Review of Demand Forecasts for Multinet

Victorian Gas Access Arrangement Review for the period 2013 – 2017

Prepared for the Australian Energy Regulator

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ACIL Tasman

Economics Policy Strategy

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1 Introduction

1.1 Background

The *National Gas Rules* (NGR), rule 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 Australian Energy Regulator (AER) is required under rule 74 of the NGR to be satisfied that the forecasts used in setting reference tariff(s) are arrived at on a reasonable basis and that they represent the best forecast or estimate possible in the circumstances.

1.2 Scope and Approach

The AER has engaged ACIL Tasman to provide independent advice through written reports on the demand forecasts contained in the access arrangement proposals submitted by the Victorian transmission and distribution businesses to assist it in its decision about whether to approve the access arrangement proposals.[1]

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).

1.2.1 Requirements of the Terms of Reference

The Terms of Reference for the review of demand forecasts are set out in Appendix B. In summary, the Terms of Reference require ACIL Tasman to provide advice on whether the demand forecasts for each business have been arrived at on a reasonable basis and represent the best forecasts for demand in the circumstances.

More specifically, the Terms of Reference require ACIL Tasman to:

1. undertake a desktop review of the demand forecasts
2. formulate questions on areas where further information or clarification is required

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[1] Envestra Victoria, Envestra Albury, Multinet, SP AusNet and APA GasNet.

3. analyse all material provided and prepare separate reports for each service provider, including recommendations on whether the demand forecasts have been arrived at on a reasonable basis and represent the best forecasts for demand in the circumstances.
4. provide alternative forecasts if necessary (that is, if the review of the forecasts submitted by the service provider finds that they have not been arrived at on a reasonable basis and do not represent the best forecasts for demand in the circumstances).

1.2.2 Approach to the review

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

- Demand forecasts may impact the forecast capital expenditure required to meet the new demand of prospective users or the increased demand of existing users and may therefore influence forecast revenue.
- Demand forecasts influence the tariffs set to meet forecast revenue in each year of the access arrangement period, and how this revenue is to be allocated between tariff classes for different reference services.

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

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

The review has been undertaken as a desktop analysis into the methodology, data and parameters, and assumptions used to develop the demand forecasts. ACIL Tasman has used its own knowledge of Australian gas markets to test assumptions.

1.2.3 Data sources

In preparing this review, ACIL Tasman relied on the following data sources:

- The National Gas Rules
- The Access Arrangement Information (AAI) submitted by Multinet (Multinet, 2012)

- The demand forecast prepared by the National Institute for Economic and Industry Research (NIEIR) (NIEIR, 2011)
- Requests for additional information to Multinet
- Various specialist reports as detailed in the Bibliography

1.3 Structure of the report

The remainder of this report is structured as follows:

Chapter 2 sets out the key findings of the report. To the extent that the review takes issue with particular elements of the forecast, it describes the nature of those concerns and recommends action to be taken to address those concerns.

Chapter 3 describes the scope of Multinet's operations.

Chapter 4 describes the forecast methodology and assumptions.

In Chapter 5 we consider whether the application of the methodologies and assumptions described in Chapter 4 has produced forecast results for the Multinet network that are reasonable in light of historical patterns of demand as well as current and anticipated influences on retail gas demand in the distribution area. We consider separately the forecasts for the Volume and Demand sectors of the market.

Finally, in Chapter 6, we set out our conclusions regarding the acceptability of the forecasts, and the actions that the AER should require to address identified deficiencies in the forecasts as submitted.

2 Key Findings and Recommendations

2.1 The forecasting approach

Multinet's forecasts were prepared by NIEIR using its integrated economic and energy forecasting models. These are regional models based on 11 Statistical Subdivisions and 31 Local Government Areas in greater Melbourne. They produce forecasts of various economic indicators which are used in projecting gas demand.

In preparing Multinet's demand forecasts, NIEIR considered key drivers of gas demand, including:

1) weather
2) population growth
3) economic activity in Multinet's distribution area
4) the nature of economic activity undertaken by commercial and industrial customers
5) type of dwelling
6) government policies –
   a) policies related to construction standards and building design
   b) a variety of Federal and State-level policies impacting gas usage
7) wholesale price of gas

ACIL Tasman's view is that the forecasting approach used to prepare Multinet's demand forecasts is reasonable. This is further discussed in section 4.

2.2 Assessment of the forecasts

In assessing the forecasts we considered the forecasts of customer numbers separately from the forecasts of average use per customer.

We consider Multinet's forecasts of customer numbers to be reasonable for all tariff classes. We consider that the forecast of total growth in Tariff V customer numbers is likely to prove high by around 2% on average over the forecast period. In the Tariff D (large customer) class we consider Multinet's forecast of declining customer numbers to be reasonable in light of the generally depressed conditions in the Victorian manufacturing industry exacerbated by the strong Australian dollar.

We note that average consumption per customer for Tariff V residential customers is forecast to decline significantly over the regulatory period, from about 60 GJ/a at present to a little over 55 GJ/a by 2017. This is attributed mainly to policy intervention, in particular the Victorian Government's recent adoption of a mandatory 6 star building energy efficiency rating and a range of other factors. Rising gas prices are also likely to have an impact. In light of these factors we do not consider the forecast decline in consumption per customer for Tariff V residential customers to be unreasonable.

Forecast usage by Tariff V residential customers reflects anticipated growth in customer numbers, offset by declining average use per connection. The result is a forecast reduction in aggregate residential consumption from about 39.5 PJ/a to 38.5 PJ/a at present. Again, we consider this is not unreasonable given the combined effect of recent policy changes driving greater energy efficiency and expected rises in gas price.

Multinet's forecast for aggregate gas demand in the Tariff D sector continues an historical downward trend, but does not anticipate any acceleration of the downward trend and indeed lies somewhat above the historical trend projection. On this basis we consider the forecast decline in gas consumption in the Tariff D customer group is reasonable and arguably conservative.

Similarly, the forecast decline in Tariff D Maximum Hourly Quantity (MHQ) from around 3,500 GJ/hr at present to 3,250 GJ/hr by 2017 is close to the historical trend and well within the confidence interval around that trend. On this basis, we consider the forecast for Tariff D MHQ is not unreasonable.

In summary, ACIL Tasman considers that the various forecasts Multinet has submitted in support of its AAI are reasonable.

3 Scope of Multinet operations

The following description of the Multinet gas distribution operations is a summary of the information provided in the Access Arrangement Information (Multinet, 2012).

Multinet's gas distribution network supplies customers from upper Port Philip Bay in the west to the Yarra Ranges in the east. It also supplies gas to certain South Gippsland towns. Multinet supplies approximately 665,000 customers including domestic customers and small and large businesses.

Multinet's network comprises 165 km of licensed transmission pipelines and almost 10,000km of distribution mains. It includes five city gate stations and 279 supply regulator sites to reduce and manage gas pressure in the network.

Unlike the other gas distribution businesses ion Victoria, Multinet is largely 'landlocked. In other words, with some exceptions in the Yarra Ranges area, Multinet's territory does not border greenfields locations where new development is expected to occur.

3.1 Historical customer numbers and gas demand

Historical customer numbers in Multinet's region is shown in Table 1.

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

Year ended 30 June	2007	2008	2009	2010	2011
Residential	632,088	634,319	639,106	643,571	647,956
Small business	16,708	16,613	16,523	16,457	16,428
Volume Customer Total	**648,796**	**650,932**	**655,630**	**660,028**	**664,385**
Demand Customers	271	264	263	267	269
Total customers	**649,067**	**651,196**	**655,893**	**660,295**	**664,654**

Note: "Demand Customers" here include Tariff D and Tariff M customers; there are currently 9 Tariff M customers.
Data source: (Multinet, 2012)

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

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

Year ended 30 June	2007	2008	2009	2010	2011
Residential	36,269	40,602	39,279	41,028	39,565
Small business	5,459	5,872	5,483	5,661	5,536
Volume Customer Total	**41,729**	**46,474**	**44,763**	**46,689**	**45,101**

Data source: (Multinet, 2012)

4 Forecast methodology and assumptions

Multinet's demand forecasts were prepared by NIEIR. They are described in the following documents, which are the sources of this summary:

1. Multinet's Access Arrangement Information (AAI)
2. A report to Multinet from NIEIR that was attached to the AAI

The information Multinet provided regarding the methodology used to develop its forecasts in the first instance was limited. The description in the AAI is very brief, mainly referring to NIEIR's report. The description in NIEIR's report is mainly limited to high level comments about what the forecasts 'are based on' or 'take into account'.

We understand that this brevity is due, at least partly, to NIEIR's desire to protect the details of its models, which are its intellectual property. We understand that NIEIR does not necessarily make more detailed information available to its clients – in this case Multinet.

Nonetheless, the combined description in those two documents stops well short of providing a full explanation of the basis on which the forecasts were prepared.

In the early stages of the review, ACIL Tasman sought further information on a number of issues to supplement the information provided in the reports. Those responses included a summary, in spreadsheet form, of the process by which residential demand forecasts were prepared and the answers to various questions. The information provided in those responses has been incorporated into this review.

4.1 Overview of forecasting approach

Multinet's forecasts were prepared using a similar methodology to that which NIEIR has used before in producing state wide gas demand and customer numbers forecasts for the Australian Energy Market Operator (AEMO).

NIEIR forecasts gas demand separately for three categories of customer, namely:

1. Tariff D customers
2. Tariff V business customers (Small to medium enterprises)
3. Tariff V residential customers

A general overview of NIEIR's forecasting approach is provided in section 4.1.1. The process by which Tariff D and Tariff V commercial demand is forecast is outlined in section 4.1.2. The approach for forecasting gas demand by residential customers is outlined in section 4.1.3.

Our conclusions regarding the reasonableness of the forecasting approaches, and the forecasts themselves are set out in section 5.

4.1.1 General forecasting approach

Multinet has advised the AER that its forecasts were prepared using an approach that has been built over a number of years and reflects NIEIR's experience forecasting gas demand for over two decades including a decade for Multinet. The modelling methodology is based around the economic models that NIEIR has developed over many years.

These models are regional economic and energy models based on 11 Statistical Subdivisions and 31 Local Government Areas in greater Melbourne. They produce forecasts of various economic indicators which are used in projecting gas demand.

The NGR require demand forecasts to be arrived at on a reasonable basis and to represent the best possible forecasts in the circumstances.[2]

There is no doubt that NIEIR has significant experience in preparing energy demand forecasts. However, in itself, the fact that NIEIR has this experience does not confirm that Multinet's forecasts satisfy the criteria in the NGR. Nor does that experience demonstrate that the forecasts satisfy the criteria listed in the introduction to NIEIR's report, namely that demand forecasts should:[3]

- be accurate and unbiased
- incorporate key drivers, including weather
- incorporate policy impacts
- be transparent and repeatable
- be subjected to model validation and testing.

At a high level, Multinet has advised the AER that its forecasts of gas demand were prepared (by NIEIR) within a broader integrated economic forecasting framework, i.e. NIEIR's economic and energy models.

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2 National Gas Rules, r.74.

3 These criteria were first published as part of the AER's determination relating to electricity distribution in Victoria. See ACIL Tasman, *Victorian Electricity Distribution Price Review, review of electricity sales and customer number forecasts",* prepared for the Australian Energy Regulator, April 2010, available from www.aer.gov.au. They are not covered in the AER Access Arrangement Guideline, though they are recited in NIEIR's report.

That framework takes account of high-level macroeconomic factors (such as GDP, interest rate, exchange rate, etc.) as well as regional-specific trends within Multinet's distribution region (demographic factors and industrial development/closures). The forecasts are adjusted to incorporate the impacts of government policy measures on gas consumption.

The macroeconomic projections that have been used are set out in NIEIR's report. As discussed in sections 4.1.2 and 4.1.3 below, those projections are connected to Multinet's gas demand forecasts.

NIEIR has emphasised that the Multinet forecasts were not prepared using a purely 'mechanistic' approach. NIEIR draws a comparison between its approach and that of the Reserve Bank of Australia, which it says "uses a mixture of model-generated results (from a variety of models), data interrogation (i.e. analysis of trends and patterns) and non-statistical information (such as liaison with industry and government)."

Multinet's AAI and NIEIR's report contain little information to explain how the modelling results upon which the forecasts are based were generated, or what alterations to those model-generated results were made to take account of policy impacts. The reports do not explain the process by which the model was developed nor do they explain the basis on which potential demand drivers were selected for inclusion or were excluded from the model. A spreadsheet provided in response to a request for further information provides insight into some of the specific assumptions made regarding Tariff V residential customers.

There is some information regarding the reasons for changes in gas demand, such as the summary of anticipated plant closures at page 35 of NIEIR's report to Multinet, which relates to the forecast of demand by large customers (see below).

Given its view that forecasts should be subject to model validation and testing, the AER requested details of statistical diagnostic tests applicable to any regression analyses that had been run.

Multinet's response was that econometric analysis of the type that would produce those results is "not always feasible".[4] Multinet's view is that a regression analysis based on small sample of data would, at best, give rise to spurious correlations. Therefore, only a limited amount of diagnostic information was provided.

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4 Multinet and NIEIR response to request for further information, 25 May 2012

ACIL Tasman accepts that regression analysis based on insufficient data can be unhelpful. Further, we note that diagnostic material of the type sought is more applicable to time series type forecasting approaches than to those based on economic models such as NIEIR's.

Multinet also expressed the view that, in the absence of consistent historical series for regression analysis, forecasting models should be calibrated with best estimates from the literature on gas demand modelling or similar works. This view is reflected in several aspects of Multinet's forecasts, notably the various elasticities used. While we agree that there is frequently a need for judgement to be used in forecasting, we note that no information has been provided regarding the judgements that were made or their basis. In our view the forecasting process should be more transparent in this regard.

4.1.2 Forecasting gas demand by commercial customers

NIEIR's approach to forecasting gas demand by commercial customers is based on the notion that energy—gas in this case—is an input to production and therefore gas demand is a function of economic activity. This distinguishes Multinet's forecasts from those submitted by SP AusNet and Envestra (both Victoria and Albury) which are based on time series approaches, albeit with economic factors as explanatory variables.

Broadly, NIEIR forecasts economic activity in Multinet's distribution region and uses that estimate to produce forecasts of gas demand.

In doing this, NIEIR draws upon estimates of the economic structure of Multinet's distribution region. In simple terms, it has insights (based on previous work and surveys) into the proportion of gas used by commercial customers in different industries in Multinet's region. Drawing on this data NIEIR has apportioned gas use by commercial customers to industry sectors using 2-digit Australian and New Zealand Standard Industry Classifications (ANZSIC) codes. The results for large business users (Tariff D) were augmented by a survey of those users to identify substantial changes in their likely demand over the regulatory period.

By this process, forecasts of economic activity in Multinet's distribution region were prepared on an industry basis. Those forecasts were aggregated to Tariff D and Tariff V commercial on the assumption that the wholesale and retail trade industries, and only those industries, are Tariff V customers. Remaining industries were assigned to Tariff D.

NIEIR then estimated the relationship between economic activity and gas usage (an output elasticity of demand). There were two possible sources:

1. Estimates based on data from Multinet's distribution region

2. ABARES estimates, which are produced at a higher level

The output elasticities of demand have not been disclosed. The basis of the output elasticities used in preparing Multinet's forecasts is not discussed in either NIEIR's report or Multinet's AAI other than a statement in the NIEIR report to the effect that, for Tariff V business customers, the output elasticities were not estimated based on Multinet data because only a four or five year time series of data was available.

We understand that the elasticity assumptions were based on NIEIR's judgement as to which of the above two data sources provided the most reasonable result, though it is not clear whether reasonableness was assessed in terms of the elasticity or the resulting gas demand forecast. Further, to the extent that relationships based on Multinet data were used (if they were used) the time period over which they were estimated has not been disclosed.

The selection of output elasticities exposes the forecasts substantially to NIEIR's judgement. The fact that those judgements have not been disclosed or discussed substantially reduces the transparency of Multinet's forecasts. This is further discussed in section 4.2.1

4.1.3 Residential customers

Broadly, Multinet's forecasts of residential gas demand are based on projections of the average consumption per household and the projected number of households it will supply.

The average consumption estimates are driven by growth in household income and current and (recent) historical gas prices. They differ for existing customers and new connections.

Forecasts based on these two market segments are then adjusted to account for policy impacts.

The need to take account of the impact of weather on gas demand, particularly for residential customers, is well established. For example, the Australian Energy Market Operator (AEMO) in commenting on the Victorian gas distribution system noted that:

> "Understanding the factors that affect the consumption of gas is central in evaluating future energy demands. When temperatures are lower than normal, energy demand for residential heating increases. This strong relationship between gas demand and climate highlights the need to identify the weather conditions assumed when calculating forecast demand. In gas forecasts, the actual demand needs to be adjusted for weather before the underlying growth can be calculated. These weather adjustments can be simplified through the use of Effective Degree Day (EDD) variable." (AEMO, 2009, p. 55)

There are two basic approaches commonly used to adjust temperature data to take account of weather variations: Heating Degree Days (HDD) and Effective Degree Days (EDD).

The HDD approach uses a single measure of weather, namely temperature. HDD is calculated from meteorological data as the sum, over a year, of the negative differences[5] between the average temperature on each day and 18^{o} Celsius.

The EDD approach preferred by AEMO is a multifactor method based on the concept of Heating Degree Days (HDD) but also taking into account measures of average wind velocity, sunshine hours and seasonal variations in consumer propensity to use heating. The EDD approach in effect seeks to extend the HDD method by taking into account other weather-related parameters that may affect consumer behaviour in relation to gas consumption for space heating and water heating.

Similarly to the other distribution businesses, NIEIR's measure of weather for these purposes is EDD. However, unlike other forecasts, NIEIR also takes account of Summer Degree Days (SDD) as well as EDD, at least in forecasting demand by residential customers.

SDD is calculated as the sum of the positive differences between mean daily temperature and a threshold temperature of 18^{o}C.

NIEIR's SDD coefficients are negative and small (relative to the coefficients on EDD), implying that demand for gas is lower in warmer conditions. This is consistent with the notion that gas demand for both water and space heating is likely to be lower in hot weather than at other times.

Turning to the projection, NIEIR has used regression analysis to establish a relationship between EDD, SDD and gas consumption. These regression results, together with a trend analysis of weather conditions, have then been used by NIEIR to calculate the annual historical impact of global and urban warming on gas demand. In doing this NIEIR has assumed that, in future, EDD will continue to decline at a rate of around 7.7 EDD each year and that SDD will increase at around 3.8 EDD each year.[6] The notion that the number of EDD has a declining trend is consistent with work conducted by CSIRO and submitted by Envestra and SP AusNet in support of their Access

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5 If the average temperature on a particular day is greater than or equal to 18^{o}C, then HDD for that day is zero.

6 Both of these are warming trends.

Arrangement proposals. The historic warming trend is, according to CSIRO, largely attributable to the Urban Heat Island (UHI) effect.[7]

Multinet's assumed rates of change in EDD and SDD are based on longer term trends. Our analysis of EDD data supplied by AEMO shows that, between 1977 and 2010, EDD in Victoria declined -7.75 EDD per year. We also calculated SDD over the same period. Our regression analysis of that data shows that SDDs increased by 3.83 SDD per year. These both match NIEIR's assumptions.

As a result of changes in weather over the forecast period, Multinet forecasts that gas demand in its region will reduce as shown in Table 3.

Table 3 **Multinet demand forecasts – reductions due to warming trend**

	2013	2014	2015	2016	2017
Total (GJ)	-162,120	-162,120	-162,120	-162,120	-162,120
Residential (GJ)	-138,613	-138,613	-138,613	-138,613	-138,613
Business (GJ)	- 23,507	- 23,507	- 23,507	- 23,507	- 23,507
Residential split into					
Existing (GJ/connection)	- 0.2126	- 0.2119	- 0.2112	- 0.2106	- 0.2100
New (GJ/connection)	- 0.2177	- 0.2187	- 0.2197	- 0.2208	- 0.2218

Data source: Multinet response to AER request for further information, 25 May 2012

The basis for projecting EDD, and thus producing weather normalised projections of demand for gas differs between the three distribution network services providers. Specifically, while Multinet's forecasts are normalised to historical data and projected on the assumption that EDD and SDD will continue to decline in line with historical trends, the other three distribution network service providers have used a projection of EDD prepared by CSIRO in 2007 and updated in 2012 as the basis for their weather normalisation (see (Commonwealth Scientific and Industrial Research Organisation, 2012).

The historical rate of decline incorporated in Multinet's forecasts is similar to the rate projected by CSIRO in its report. However, CSIRO's projection suggests that the number of EDD observed each year will be significantly less than NIEIR's analysis (which ACIL Tasman has replicated) suggests. The difference varies between 31 and 34 EDD each year. The effect of using the lower EDD trend based on the CSIRO forecast would be to make the demand

7 In very simple terms the UHI effect is the result of increased 'urbanisation' and thus increased numbers of buildings and other man-made structures in urban areas. Those structures themselves radiate heat thus preventing minimum temperatures from being as low as they may otherwise have been.

forecasts lower, on average, for each year of the regulatory period than they are using the AEMO regression line.

We consider Multinet's approach based on regression analysis of the AEMO data is an appropriate basis for weather normalising historical data and for preparing standard weather forecasts given that it is based on actual temperature outcomes for the period 1970 to 2011.

4.2 The importance of rising energy prices – the price elasticity of demand

Each of the distribution businesses has made assumptions regarding the price of gas over the regulatory period with each projecting that it will increase. In Multinet's submission, residential gas price is forecast to increase from $17.20 per GJ in 2012/13 to $18.90 per GJ in 2016/17 and $19.30 per GJ in 2017/18.

In addition to gas price increases, ACIL Tasman expects that the price of electricity will also increase over the regulatory period, which we also consider to be an important factor in forecasting gas demand over the regulatory period.

The changes in fuel prices could reasonably be expected to have contradictory effects. Increases in gas price are likely to lead to a reduction in gas demand through the price effect. Increases in the price of electricity would be likely to lead to an increase in gas demand through the substitution effect. Similarly, changes in the price of other fuels may also impact gas demand. At the industrial level this may include fuels such as fuel oil and diesel. At the household level the price of solar powered appliances may be relevant.

It is difficult to estimate the likely size of these competing effects with any confidence.

Each of the relationships can be described using an elasticity. The price effect is summarised using the 'own price elasticity of demand for gas'. The substitution effect is summarised using the 'cross price elasticity of demand for gas'.[8] These two elasticities are discussed in turn below.[9]

4.2.1 Own price elasticity of demand for gas

The own price elasticity of demand, (commonly 'price elasticity') describes the relationship between the price of a good and the quantity of it that will be

8 One cross price elasticity is necessary for each substitute fuel, therefore there may be a cross price elasticity for gas and electricity and others for gas and fuel oil, solar power etc.

9 The own price elasticity of demand is relevant to the estimated impact of the carbon price as well as to the impact of rising gas prices generally.

demanded. Being an elasticity it is expressed in percentage terms. For example a price elasticity of -1 suggests that for a one per cent increase (decrease) in price quantity demanded will decrease (increase) by one per cent.

The price elasticity of demand is an important input into the forecasting process. Given the price increases forecast for the coming regulatory period, an overly high elasticity estimate will lead to gas demand forecasts being understated and, in turn, to gas prices being higher than necessary.

Each of the distribution businesses has used its own assumed price elasticity in preparing forecasts. The assumptions are shown Table 4.

Table 4 **Price elasticity assumptions**

distribution business	Price elasticity	Source/ Basis
SP AusNet – Residential SP AusNet – Commercial	-0.17 -0.77	CIE analysis of SP AusNet data
Multinet – All customer classes	-0.28	Not specified
Envestra (Victoria and Albury)	-0.30	AER determination for Envestra in South Australia and literature review

The fact that the different distribution businesses have made different assumptions regarding price elasticity is not surprising. Each distribution business is independent of the others and the regulatory proposals were prepared independently as well.

Envestra's assumption of -0.30 is consistent with the AER's recent decision regarding its access arrangement in South Australia. It is also broadly supported by analysis undertaken by Envestra's consultant Core which resulted in an estimated price elasticity of about -0.27 for all customer classes.

CIE for SP AusNet has produced elasticity estimates based on recent experience with SP AusNet's own customers (SP AusNet, 2012), (CIE, 2012). That experience led CIE to conclude that the price elasticity of demand for gas is -0.17 for SP AusNet's residential customer group (that is, Tariff V Residential) and -0.77 for its commercial customer group (that is Tariff V Non-residential). The reason for the large difference in price elasticity between the two customer groups was not discussed by CIE. However we note that on a volume-weighted average basis (using the above elasticity estimates and actual consumption data for residential and non-residential Tariff V customers) the price elasticity across all Tariff V customers would be -0.27. On this basis, the CIE price elasticity estimates can be viewed as being comparable to the assumptions made by Envestra and Multinet. The CIE report makes no specific reference to price elasticity for Tariff D customers.

We understand from Multinet's response to questions that its elasticity assumption was based on a combination of literature reviews and empirical analysis by NIEIR. However, no detail has been provided regarding the particular literature that was reviewed in making that assumption or the empirical analysis.

NIEIR has expressed the view that Multinet's assumption is conservative and that "*given the current environment of rising electricity and other fuel prices, it is quite possible that the elasticity could be double -0.28, or -0.56.*"[10] If the elasticity is indeed larger in absolute terms, the result (with all else being equal) would be that Multinet's volumes would be reduced. If elasticity is smaller, volume would be more than forecast.

In light of the foregoing, we consider that Multinet's own-price elasticity assumption of -0.28 can be regarded as being broadly consistent with the estimates used the other distribution businesses and with recent precedent. Accordingly we consider the assumption to be reasonable.

4.2.2 Cross price elasticity of demand

The cross price elasticity of demand summarises the relationship between the price of one good and the quantity demanded of another. In this case, the cross price elasticity of interest summarises the relationship between the price of electricity and the quantity of gas demanded.

A positive cross price elasticity suggests that as the price of one good increases demand for the other good also increases. These goods are defined as substitutes.[11]

Given that electricity and gas can be used similarly it would be reasonable to expect that they are substitutes (with a positive cross price elasticity of demand). The need to change appliances to allow substitution to occur suggests that the cross price elasticity of demand may become larger as it is measured over a longer time frame.

However, the extent to which rising electricity prices are likely to offset the reduction in gas demand cause by higher gas prices is not clear. In the next regulatory period, all of the distribution businesses are anticipating that the price of both electricity and gas will increase significantly. However, only SP

[10] NIEIR "Natural gas forecasts and customer number forecasts for the Multinet distribution region to 2021", p.68

[11] A negative cross price elasticity suggests that as the price of one good increases demand for the other good falls. These goods are defined as complements.

AusNet appears to have considered the impact that higher electricity prices will have on gas demand.

In its report to SP AusNet, CIE examined the substitution effect using two different measures of the price of electricity. The results were contradictory. In one model the relationship CIE found between electricity price and gas demand[12] was positive, as would be expected, and very small. In the second model the relationship was negative, which is contrary to the theoretical expectation.[13] On this basis, CIE concluded that the price of electricity should not be included in its models of gas demand.

Multinet has noted that estimating the cross price elasticity of demand for gas in Victoria would be a highly data intensive exercise requiring a total energy demand model and data for all fuels that could be used, ranging from diesel, wood and fuel oil to electricity, gas and alternatives such as solar.

Multinet has advised that its forecasts are based on the assumption that the cross price elasticity of demand between electricity and gas is zero. In effect, this assumes that the regulatory period is too short to enable switching between fuels in response to rising prices.

In light of the practical difficulties involved in estimating the cross price elasticities of gas with other fuels and the likelihood that the size of any substitution would be small during the regulatory period, we do not consider this assumption to be unreasonable.

4.3 Policy factors affecting the forecasts

A number of policy measures implemented by the Victorian and Commonwealth Governments will potentially impact demand for gas during the coming regulatory period.

Multinet's forecasts were prepared with reference to the policy measures listed in Table 5, although not all were quantified.

12 In this case the estimated cross price elasticity was 0.001.

13 In the second model the cross price elasticity was -0.019 whereas the own price elasticity was -0.133.

Table 5 **Policy factors considered by Multinet**

Policy	Mechanism and impact on gas demand	Quantified in Multinet's forecasts?
Clean Energy Future Plan (Carbon Tax)	Internalise cost of greenhouse gas emissions making gas more expensive, but with a relatively smaller increase than electricity	Yes – included in price projection
Renewable Energy Target	Renewable energy certificate scheme for which solar hot water is eligible, thus reducing demand for gas for water heating	No direct adjustment
Energy Efficiency Opportunities Program	Research and reporting program to encourage energy efficiency improvements among large energy users	Not directly – incorporated in large user survey
Mandatory Energy Performance Standard for water heaters	*De facto* ban on electric resistance water heaters in most cases	Yes - 0.19 GJ per household per year for new homes, -0.07 GJ per household per year for existing households. Approximately 47 TJ per year in Multinet's region in total.
National Strategy on Energy Efficiency	Wide ranging program with numerous aspirational targets. Impact on gas demand is ambiguous due to potential fuel switching	No
Mandatory disclosure of energy performance of buildings	In place for commercial buildings and under consideration for residential buildings.	No
Building (residential) energy efficiency standards	Mandatory 6-star energy efficiency standard for all homes built since 2011	Yes – 3.83 GJ per new household from 2013
Victorian Energy Efficiency Target	White certificate scheme requiring energy retailers to achieve energy efficiency targets	Yes – 0.12 GJ per household per year, approximately 77 TJ per annum in Multinet's region.
Other rebate schemes	Rebates for purchase of energy efficient or reduced greenhouse gas emitting appliances	No

Carbon pricing/emissions trading

The Commonwealth Government has introduced a carbon trading scheme to address the externality cost of greenhouse gas emissions that are associated with energy use (and other sources). The carbon trading scheme commenced with a period of fixed prices from 1 July 2012 until 30 June 2015. The intention is that it will then transition to a cap and trade type scheme where a finite quantity of greenhouse gas emissions are permitted and the carbon price itself is determined by the market.

The carbon price will influence consumers' choices regarding energy use and suppliers' choices regarding technology. It will do this by increasing the cost (and thereby the price) of energy sources, particularly electricity and gas, in proportion to the carbon emissions generated through their use.

As the price of gas increases customers will face increased incentives to use less of it, which they could achieve either by improving the energy efficiency of their appliances or by changing their consumption behaviour.

However, the greenhouse emissions intensity of Australia's electricity supply is such that, in many applications, substituting gas appliances for electricity powered alternatives would reduce greenhouse gas emissions. Therefore, the relative impact of the carbon price on gas will be less than on electricity. To some extent energy customers will face an incentive to 'fuel switch' from electricity to gas.

Multinet's forecasts are based on a price projection that, in turn, includes the impact that Multinet expects the carbon tax will have on gas prices. This, together with its assumption that the own price elasticity of demand for gas is – 0.28 quantifies the impact of the carbon tax on gas demand.

As noted above, Multinet has assumed that the cross price elasticity of demand for gas and electricity is zero and, therefore, has assumed that the impact of the carbon price on electricity prices will have no impact on demand for gas.

Renewable Energy Target

The Renewable Energy Target is a policy that requires electricity retailers to acquire a certain number of Renewable Energy Certificates (RECs) each year. RECs are created when electricity is generated by an eligible generator, which is generally one which generates electricity with zero greenhouse gas emissions. RECs can also be created by solar water heaters, which do not generate electricity but reduce the amount of electricity needed in the first place.

The number of RECs each retailer must buy depends on the quantity of electricity they sell.

The Renewable Energy Target has existed in approximately the same form since 2001 although there have been numerous changes in the details of the scheme. It now comprises the Large-scale Renewable Energy Target and the Small-scale Renewable Energy Scheme.

The Renewable Energy Target could be expected to influence demand for gas in two ways:[14]

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[14] This assumes that other factors remain constant.

1. By providing an increased incentive to consumers to use solar water heaters, thus reducing demand for gas for water heating
2. By increasing the price of electricity, making gas relatively less expensive and thus providing an increased incentive to 'fuel switch' to gas where possible.

Multinet's forecasts do not take account of the second of these effects. In response to questions, Multinet gave three reasons for this.

First, while the rising price of electricity may provide an incentive to fuel switch to gas when all else is equal, the price of gas is also likely to increase. This would offset the gain from fuel switching and reduce the incentive.

Second, fuel switching requires replacement of long lived appliances such as stoves and water heaters (and their commercial and industrial equivalents). Multinet has assumed that the regulatory period is too short to allow substantial change in the rate at which appliances are changed over and that any ongoing trend in fuel use, whether towards or away from gas, would be reflected in the historical data.

Third, Multinet believes that the majority of customers in its region have had access to gas for a sufficiently long time that any fuel switching that may occur could not be regarded as a change induced by the Renewable Energy Target.

NIEIR notes (in Table 5.1) that the RET scheme could be expected to have a significant impact on gas demand "via switch to gas boosted solar hot water in Victoria". However no explicit adjustment has been made to the forecast average gas usage for residential customers to account for the RET—in effect it appears that NIEIR has either assumed that the impacts of the scheme are already reflected in the historical data or are accounted for in the MEPS water heating adjustment.

Energy Efficiency Opportunities Program

The Energy Efficiency Opportunities (EEO) Program requires large energy users to review their operations and identify potential energy saving projects.

EEO is intended to encourage large energy-using businesses to improve their energy efficiency by requiring them to identify, evaluate and report publicly on cost effective energy savings opportunities.

NIEIR's report contains an overview of the EEO program and says that any impact it can be expected to have is already accounted for in NIEIR's broader energy models. Therefore, no explicit adjustment was made to the model to account for this program.

Therefore, we cannot comment on the individual impact of this policy on gas demand in Multinet's region.

Minimum Energy Performance Standards

Minimum Energy Performance Standards (MEPS) are an element of the broader National Framework on Energy Efficiency. In summary, they prevent certain products from being sold in Australia unless they satisfy specific energy efficiency requirements.

Multinet took the impact of MEPS for hot water heaters into account in preparing its forecasts. It also took account of the possibility that MEPS would be introduced for gas space heaters and cookers, which are currently only required to carry an energy efficiency label.

Multinet's response to questions from the AER indicates that its demand forecasts were reduced by 0.19 GJ per household per year for new homes and 0.07 GJ per household per year for existing households to account for the MEPS for hot water heaters.

The estimated savings are calculated by assuming 10 GJ gas usage for water heating and a ten per cent performance improvement in water heaters due to the MEPS. The efficient heaters are assumed to be phased in over time.

This amounts to a total annual reduction of approximately 47 TJ in Multinet's region.

These assumptions in relation to MEPS were informed by the Regulatory Impact Statement for MEPS, and on this basis we consider them to be reasonable.

National Strategy on Energy Efficiency

In July 2009 COAG agreed to the National Strategy on Energy Efficiency (NSEE). Its objective was to accelerate energy efficiency improvements and deliver cost-effective energy efficiency gains across all sectors of the Australian economy.

Under the NSEE a range of measures are now being managed by the Australian Government. These measures apply to both commercial buildings and homes.

Multinet and NIEIR identify the National Strategy on Energy Efficiency as possibly having an impact on gas demand gas in Multinet's distribution region but say that its impact is "uncertain and difficult to quantify." Our understanding is that no changes were made to the forecasts to account for NSEE.

The impact that NSEE may have on gas demand is ambiguous because some measures under development would potentially reduce gas demand, while others would increase it through fuel switching (from electricity) in an attempt to reduce greenhouse gas emissions.

In addition, at least some of the measures under development through NSEE were under development through the National Framework for Energy Efficiency (NFEE) before NSEE. In many cases it is unclear when, or whether, changes will actually occur.

Mandatory disclosure of energy performance

One of the energy efficiency measures contemplated under NSEE (and previously under NFEE) is the mandatory disclosure of energy performance of residential buildings.

The proposal is that owners of existing houses, flats and apartments would be required to provide energy, water and greenhouse performance information when they sell or lease their properties. The rationale is that this information would allow buyers and renters to make a better comparison between alternative properties.

This policy measure is still in the development stage.

Multinet's forecasts were prepared on the assumption that mandatory disclosure of energy performance of residential buildings would not have an effect on gas consumption during the forthcoming regulatory period.

Mandatory disclosure of the energy performance of commercial buildings has been in place in Victoria since 2010. The impact of that program has not yet been reviewed, which makes it difficult to estimate its impact in future. In its report to Multinet, NIEIR points to a number of comments made by representatives of the commercial property industry to the effect that significant effort is currently underway to improve the energy performance of commercial buildings.

We understand that this has been occurring for some time so, to some extent, it will be reflected in the historical data. For forecasting purposes the challenge is to identify the extent to which gas demand can be expected to diverge from the historical trend as a result of the ongoing improvement of energy efficiency of commercial buildings.

Neither NIEIR nor Multinet has provided information regarding the extent to which forecasts for commercial gas consumption were adjusted (if at all) to take account of mandatory disclosure. The fact that no explicit adjustment was indicated in the spreadsheet provided by NIEIR in response to AER's request for further information leads us to conclude that no adjustment was made. We consider this to be a reasonable approach given the fact that no review of the program impacts has yet been undertaken.

6-star building policy

A key factor in projecting gas demand in the residential sector is the likely gas requirement of new homes. For a gas distribution business, growth in residential customer numbers can take one of only three forms:

1. existing home connected to gas due to 'infill' of customers in gas connected areas, without major renovation or new home construction
2. existing home connected to gas due to extension of gas network into a new area
3. new home (or substantial renovation), either replacing an existing home without gas supply or in a newly developed residential area.

In most cases the number of new customers in the first two categories is likely to be relatively modest by comparison to the third category.

Therefore, the majority of a gas distribution business's new customers are likely to be customers with newly built homes (or substantially renovated homes).

Each of the distribution businesses has taken a broadly similar approach to projecting growth in demand by residential customers. That approach is to forecast the number of new customers expected to connect to gas supply in their region and to multiply that number by the expected average gas demand per customer.

Conceptually it would be possible to produce a forecast of demand from new residential customers by multiplying the projected number of new customers by the average gas demand of the existing (residential) customer base. However, each of the distribution businesses has argued that this would be inappropriate.

While the approaches differ, each distribution business has argued that, on average, their new residential customers use less gas than 'older' customers. The reasons are, broadly, that new houses and the appliances they contain are more energy efficient than older houses and appliances.

The gradual replacement of existing houses and appliances with more efficient options is a contributing factor to the gradual decline in gas usage by existing customers. Another factor is the replacement of gas fuelled appliances with alternatives that use different fuels, in particular substituting (electric) reverse cycle air conditioners for gas space heaters and solar water heaters for gas alternatives.

An additional factor that each of the distribution businesses has argued should be considered is the introduction of mandatory 6-star energy efficiency ratings for new homes.

In 2009, the Council of Australian Governments (COAG) requested the Australian Building Codes Board to modify the Building Code of Australia (BCA) to require that all new homes and major renovations achieve a six-star energy efficiency rating (or equivalent). The necessary changes were included in BCA 2010 and subsequently enacted in State and Territory legislation.

The Victorian Government was reported to have reconsidered that commitment in early 2012 as part of a drive to reduce red-tape. However, in mid April 2012, the Premier of Victoria reaffirmed the government's commitment to the mandatory 6-star energy efficiency rating.

Therefore, the distribution businesses have argued that new homes (and major renovations) in the distribution regions will use significantly less gas, on average, than older homes.

In deciding to implement the 6-star energy efficiency requirement, COAG had regard to a Regulation Impact Statement (RIS) prepared by the Centre for International Economics (CIE).[15] In that RIS, CIE estimated that the introduction of the 6-star energy efficiency requirement would cause new Victorian houses to use approximately 6.5 GJ less gas than they would if the energy efficiency requirement remained at 5 star.

Multinet's demand forecasts are based on an assumption that from 2013 new homes will on average use 3.83 GJ of gas per annum less than they would use if the 6-star building standards were not made mandatory. This is significantly lower than either the average 5.8 GJ per new household assumption made by Envestra or 6.4 GJ per new household assumed by SP AusNet (both based on the RIS referred to above). In our view this assumption is conservative and reasonable.

Victorian Energy Efficiency Target

The Victorian Energy Efficiency Target (VEET) is a 'white certificate' scheme. Energy retailers, both electricity and gas, are required to acquit a certain number of Victorian Energy Efficiency Certificates (VEECs) each year. The number of VEECs that a retailer must surrender represents a portion of the

15 CIE prepared the demand forecasts for Multinet.

scheme's overall annual target and is a function of the share of the energy market that the retailer held in that year.

A VEEC represents one tonne of carbon dioxide equivalent (CO_2-e) greenhouse gas emissions abated by specified energy saving activities known as Prescribed Activities.

VEET commenced on 1 January 2009 with an annual target of 2.7 Mt CO_2-e to be abated each year until 2011. In 2012 the VEET Target was doubled to 5.4 Mt CO_2-e per annum.

In its report to Multinet, NIEIR notes that the majority (80 per cent) of VEECs created in 2009 were created by replacing incandescent lighting with compact fluorescent lamps and almost all of the remainder (16 per cent of the total) were created by activities associated with solar hot water. Further, NIEIR notes that the number of VEECs created by activities that would reduce gas use was about 20 per cent higher than the number created by activities that would increase gas use.

NIEIR goes on to say that "based on the phase 1 of VEET activities" it estimates that VEET will reduce Victorian gas demand by 0.2 PJ per annum to 2014 (allowing for 30 per cent "rebound, additionality, attribution and compliance").

Multinet's demand forecasts appear to be based on the assumption that Multinet's 'share' of this total reduction will be approximately 40 per cent, which corresponds to Multinet's current volumetric share of the Victorian residential gas market.

5 Assessment of the forecasts

In this chapter we review the forecasts themselves, to consider whether the application of the methodologies and assumptions used by Multinet has produced forecast results that are reasonable in light of historical patterns of demand as well as current and anticipated influences on retail gas demand in the distribution area. We consider separately the forecasts for the Volume and Demand sectors of the market.

5.1 Use of trend extrapolation for forecast verification

In the following analysis we have used historical trend analysis as a cross-check on the results generated using the NIEIR methodology. ACIL Tasman recognises that forecasting on the basis of extrapolation of historical trends involves a risk of overlooking changes in market drivers that could result in future trends differing from historical trends. The fact that a forecast diverges from the historical trend cannot in itself be taken as proof that the forecast is unreasonable. Rather, such divergence may prompt us to ask whether there are good reasons for the break in trend.

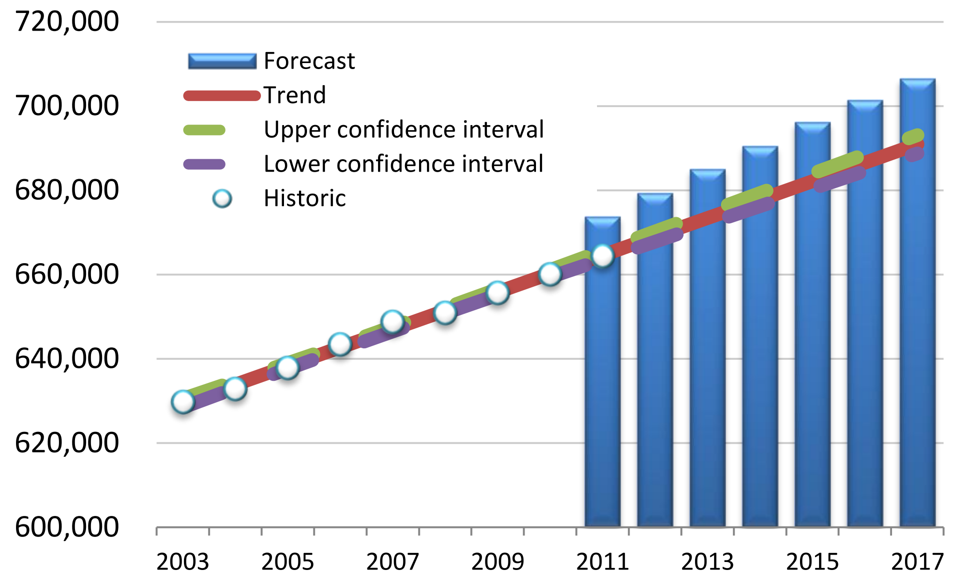
Note that the scale of the Y axis in the following charts has been chosen to allow the relationships between forecasts, historical trends and confidence intervals to be seen clearly. This has the effect of exaggerating the apparent extent of deviations from historical trends, when in fact the changes may be much less pronounced when viewed in absolute terms. Care should therefore be exercised in interpreting the charts.

5.2 Tariff V Customer forecasts

5.2.1 Tariff V customer numbers

The forecast of total customer numbers for the Tariff V customer sector is summarised and compared with historical actual customer numbers in Figure 1. Forecast growth in customer numbers is above the historical trend, which was generated using an Ordinary Least Squares (OLS) regression on actual customer numbers from 2003 to 2011. On this basis, and in the absence of any information to explain why a step increase in customer numbers might be expected, we consider that the forecast of total Tariff V customer numbers is likely to prove high by around 2% on average over the forecast period.

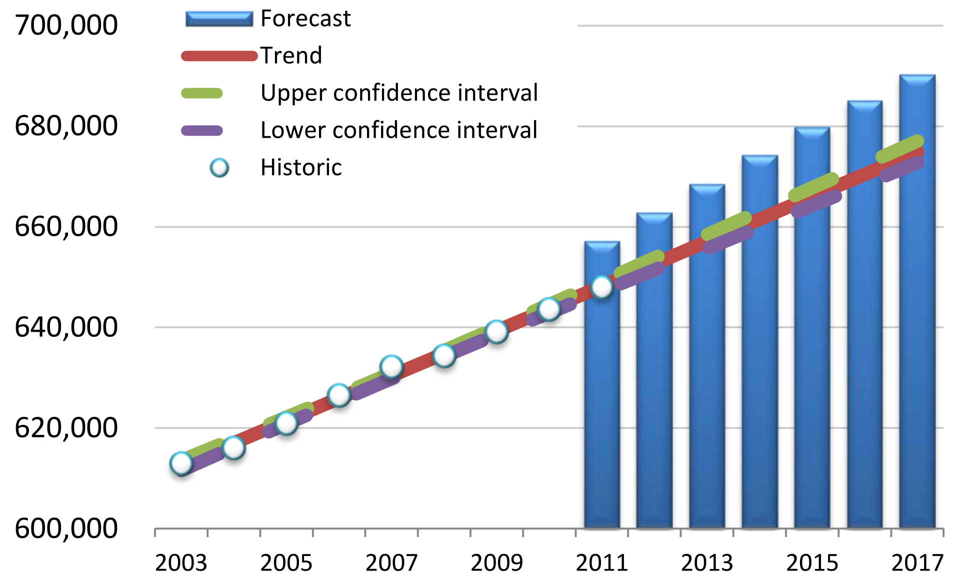
Figure 1 **Historical and forecast customer numbers—Tariff V Total**



Data source: (NIEIR, 2007); (NIEIR, 2011); (Multinet, 2012b); ACIL Tasman analysis

Figure 2 shows the corresponding data and forecast trends for residential customer numbers as a subset of the Tariff V customer class. This shows a very similar pattern to the total Tariff V customer numbers in Figure 1, which is unsurprising given that more than 95% of Tariff V customers are residential. Again we consider that the forecast of Tariff V residential customer numbers is likely to prove high by around 2% on average over the forecast period.

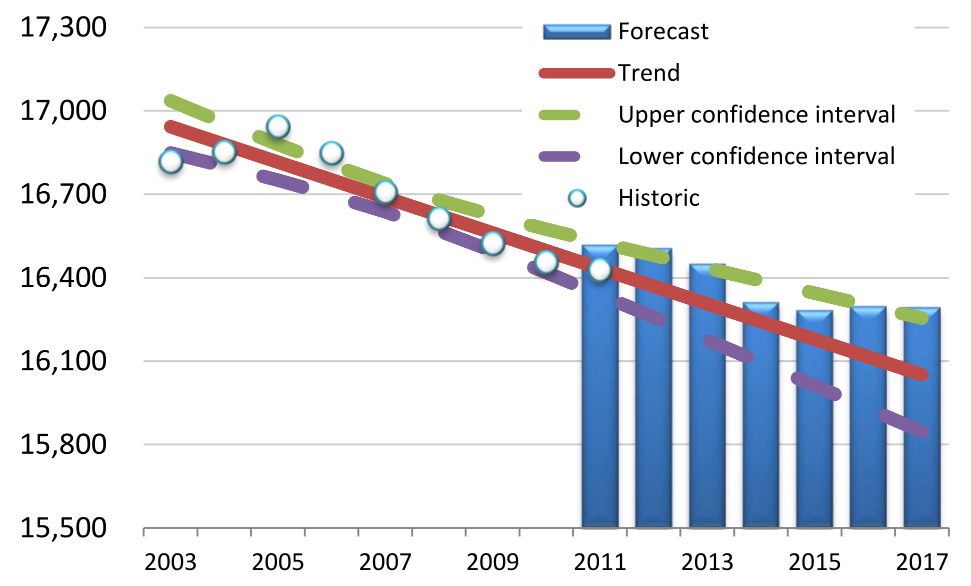
Figure 2 **Historical and forecast customer numbers— Tariff V residential**



Data source: (NIEIR, 2007); (NIEIR, 2011); ACIL Tasman analysis

Figure 3 shows the corresponding results for the Commercial and Industrial Tariff V customers. In this case the projection is for a decline broadly in line with historic trend. Given that these customer number projections fall close to trends observed in recent data we consider these forecasts to be reasonable.

Figure 3 **Historical and forecast customer numbers—Commercial & Industrial Tariff V**

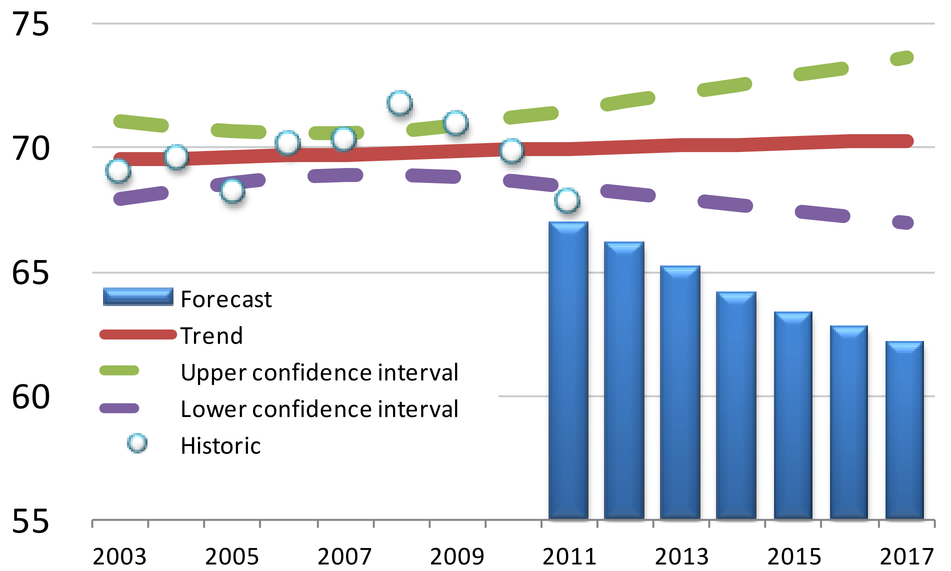


Data source: (Multinet, 2012b); *(NIEIR, 2011)*; ACIL Tasman analysis

5.2.2 Tariff V forecast average consumption

Assumptions regarding average gas consumption per customer for the Tariff V sector are critically important to the overall demand forecasts because the forecasts are generated by applying average gas consumption rates to the projected customer numbers in each demand segment. The implied average gas consumption per customer in the Tariff V sector as a whole (derived from Tariff V demand and customer numbers) is shown in Figure 4.

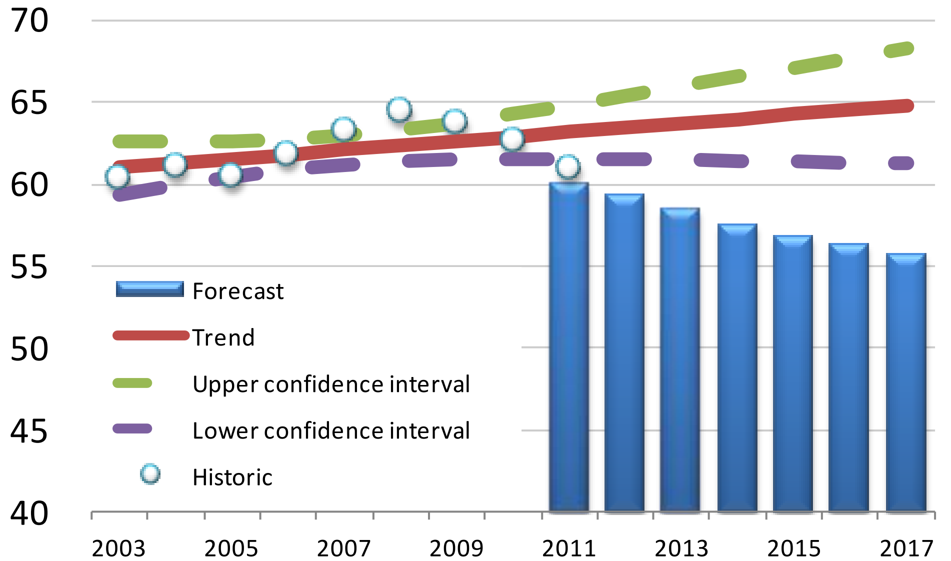
Figure 4 **Actual vs forecast average gas consumption per Volume Customer, after weather normalisation (GJ/a)**



Data source: (NIEIR, 2007); *(NIEIR, 2011)*; ACIL Tasman analysis

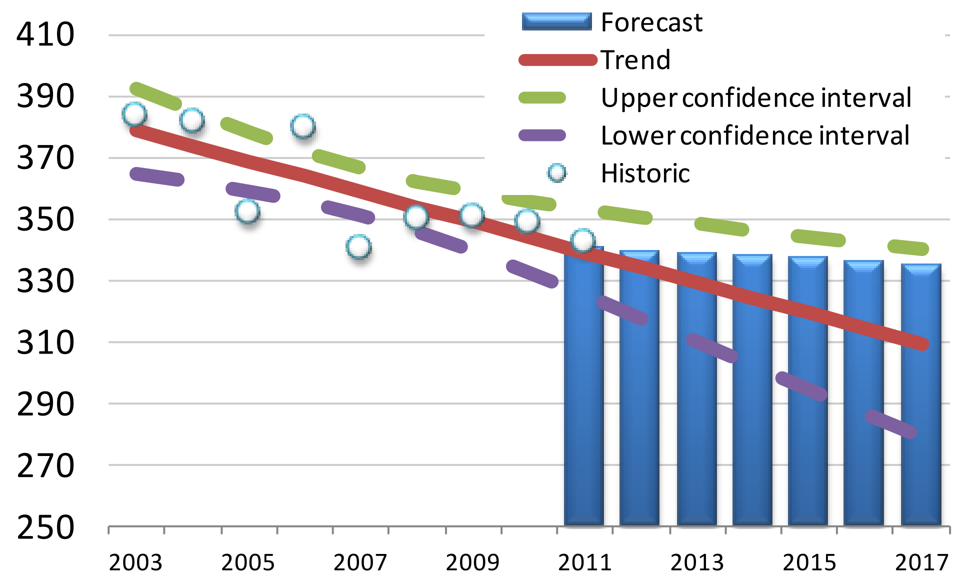
The corresponding comparisons for the Tariff V Residential and Tariff V Business customer groups are shown in Figure 5 and Figure 6 respectively.

Figure 5 **Actual vs forecast average gas consumption per customer, after weather normalisation—Tariff V Residential customers (GJ/a)**



Data source: (NIEIR, 2007); *(NIEIR, 2011)*; ACIL Tasman analysis

Figure 6 **Actual vs forecast average gas consumption per customer, after weather normalisation—Tariff V Business customer (GJ/a)**



Data source: (NIEIR, 2007); *(NIEIR, 2011)*; ACIL Tasman analysis

For Tariff V residential customers the projection falls substantially below historical trend values. The scale of the axes on these charts tends to exaggerate the impact, but nonetheless the projections fall outside the confidence intervals around the historic trend.

This decline raises the question whether there are plausible reasons to expect that the average residential customer in Multinet's region will use less gas in future than in the past. Multinet and NIEIR put forward several reasons why this might be expected.

The first reason is the 6 star building policy that has been adopted very recently and is therefore not substantially reflected in historical data. As discussed in section 4.3, Multinet expects this policy to reduce the average consumption of each new dwelling by around 4 GJ per year.

The second factor to consider is that Multinet's area is substantially 'landlocked' in the sense that, with a few exceptions, any new customers in Multinet's region will be in dwellings built through urban infill. Generally speaking, new dwellings in Multinet's region can be expected to be smaller and more densely built than existing dwellings. When coupled with relatively strong growth in customer numbers, this would contribute to the decline in average use per customer, though no specified adjustment was made to the forecasts to account for this.

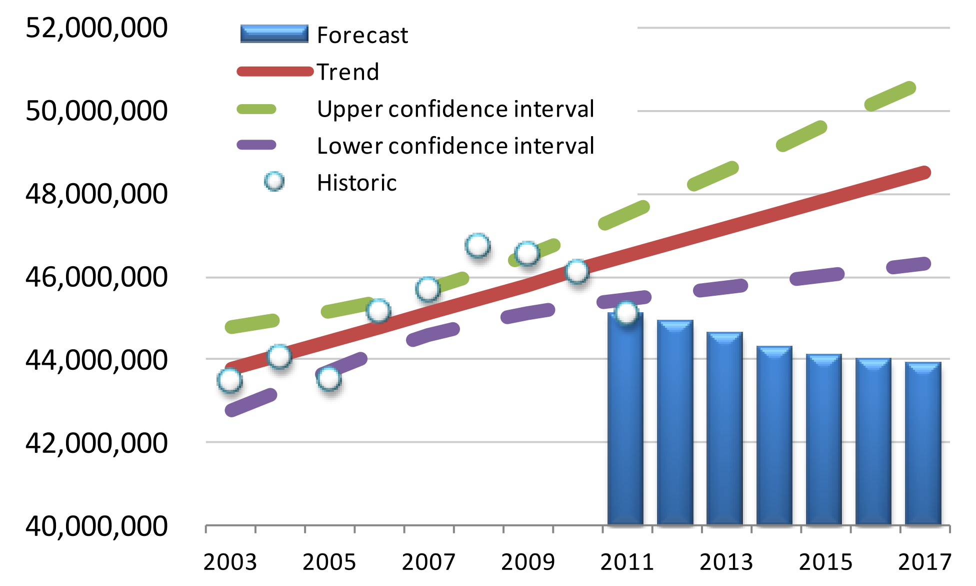
Other factors to consider are the relationships between real household disposable income, gas price and gas consumption and the increasing uptake of reverse cycle air conditioners, which tend to displace gas demand for heating.

In light of these factors, and given our general comfort with the core forecasting methodology, we do not consider the forecast average consumption per customer to be unreasonable.

5.2.3 Tariff V gas demand

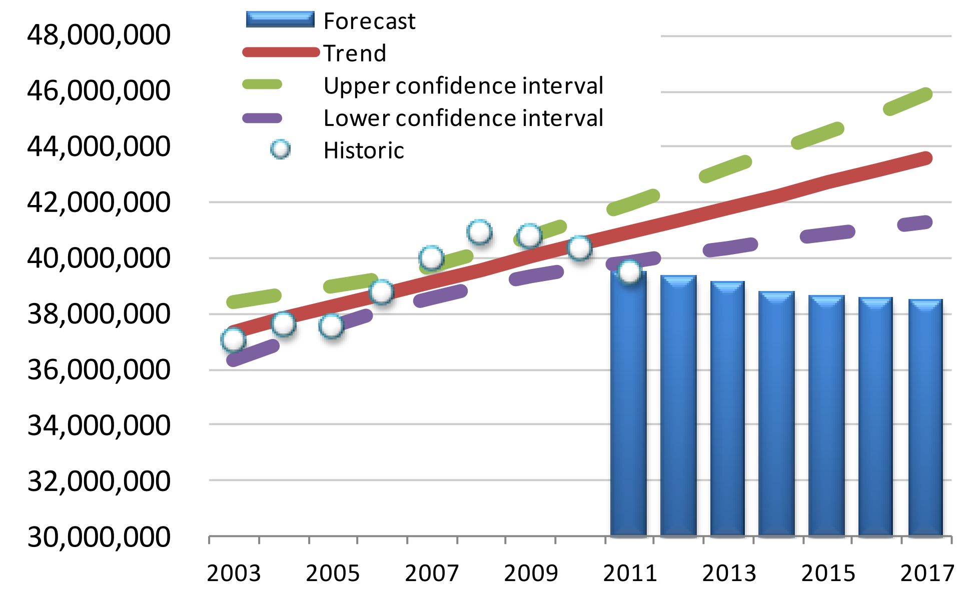
In Figure 7 the forecast of gas demand for the total Tariff V Customer sector is compared with weather normalised historical data. The corresponding comparisons for the Tariff V Residential and Tariff V Business customer groups are shown in Figure 8 and Figure 9 respectively.

Figure 7 **Forecast consumption compared to historical trend—Tariff V Total customer sector (GJ)**



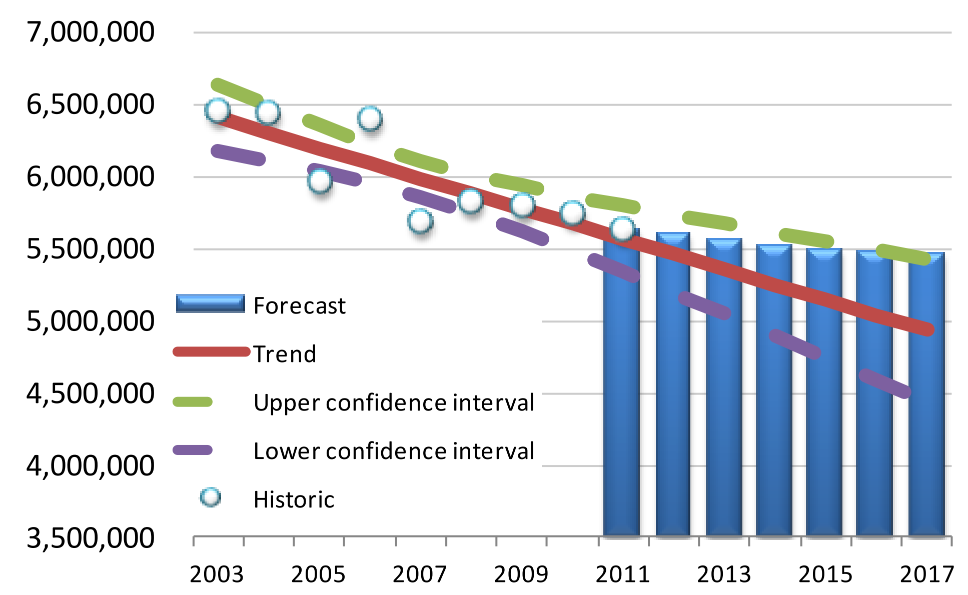
Data source: (NIEIR, 2007); (NIEIR, 2011); ACIL Tasman analysis

Figure 8 **Forecast consumption compared to historical trend—Tariff V Residential customers (GJ)**



Data source: (NIEIR, 2007); (NIEIR, 2011); ACIL Tasman analysis

Figure 9 **Forecast consumption compared to weather-adjusted historical trend—Tariff V Business customer (GJ)**



Data source: (NIEIR, 2007); (NIEIR, 2011); ACIL Tasman analysis

For Tariff V residential customers the projection falls substantially below historical trend values. As noted earlier, the scale of the axes on these charts tends to exaggerate the impact, but nonetheless the projections fall outside the confidence intervals around the historic trend.

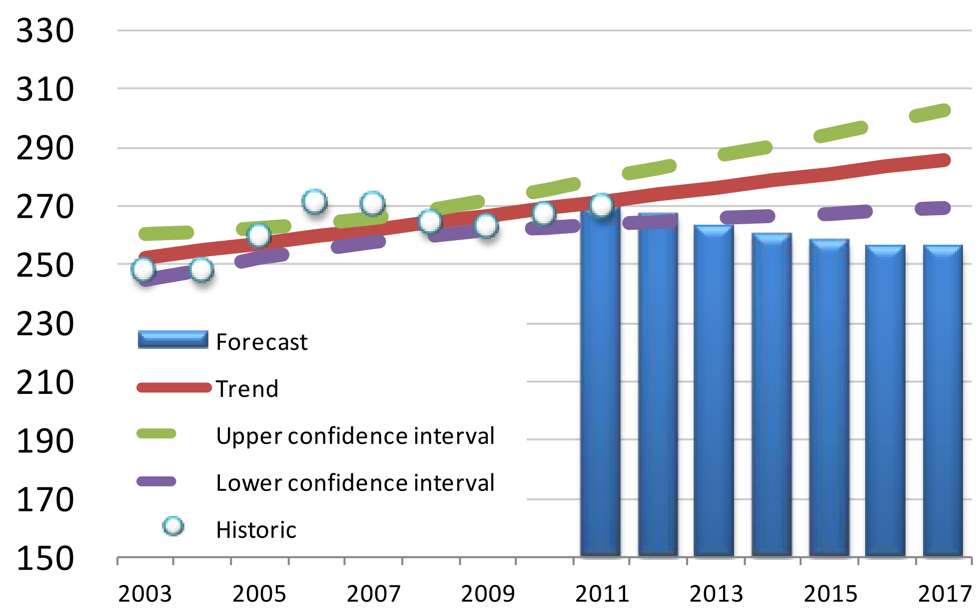
This decline is consistent with the on-going reductions in average consumption per customer as discussed in the previous section. Given our findings that the forecast of Tariff V customer numbers is if anything likely to be on the high side, and that the forecast decline in average consumption per customer can be justified in light of recent policy and market developments, we consider the forecasts of Tariff V consumption (in total and divided between the residential and business customer classes) to be not unreasonable.

5.3 Tariff D customer forecasts

5.3.1 Tariff D customer numbers

Figure 10 shows historical and forecast customer numbers in the large customer (Tariff D) class for the Multinet network. Multinet is forecasting that the number of customers in this class will decline from 267 in 2012 to 256 by the end of the next access arrangement period. The Multinet access arrangement information document(Multinet, 2012) and the NIEIR report for Multinet (NIEIR, 2011) point to weak conditions in the Victorian manufacturing sector and a spate of recent plant closures (some but not all of which are in the Multinet distribution area).

Figure 10 **Actual and forecast Tariff D customer numbers**



Data source: (NIEIR, 2007); *(NIEIR, 2011)*; *(Multinet, 2012b)*; ACIL Tasman analysis

Asked to provide additional information on the basis for the Tariff D customer number and demand forecasts, Multinet responded as follows:

> "The decline in tariff D is primarily being driven by the decline in manufacturing in Victoria, although energy efficiency measures in the commercial sector (Public sector)

are also limiting the growth in tariff D. Manufacturing has for a long time, been falling as a share of GSP. Over recent years, the high exchange rate and associated loss of competitiveness has lead to a large number of industry closures and rationalisations in the basic metals, chemicals, and non-metallic minerals sectors of manufacturing. Over the last 10 years, Victorian tariff D gas volumes have fallen by 12.5 petajoules, or 13 percent. High exchange rates are likely to remain for quite some time.

The decline in Multinet tariff D is reinforced by the high land values in Melbourne, leading to rezoning of commercial and industrial land. Taking these factors into account, the forecasts presented above for Multinet are reasonable, although may prove too optimistic for MHQ". (Multinet, 2012c)

In the same response, Multinet also pointed out that one major building manufacturer announced in 2011 that it intends to close two plants in the Multinet region, and that these plants use around 1,750 TJ/a at present.

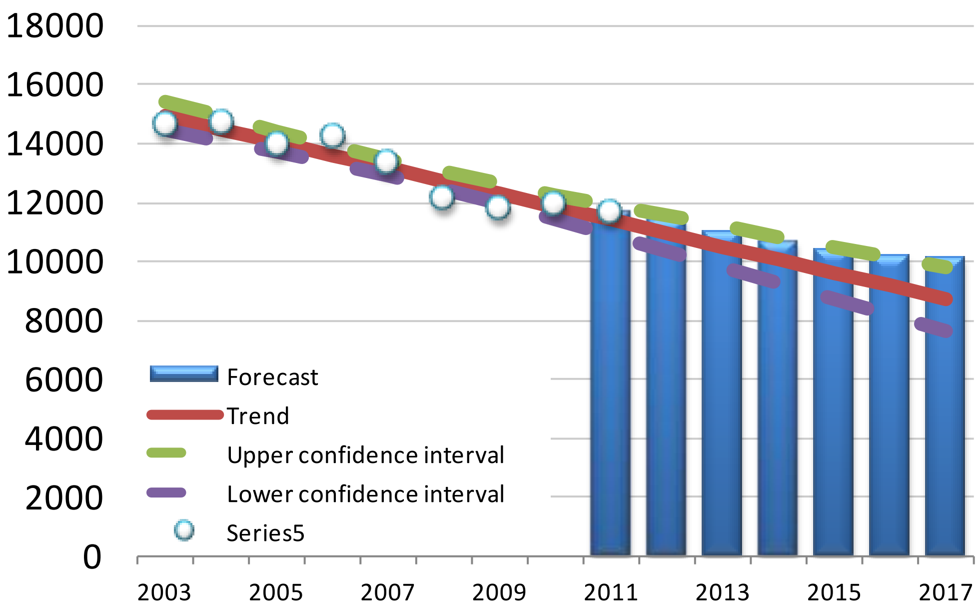
Given the small numbers in the Multinet Tariff D customer class, a relatively small change in absolute numbers (in this case, the projected loss of 13 customers over a six year period) represents a significant percentage of the total customer group. However, we accept that the factors identified by Multinet, in particular the generally depressed conditions in the Victorian manufacturing industry exacerbated by the strong Australian dollar, are likely to see a net reduction in the number of Tariff D customers over the period of the forthcoming access arrangement. In these circumstances we consider the forecast for Tariff D customer numbers is not unreasonable.

5.3.2 Tariff D gas demand

The historical gas usage and demand forecasts for the Tariff D customer group in aggregate are shown in Figure 11.

The historical data shows a clear downward trend in aggregate demand, from almost 15 PJ/a in 2003 and 2004 to less than 12 PJ/a at present. The forecast continues that downward trend with aggregate Tariff D demand falling to 10 PJ/a by 2017. However, as shown, the forecasts do not anticipate any acceleration of the downward trend and indeed lie at the upper bound of the confidence interval around the trend projection. On this basis we consider the forecast decline in gas consumption in the Tariff D customer group is reasonable and arguably conservative.

Figure 11 **Actual and forecast Tariff D aggregate demand (Commercial and Industrial)**



Data source: (NIEIR, 2007); (NIEIR, 2011); (Multinet, 2012c); ACIL Tasman analysis

5.3.3 MHQ forecasts for Tariff D customers

Relationship between MHQ and gas demand

While it is important to consider the volume forecasts for Tariff D customers, it is the forecasts of Maximum Hourly Quantity (MHQ) bookings that are critical in terms of implications for tariff setting. This is because the charges for Demand Customers are calculated on the basis of the system capacity (MHQ) used, rather than the physical quantity of gas delivered.

The relationship between gas demand and MHQ is complex. The ratio of average daily throughput to peak daily throughput (that is, the "load factor") varies widely from customer to customer. MHQ is directly related to peak daily requirements, rather than average daily requirements.

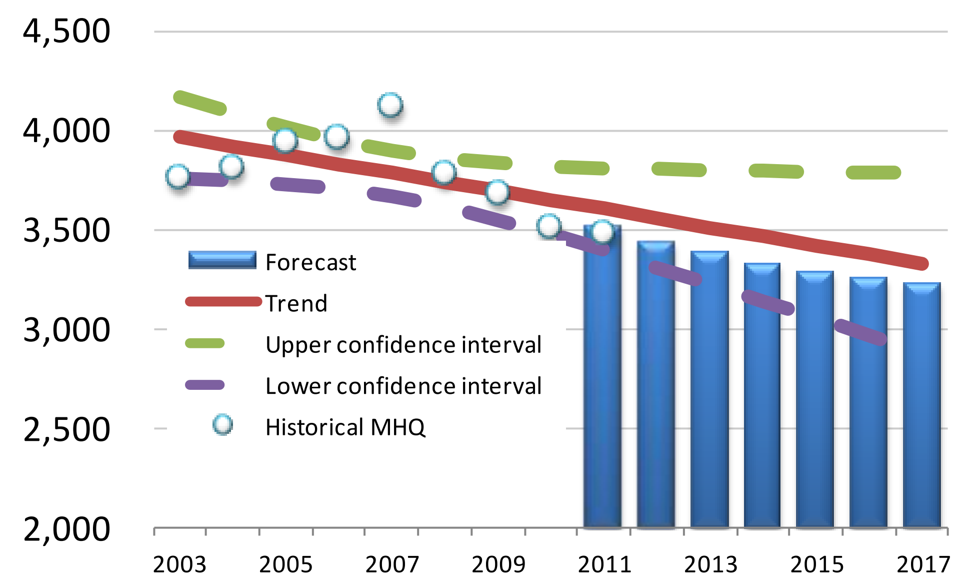
Hence the loss or gain of a demand customer has an impact on aggregate system MHQ requirements that is not necessarily proportional to the corresponding impact on total gas demand. A very low load factor customer such as a peaking electricity generator may have a large MHQ requirement, but may consume only a small quantity of gas over the course of a year.

The impact of changes in MHQ is further complicated by the fact that capacity is not uniform throughout the pipeline network. Hence the cost impact of adding or subtracting a customer with a given MHQ requirement may vary depending on where that requirement is located within the system.

MHQ history and forecast

Historical and forecast MHQ for the Multinet Tariff D customer group as a whole is shown in Figure 12.

Figure 12 **Tariff D Customer Maximum Hourly Quantity (MHQ)—TOTAL**



Data source: (NIEIR, 2007); (NIEIR, 2011); (Multinet, 2012c); ACIL Tasman analysis

As shown, the forecast decline in Tariff D MHQ from around 3,500 GJ/hr at present to 3,250 GJ/hr by 2017 is close to the historical trend and well within the confidence interval around that trend. On this basis, we consider the forecast for Tariff D MHQ is not unreasonable.

6 Conclusions

Having examined the forecasts of customer numbers for Tariffs V and D, we conclude that those forecasts do not appear to be unreasonable.

The projected consumption per customer for Tariff V residential customers falls below the historic trend. However, in light of the recent adoption of a 6 star building energy efficiency policy and the densely populated nature of Multinet's distribution region, together with an expectation of rising gas prices, we do not consider these projections to be unreasonable.

For the commercial customer groups demand forecasts are prepared in line with forecasts of economic activity.

Projected declines in both aggregate consumption and MHQ in the large customer (Tariff D) group are generally in line with projected historical trends and are in our view reasonable, particularly given the depressed state of the manufacturing industry in Victoria which continues to be affected by the strong Australian dollar.

7 Bibliography

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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.

Joel Etchells

Joel Etchells is a Consultant in ACIL Tasman's Brisbane office. Prior to joining ACIL Tasman Joel was employed by the Federal Treasury as a member of the International and Model Development Unit, within the Macroeconomic Modelling Division. In this role he was required to produce and analyse economic modelling results, including results from a variety of models. Joel used CGE models to forecast the impact of alternative climate change mitigation policies on the Australian economy and its major trading partners.

This involved examining the broad macroeconomic impacts of proposed polices, through to sector specific analysis within a CGE framework.

Since joining ACIL Tasman, Joel has used CGE modelling techniques to analyse the economic impact of variety of infrastructure/capital investments and economic policies; ranging from large natural resource development projects, through to an analysis of the impact of geospatial information for the Tasmanian economy. This work involved formulating and subsequently simulating economic shocks associated with a particular scenario as well as the qualitative analysis of the model output. He has also worked on gas access regulation in Victoria.

Joel has an Honours degree in economics from the University of Queensland and is currently completing a Bachelor of Applied Mathematics at the Queensland University of Technology. His honours year encompassed 12 months of postgraduate coursework and research with a major in econometrics, equipping him with the requisite skills to undertake a wide range of economic analysis.

Jeremy Tustin

Jeremy Tustin is a senior consultant in ACIL Tasman's Melbourne office. He has a degree in Economics from the University of Adelaide. His background is in economic regulation, in particular in the energy and water sectors, and competition and consumer protection.

Jeremy's energy background includes significant experience in greenhouse and renewable policy. He represented South Australia on the National Emissions Trading Taskforce, which was the joint taskforce of Australian States and Territories that was first to propose a cap and trade emissions trading system for Australia. In this area, Jeremy and his team developed and interpreted models of the impact an emissions trading scheme would have on South Australia and in developing a mechanism for offsets. Jeremy was also closely involved with the development of South Australia's solar feed-in law.

In relation to energy efficiency, Jeremy developed a reporting methodology for the South Australian Government's target to improve the energy efficiency of its buildings. He also coordinated interdepartmental activity in relation to that target, developed strategies to achieve it and prepared public reports on progress.

In his role with the Department of Treasury and Finance (SA), Jeremy advised the Treasurer on water policy, both rural and urban. He worked with the Office for Water Security to prepare Water for Good, South Australia's water security plan. In particular, Jeremy worked on the early stages of the design of the future economic regulatory regime for the South Australian urban water sector. This included the decision to assign the regulator's role to the Commission. He also worked on a cost benefit analysis of a number of possible means of meeting South Australia's urban water demand.

Jeremy recently conducted (with others) the following projects:

- A review of the electricity sales, customer numbers and maximum demand forecasts submitted by the five Victorian electricity distribution businesses to the AER for the upcoming regulatory period (2011 to 2016).
- A review of the demand forecasts submitted to the Essential Services Commission of South Australia by SA Water
- A review of certain principles underpinning the Essential Services Commission of South Australia's upcoming determination of the standing contract price for gas in South Australia

Dr Leo Yanes

Leo Yanes is a Senior Consultant in ACIL Tasman's Brisbane Office. Dr Yanes has a strong background in quantitative economics, with an emphasis on econometrics, planning, valuation (discounted cash flows, cost-benefit analysis), quantitative risk analysis (Monte Carlo simulation, real options), and general equilibrium analysis.

Dr Yanes' modelling expertise encompasses supply chain modelling (including consolidated valuation using discounted cash flows, tax modelling and quantitative risk analysis), partial and general equilibrium models, input-output analysis and cost-benefit analysis.

Dr Yanes' regulatory and policy experience includes the following economic impact studies:

- Oil & gas sector expansion in Venezuela (PDVSA, Venezuela, 1994-1997)
- Santos GLNG project (Santos/Petronas/Total/KoGas, QLD, 2008)
- Australia-Pacific LNG project (Origin/ConocoPhillips, QLD, 2009)
- Impact to 2070 of the educational aspects of the National Reform Agenda, encompassing early childhood, schools and tertiary (Department of Education, Employment and Workplace Relations, ACT, 2010)

Dr Yanes has several years of econometrics training, most of it received at the London School of Economics (U.K.), were he completed the M.Sc. and Ph.D. in economics. His econometrics expertise includes non-parametric methods (Data Envelopment Analysis or D.E.A.), time series, cross-section and panel data studies, using classical econometrics. His experience in this field includes:

- Forecasting private mining exploration expenditure and mining production for NSW to 2025. These forecasts were based on time series and dynamic panel data econometrics, and required forecasting the Reserve Bank of Australia's Commodity Price Index (for the NSW Geological Survey, 2010)

- A time series (co-integration) analysis of oil sector linkages in Venezuela, spanning 1950-1995 (for PDVSA, the National oil company of Venezuela, 1995)
- Forecasts for the Eastern Australia gas market to 2100. These forecasts were based on market growth projections (for Santos, 2009)

Dr Yanes' commercial/business planning experience includes project appraisal using discounted cash flow and long and short-run forecasting. He has built cash flow models for various oil & gas projects at Santos and PDVSA (the Venezuelan national oil company). Among these, Dr Yanes contributed to the construction of an integrated supply chain model for the Santos GLNG project, which encompasses all aspects of the production process, from a module forecasting gas and water flows through to LNG delivery.

As a lecturer at the School of Economics, University of Queensland (2002-2008), Dr Yanes taught and carried out research in industrial economics (monopoly, oligopoly & antitrust), mathematical economics, game theory, international trade, economic growth and firm structure. His research concentrated on analysing the impact of oligopolies on economic growth and international trade (in dynamic general equilibrium).

B Terms of Reference

The AER is seeking independent advice through written reports on the demand forecasts contained in the access arrangement proposals submitted by the Victorian transmission and distribution businesses to assist it in its decision about whether to approve the access arrangement proposals.

The consultant will be required to provide advice on whether the demand forecasts for each business have been arrived at on a reasonable basis and represent the best forecast for demand in the circumstances.

The review will require the consultant to undertake the following:

(i) a desktop review of demand forecasts and any relevant materials contained in the access arrangement proposals submitted by service providers

(ii) formulate a series of detailed questions on areas where it is considered that further information or clarification is required from the service providers to substantiate the demand forecasts

(iii) analyse all material provided and prepare separate reports for each service provider containing a list of issues identified from the review, and recommendations on whether the demand forecasts for each service provider have been arrived at on a reasonable basis and represent the best forecast for demand in the circumstances.

(iv) provide alternative forecasts of demand for the service providers if the consultant finds that the proposed demand forecasts have not been arrived on a reasonable basis and do not represent the best forecast for demand in the circumstances.

If requested by the AER the consultant will also:

(v) provide further advice on the revised access arrangement proposals from service providers scheduled to be submitted after the release of the AER's draft decisions.

The AER's decisions are subject to merits review by the Australian Competition Tribunal and judicial review by the Federal Court. The consultant's analysis and reports must be produced to a standard that is commensurate with scrutiny at that level. The consultant must describe in its written report the qualitative and/or quantitative methodologies applied in any calculation or formulae, the input values used or assumed, the rationale for any substituted values used or assumptions made and the conclusions reached in sufficient detail to support the AER in meeting its obligations under the relevant clauses of Part 9 of the NGR.

In addition to the draft and final reports, the consultant must provide supporting spreadsheets and analysis to ensure the AER can meet the requirements set out in Rules 59 and 62 of the NGR for the making and publication of decisions.

The consultant will be required to liaise with service providers and AER staff during the course of the access arrangement review. These consultations may include e-mail and telephone communications with AER staff and service providers.

C Establishment of Confidence Intervals around historical trend lines

The following explanation of the construction of confidence intervals is based on information provided in the manual for the Statistica software package.

> The confidence intervals for specific statistics (for example, means or regression lines) provide a range of values around the statistic where the "true" (population) statistic can be expected to be located (with a given level of certainty).
>
> The confidence intervals for the mean give us a range of values around the mean where we expect the "true" (population) mean is located (with a given level of certainty). Confidence intervals can be calculated for any p-level; for example, if the mean in a sample is 23, and the lower and upper limits of the p=.05 confidence interval are 19 and 27 respectively, then we can conclude that there is a 95 per cent probability that the population mean is greater than 19 and lower than 27. If the p-level is reduced to a smaller value, then the interval would become wider thereby increasing the "certainty" of the estimate, and vice versa. The width of the confidence interval depends on the sample size and on the variation of data values. The calculation of confidence intervals is based on the assumption that the variable is normally distributed in the population. This estimate may not be valid if this assumption is not met, unless the sample size is large, say n = 100 or more.

Confidence Intervals (CI's) have the form:

$$Est \ \pm t_{1-\underline{\alpha 2},(n-2)} SE_{est}$$

For the CI around the y-estimate in the linear regression equation, the CI is given by:

$$CI = Est_y \ \pm t_{1-\frac{\alpha}{2},(n-2)} SE_{est}$$

Where $t_{1-\frac{\alpha}{2},(n-2)}$ is the inverse of the Student's t-distribution for confidence level α given that n is the number of data points (so that n-2 is the number of degrees of freedom in the distribution)

and

$$SE_{est} = SE_y \times \sqrt{\frac{1}{n} + \frac{(x_i - \bar{x})^2}{\sum(x_i - \bar{x})^2}}$$