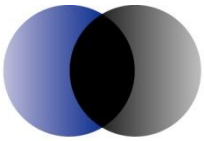
# Review of Demand Forecasts for ActewAGL

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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# 1 Demand forecasts for ActewAGL

## 1.1 Background

The Australian Energy Regulator (AER) engaged ACIL Tasman to review the adequacy and appropriateness of the methodology used to develop forecasts of demand in the ACT/Queanbeyan and Palerang gas distribution networks for the access arrangement proposal submitted to the AER by ActewAGL.

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).

## 1.2 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 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.

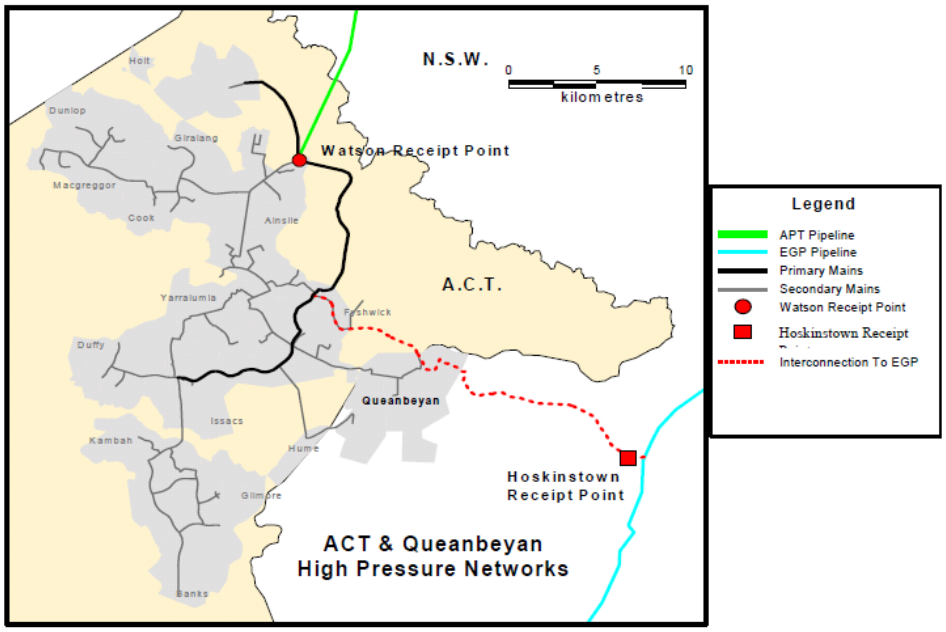
This report documents ACIL Tasman findings.

# 2 Scope of ActewAGL operations

ActewAGL Distribution is a partnership between ACTEW Distribution Limited and Jemena Networks (ACT) Pty Ltd.

Demand forecasts are included in the document titled "ActewAGL Access Arrangement Information for the ACT, Queanbeyan and Palerang gas distribution networks" dated June 2009 (ActewAGL, June 2009). The location of the operations is shown in Figure 1.

Figure 1 **Coverage area for the gas distribution assets**




*Data source: ActewAGL Distribution, Access Arrangement Information for ACT and Greater Queanbeyan Network, November 2004*

The historic throughputs and customer numbers for the ActewAGL distribution network are shown in Table 1.

Table 1 **ActewAGL gas distribution business – gas demand**

| | 2004/05 | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|---|---|---|---|---|---|
| **Throughput** | | | | | |
| Tariff (actual) (TJ) | 6,050 | 6,584 | 5,889 | 6,370 | 6,654 |
| Contract (actual) (TJ) | 1,018 | 1,082 | 1,038 | 1,020 | 1,100 |
| **Customer numbers** | | | | | |
| Tariff (actual) | 98,657 | 101,460 | 104,495 | 109,791 | 112,765 |
| Non-tariff (actual) | 36 | 38 | 37 | 38 | 40 |

*Data source: Table 5.1 and 5.4 of Access Arrangement Information. (ActewAGL Distribution, June 2009)*

# 3 Reports and information supplied

ActewAGL supplied the following documents relevant to the demand forecasts:

- ActewAGL Distribution. Access arrangement information for the ACT, Queanbeyan and Palerang gas distribution network (ActewAGL Distribution, June 2009)
- Attachment G to the above paper prepared by the National Institute of Economic and Industry Research (NIEIR) entitled 'Natural gas projections for ActewAGL distribution' (NIEIR, May 2009).

- Further information provided by ActewAGL in relation to the NIEIR forecasts.

# 4 Approach to the review

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

1. adequacy of the methodology
2. reasonableness of the assumptions
3. account taken of critical factors
4. application of the methodology
5. adequacy of the forecasts.

The review was undertaken as desktop research into the methodology, data and parameters, and assumptions. ACIL Tasman used its own gas market modeling and knowledge to test assumptions. In the course of the work we also asked for and received further clarification of the adjustment model in the projections prepared by NIEIR.

## 4.1 Methodology

### 4.1.1 NIEIR projections

NIEIR methodology involves a two step process. The first step involves developing a forecast of the ACT economy based on a national economic projection. The second step uses these projections along with projections of population growth and dwelling stock, to develop projections of throughputs in the tariff and contract markets.

The demand forecast is adjusted to take account of policies of the Commonwealth and State governments developed to address a range of climate change and energy efficiency policies. The impact of these policies at the consumer end is done through a gas application model referred to below.

#### Tariff customers / volume

NIEIR models the residential gas demand by disaggregating users into new and established customers. New customers are separated into net new customers from new dwellings and new customers in existing dwellings (electricity to gas (E-to-G) customers).

Residential gas demand is normalized for the differences in Heating Degree Days (HDD).

For each disaggregation, an econometric model is estimated. The equation to be estimated is a demand function on which income and price are the main economic variables. Other factors taken into account are:

- ACTHERS – the ACT Housing Energy Rating Process
- the review and standardization of energy labeling of gas appliances
- increasing penetration of energy efficient showerheads
- banning of electric resistance hot water appliances from 2010
- ongoing negative impact of higher installation of reverse cycle air conditioning
- Commonwealth stimulus package with subsidies for insulation
- gas marketing and promotion programs.

The gas application model addresses changes in consumption patterns in:

- Cooking
- Space/area heating
- Hot water appliances

The models apply assumptions on eating out patterns, substitution of electricity alternatives for space heating at replacement time and the impact of energy efficient shower heads and substation of electricity alternatives for gas hot water systems at replacement time.

The methodology for addressing these factors in the application model was examined and is considered appropriate for the purposes of providing an allowance for energy efficiency policies in the forecasts.

#### Contract customers / volume

The gas demand forecast for contract customers was developed on an industry and customer-by-customer basis.

The econometric model used the industry output and price to estimate a demand function. The resulting coefficients of demand where adjusted to reflect potential gas intensity differences between industries.

The methodology adopted by NIEIR is a well established approach to developing local projections of demand and customer numbers and is considered suitable for the purpose of developing projections of demand for the ActewAGL gas distribution network.

### 4.1.2 Gas marketing scheme

ActewAGL has further adjusted the NIEIR forecasts to allow for the impact of a gas marketing campaign 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. A cumulative additional 18 TJ is added to the NIEIR forecasts of residential demand each year as a response to the marketing program. This is an estimate made by ActewAGL 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 0.3%) therefore not material in terms of the acceptability of the forecasts.

# 5 Assumptions

## 5.1 Economic growth

The NIEIR report for ActewAGL is based on the NIEIR's economic outlook for Australia and its breakdown to the ACT. This report was published in December 2008 when 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 has based the economic outlook for the ACT on the overall Australian economic outlook together with key indicators at regional level that include growth in population, dwelling stock and gross regional product. This is considered an appropriate approach for the purpose of developing the demand forecasts.

The macroeconomic aggregates and selected indicators for the ACT are in line with the Australian economy. Table 3.2 of the NIEIR report suggests a sharp reduction in investment by business and government from 2009–10 to 2012–13, and a contraction in private dwelling investment from 2010–11 to 2014–15.

In light of the performance of the Australian economy during the first half of 2009 and the apparent efficacy of the government stimulus measures, the macroeconomic indicators for the ACT may well prove more favorable than

assumed in the NIEIR report. However the trajectory of economic growth over the regulatory period remains subject to significant uncertainty and the NIEIR assumptions are within the range of reasonable probability. Accordingly we consider that the assumptions adopted by NIEIR with regard to economic outlook constitute a reasonable basis on which to develop the gas demand forecasts.

## 5.2 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 the ACT. NIEIR has provided a detailed account of the effects of such policies upon gas demand in the ACT for the policies outlined below.

### 5.2.1 Mandatory energy performance standards (MEPS)

#### Switch on gas strategic plan

The switch on gas plan is intended to implement a nationally consistent regulation scheme for energy efficiency in gas appliances under the National Framework for Energy Efficiency introduced by the Ministerial Council on Energy. NIEIR has assumed a 5 % reduction in gas consumption over business as usual. NIEIR has provided no supporting evidence for this assumption but it is not considered unreasonable.

#### Energy efficiency labeling

The energy efficiency labeling policy aims to phase out appliances below the 4.5 star rating. This is estimated to have an impact of around 15 per cent based on the difference between energy consumption between appliances with a 3.5 and a 5 star rating.

NIEIR developed a hot water demand model to estimate the impact of this policy on gas consumption. The model takes into account the banning of electric resistance water heaters in new and existing homes in gas reticulated areas from 2010 and for flats and apartments from 2012 and is part of the gas application model referred to in section 4.1 above.

The assumptions for hot water service replacement in the application model include:

- estimates of replacement of hot water services indicating that mains gas and solar electric would be the main beneficiaries
  - mains gas increasing from 20 per cent of replacements to 42.5 per cent by 2012 and remaining at that level to 2019

  - solar electric increasing from 20 per cent to 42.5 per cent by 2012 increasing to 49.5 per cent by 2019
- estimates of electric water heater unit failure rates of 5 per cent with electricity to gas conversions rising from 20 per cent to 42.5 per cent of total conversions by 2012 to 2019
- mains gas in new dwellings declining from 75 per cent to 61 per cent of new dwellings by 2019
  - as a result of substitution by electric heat pumps.

ACIL Tasman considers that these assumptions are not un-reasonable for the purpose of the forecasts.

### Energy efficient showerheads

The Water Efficiency Labeling and Standards (WELS) introduced by the Australian and State Governments together with mandated water efficient showerheads will have an impact on gas consumption in ACT.

NIEIR has assumed that the penetration of efficient showerheads will continue at 3 per cent per annum through the access arrangement period. The effect is estimated to be a reduction in gas usage of approximately 0.1 GJ per annum.

### Space/area heating

The gas application model also includes the impact of the Commonwealth government's scheme for insulation and the impact of gas heating to reverse cycle electric heating which includes the following assumptions:

- Gas heating represents about 51 per cent of total heating appliances (based on ABS)
- Gas heater replacement cycle is 15 years
- Reverse cycle electric heating replacement proportion of 15 per cent.

The ACTHERS program was also considered in this model.

The NIEIR report and additional material does not provide any estimate of the total impact of these measures on the gas demand projections or any supporting evidence for the substitution rate.

### Other energy efficiency policies

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

- the ACT House Energy Rating Scheme (ACTHERS)
- subsidies on insulation as part of the Energy Efficient Homes program of the Australian Government

### 5.2.2 Changes in cooking trends

In response to a question raised by ACIL Tasman, ActewAGL advised that NIEIR had assumed a 2.5 per cent per year decline in the demand for gas used in cooking owing to an increased trend towards eating out. No evidence was provided to support this assumption.

## 5.3 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 emissions trading scheme including compensation to 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 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% in the tariff market and 17% in the contract 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.

## 5.4 Other energy policies

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

- the ACT Climate Change Strategy 2007-2025
- the Renewable Energy Target (RET).

# 6 Key drivers

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 ACT 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. However the potential impact on demand over the access arrangement period has been given appropriate consideration in preparing the forecasts.

Overall we conclude that, in developing the demand forecasts, appropriate consideration has been given to the key drivers affecting future gas demand. In particular, account has been taken of factors that may cause future gas demand growth to follow a different growth trajectory when compared to past experience.

## 6.1 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.

ActewAGL has adopted the NIEIR forecast and parameters for two purposes:

- estimating growth in gas consumption
- estimating growth in gas connections.

Specific comments on the application of the methodology follow.

### 6.1.1 Historical data and discussion of previous access arrangement period

The historical data, assumptions and discussion of future factors that can affect the tariff and contract 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 tariff and contract markets and in total demand. The report acknowledges that tariff market demand was 3 per cent below the limit set by the Independent Competition and Regulatory Commission (ICRC). In the contract market demand was above the level allowed by ICRC, reaching an excess of 23 per cent in 2009-10.

Historic customer numbers in the tariff market were below the approved forecast in early years of the access arrangement period. The lower growth in customer numbers is explained by lower than forecast rates of construction of new dwellings and medium/high density residential developments.

ActewAGL has noted that the reduced number of customers explains most of the mismatch in the gas volumes forecast for the previous access arrangement period. However other important contributing factors include increased energy efficiency measures, reduced hot water consumption and energy substitution. These factors are adequately discussed in the ActewAGL report and are taken into account in the forecast for the next access arrangement period.

### 6.1.2 Weather normalization

ActewAGL 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.

Gas demand on any day is influenced by temperature and a normalization method is used in the NIEIR forecast document to account for abnormal weather effects. The normalization method uses heating degree days (HDD) methodology. HDD for a day is the number of degrees that a day's average temperature is below 18° Celsius – the temperature below which buildings need to be heated. HDD for a year is equal to the sum of the daily HDDs.

The yearly standard HDD used by NIEIR is 1,812; which is the average of the observed HDD from 2003 to 2008. The difference between the observed HDD and standard HDD is referred to as the abnormal HDD. Abnormal HDD is multiplied by a temperature sensitivity coefficient (TJ/HDD) to adjust consumption in abnormal years. NIEIR based its estimates of temperature sensitivity coefficient on observations of demand and HDD from historical records. No detail is provided of the length of historical records. However ACIL Tasman sees no reason to question the integrity of the NIEIR estimate.

# 7 The forecasts

As discussed above, ACIL Tasman considers that the historical review, assumptions and modeling approach for the forecast offered by NIEIR to ActewAGL is acceptable for the purposes of preparing these forecasts.

The forecasts are summarised in Table 2.

Table 2 **Gas sales forecasts**

| | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| ***Residential tariff - Gas sales (TJ)*** | 4,992 | 4,973 | 5,003 | 5,039 | 5,080 |
| ***Business tariff gas sales (TJ)*** | 1,553 | 1,552 | 1,563 | 1,602 | 1,656 |
| **Total tariff sales (TJ)** | 6,545 | 6,525 | 6,565 | 6,642 | 6,736 |
| **Contract customers gas sales (TJ)** | 1,166 | 1,171 | 1,179 | 1,192 | 1,210 |
| **System total (TJ)** | 7,711 | 7,696 | 7,744 | 7,834 | 7,946 |

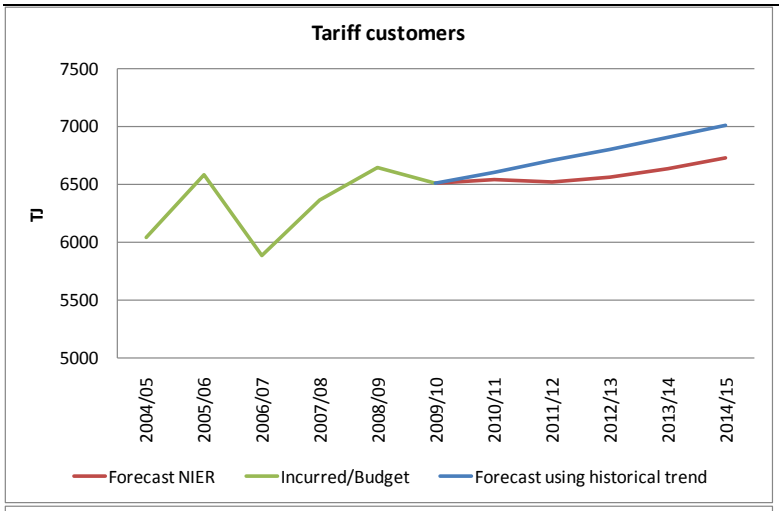
*Data source: (ActewAGL Distribution, June 2009) page 91*

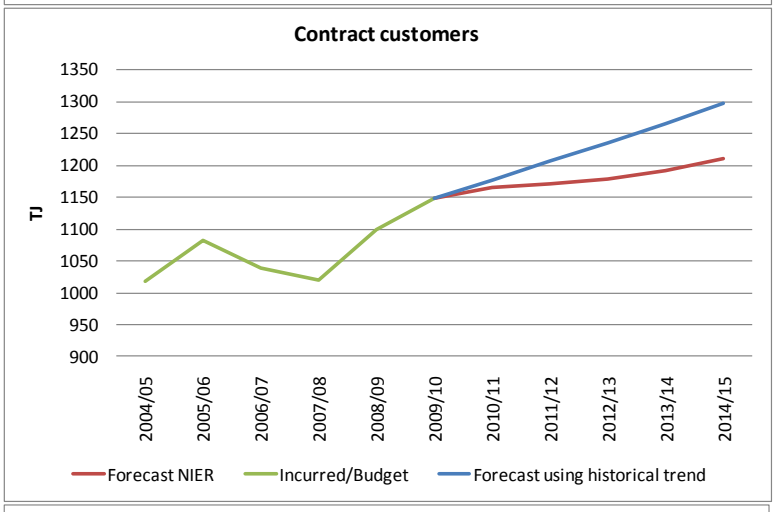
## 7.1 Impact of the gas application model

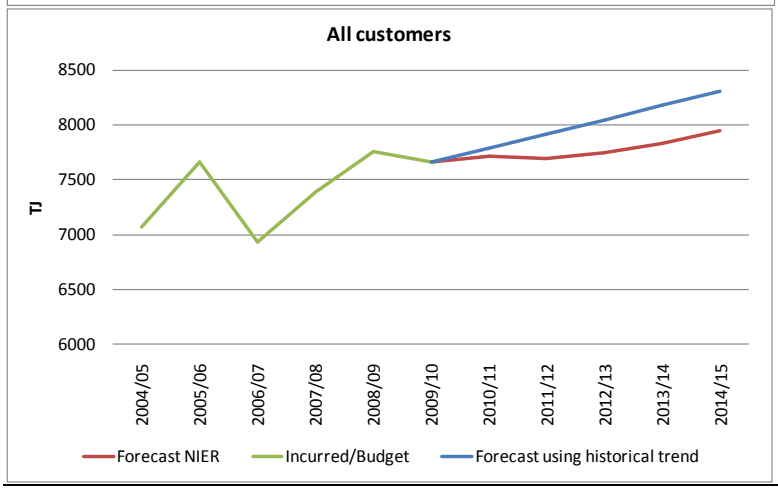
The NIEIR report does not provide any indication of the impact of the energy saving policies on the forecasts. In other words, what would the forecast be if the energy saving policies were not implemented? A comparison of the NIEIR forecasts, including the impact of the gas marketing campaign, with the historical growth trends for tariff customer demand, contract customer demand and total demand is shown in Figure 2 below.

The extrapolation of the historical series is based on a least squares regression that provides an indication of what would happen if past trends continued without the energy saving policies. The trend line shows that the NIEIR forecasts are 4.4 per cent below the extrapolated trend line for total market demand by 2014-15. The tariff forecasts are 4.0 per cent below trend and the contract market forecasts are 6.7 per cent below trend by 2014-15.

Figure 2 **Comparison of NIEIR forecasts with historic trends**




*Data source: (ActewAGL Distribution, June 2009)* page 76, *(NIEIR, May 2009)* pages 46 and 48

The differences between NIEIR forecasts and the historical trends can be attributed to a combination of the cumulative effect of various energy efficiency and policy measures, together with lower economic growth forecasts.

Table 3 compares the economic and demographic growth rate assumptions used by NIEIR with the compound average growth rates for the tariff and contract customer groups as well as the market overall, for the period 2007–08 to 2014–15. The comparison provides some insight into how the various energy efficiency and policy measures impact on different parts of the gas market. The tariff sector of the market might be expected to show growth generally aligned to demographic/population growth or housing growth. However, the forecast growth rate in this sector is 0.80%, compared to an assumed population growth rate of 1.3%. The aggregate impact of the energy efficiency measures has therefore had a marked effect in suppressing demand growth in the tariff sector. On the other hand, the contract sector might be expected to show growth broadly in line with general economic growth (as reflected by Gross State Product) since this sector comprises mainly larger business customers. The forecast growth rate in the contract sector is 2.47% compared to a GSP growth rate assumption of 2.3%. This suggests that the energy efficiency measures are not suppressing demand growth in the contract sector—a result that is in accordance with expectation given that the energy efficiency measures are targeted principally at the household level.

Table 3 **Comparison of gas forecasts with NIEIR economic aggregates**

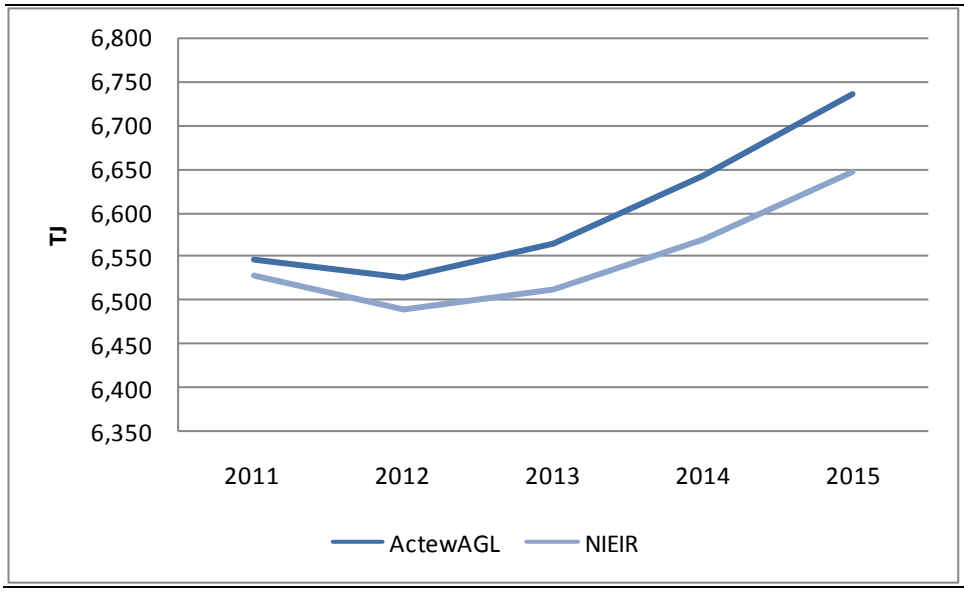
| NIEIR compound annual growth rate projections for gross state product 2007-8 to 2014-15 | Market | Compound average growth rate 2007-8 to 2014-15 |
|---|---|---|
| Final state demand - 2.5%<br>Gross state product - 2.3%<br>Population - 1.3% | Tariff | 0.80% |
| | Contract | 2.47% |
| | Total | 1.04% |

*Data source*: *(NIEIR, May 2009)* page 21, ACIL Tasman

## 7.2 Impact of the gas marketing campaign

The cumulative impact of the assumed 18 TJ increase in residential tariff demand as a result of the gas marketing campaign is shown in Figure 3.

Figure 3 **Total tariff customer gas sales forecast uplift for marketing campaign**




*Data source: (ActewAGL Distribution, June 2009) page 91 and (NIEIR, May 2009) Table 5.4*

The increment attributable to the gas marketing campaign amounts to an increase of around 1.4 per cent above the NIEIR forecasts in the final year. This is a relatively modest increase and appears to be a reasonable expectation of the impact of the marketing campaign. ACIL Tasman considers that the resulting adjusted forecast of natural gas sales for tariff customers is reasonable.

The forecast of MDQ for the contract customers is shown in Table 4.

Table 4 **Forecast of contract customers MDQ**

| Contract customers | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| MDQ (GJ) | 6,677 | 6,693 | 6,721 | 6,764 | 6,827 |

*Data source: (ActewAGL Distribution, June 2009) page 91*

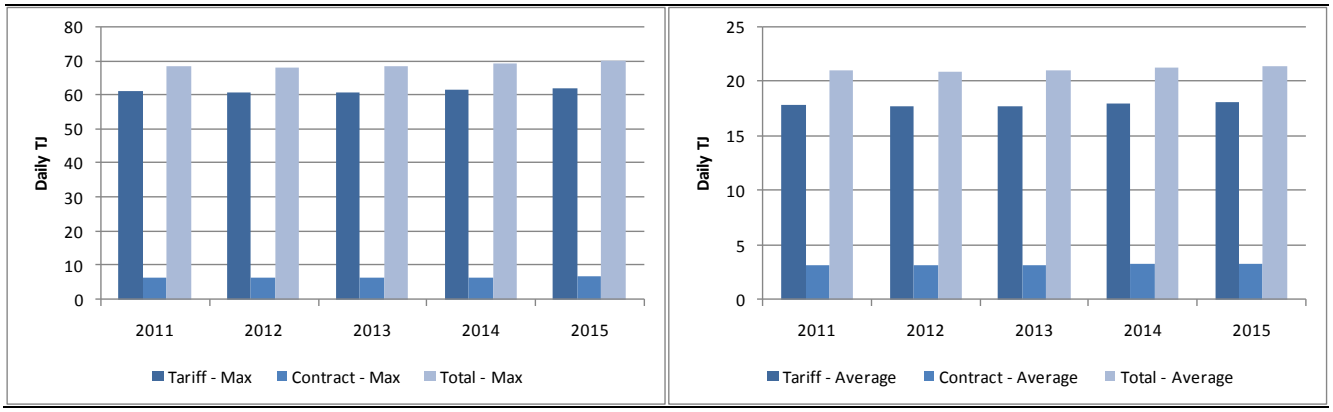
These numbers reflect the NIEIR forecasts which note the importance of assumptions on price impacts of the CPRS and the economic prospects inherent in their forecasts. NIEIR notes that economic prospects could result in the forecasts being too optimistic. This is less likely in the light of the performance of the Australian economy since the forecasts were prepared.

The forecast maximum and average demands for the tariff and contract markets and for the total system are shown in Figure 4. The contract maximum and average demand are derived from the NIEIR forecast tables.

Peak load data is not available for all customers including tariff customers. The forecasts of demand for tariff customers are therefore derived from analysis of annual usage. Peak load is calculated from annual winter monitoring data.

ACIL Tasman has not reviewed this data but considers the approach described in the access arrangement information to be appropriate for the estimation of future peak demand.

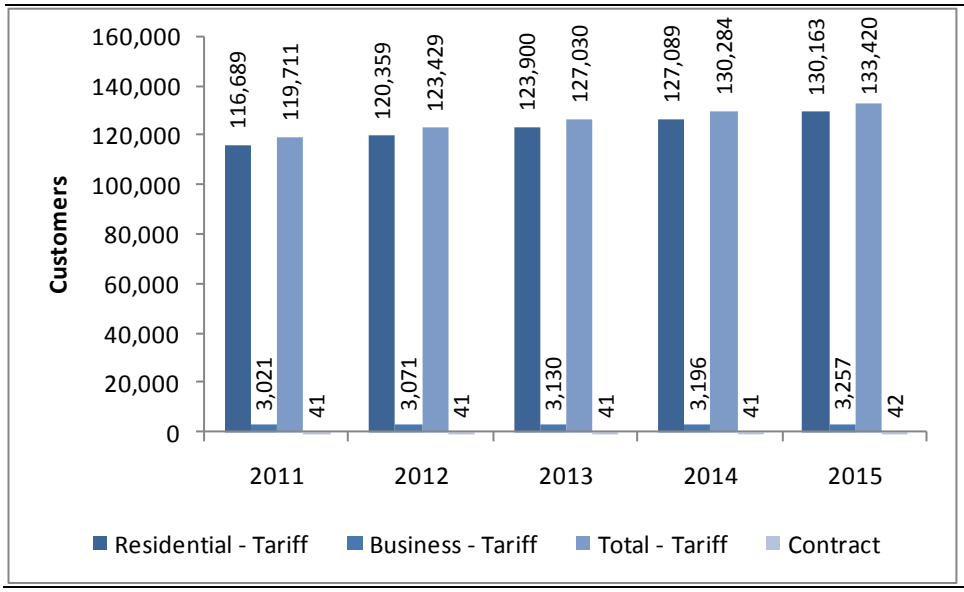
Figure 4 **Forecast maximum and average demand**




*Data source: (ActewAGL Distribution, June 2009)* page 91

The forecasts of customer numbers are summarised in Figure 5.

Figure 5 **Forecast of customer numbers**




*Data source: (ActewAGL Distribution, June 2009)* page 92

As discussed above the customer number forecasts are derived from the NIEIR report which is considered consistent with the assumptions and analysis of that report.

# 8 Conclusions

ACIL Tasman considers that the forecast developed by NIEIR on behalf of ActewAGL distribution is appropriate and is forecast or estimated on a reasonable basis taking into consideration the data available at the time the forecasts were prepared.

ACIL Tasman notes that the forecasts result in demand that is around 4.4 per cent below a trend based on the past six years. The differences between forecast demand growth and the historical trends can be attributed to a combination of the cumulative effect of various energy efficiency and policy measures, together with lower economic growth forecasts.

ACIL Tasman notes that the macroeconomic outlook of the Australian economy is now less pessimistic than in the NIEIR projections. However uncertainty over the future course of economic growth in Australia remains and ACIL Tasman does not believe that a change in outlook is justified for the purposes of developing the forecasts of gas demand.

# A References

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# B 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.