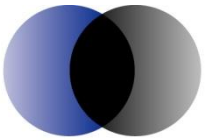
Review of Demand Forecasts for Country Energy Gas network

For the Access Arrangement period commencing 1 July 2010

Prepared for the Australian Energy Regulator

18 September 2009



ACIL Tasman

Economics Policy Strategy

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ACIL Tasman Pty Ltd

ABN 68 102 652 148
Internet www.aciltasman.com.au

Melbourne (Head Office)
Level 6, 224-236 Queen Street
Melbourne VIC 3000

Telephone (+61 3) 9604 4400
Facsimile (+61 3) 9600 3155
Email melbourne@aciltasman.com.au

Brisbane
Level 15, 127 Creek Street
Brisbane QLD 4000
GPO Box 32
Brisbane QLD 4001

Telephone (+61 7) 3009 8700
Facsimile (+61 7) 3009 8799
Email brisbane@aciltasman.com.au

Canberra
Level 1, 33 Ainslie Place
Canberra City ACT 2600
GPO Box 1322
Canberra ACT 2601

Telephone (+61 2) 6103 8200
Facsimile (+61 2) 6103 8233
Email canberra@aciltasman.com.au

Darwin
Suite G1, Paspalis Centrepoint
48-50 Smith Street
Darwin NT 0800
GPO Box 908
Darwin NT 0801

Telephone (+61 8) 8943 0643
Facsimile (+61 8) 8941 0848
Email darwin@aciltasman.com.au

Perth
Centa Building C2, 118 Railway Street
West Perth WA 6005

Telephone (+61 8) 9449 9600
Facsimile (+61 8) 9322 3955
Email perth@aciltasman.com.au

Sydney
PO Box 1554
Double Bay NSW 1360

Telephone (+61 2) 9389 7842
Facsimile (+61 2) 8080 8142
Email sydney@aciltasman.com.au

For information on this report

Please contact:

Paul Balfe
Telephone (07) 3009 8715
Mobile 0404 822 317
Email p.balfe@aciltasman.com.au

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Introduction

The Australian Energy Regulator (AER) has asked ACIL Tasman to conduct a review of the demand forecasts proposed by Country Energy Gas Networks (CEG) for the Wagga Wagga gas distribution network as part of a consideration of proposed new Access Arrangements to apply from 1 July 2010. The objective of the review is to determine whether the forecasts are reasonable.

ACIL Tasman has undertaken a desktop review of the methodology, data and parameters, and assumptions used by CEG in developing its market forecasts. We have used our knowledge of Australian gas markets to test assumptions, and have sought and received clarification on certain matters relevant to the approach and assumptions used by CEG in developing its market forecasts.

Findings

The approach to forecasting of loads and demand in the Volume and Contract sectors of the market serviced by CEG are generally considered to be appropriate and

1. The overall approach and methodology is considered to be adequate
2. The assumptions adopted are, for the most part considered to be reasonable. There are, however, a number of assumptions that we consider either require clarification/verification or should be altered to reflect positions that are more likely to be reflective of future outcomes. These are taken up in the recommendations.
3. The currency and accuracy of the data used is, for the most part, appropriate. We have raised issues in relation to apparent anomalies in data relating to
4. The account taken of key drivers
5. Whether the methodology was properly applied.

Recommendations

Recommendation 1: CEG should correct or explain the apparently anomalous data on minimum and average daily consumption for 2008–09.

Recommendation 2: CEG should investigate and reconcile the apparently anomalous data on connection numbers and customer numbers for the year ended June 2008, and advise any consequent

revisions to the forecast of customer numbers at the commencement of the 2010 access arrangement.

Recommendation 3: In the absence of better information, CEG should be required to adjust their Volume customer growth forecasts to reflect a new customer growth rate of 315 per year, based on 90% penetration of 350 new dwellings per year.

Recommendation 4: CEG should be asked to consider the potential impact of factors other than temperature that may affect future levels of gas demand. To the extent that such factors are assessed as being likely to have a material impact on demand within the access period, the demand forecasts should be adjusted accordingly.

1 Background

The Australian Energy Regulator (AER) has asked ACIL Tasman to conduct a review of the demand forecasts proposed by Country Energy Gas Networks (CEG) for the Wagga Wagga gas distribution network as part of a consideration of proposed new Access Arrangements to apply from 1 July 2010.

The previous Access Arrangement was drafted and approved by the Independent Pricing and Regulatory Tribunal (IPART) and came into effect on 1 January 2006. In order to align the current Access Arrangement with financial years, it was designed to operate for the four and a half year period ending 30 June 2010. Revisions were required to be submitted by 1 July 2009.

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 possible in the circumstances.

The process followed by the AER for assessing proposed access arrangements and access arrangement renewals 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 impact the tariffs set to meet forecast revenue each year of the access arrangement period, and how this revenue may be allocated between tariff classes for different reference services.

ACIL Tasman has been engaged by the AER to advise on whether the demand forecasts for Country Energy 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.

1.2 Approach to the review

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

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 research 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 CEG in developing its market forecasts.

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

- CEG provided its forecasts and accompanying information in the Access Arrangement Information. CEG also provided a copy of a Load Forecast Report prepared by Infrastructure and Regulation Services (IRS, 2009).
- 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 CEG.

- The responses were supplied to ACIL Tasman in the form of a document in which CEG provided answers and/or undertakings to provide further information in relation to each of the questions.
- ACIL Tasman sought and obtained information from other sources, in particular the Wagga Wagga City Council, on relevant matters such as population growth rates, new subdivisions and expected rates of housing start-ups.
- ACIL Tasman's draft reports sets out our initial conclusions regarding the demand forecasting methodology, assumptions, data and conclusions reached by CEG.

2 Country Energy Gas

2.1 Overview of operations

The following overview of CEG's operations is adapted from the Access Arrangement Information provided by CEG (CEG, 2009).

Gas has been available in Wagga Wagga since the late 1880s when reticulation of Manufactured Gas commenced. In 1981 natural gas became available via a branch line off the pipeline from Moomba (in the Cooper Basin) to Sydney.

The gas distribution system was acquired from the Wagga Wagga City Council by Great Southern Energy in June 1997. Great Southern Energy, along with Advance Energy and NorthPower, were merged together to form Country Energy on 1 July 2001. As part of this merger Country Energy Gas Networks became the owner and operator of the Wagga Wagga Gas Network.

The network currently serves around 18,300 customers, mainly domestic and small commercial consumers. These small Volume Customers account for 57 per cent of gas sales through the system, with the remaining 43 per cent sold to a small number of large Contract Customers (currently 15). The Contract customers are concentrated in three zones:

- the Bomen zone, covering a predominantly industrial area north of the Murrumbidgee River. Approximately 73% of the Contract Customer demand is located in this zone.
- the Central zone, covering the main area of the City of Wagga Wagga. Approximately 6% of the Contract Customer demand is located in this zone.

- the Fringe zone, covering customers located on the extensions of the network to the Kapooka and Forest Hills areas. Approximately 21% of the Contract Customer demand is located in this zone.

Penetration levels for gas in the residential market are relatively high, with the gas network serving approximately 70% of households. Volume Customer demand is strongly correlated with temperature, with about 94% of the day-by-day variation in Volume load explained by Heating Degree Day (HDD) deficiencies. (IRS, 2009, p. 1)

Data presented by IRS shows that there were an estimated 27,777 dwellings (Wagga Wagga and 21 surrounding suburbs) in 2008 and a total 19,033 connections, implying a market penetration level of about 69%. However the 2010 Access Arrangement Information (CEG, 2009, p. 19) makes the apparently contradictory statement that "Around 95 per cent of domestic households are connected to the Network". We sought clarification from CEG on this point. CEG explained that the 95% figure referred to in the AAI represents connection on line of main, not the proportion of households connected. CEG also advised that there is some definitional inconsistency in the household count of Wagga Wagga between NIEIR and Wagga Wagga City Council, and whether this includes surrounding suburbs. In seeking to reconcile the customer number data, account also needs to be taken of the distinction between "connections" and "customers", with not all connections having an associated customer.

Table 1 provides a reconciliation of customer penetration rates based on the different data sources:

Table 1 **Reconciliation of customer penetration rate data**

		Customers (1)	Connections (2)
		17378	18624
Household numbers (3)	23076	75.3%	80.7%
Dwelling numbers (4)	27302	63.7%	68.2%

Data sources: (1) Customer numbers, 2007 Actual (IRS Report page10)

(2) Connection numbers, 2007 actual (IRS Report page 12)

(3) Household numbers, 2007 actual NIEIR Report (IRS Appendix A)

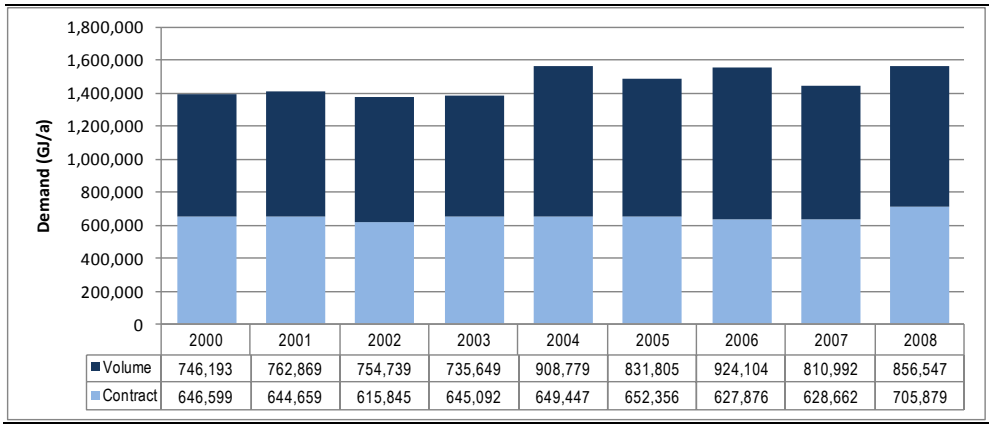
(4) Dwelling numbers, 2007 actual (Wagga Wagga City Council, IRS Report page 12)

Within the large-volume Contract sector of the market, some loads show a clear temperature sensitivity while others are insensitive to variations in temperature. IRS presents a detailed analysis of Contract load temperature sensitivity on a load by load basis (IRS, 2009, pp. 31-46)

2.2 Historical gas demand

Data on actual historical gas demand from 2000 to 2008 (FY ended June 30) is set out in (IRS, 2009) at Table ES 1 (Volume Customer demand) and Table 6.1 (Contract customer demand). The data is summarized in Figure 1.

Figure 1 **CEG historical gas demand**



	2000	2001	2002	2003	2004	2005	2006	2007	2008
Volume	746,193	762,869	754,739	735,649	908,779	831,805	924,104	810,992	856,547
Contract	646,599	644,659	615,845	645,092	649,447	652,356	627,876	628,662	705,879

Data source: (IRS, 2009)

The data indicates that gas demand in the Contract sector has been relatively stable at between 600,000 and 700,000 TJ/d with no clear upward trend. However 2008 showed a significant increase over previous years in the Contract Market, with demand some 50,000 GJ higher than the previous highest demand over the data period. Demand in the Volume sector shows significantly greater variation, consistent with greater weather sensitivity in this sector. As discussed elsewhere in this report, evidence is presented to show that several Contract loads which together account for a significant proportion of total gas demand on the system are not weather sensitive, whereas variations in demand in the Volume sector are highly correlated to temperature.

2.2.1 System load variability

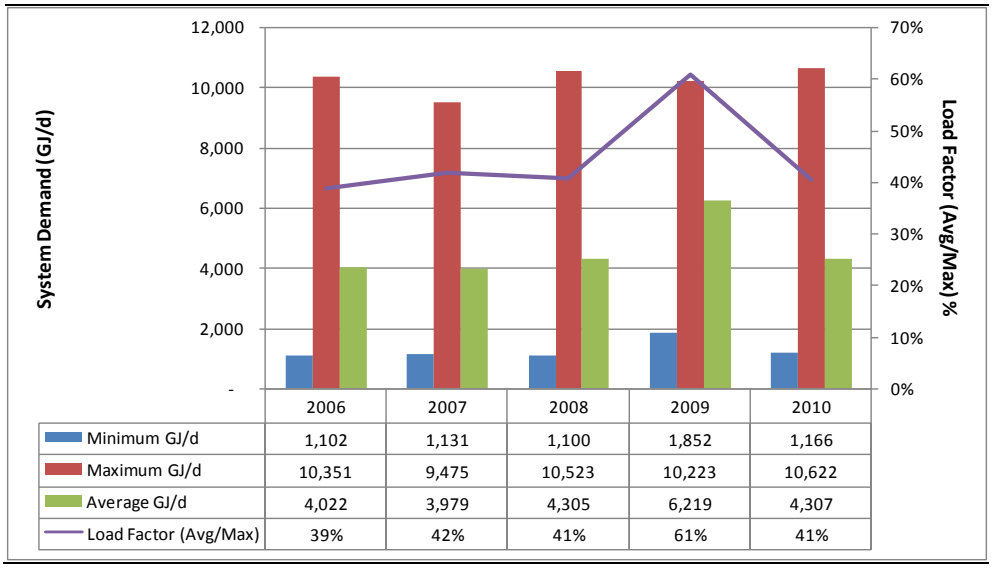
The National Gas Rules [Rule 72 (1)(a)(iii) (A)] require distribution service providers to include in their Access Arrangement Information usage of the pipeline over the earlier access arrangement period showing minimum, maximum and average demand. CEG has published this information in the 2010 Access Arrangement Information in Table 2 (CEG, 2009, p. 7). The information provided is summarised in Figure 2. The data for 2008–09 appears to be anomalous, with average demand reported to be around 2,000 TJ/d higher than for other years. The minimum demand estimate in for the same year is also anomalous. The reported average demand for 2008–09 is also inconsistent with the total system consumption for the same period which is reported in Table 1 of the 2010 AAI to be 1,567,761 GJ (CEG, 2009, p. 6). On

this basis the average daily consumption calculated on a simple average basis would be 4,295 GJ/d.

Whereas the apparent anomaly seems to have been corrected in the forecasts for 2009–10 (which are in line with the longer-term trends), in our opinion it is important to confirm the correct minimum, maximum and average demand data for the most recent historical period 2008–09, since this provides the starting point for the forecasts in the next access arrangement period. If the numbers currently presented for 2008–09 were proven to be correct, then the demand forecasts for 2009–10 and subsequent years should be significantly higher than they are.

Recommendation 1: CEG should correct or explain the apparently anomalous data on minimum and average daily consumption for 2008–09.

Figure 2 **Maximum, minimum and average daily demand**



	2006	2007	2008	2009	2010
Minimum GJ/d	1,102	1,131	1,100	1,852	1,166
Maximum GJ/d	10,351	9,475	10,523	10,223	10,622
Average GJ/d	4,022	3,979	4,305	6,219	4,307
Load Factor (Avg/Max)	39%	42%	41%	61%	41%

Note: All data for YE June except 2006 which is January – June only. Actual data 2006 to 2008: estimates for 2009 and 2010

Data source: (CEG, 2009)

3 Review of performance in the current access arrangement period

3.1 Forecast methodology

3.1.1 Methodological issues from the 2004 access arrangement review

The demand review for the previous access arrangement, conducted by McLennan Magasanik Associates (MMA, 2004) identified a number of methodological issues with the demand forecasting methodologies used at that time. It is relevant to review those issues and to consider whether those issues persist in the forecasts for the access arrangement commencing 1 July 2010.

Data integrity

MMA noted that CEG had expressed significant reservations about its historical sales data, citing both data problems and billing changes. Rather than using direct measurements of sales in the Volume sector, CEG relied on derived estimates of Volume sector sales plus unaccounted for gas (UAG) calculated as total daily gas receipts minus daily measured contract customer volumes. As a result of the data issues, MMA concluded that:

> " … there is a degree of uncertainty about these results and forecasts because of the lack of consistent information about sales to the Volume market as a whole and to the sub-components of the market." (MMA, 2004, p. 7)

MMA went on to recommend that CEG should ensure that systems are in place to accurately collect customer number and sales data for at least the residential and non-residential components of the Volume market.

Data quality for the 2010 Access Arrangement

The IRS report discusses in detail the issue of data reliability for the Volume market—see section 4.2.1.

Customer numbers

- MMA identified a significant difference between the household growth expectations adopted by NIEIR in their report prepared for Country Energy and those of the Wagga Wagga city council. MMA recommended CEG use an average of the two.
- Population forecasts and household growth forecasts were related via the persons per dwelling ratio, which was projected to decline from 2.65 in 2003 to 2.51 in 2010.

- Customer number growth was shown to have exceeded household growth over the period 1996 to 2002, but was forecast to lag between 2004 and 2010.
- Greater customer number growth was attributed to electricity to gas conversions and small business connections
  - CEG assumed that electricity to gas conversions would not continue into the forecast period with the market expected to reach saturation. MMA recommended CEG assume a decline of say 50% per year instead of a complete and sudden decline to zero.
- MMA recommended that CEG should not separately account for the number of disconnections as these were already accounted for in their methodology

Forecasting of customer numbers for the 2010 Access Arrangement

The methodological changes adopted for the forecasts of customer numbers for the new access arrangement period are further discussed and assessed in section 4.2.1.

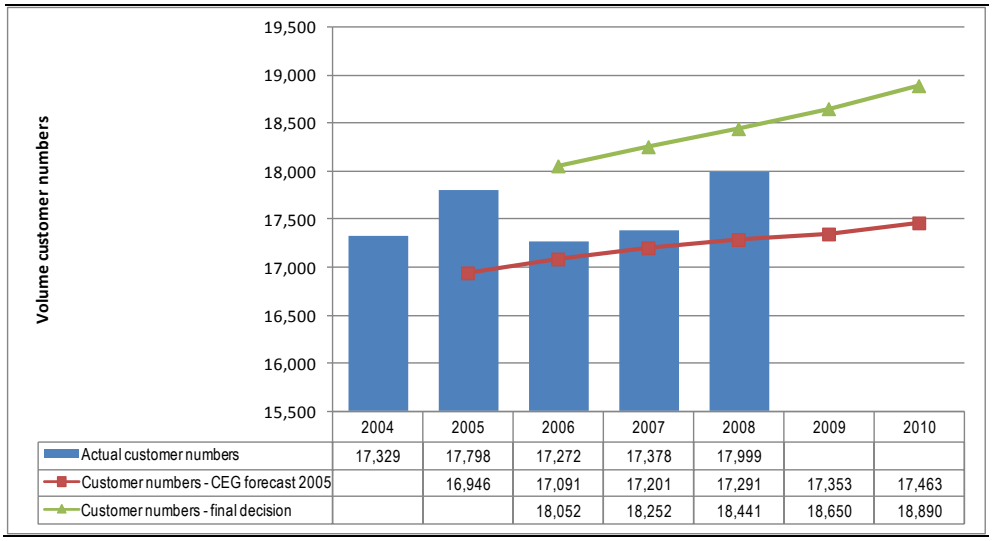
3.2 Actual v forecast performance in the current access arrangement

In this section we review actual demand outcomes in the Volume and Contract sectors of the CEG distribution system with the forecasts proposed by CEG at the time of the IPART draft decision (IPART, 2005a) and the forecast adopted by IPART in the final decision on the current access arrangement.

3.2.1 Volume market — customer numbers

Actual performance in terms of customer numbers relative to the revised forecasts proposed by CEG in February 2005 and the IPART forecasts adopted in the final decision are summarised in Figure 3. For reasons explained in section 3.1.1, there is a discontinuity in the historical data on actual customer numbers between YEJ 2005 and 2006, resulting from the fact that accurate customer billing data was not available prior to 2006. The earlier data is based on customer connection numbers which include inactive connections with no associated customer. IRS estimates that the earlier data may overstate customer numbers by as much as 1,000, or around 5.5% (IRS, 2009, p. 9). Adjusting the "actual" results for 2004 and 2005 for this effect would result in customer numbers being close to the CEG forecast trend—and considerably below the forecast adopted by IPART in its Final Decision—at least until 2007.

Figure 3 **Comparison of actual vs forecast customer numbers for the current access arrangement period**



	2004	2005	2006	2007	2008	2009	2010
Actual customer numbers	17,329	17,798	17,272	17,378	17,999		
Customer numbers - CEG forecast 2005		16,946	17,091	17,201	17,291	17,353	17,463
Customer numbers - final decision			18,052	18,252	18,441	18,650	18,890

Data source: (IPART, 2005a), (IPART, 2005b), (IRS, 2009)

The results for 2008 show actual customer numbers to be about 700 (4%) higher than the CEG forecast. No commentary is provided by CEG or IRS on the reason for the uplift in customer numbers in 2008. We have reviewed the data provided, and concluded that the result is likely to be an anomaly resulting from data quality problems. Information presented in the IRS report in relation to changes in dwelling numbers, connections and customers between 2007 and 2008 is summarised in Table 2. The data indicates that whereas dwelling numbers increased by 475 and gas connections by 409 over the period, customer numbers rose by 621. There is no explanation of how customer numbers could have risen more quickly than connection numbers. One possible explanation is that some previously inactive connections were reactivated, but that possibility is not discussed.

Table 2 **Changes in Volume customer numbers and other key drivers from 2007 to 2008**

	Dwellings	Connections	Customers
2007	27,302	18,624	17,378
2008	27,777	19,033	17,999
Change 2007 to 2008	475	409	621

Note: Data relates to Wagga Wagga Council area including surrounding townships

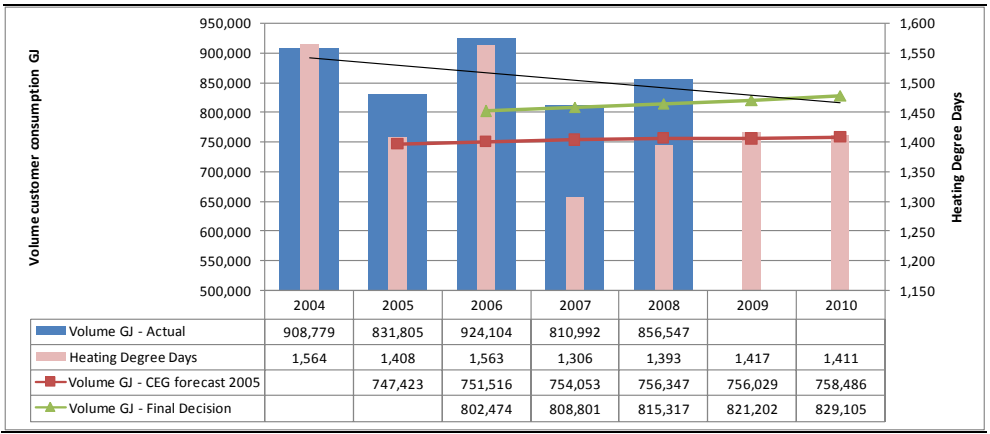
Data source: (IRS, 2009)

3.2.2 Volume market — annual gas demand (GJ)

Figure 4 compares actual Volume customer demand data for the period 2004 to 2008 with CEG's amended forecast for the current access arrangement period, and with IPART's final decision. Actual consumption has exceeded

both forecasts, although there has been a downward trend over the period, notwithstanding the growth in customer numbers.

Figure 4 **Comparison of actual vs forecast Volume customer demand for the current access arrangement period**



	2004	2005	2006	2007	2008	2009	2010
Volume GJ - Actual	908,779	831,805	924,104	810,992	856,547		
Heating Degree Days	1,564	1,408	1,563	1,306	1,393	1,417	1,411
Volume GJ - CEG forecast 2005		747,423	751,516	754,053	756,347	756,029	758,486
Volume GJ - Final Decision			802,474	808,801	815,317	821,202	829,105

Data source: (IPART, 2005a), (IPART, 2005b), (IRS, 2009)

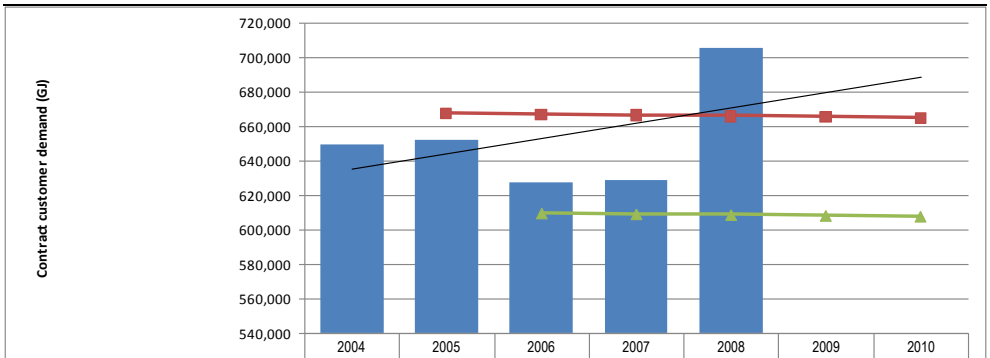
Super-imposing the actual and forecast Heating Degree Day (HDD) deficiency data[1] as reported by IRS, a strong correlation between temperature (as represented by HDD) and consumption is apparent.

3.2.3 Contract market — annual gas demand (GJ)

Figure 5 compares actual and forecast gas consumption in the Contract customer group over the current access arrangement period. The upward trend is driven entirely by an increase of around 65,000 GJ in 2008 over the average consumption level in the previous four years. The increase is accounted for partly by commencement during 2008 of delivery to two new customers that together accounted for about half the increase, with the balance coming from variations in demand from existing customers.

[1] HDD provides a measure of how cold or mild the weather is. HDD is calculated from meteorological data as the sum, over a year, of the negative differences between the average temperature on each day and 18° Celsius.

Figure 5 **Comparison of actual vs forecast Contract customer demand for the current access arrangement period**



	2004	2005	2006	2007	2008	2009	2010
Contract Volume GJ - Actual	649,447	652,356	627,876	628,662	705,879		
Contract Volume GJ - CEG forecast 2005		667,781	667,295	666,809	666,323	665,838	665,352
Contract Volume GJ - Final Decision			609,732	609,262	608,794	608,323	607,854

Data source: (IPART, 2005a), (IPART, 2005b), (IRS, 2009)

On average the CEG amended (2005) forecast has proven to be about 2% higher than actual demand, and the final IPART forecast about 6% lower.

4 Market forecasts for the 2010 access arrangement

In this section we first review the methodology employed by CEG to prepare the demand forecasts for the 2010 access arrangement. We then turn to a consideration of how those methodologies have been applied, the key assumptions made, and the reasonableness of the resulting forecasts.

4.1 Forecast methodology for the 2010 access arrangement

4.1.1 Methodology overview

The forecasts presented by CEG are drawn from analysis commissioned by CEG and conducted by IRS. A detailed explanation of the methodology employed is contained in the IRS load forecast report (IRS, 2009). In summary, IRS has used a combination of micro-analysis and macro-analysis.

- The micro-analysis was informed by survey of customers, market analysis (including major changes such as contestability in the retail market) and plans to extend the network. This approach is mainly applicable where there are identified customers and good knowledge about their demand over the forecast period. Accordingly, micro-analysis was principally applicable to the Contract customer group.
- The macro-analysis was driven by historical trends and relationships between drivers of gas demand, including population growth and weather. This approach is mainly applicable to forecasting demand from groups of

homogeneous customers for which it is not practical to survey. Accordingly, macro-analysis was principally applicable to the Volume customer group.

4.1.2 Volume sector forecast methodology

The macro-analysis approach which was applied in developing the Volume demand forecasts involved examination of the relationship between gas consumption and potential drivers among homogenous customer groups.

The variability and growth of the Volume customers' load was tested against a number of climatic variables and population statistics including:

- analysis of customers numbers, population and demographic data
- analysis of historical metering data
- analysis of climatic variables

These three streams of analysis were then brought together to develop the load and demand forecasts for the Volume customers.

Account was also taken of the micro-derived load forecasts of two Volume Industrial customers that, because of declining demand requirements, have transferred from the Contract to Volume classification.

4.1.3 Contract sector forecast methodology

There are presently 15 Contract customers served by CEG. The methodology employed by IRS to develop the Contract customer load forecasts is summarized below:

- For each Contract customer, an analysis was conducted to determine historical annual load over the period of data availability, to assess changes in total load. The Customer's peak day, average day and load factor were also determined to establish whether there have been any changes in usage patterns that needed to be considered in the forecast.
- For those customers demonstrating strong correlation with weather, the loads were projected using a regression analysis against positive HDD, in a similar manner to the Volume customers' load forecast.
- For those customers demonstrating stable loads, or low correlation with temperature patterns, a judgment was made on future demand based on the results of discussions with those customers.

The forecast load and demand forecasts for the Contract customer group was then established by adding together the individual forecasts for each customer.

Note that the detailed information at individual customer level is commercially sensitive and confidential.

4.2 Application of the methodology

4.2.1 Volume market

Developing the forecast of Volume customer demand requires estimation of two factors:

- the current number of customers on the system and trends in customer numbers
- the current average consumption per customer and trends in average consumption rates.

Customer numbers

The analysis by IRS relied on a two main sources of historical data to determine Volume customer numbers:

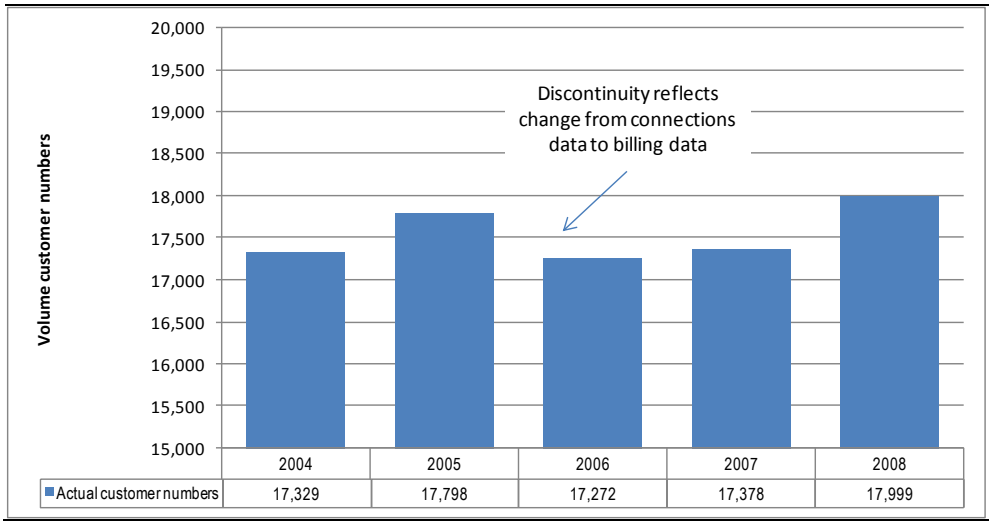
- Connection and disconnection information by date. This data was available from the time of acquisition of the network by Great Southern Energy (1997)
- Billing data from CEG

There are issues with the connection/disconnection data in that not every premise that is connected (ie has a meter in place) has a gas-consuming customer at that premise. IRS reports that by checking the connection data against its billing system, CEG found that there are approximately 1000 "connections" that are not "customers". However, owing to changes in the billing system the reconciliation of connection data to adjust for inactive connections could not be extended back earlier than 2006.

Reliance on the connections data would tend to overstate the number of customers and, assuming the same average usage factor is applied, the gas demand from this sector by around 5% to 6%.

Given this limitation in the historical data, IRS has adopted a "best data available" approach for the relevant period which means that the connections data is used prior to 2006, and the customer billing data from 2006 on. This approach results in a discontinuity in the customer number data between 2005 and 2006 (see Figure 6). According to IRS, the approach means that "the customer number count should be accurate as at 30 June 2008, providing a firm foundation on which to build the forecast number of customers" (IRS, 2009, p. 9).

Figure 6 **Historical Volume Customer numbers**



Data source: (IRS, 2009)

However, as discussed in section 3.2.1, there appear to be some remaining issues in reconciling the connections/disconnections data and the billing data in order to derive an accurate estimate of Volume customer numbers.

A robust estimate of existing customer numbers at the commencement of the next access arrangement period is needed to establish an accurate starting point for customer growth forecasts.

Recommendation 2: CEG should investigate and reconcile the apparently anomalous data on connection numbers and customer numbers for the year ended June 2008, and advise any consequent revisions to the forecast of customer numbers at the commencement of the 2010 access arrangement.

Population and housing growth

Population and demographic data from research conducted by NIEIR for inclusion in Country Energy's submission to the AER on electricity demand forecasting has been used as the foundation of the population projections in the new load forecast. According to IRS the NIEIR analysis was updated to take into account the impacts of the Global Financial Crisis (GFC). Because the research was undertaken for the entire Country Energy region, the results are said to have been applied "judgementally" to the dwelling and customer forecasts.

IRS explains that:

> "In the 2003 load forecast report, it was assumed that the growth in gas customers would be aligned to the growth in dwellings in the Wagga Wagga local government

area. The forecast of customer growth was therefore linked to the rate of Wagga Wagga dwelling growth as estimated by NIEIR.

The experience has shown this not to be correct, as customer number growth has not been aligned with Wagga Wagga dwelling growth, considerably outstripping Wagga Wagga dwelling growth in 2007 and 2008 in particular." (IRS, 2009, p. 10)

Data presented by IRS shows that between 2002 and 2008, the number of new dwellings grew by an average 366 per year, while the number of new gas connections rose by an average 457 per year. IRS has concluded that:

" ... the customer number growth is driven much more by penetration into new development than by infill connections within Wagga Wagga ... the increases in Wagga Wagga gas customer numbers aligns much more closely to the increases in new dwellings in the Wagga Wagga and 21 surrounding suburbs." (IRS, 2009, p. 11)

Penetration of new developments

Whereas the CEG network serves approximately 70% of dwellings in the Wagga Wagga area (including surrounding townships), IRS found that the rate of penetration of new developments was significantly higher at around 90%. This higher penetration rate is attributed to the impact of new building energy efficiency requirements and schemes such as BASIX (a sustainable housing construction program).

This rate of penetration of new housing developments is well supported by the data presented in the IRS report at page 12.

Housing growth

IRS drew on the Wagga Wagga City Council plans for new development land releases as outlined in the Spatial Plan component of the Council's 2008 Local Environment Plan. This study concluded that it is reasonable to assume a housing growth rate of about 350 new units per year, comprising 310 new dwellings and 40 multi-unit dwellings.

The updated NIEIR report referred to above forecasts a dwelling growth rate for the Country Energy Southern Region as a whole of 0.96% per year for the period 2009 to 2014, and 0.97% for the period 2009 to 2018 (IRS, 2009, p. 14).

Applying this growth rate to a current base dwelling stock of about 27,800 units implies a rate of new housing construction of about 275 units per year.

IRS pointed to the fact that NIEIR revised their forecast rate of economic growth (Gross Product) for the region downward from 1.17% to 0.51% for the period 2009 to 2014, presumably to reflect estimated impacts of the GFC. They draw on this change to infer that:

> "… while Wagga Wagga City Council may release land for new development, there may be a lag between the release of the land, construction of a dwelling on the property, and the ultimate sale and occupancy of that dwelling. It is ultimately the occupancy of the dwelling that will result in a new customer connecting to the gas system." (IRS, 2009, p. 15)

On this basis IRS has assumed for the purpose of the load and demand forecast that only 50% of land released by Wagga Wagga City Council will be developed in the forecast period. This has been reflected in the forecast not by reducing the assumed number of new dwellings (taken to be 350 per year in line with the Wagga Wagga City Council Spatial Plan) but by reducing the assumed rate of penetration of new development from 90% to 50%.

This results in a forecast rate of new connections of 175 per year (rather than 315 per year based on 90% penetration of 350 new dwellings).

Assessment

We disagree with this approach. We invited CEG to provide further justification for the 50% penetration assumption. In response CEG pointed to the assumption in the IRS report that not all land released will be developed (or have gas connected) as released, and stated that this assumption reflected the impact of the GFC and softening economic conditions. However, this ignores the fact that the 2008 NIEIR report update—which IRS interpreted as painting "a gloomy picture on forecast economic activity, population growth, new housing investment and energy consumption over the forecast period"—in fact forecast a slightly increased population growth rate (0.26% compared to 0.24%) and only a very mild decrease in the dwelling growth rate (0.98% to 0.96%). The suggestion that the GFC and softening economic conditions would slash the rate of dwelling growth is not supported by NIEIR's updated forecasts.

We therefore view the assumption that only 50% of blocks released will be built on as being arbitrary and unsupported.

Given that the Country Energy Southern Region covered by the NIEIR is a considerably larger region than Wagga Wagga and the surrounding townships in the region serviced by CEG, with a population almost seven times larger,[2] we believe more weight should be placed on the dwelling growth rate forecasts contained in the Wagga Wagga planning studies, and on the historical rate of gas penetration into new developments which stands at around 90%.

[2] 2008 population in the CESR of 409,839 according to NIEIR 2008 update, compared to 59,769 in Wagga Wagga and surrounds, according to NIEIR quoted in Appendix A of the IRS study.

Wagga Wagga City Council's assumption of a housing growth rate of 350 new dwellings per year is not inconsistent with recent history. Over the last five years the annual increase in dwelling numbers has averaged 477 (range 414 to 531: see (IRS, 2009, p. 12)). On this basis the growth rate of 350 is arguably conservative. This has been confirmed in a discussion with a representative of the Wagga Wagga City Council[3] who advised that the local economy remains strong and that there has been no noticeable downturn in housing starts as a result of the GFC. Population is growing strongly on the back of new industrial developments. The Council's expectation is that the rate of new housing development in the district over the next five years will, if anything, be higher than the 350 units per year assumed in the planning studies.

We consider that a growth rate of 315 customers per year in the Volume sector (based on 90% penetration of 350 new dwellings per year) represents a more likely estimate of the future trend than the assumption currently used by CEG.

Recommendation 3: In the absence of better information, CEG should be required to adjust their Volume customer growth forecasts to reflect a new customer growth rate of 315 per year, based on 90% penetration of 350 new dwellings per year.

Disconnections and deactivations

IRS draws a distinction between:

- "Disconnections" are defined as a "lock" of the meter which means gas is no longer delivered to the site, but the meter remains in place.
- "Deactivations" which involve physical removal of the meter.

IRS reports that the number of customer disconnections has varied considerably from year to year and averaged 41 per year over the data period. They further advise that CEG staff have advised that here are typically 20 to 25 deactivations per year.

The estimated penetration of new development (90%) is based on the change in customer numbers (that is, new connections minus disconnections) and therefore already takes into account disconnections. Deactivations are not included in the change in customer numbers and must therefore be adjusted for. IRS has adopted an assumption of 25 deactivations per year, in line with historical rates.

ACIL Tasman considers this to be a sound approach.

[3] Mr James Davis, Wagga Wagga City Council, personal communication

Treatment of Unaccounted for Gas

Unaccounted for gas (UAG) is the difference between metered injections into the distribution system and metered withdrawals from the system. The main causes of UAG are leakages from the low-pressure distribution system and metering errors.

IRS explains the treatment of UAG in section 3.2 of its report (IRS, 2009, p. 17). Total Volume customer consumption is calculated on the basis of the following formula:

$V = (T1 + T2) – C – UAG$

where

V = total Volume customer consumption

T1, T2 = metered injections from the Bomen and Uranquinty gate stations

C = total metered deliveries to Contract customers

UAG = Unaccounted for gas = 5.75% of (T1 + T2)

The average UAG rate of 5.75% is proposed by CEG in the 2010 Access Arrangement Information (CEG, 2009, p. 40) on the basis that this was the average of actual UAG for the current access arrangement period. This compares with an allowed level of 5.83% under the current access arrangement, and represents a large increase on the UAG rate of 2.5% in the first (1999) access arrangement.

The IRS report uses an average UAG assumption of 5.83%, consistent with the current access arrangement. CEG has explained that the IRS report was based on the UAG levels in the current access arrangement due to timing issues, and will be updated to reflect the latest UAG prior to submission of the revised access arrangement proposal.

CEG has provided information in support of the 5.75% UAG level. ACIL Tasman has not sought to independently verify these calculations. We note that the 5.83% UAG level in the previous period was agreed between IPART's market consultants MMA and CEG after a review by MMA of the UAG estimation methodology.

The proposed Access Arrangement includes a provision (5.3.3; see also AAI section 8.1.4) relating to UAG as follows:

> "In calculating the amounts owed by Customers to the User for Transportation Services, the volume of gas withdrawn at Delivery Points must be increased by the

> following percentages to reflect the cost of Unaccounted for Gas assumed in the network demand forecast from the Regulator's final decision."

The UAG percentages specified are 1% for Contract Delivery Points and 5.75% as the weighted average across the network. This implies an average UAG rate to be applied to Volume customers of about 9.66% (based on the Volume sector accounting for 54.8% of deliveries, or 871,471 GJ out of a total 1,562,462 GJ in 2008).

The effect of this provision is that metered withdrawals are to be grossed up for UAG, and charges for transportation services calculated on the grossed up volumes.

However, the demand forecasts developed by IRS and proposed by CEG as the basis for tariff determination are *net of UAG*. This is apparent from section 3.2 of the IRS report, which states that:

> "As the total system load is measured by system injections from the Bomen and Uranquinty gate stations, it was adjusted for Unaccounted For Gas." (IRS, 2009, p. 17).

CEG has confirmed that UAG has been subtracted from the Bomen and Uranquinty gate stations and therefore is not included in the demand forecast in section 4 of the AAI.

We understand that the "grossing up" mechanism is designed to compensate for the fact that no provision for UAG has been included in the cost base or total revenue requirement. In our opinion it would be preferable, in the interests of transparency, for costs of UAG to be included in the cost base and reflected in the total revenue requirement. This would result in the reference tariffs, calculated on the basis of the net market demand, increasing to a level that would cover costs of UAG without the need for the grossing-up provision.

Load and demand drivers

Section 4 of the IRS report discusses load and demand drivers.

Temperature

Based on analysis undertaken in 2003 which attempted to correlate gas consumption with a wide range of climatic variables (daily maximum temperature, daily minimum temperature, speed of maximum wind gust, daily precipitation, cloud cover, daily hours of bright sunshine), IRS concludes that there is virtually no correlation between gas consumption and any climatic variable except temperature.

A rigorous analysis of temperature data is provided and evidence presented (including reference to a CSIRO report on projected changes in temperature and HDD for Melbourne) that demonstrates a downward trend in HDD across the entire data set from 1943. The evidence shows that the rate of decline in the number of HDD has been accelerating.

The analysis results in the identification of two components of Volume customer load:

- A Base component which is not temperature dependent. This component is estimated at around 18.15 GJ/customer/year
- A temperature sensitive component estimated at 29.87 GJ/customer/year in 2009 and declining over time as a result of the downward trend in HDD.

IRS has based its load forecast on the HDD trend line using 30 years' data, which results in a negative slope of -6.2 HDD per year. This is similar to the approach that was accepted for the current access arrangement. On this basis, we consider the proposed treatment to be reasonable.

Other drivers

No other demand drivers are considered in the IRS study.

IRS noted that the Volume load is strongly correlated with temperature, with about 94% of the variation in Volume load explained by movements in HDD deficiencies. While we accept that temperature is the most important determinant of day-to-day variations in demand, there are other factors that we consider could have a significant effect on the overall demand forecasts, including:

- Appliance efficiency improvements
- Changes to building standards for energy efficiency and insulation
- Rate of conversion from electricity to gas—this was a significant and contentious issue for the previous access arrangement
- Implications of policy changes including the expanded Renewable Energy Target (RET) and the Carbon Pollution Reduction Scheme (CPRS) which may affect demand for gas and pricing relativities between different energy forms.

ACIL Tasman has not undertaken an assessment to establish whether, and if so to what extent, these factors might affect future gas demand in the Wagga Wagga region. However it would, in our opinion, be reasonable for CEG to consider these and any other potentially relevant factors, and to include in the discussion of the demand forecast an assessment of the extent to which these factors may cause forecast demand to follow a different path from past trends.

Recommendation 4: CEG should be asked to consider the potential impact of factors other than temperature that may affect future levels of gas demand. To the extent that such factors are assessed as being likely to have a material impact on demand within the access period, the demand forecasts should be adjusted accordingly.

Assessment of the volume market forecasts

IRS has developed the forecast for Volume customers based on the interaction of three key variables:

- Customer numbers. The forecast for customer numbers is driven by assumptions regarding the current number of Volume customers; net customer growth rates determined by rates of new residential construction; rates of gas penetration into new developments; and customer deactivation rates.
- Average base load consumption per customer. A base load consumption of around 18.15 GJ/customer/year is assumed based on the temperature – consumption data analysis.
- Average temperature sensitive consumption per customer. A temperature sensitive consumption of 29.87 GJ/customer in 2009 is assumed based on the temperature –consumption data analysis. This element decreases over time as a result of the downward trend in HDD.

The base Volume demand forecasts calculated in this way are then modified to take into account two customers previously classified as Contract customers but which, because of declining consumption rates, are now reclassified as large Volume customers.

We consider the basic methodology adopted to be sound, subject to resolution of the matters identified in the Recommendations.

4.2.2 Contract market

Customer numbers

There are currently 15 Contract customers serviced by CEG. We have sought information from CEG on possible new entrant Contract customers. CEG has advised that the proposed development of a Business Park at Bomen is likely to attract commercial and industrial customers to the area. The draft Business Park plan consists of a shopping centre, rail siding to unload and load goods, and diverting and upgrading of roads to cater for heavy vehicle access into the area and Wagga Wagga. Two large blocks of land either side of the railway line will be developed for commercial and industrial customers, and in time it is expected new customers will connect to the gas network.

While the new Wagga Wagga Business Park has identified the possibility of businesses starting up in the area, as of late July 2009 only one application had been received by CEG. This potential large customer first lodged an application with CEG in early 2008. The subdivision is yet to be gazetted and no site development has occurred. In the current circumstances there is significant uncertainty regarding the timing of this load.

Past experience has shown that, notwithstanding some changes in the Contract customer mix, the total gas consumption in the sector has been relatively stable at between 600,000 and 700,000 GJ/a. In the absence of any firm proposals for entry of new customers, we consider it reasonable to base the Contract customer demand forecast on existing customers only. In so doing, we are implicitly recognizing that there is a reasonable expectation that one or more Contract customers may enter the market during the access period, but that such entries may be partly or fully offset if, as is entirely possible, one or more existing Contract customers exit the market.

Survey of existing contract customers

The forecast demand for contract customers has been based on a survey of existing customers conducted by IRS. That survey set out to identify, for each Contract customer, the customers historical consumption over the period of data availability, expected future gas requirements (stable, falling or rising) as well as peak day and average day demand and load factors.

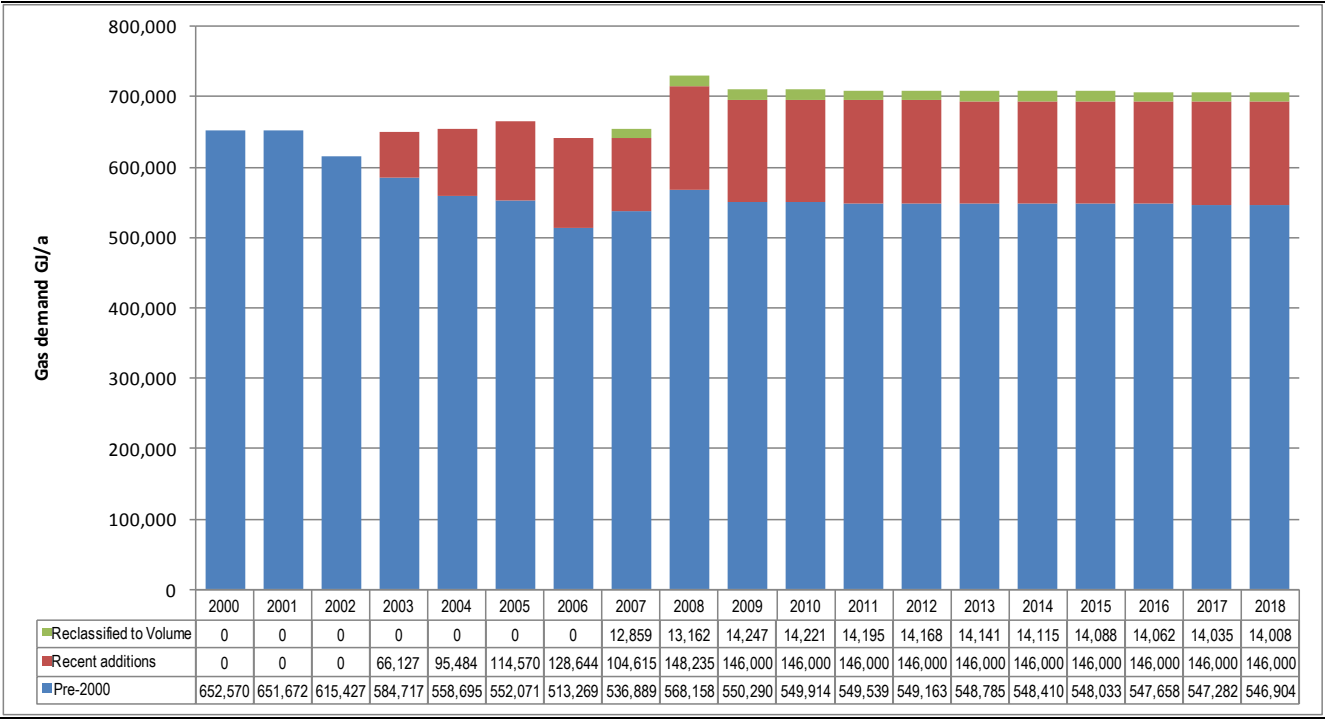
For those customers demonstrating strong correlation with weather, the loads were projected using a regression analysis against positive HDD, consistent with the Volume customers' load forecast. For those customers demonstrating stable loads, or low correlation with temperature patterns, judgments were made on the future demand based on the results of discussions with those customers regarding their expected future gas requirements (stable, falling or rising).

Results of the Contract customer survey

ACIL Tasman has reviewed the results of the Contract customer survey as set out in the IRS report. The survey covered all 15 of the existing Contract customers. Historical data extending back to the later of 1999–2000 or the year of in which the customer joined the market provides a sound basis for understanding past demand and for identifying demand trends. The historical data also allows identification of those Contract customers that have temperature sensitive loads and those that do not. Of the 15 current Contract customers, five are regarded as temperature sensitive while the other 10 show relatively little correlation between demand and temperature.

Figure 7 shows historical and forecast Contract customer gas demand, divided into those customers that have been active since year 2000 or earlier, those that have become customers since year 2000, and those that have been reclassified as Volume customers because of consumption rates that have fallen below the Contract Customer threshold of 10,000 GJ/a on a sustained basis.

Figure 7 **Historical and forecast Contract customer gas demand**



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reclassified to Volume	0	0	0	0	0	0	0	12,859	13,162	14,247	14,221	14,195	14,168	14,141	14,115	14,088	14,062	14,035	14,008
Recent additions	0	0	0	66,127	95,484	114,570	128,644	104,615	148,235	146,000	146,000	146,000	146,000	146,000	146,000	146,000	146,000	146,000	146,000
Pre-2000	652,570	651,672	615,427	584,717	558,695	552,071	513,269	536,889	568,158	550,290	549,914	549,539	549,163	548,785	548,410	548,033	547,658	547,282	546,904

Data source: (IRS, 2009)

The historical data shows that Contract customer demand has been relatively stable, with loads associated with new entrants to the market roughly offsetting customers that have seen reduced gas demand.

Assessment of the contract market forecasts

The survey based micro-analytic approach adopted for the Contract customer group provides a sound basis for forecasting. The information presented on a customer-by-customer basis shows a high level of detail based on individual meter data, as well as insights into the future intentions of individual customers based on interviews.

The forecasts that have been developed using this approach are, in our opinion, based on sound methodology and reasonable assumptions utilizing current and accurate data. Key drivers of future demand have been taken into account, including separation of temperature dependent and non-temperature dependent loads, and the methodology has been appropriately applied.

As discussed above, a question could be raised whether provision should be made in the forecast period for entry of new customers. While on the balance of probabilities it is likely that one or more new customers will enter the market during the access period, at this point in time any assumptions about such entry would be conjectural.

We therefore consider that the forecasts of Contract customer demand have been arrived at on a reasonable basis and represent the best forecast possible in the circumstances.

4.3 Conclusions

Overall, the approach to forecasting the various elements of gas demand in the distribution area serviced by CEG can be considered to be systematic, being based on data of generally good quality. The resultant forecasts are for the most part reasonable. There are a few areas in which the data ambiguities and inconsistencies that were apparent in the previous review have not been entirely resolved, and we have made recommendations that CEG should address and resolve these matters so that the starting points for the projection period are clearly established. The matters requiring clarification and/or correction relate to recent minimum and average daily consumption data for the Volume customer sector; reconciliation of connection numbers, dwelling numbers and customer numbers for the year ended June 2008; new customer growth rates in the Volume sector; and the potential impact of drivers other than temperature on future demand trends in the Volume sector.

An issue has also been noted relating to the treatment of Unaccounted for Gas.

Subject to satisfactory resolution of these issues, we consider that the proposals by CEG in relation to load forecasts could be regarded as being reasonable.

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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.