is illustrated in the temperature adjusted actual versus forecast average gas consumption per customer shown in Figure 11. This is particularly true given that the forecast average demand reduction applies across all Volume Customers (more than 1 million) whereas the factors driving reduced average consumption are primarily associated with new customers and new dwellings.

Accordingly, further information was sought from Jemena regarding actual Volume Customer numbers and consumption during 2009 to better assess the average consumption trend. Jemena advised[5] that actual Volume Customer consumption for the six months to end of December 2009 was 20.702 PJ and that, based on the percentages of actual 2008–09 billings for residential and small business customers that occurred in the second six months of that year, Jemena now expects total Volume Customer sales in 2009–10 to reach 32.721 PJ. This compares to the forecast in the proposed Access Arrangement

[5] Document dated 8 January 2010 entitled "Response to AER 08 December 2009 Questions", at p.5, Table 4.

Information of 32.510 PJ for the corresponding period—an increase of just over 0.2PJ or about 0.6 per cent.

However, we note that the 2008-09 year was significantly colder than average with HDD of 602 compared to an average HDD of 512 for the five years ended June 2009 (based on HDD data used by NIEIR for weather normalization). As a result we would expect that the proportion of total gas consumption in 2008–09 occurring in the first half of the year would have been higher than usual because of the increased winter heating load. As a result, using 2008–09 data on the split between the first and second halves of the year as the basis for estimating consumption in the second half of 2009–10 is likely to significantly understate second half consumption.

On this basis we recommend that the Volume Customer demand forecast should be adjusted upward to reflect an average rate of consumption per customer consistent with the trend line shown in Figure 11. Applying these average consumption rates to the customer numbers forecast in the Access Arrangement Information leads to the proposed alternative forecast for Volume Customer demand set out in Table 5.

Table 5 **Proposed alternative forecast for Volume Customer demand**

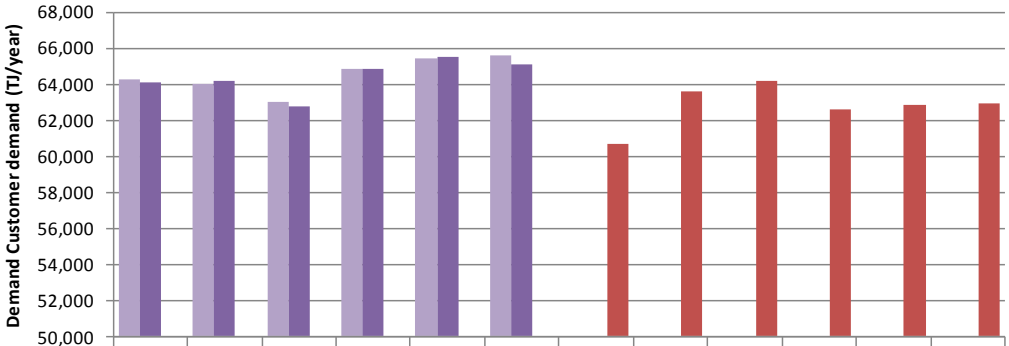
	Volume demand forecast - AAI (PJ/a)	Proposed alternative forecast
2010	32.510	34.231
2011	32.436	34.967
2012	32.479	35.864
2013	33.187	36.804
2014	34.009	37.561
2015	34.769	38.175

Data source: ACIL Tasman analysis of Jemena, NIEIR data from AAI

5.2 Demand Customer forecasts

The forecast gas demand for the Demand Customers is summarized and compared with historical actual consumption (raw and weather adjusted) in Figure 12.

Figure 12 **Historical and forecast consumption—Demand Customer sector**



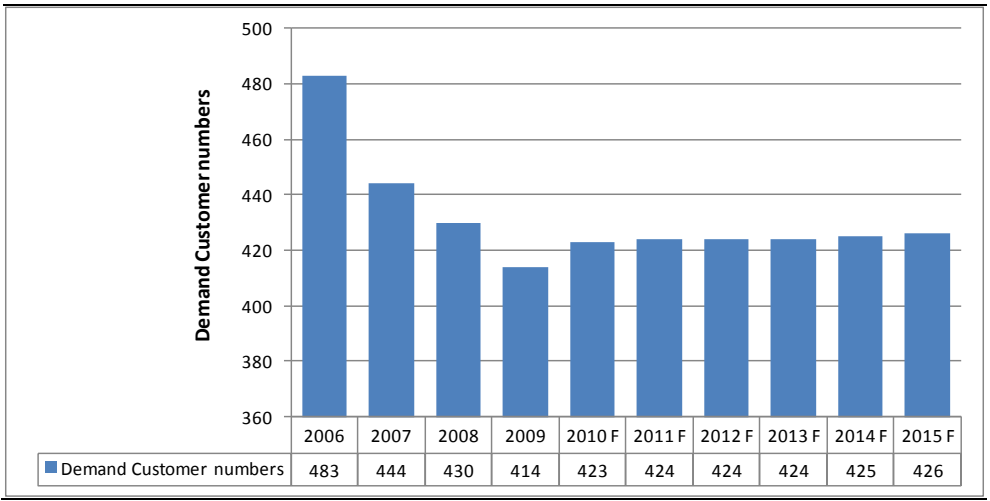
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Demand customer consumption - actual	64,230	64,050	62,988	64,857	65,452	65,618						
Demand customer consumption - weather adjusted	64,059	64,163	62,790	64,871	65,506	65,108						
Demand forecast							60,690	63,590	64,149	62,570	62,829	62,933

Data source: Jemena Access Arrangement Information, NIEIR; ACIL Tasman analysis

A sharp drop in gas consumption in the Demand Customer sector—around 4.4 PJ/a or some 6.8 per cent—is forecast for the 2009–10 year. Given that the forecast in this year effectively sets the starting point for the subsequent access arrangement period, it is important to investigate the reasons why the NIEIR modeling produced this result.

Some softening of demand in the commercial and industrial sector could reasonably be expected as a result of flow-on effects from the GFC and this seems to be reflected in the observed decline in customer numbers in the Demand Customer sector which have fallen from 483 in 2005–06 to an (actual) 414 in 2008–09. The forecast number for 2008–09 at the time the NIEIR analysis was undertaken was 421, so the actual outcome was somewhat below expectations. As shown in Figure 13, the forecast customer numbers show a moderate increase from 2010 on. Notwithstanding the weak actual customer numbers in 2008–09, consumption in the sector was 65.618 PJ, slightly higher than the forecast of 65.597 PJ used by NIEIR. Furthermore NIEIR had assumed a decline of 0.9 per cent in New South Wales GDP for 2008–09 and the observed decline in Demand Customer consumption for the same period was only 0.4PJ/a (weather adjusted) or about 0.6 per cent on the previous corresponding period (2007-08). It was therefore unclear to us why a further forecast decline in NSW GDP of 1.7 per cent for 2009–10 would lead to such a steep decline in the Demand Customer sector.

Figure 13 **Actual and forecast Demand Customer numbers**



Data source: Jemena Access Arrangement Information, NIEIR; ACIL Tasman analysis

In light of these observations, further information was sought from Jemena by way of explanation of the forecast decline in Demand Customer consumption in 2009-10. The matter was referred by Jemena to NIEIR, who responded as follows:

> "The large projected decline in gas consumption by contract customers in 2009/10 is largely driven by a projected decline in gas consumption by the industrial sector (i.e., non-commercial part of the contract market). More precisely, much of the 4.4 PJ decline stems from declines in consumption by
>
> - 'chemical, petroleum and coal manufacturing' (down 2.1 PJ),
> - 'non-metallic minerals manufacturing' (down 1.0 PJ), and
> - 'basic & fabricated metal products manufacturing' (down 1.1PJ).
>
> At the time of forecasting (March/April 2009), these three industries were expected to be hit disproportionally hard by the world economic recession. **Our view has not changed in regards to these industries. Recent evidence has only reinforced our view...** *[emphasis added]"*

(NIEIR, letter dated 20 October 2009 from Mr A O'Dwyer addressed to Mr P Harcus, Manager Gas Network Development, Jemena)

NIEIR went on to note that recent gas data from Victoria shows a steep decline in manufacturing gas consumption, notably in the chemical and basic metals industries, with the Victorian Tariff D (Contract) market falling by more than 4 per cent between 2008 and 2009 and with further losses expected in the next two years. NIEIR stated that it expects to see similar falls in gas consumption in NSW.

While it may be the case that NSW will follow a similar pattern to Victoria, we reiterate the observation made earlier that actual demand data provided by Jemena shows that the decline in Demand Customer consumption from 2007–

08 to 2008–09 was only 0.4PJ (weather adjusted) or about 0.6 per cent. Before weather adjustment, demand in the sector actually increased by almost 0.2PJ.

5.2.1 Evidence from the National Gas Market Bulletin Board

To estimate the actual quantities of gas delivered for sale in the Jemena distribution area in New South Wales, we have looked to data posted by the Australian Energy Market Operator on the National Gas Market Bulletin Board that shows the total imports of gas into New South Wales. Total imports are defined as the flows into New South Wales via the Moomba – Sydney Pipeline, Eastern Gas Pipeline and the Victoria – NSW Interconnect (net flow from Victoria). Adjustments have then been made for gas supplied to customers via Country Energy (approximately 1.5 PJ over the period) and by ActewAGL (about (7.7 PJ). Allowance has been made for consumption by major customers supplied direct from the transmission system that do not use the Jemena network, including TRUenergy's Tallawarra CCGT (with estimated consumption 18.5 PJ over the relevant period) and the Smithfield cogeneration facility (9.2 PJ). No adjustments have been made for local gas production (Narrabri CSG to power generation – not delivered via Bulletin Board assets or Jemena) or for unaccounted-for gas (UAG). As shown in Table 5, the analysis conducted on this basis suggests a total gas delivery for customers served via the Jemena network of 101.5 PJ in the year to end November 2009. This compares with a forecast 97.5 PJ based on Jemena's 2008–09 (7 months) and 2009–10 (5 months) forecasts as presented in the Access Arrangement Information. In other words, the data suggests that the actual deliveries via the Jemena network over the period in question have been around 4 PJ higher than the Jemena forecasts would suggest. This could be a result of other customers that ACIL Tasman is not aware of that are supplied direct from the transmission pipelines. However, the actual consumption for the year ended June 2009 (as advised by Jemena) was 100.6 PJ, suggesting that our estimate of 101.5 PJ for the year ended November 2009 is close to the mark, and the forecast 93.2 PJ for 2009–10 appears much too low based on current trend.

Table 6 **Analysis of Jemena demand based on Bulletin Board data for 12 months ended 30 November 2009**

Total for year ended 30 Nov 2009	138.4 PJ
Country Energy Distribution Area	1.5
ActewAGL Distribution Area	7.7
TRU Tallawarra	18.5
Smithfield cogen	9.2
Balance = Jemena distribution	101.5
Jemena Forecast	97.5
Differential	4.0

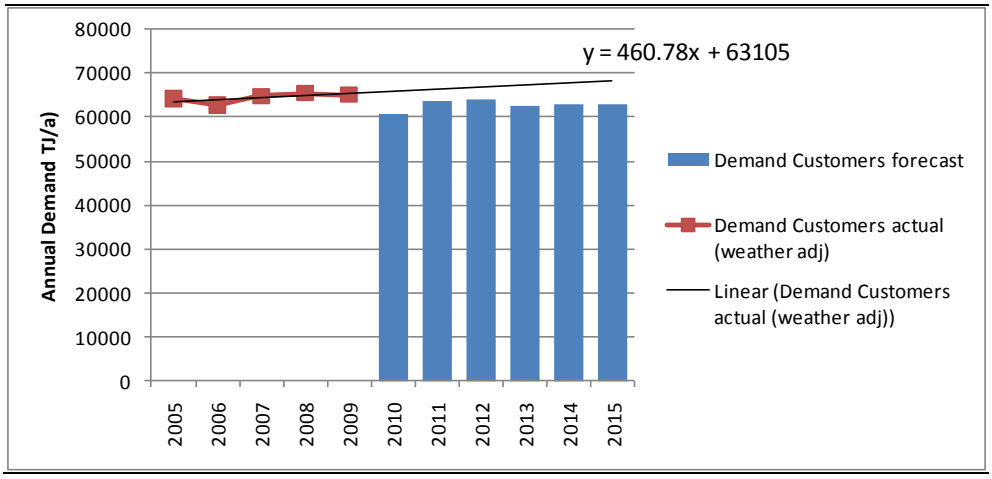
Data source: ACIL Tasman analysis of National Gas Market Bulletin Board data

5.2.2 New data on actual consumption

In response to a request from AER, Jemena recently provided data on actual gas consumption in the Demand Customer sector for the second half of calendar 2009[6]. This data shows that Demand Customer consumption for the six months ended 31 December 2009 was 31.813 PJ and on this basis Jemena now expects Demand Customer load for 2009–10 to reach 64.262 PJ. This compares to a forecast in the Access Arrangement Information of 60.690 PJ for the corresponding period. Thus the evidence of actual consumption to the end of 2009 now suggests that Demand Customer load in 2009–10 will be some 3.6 PJ higher than the NIEIR forecast.

On this basis we conclude that the sharp drop in Demand Customer load forecast for 2009–10 by NIEIR is not evident, either from an analysis of bulletin board data or from actual consumption data to end 2009 and we note that Jemena no longer expects to see such a fall in load. Accordingly, we propose that a better forecast of Demand Customer consumption would be obtained by extrapolating the past five years of historical data on linear trend (weather normalized). This would yield the alternative forecast shown in Figure 14 and Table 7.

Figure 14 **Historical and forecast Demand Customer load**



Data source: Jemena Access Arrangement Information

[6] Document dated 8 January 2010 entitled "Response to AER 08 December 2009 Questions", at p.5, Table 5.

Table 7 **Alternative Demand Customer load forecast based on historical data trend**

	2010	2011	2012	2013	2014	2015
AAI forecast	60,690	63,590	64,149	62,570	62,829	62,933
Proposed alternative based on 5-year trend	65,409	65,870	66,330	66,791	67,252	67,713

Data source: ACIL Tasman analysis of Jemena, NIEIR data from AAI

5.2.3 "First Response" service for Demand Customers

Jemena is proposing to introduce a new "first response" service for large Demand Customers willing to have supply curtailed in the event of system constraints. The service is designed to give Jemena improved capability to deal with unexpected supply constraints, rather than as a regular operational device. As such, it is not clear how this service will operate relative to other arrangements already in place for dealing with emergency outages or other circumstances that may require load shedding.

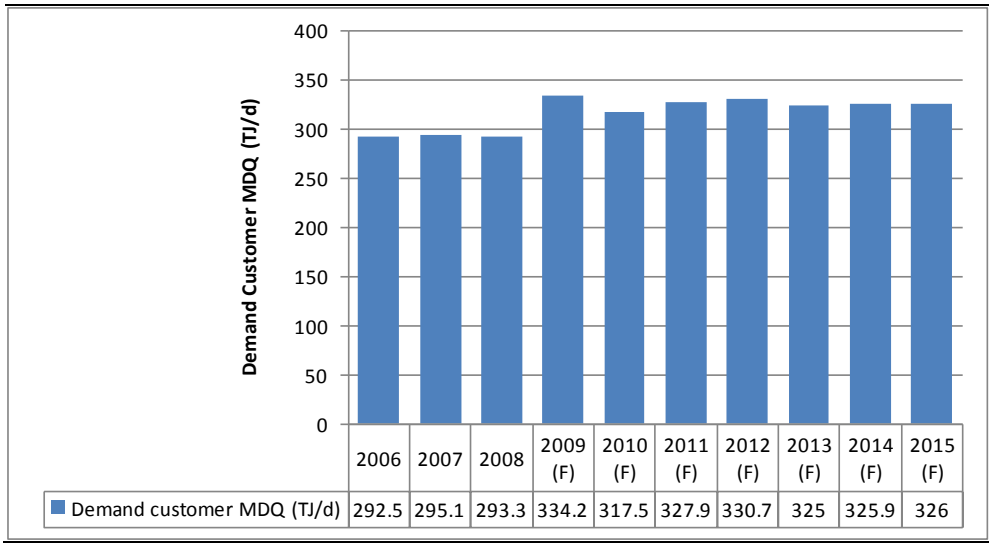
The proposed tariff for the "first response" service represents a discount of some 50 per cent on the proposed Demand tariffs. Jemena is also forecasting a strong uptake of this service on the basis of an expectation that "(the) vast majority of eligible sites would take up this tariff and that more sheddable load will become available" (Jemena document dated 8 January 2010 entitled "Response to AER 17 December 2009 Questions", p.3). The result is that, in order to achieve overall recovery of allowable revenue, tariffs for customers not moving to the "first response" service will rise steeply. In view of the large differential impact on tariffs faced by some customers and the potential for windfall gains if the forecast levels of uptake of the "first response" service are not achieved, we consider that Jemena should be required to provide clear justification for the level of discount offered and the assumptions regarding rate of uptake amongst eligible customers.

5.3 Demand Customer MDQ forecasts

Historical and forecast of Maximum Daily Quantity (MDQ) for the Demand Customers is shown in Figure 15. Over the past few years, the MDQ requirement for Demand Customers has been quite stable at between 290 and 295 TJ/d with an implied load factor (average/peak load) of between 59 per cent and 61 per cent. As indicated in Figure 15, a step change upward in MDQ is anticipated in the current financial year. This relates to inclusion of a large new customer with a significant MDQ requirement. The fall in MDQ in 2009–10 relates to the forecast drop in Demand Customer consumption in that year, and so the same issues as were discussed in the preceding section apply. To the extent that actual performance in the 2009–10 year turns out to be stronger than the current forecast there should be a corresponding increase in MDQ,

although the relationship may not necessarily be one-for-one. In other words, a change in a particular Demand Customer's annual gas consumption of a certain percentage does not mean that the customer's peak daily gas demand will necessarily change by the same percentage. Overall load factor is expected to decline to between 50 per cent and 55 per cent as a result of inclusion of a large new customer with a significant MDQ requirement.

Figure 15 **Demand Customer Maximum Daily Quantity (MDQ, TJ/d)**



Data source: Jemena Access Arrangement Information Tables 4.3 and 5.2

6 Conclusions

ACIL Tasman considers that the forecast developed by NIEIR on behalf of Jemena, and the adjustments to the NIEIR forecast made by Jemena to take into account certain changes following the completion of the NIEIR analysis have been prepared using established and clearly described methodologies. However, the forecasts show short-term changes from historical trends, in both the small customer (Volume) and large customer (Demand) segments of the market that, if accepted, establish low starting points for the next access arrangement period. In the case of the Volume Customer segment, the reduction in demand has been attributed to a mix of government policies and consumer trends that are causing average rates of gas consumption per customer to decline. However, the step change in average consumption per customer that is implicit in the forecast for the year ended June 2010, and is carried forward into subsequent years, is not apparent in the recent actual consumption data, nor have convincing reasons been presented why the mix of government policies and consumer trends (most of which have been in evidence for some time) should now lead to a step change in consumption. We therefore recommend that the Volume Customer demand forecast should be

adjusted upward to reflect an average rate of consumption per customer consistent with historical trends.

The forecasts for the Demand Customer segment show a steep decline from 65.6PJ in 2008–09 to 60.7 PJ in 2009–10. This steep decrease in Demand Customer load will purportedly occur as a result of weak economic circumstances associated with the GFC. However actual consumption data to end December 2009 does not show any such decline in demand, and Jemena now expects Demand Customer load in 2010–10 to be some 3.6 PJ above the forecast in the Access Arrangement Information. This is consistent with ACIL Tasman's analysis of the overall NSW gas supply situation in the year ended November 2009 based on Bulletin Board data that suggests total gas deliveries via the Jemena network remain more or less on trend with historical rates.

We therefore conclude that a better forecast of Demand Customer load would be obtained by extrapolating the past five years of historical data (weather normalised) on linear trend, and have proposed an alternative forecast on this basis.

A Curriculums Vitae

Following are brief curriculums vitae for the consulting team involved in the preparation of this report

Paul Balfe

Paul Balfe is an Executive Director of ACIL Tasman and has overall responsibility for ACIL Tasman's gas business. Paul has more than 30 years experience in the energy and resources sectors. Previously he held a number of senior executive positions in the Queensland Department of Minerals and Energy. He has a Masters in Business Administration and a degree in Science.

Paul is responsible for the development and commercialisation of ACIL Tasman's *GasMark* model and its application to strategic and policy analysis throughout Australia, New Zealand and in South East Asia. He provides a range of analytical and advisory services to companies, government agencies and industry associations, particularly in the gas, electricity and resources sector. He has expertise in gas, electricity, resources, mining, economic impact analysis and in the analysis of core risk management, safety and health.

He has advised government and corporate sector clients on matters relating to the coal, oil and gas industries, coal seam gas, oil shale, mining safety and health, environmental management and alternative and renewable energies. With qualifications in geology and business administration, his experience ranges across both technical and commercial aspects of project evaluation and development.

Paul has worked extensively on gas industry matters, particularly gas policy reform issues; gas market analysis; gas pipeline developments, acquisitions and disposals; and gas project commercial analysis. He has worked extensively in the Queensland coal seam gas industry as an adviser to both government and corporate sector clients on regulatory, technical, economic and commercial aspects of CSG development.

Owen Kelp

Owen Kelp is a Consultant with ACIL Tasman specialising in electricity and gas markets. Owen has worked extensively on energy industry matters and across a broad range of assignments including upstream conventional and coal seam methane economics; market demand, supply and price forecasting studies; strategic reviews; transmission and distribution networks (project evaluation, throughput forecasts, asset sales and due diligence work); project evaluation (financial modelling, market studies and economic benefits);

regulatory and policy change impact studies. Over the last eight years Owen has managed more than 50 energy industry assignments.

He has extensive modelling capability using various software packages and programming languages as well as practical experience with operations research methods including linear programming and optimisation. He also has a good theoretical knowledge of financial markets and instruments. Owen has been principally responsible for the development and maintenance of a number of ACIL Tasman energy market models, in particular:

- GasMark Global – ACIL Tasman's global model for gas trade for both LNG and pipeline gas
- GasMark – ACIL Tasman's regional model of the interconnected Australian gas market
- GasMark New Zealand – supply demand model for the New Zealand system
- PowerMark – detailed model of the National Electricity Market used for price forecasting and asset due diligence
- PowerMark WA – detailed model of the Western Australian electricity market.

Owen holds a Bachelor of Business (Economics and Finance) from Queensland University of Technology and a Graduate Diploma of Applied Finance and Investment from the Financial Services Institute of Australasia (FINSIA).

Alan Smart

Alan Smart is a Principal Consultant working in the Canberra office of ACIL Tasman. He provides advice on economics, markets and policy for corporate and government clients.

Alan consults in the energy, water and infrastructure sectors. He has also undertaken projects in evaluation and prioritisation of research and development, and in economics and strategy in trade, transport, defence, agriculture, geoscience and spatial information systems.

He is an expert in the energy sector. He has been gas market advisor for strategy and due diligence projects including gas market assessments in Australia and New Zealand for AGL, Alinta, Duke Energy, Zinifex, Edison Mission, Macquarie Bank and Mariner Financial Services. He has also undertaken projects in assessing the economics of power generation including carbon capture and storage.

Alan has also undertaken projects on energy, water and petroleum import infrastructure for the Federal Government. In the petroleum sector he

undertook a review of the *Liquid Fuels Emergency Act* in 2006, a review of liquid fuels vulnerability in 2007 and an audit of petroleum import infrastructure in 2008-09.

Prior to entering consulting in 1998, Alan had over seventeen years experience as a senior executive in the Commonwealth Government in the energy, water and agriculture. He has extensive experience in water policy reform and regulation. His appointments were in senior policy advising roles as well as in business operations including Chief Executive of the Pipeline Authority and Executive Director of the Timor Gap Joint Authority and General Manager in the Australian Maritime Safety Authority. Relevant areas of Alan's work included oil pricing and taxation, gas and electricity market reform, regulation, pipeline access, risk and safety policy and corporate governance.

Alan has qualifications in engineering and economics and completed the Advanced Management Program at Harvard Business School. He is Chartered Professional Engineer.