Deloitte Access Economics

Review of ATCO Gas Australia's gas demand forecasts

Economic Regulation Authority

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Deloitte.

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Glossary

AEMO	Australian Energy Market Operator
ATCO	ATCO Gas Australia
BD	Business Development
CAGR	Cumulative/Compound Average Growth Rate
CORE	Core Energy Group
DAE	Deloitte Access Economics
EDD	Effective Degree Days
FY	Financial Year
GDS	Gas Distribution System
GJ	Gigajoules
GSP	Gross State Product
HDD	Heating Degree Days
WA	Western Australia

Executive Summary

Deloitte Access Economics has been engaged by the Economic Regulation Authority (the Authority) to perform a review of ATCO Gas Australia's (ATCO) gas demand forecast for the Mid-West and South-West Gas Distribution System (GDS) and in particular whether there are any areas of material error and, if so, propose an approach that would remedy the error. The forecasts were largely prepared by the Core Energy Group (Core).

In undertaking this work we were required to evaluate:

- ATCO's proposed methodology to forecast GDS demand, including key drivers, assumptions and trends behind customer numbers and consumption forecasts in total and by tariff class, in light of ATCO's historical trends and trends in natural gas consumption in Western Australia.
    - Also, specifically assessing ATCO's proposed methodology to forecast GDS demand in greenfield areas that ATCO has proposed to expand into, including key drivers, assumptions and trends behind customer numbers and consumption forecasts in total and by tariff class.
- ATCO's proposed methodology to forecast additional GDS demand in response to the business development and marketing campaign that ATCO has proposed, including key drivers, assumptions and trends behind customer numbers and consumption forecasts in total and by tariff class.

Reasonableness of the forecasts and points of material error

The lack of consideration of the impact of economic activity (through its omission from the forecasting equations) is what we consider to be a point of material error. Economic activity has previously been found to have a statistically significant impact on gas demand and, in light of lower economic growth forecasts for Western Australia over the review period compared with history, is expected to have an impact on gas demand across the Mid-West and South-West GDS. As such, we consider the forecasts to be an overestimate.

Table i presents an overview of our review of the key assumptions underlying the forecasts and our recommendations for amendments/modifications.

Table i: Review of assumptions and recommendations

Assumption	Review and recommendations
Weather normalis-ation	The approach adopted is consistent with industry standards and has been transparently applied.
Economic conditions	Economic conditions have not been incorporated into the modelling of future gas demand. Indeed there is no mention of the potential for economic conditions to have an impact on demand, despite Core incorporating and/or discussing this in other gas forecasts (see for example Core's 2012 gas demand forecast prepared for Envestra's Victorian and Albury networks). We consider this a material error. Given the strong correlation of Gross State Product (GSP) with A2 demand per connection, in particular, we would expect economic

Assumption	Review and recommendations
	conditions to be statistically significantly related to gas demand in WA. With WA's GSP expected to decline over the forecast period, this could result in an overestimate of gas demand. *It is our recommendation that the forecasts be re-done to reflect the responsiveness of gas demand to declining economic conditions over the forecast period.*
Prices	We agree with Core's estimate of wholesale gas price forecast and the price elasticity factors. We note that Core has not adjusted the retail price of gas for movements in the price of distribution – as distribution prices are projected to remain flat in real terms over the forecast period. In the absence of estimates for own-price elasticity in the Western Australian context we consider it reasonable to apply estimates from the eastern states. We note that Core has not applied a cross price elasticity (electricity) factor in their analysis (in contrast to their work for Jemena's NSW gas demand forecasts). Depending upon the relative price movements between gas and electricity – this could impact gas demand. We note, however, that there is currently no data on cross-price elasticity in the Australian context; caution should therefore be taken when applying a cross-price elasticity. We consider it reasonable for Core to not include a cross-price elasticity with sufficient justification for its omission in demand forecasts for ATCO.
Marketing and BD	Overall, the approach to estimating the impact of marketing programs is not transparent and, in some cases, is overly simplistic. While we have insufficient evidence to conclude that the underlying assumptions are incorrect, we note that the programs are expected to increase total consumption across affected tariffs by 2.2% by 2019 (increasing to 7.5% for the A2 Tariff) (i.e. not insignificant). *It is our recommendation that ATCO undertake a more detailed analysis of the potential take-up rates of the different rebates on offer, rather than assuming all will be fully subscribed (unless evidence can be provided to the contrary) or that the experiences of a single previous program will apply to these new programs. This may include undertaking a survey of potential customers to understand the level of unmet demand for gas in the target areas and the potential impact marketing and BD activities will have on consumers' decisions to install gas.* *Furthermore, without further explanation from ATCO, we recommend removing the assumption that the existing customer HWS and appliance incentives increase average consumption across all existing B3 connections.* • Infill: adopting a basic modification of the take-up rate of a previous infill project is simplistic and not transparent. Similarly, assuming new infill customers adopt the same consumption profile as existing customers – without justification – is simplistic, but is not expected to have a material impact on the forecasts. However, without evidence to contradict these assumptions we are not in a position to call them material errors. • Infill HWS: as with Infill, the expected 15% take-up rate is largely unsubstantiated and, in the absence of a sensitivity analysis, not transparent. The expected annual consumption is reasonable. •Existing customer HWS: as with GPAC and generation, the expected number of new customers each year due to the existing customer HWS program is based on the maximum number of rebates ATCO will provide each year. This makes the unsubstantiated assumption that ATCO's rebates are fully subscribed. The expected annual consumption is reasonable. •Appliance: the assumptions underlying the appliance program appear reasonable. Care needs to be taken to ensure the appliance program does not double count greenfield customers. Clarification should be given on the target markets of the two incentive programs to ensure that they are not the same (and therefore subject to double counting). • GPAC: as explained under existing customer HWS, the basis for the forecast additional customers is the maximum number of rebates on offer. No explanation has been given as

Assumption	Review and recommendations
	to why the market is expected to take up all rebates on offer. The expected annual consumption of new customers is reasonable. • Generation: as explained under existing customer HWS and GPAC, the additional customers gained from the generation program is based on the number of rebates on offer. The generation program is expected to increase consumption in the A2 Tariff by 7.5% by 2019, representing a material impact on the forecast results. Explanation should be provided as to why ATCO expects the value of the rebate to be sufficient to increase demand by this amount. • Approach to incorporating marketing and business development programs for the B3 tariff: ATCO have assumed that the existing customer HWS and appliance programs will increase consumption per year for all B3 connections. No justification has been provided as to why ATCO expects these two initiatives to increase all residential consumption and not just those who subscribe to the specific rebates.
Greenfield	The majority of new connections over the forecast period will come from greenfield sites (with just a small number of infill connections arising from marketing initiatives). In its Response to the Draft Decision, ATCO revised its approach to forecasting consumption per connection for B3 greenfield customers, correctly adjusting for the expected lower, on average, consumption profile of new builds (due to 6 star energy efficiency building standards). In contrast, new B2 connections have been assumed to adopt the same consumption profile as existing connections (which is higher over the forecast period due to the shift of small customers into AL10 connections). Given that these new B2 connections are also expected to be new builds, we would reasonably expect new commercial connections to have, on average, a lower consumption profile than existing connections. *It is our recommendation that ATCO provide a more detailed explanation as to why new B2 connections in greenfield areas are not expected to have a lower consumption profile than existing connections. This could be ascertained through discussions with commercial builders on the demand for gas connections in new commercial developments. Further, no reference has been made to the potential impact of a slowdown in economic activity on the expected growth in new commercial connections.* (See the comments on B3 and B2 connections for a review/recommendation on the assumptions underpinning greenfield connections for these two tariffs.)
B3	The average of the annual percentage change in B3 consumption per connection between 2011 and 2014 – adjusted for the impact of price – was used as the basis of the residential B3 forecasts. The trend analysis was restricted to three years due to what was described by ATCO as a "fundamental change in B3 demand over recent years", further explained as due to the "large retail tariff price increases in July 2009 and April 2010, which cumulatively increased residential tariffs by 30% in 10 months. This resulted in a step change in average residential usage which did not normalise until 2011." This is an important assumption, and results in a 2GJ per connection difference in annual consumption by 2019. Upon review of the historical price and consumption series, Deloitte Access Economics agrees that there is a structural break in the data, whereby consumption per connection between 2009 and 2011 is substantially different to consumption per connection pre-2009 and post-2011. Therefore, we consider this approach reasonable. *The omission of statistical analysis of the potential for changing economic circumstances to impact on WA residential gas demand would be considered a material error, however, with the restriction of the analysis to 2011 to 2014 there are insufficient data points to test this relationship.* The number of new Tariff B3 connections to new houses is based on a forecast of the number of new homes completed in WA and the proportion of new homes connecting to

Assumption	Review and recommendations
	gas. New homes completed is assumed to be the forecast dwelling starts for a year, less/plus accumulation/completion of backlog. For 2013-14, the forecast dwelling starts is assumed to be the Housing Industry Association (HIA)'s forecast. After 2013-14, the forecast dwelling starts is assumed to be the mid-point between the HIA's forecast of dwelling starts and the HIFG's forecast of dwelling commencements. The number of new Tariff B3 connections to new houses is forecast to be 75% of forecast new homes completed in WA in 2015, which is the historical average, declining to 72% thereafter to reflect the view that the gas supply market will be exposed to increasing competitive pressures. On balance, we consider this forecast to be reasonable. *However, for the new homes forecast, rather than basing them on an estimate of dwelling starts and converting this to dwelling completions through a 'backlog' factor, we recommend using independent forecasts of dwelling completions (for example, as prepared by BIS Shrapnel).* The forecast rate of disconnection is equal to the historical average from 2008 to 2014. It is possible that factors such as possible stepped price rises over the 2015 to 2019 period, or changes in the economy, or payment and hardship policies, may impact on the disconnection rate. However, it seems that it would be quite difficult to identify particular factors impacting the disconnection rate without significance further research and modelling, and the benefits of doing so would be unlikely to outweigh the costs. For example it is difficult to discern a historical relationship between the disconnection rate and prices for ATCO. Without undertaking significant further work, we consider that the 0.37% forecast disconnection rate is not unreasonable.
B2 and B1	The key omission from the forecasting approach used for commercial consumption per connection is the potential for declining economic conditions to impact on commercial gas consumption over the forecast period – we would expect this to have a statistically significant impact on gas demand in WA. *We therefore recommend econometrically testing for this relationship and, if necessary, re-doing the forecasts to account for declining GSP.* The connection numbers for B1 is forecast using the average growth rate from 2007 to 2014. Use of the average historical growth of connection seems reasonable given that the time series is extremely stable. For B2, we note that the growth rate is assumed to increase at a non-linear rate, which is different from the approach used for Tariffs A1, A2 and B1. ATCO has advised that "for each individual tariff class Core has estimated a function that best fits historic data as a predictor of future connection rates - a regression." We note that, over the forecast period of five years, the use of a linear versus quadratic has only a minor impact on the forecasts. The impact of the functional form would not be expected to be seen well past the end of the forecast period. This, combined with ATCO's explanation gives us reason to conclude this is not a source of material error.
A2	As with the forecasts for commercial consumption per connection, we consider the omission of economic conditions from the forecast equation to be a material error. *We therefore recommend econometrically testing for this relationship and, if necessary, re-doing the forecasts to account for declining GSP.* The connection numbers for A1 and A2 is forecast using the average growth rate from 2007 to 2014. Use of the average historical growth of connections over the period 2007 to 2014 seems reasonable when forecasting connections for the A1 Tariff, because the time series is extremely stable. For the A2 tariff however, the spike in connections in 2011 is followed by a decrease in 2013 and 2014. The key issue is whether only the recent historical average should be used or whether it is reasonable to include the impact of the spike. We would expect a model that includes economic conditions to address much of this issue.

Assumption	Review and recommendations
A1	Given the size and concentration of the A1 Tariff we question Core's approach to forecasting consumption per connection for this tariff. That is, forecasts are usually based on a survey of large customers, however, in this instance Core have utilised a linear trend through the historical data as the basis of the forecasts. *As the A1 Tariff is ATCO's largest tariff we recommend adopting a more tailored approach to forecasting A1 consumption. To this end, a survey would provide ATCO with the necessary information to better understand the planned future demand of its largest customers. This is particularly relevant given the expected slowdown in economic growth in WA over the forecast period.*

Where italics represents a specific recommendation.

Deloitte Access Economics

1 Introduction

Deloitte Access Economics was commissioned to provide advice to assist the Authority with its assessment of the Mid-West and South-West Gas Distribution System (GDS) demand forecast that ATCO Gas Australia (ATCO) submitted as part of its Access Arrangement revision proposal and the response to the Draft Decision on the GDS Access Arrangement.

In undertaking this work we were required to evaluate:

- ATCO's proposed methodology to forecast GDS demand, including key drivers, assumptions and trends behind customer numbers and consumption forecasts in total and by tariff class, in light of ATCO's historical trends and trends in natural gas consumption in Western Australia.
    - Also, specifically assessing ATCO's proposed methodology to forecast GDS demand in greenfield areas that ATCO has proposed to expand into, including key drivers, assumptions and trends behind customer numbers and consumption forecasts in total and by tariff class.
- ATCO's proposed methodology to forecast additional GDS demand in response to the business development and marketing campaign that ATCO has proposed, including key drivers, assumptions and trends behind customer numbers and consumption forecasts in total and by tariff class.

1.1 The Access Arrangement submission

ATCO Gas Australia (ATCO) has submitted its proposed gas demand forecasts to the Economic Regulation Authority (the Authority) for its Gas Access Arrangement Review for the Mid-West and South-West Gas Distribution System (for the calendar years 2014 to 2019).

The initial forecasts were developed in January 2014. In response to the Authority's Draft Decision, Core and ATCO produced a revised set of forecasts, dated 27 November 2014.

These revised forecasts incorporated updated demand data (supplied by ATCO) and revised modelling of the impact of marketing on demand and connections (supplied by ATCO). Changes were also made to the modelling to reflect the repeal of the carbon tax.

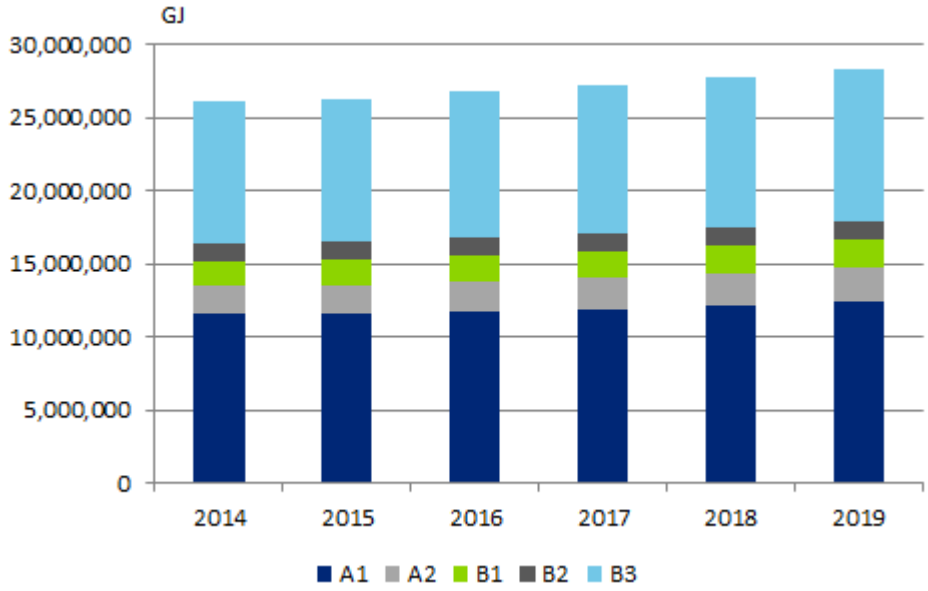
The approach to forecasting B3 residential consumption per customer was also revised – rather than using the full 2007 to 2013 historical series as the basis of the forecasts, 2011 to 2013 was selected due to a "fundamental change" in the historical series in 2009 and 2010 (discussed in more detail in section 3.1).

The figures quoted in this report are based on the revised forecasts (November 2014), as are the comments on the modelling approaches adopted, unless otherwise specified.

1.2 ATCO's forecasts

Total demand for gas across ATCO's network is forecast to increase at an average annual rate of 1.6% over the review period (see Chart 1.1 and Table 1.1). The greatest GJ contribution to this growth is expected to come from the two largest Tariff classes – A1 (779,291 GJ over 5 years) and B3 (745,565 GJ over 5 years) – while the fastest rate of growth will be experienced in the A2 Tariff class (4.6% per annum).

Chart 1.1: Gas demand forecasts



Source: Core

Table 1.1: Gas demand forecasts

	Tariff	2014*	2015	2016	2017	2018	2019	CAGR
A1	Industrial	11,571,022	11,572,769	11,720,093	11,883,212	12,105,157	12,350,313	1.3%
A2	Industrial	1,914,907	1,982,745	2,092,394	2,184,157	2,288,724	2,400,155	4.6%
B1	Commercial	1,646,743	1,671,627	1,706,345	1,754,091	1,808,694	1,866,278	2.5%
B2	Commercial	1,251,134	1,249,783	1,242,812	1,242,746	1,244,572	1,245,362	-0.1%
B3	Residential	9,785,209	9,858,722	10,007,804	10,188,283	10,372,812	10,530,472	1.5%
Total		**26,169,015**	**26,335,646**	**26,769,449**	**27,252,489**	**27,819,960**	**28,392,579**	**1.6%**

* History (estimated)

Source: Core

2 Approach and assumptions

This section identifies and discusses some of the approaches and key assumptions used by Core in preparing gas demand forecasts for ATCO's distribution network.

2.1 Approach

In June 2014 ACIL Allen Consulting (ACIL Allen) prepared a report for the Australian Energy Market Operator (AEMO) proposing an approach to forecasting gas consumption in eastern and south eastern Australia.[1] While the approach was tailored for this specific purpose, Deloitte Access Economics believes that it provides some relevant guidelines for preparing demand forecasts more generally, including in Western Australia (WA). Furthermore, this report provides – what we are aware as – the only set of recommendations on how to undertake robust Australian gas demand forecasting. The recommendations are consistent with what Deloitte Access Economics considers best practice in this area.

The methodology proposed by ACIL Allen to develop demand forecasts is based on an econometric approach for residential, commercial and small industrial consumers, and a survey approach for large industrial consumers.

Core's approach to forecasting commercial consumption is broadly consistent with ACIL Allen's recommendations in that it uses a simple trend-based regression. However, Core's approach to forecasting residential and industrial consumption is not consistent with ACIL Allen's recommendations. In particular:

- Residential consumption forecasts are based on the average annual change between 2011 and 2014 (rather than the historical trend). However, after questioning this approach, ATCO clarified that due to significant price changes in 2009 and 2010 they did not consider a trend approach appropriate. Deloitte Access Economics consider this a reasonable conclusion.
- Industrial consumption forecasts are based on a linear trend through the historical data, and not a survey of large customers. As ACIL Allen explains, "the issues involved in forecasting gas consumption by 'large' customers are different from those involved in forecasting for other customers" (p. 44). Due to the different characteristics of large customers, and ultimately their drivers of consumption, it is not appropriate to expect an econometric regression to adequately capture this heterogeneity.

  The value of the survey approach is that the forecasts incorporate the customers' expected future consumption, rather than an uninformed extrapolation of the historical trend. No explanation was provided for the utilisation of this approach by Core and ATCO. We note other industrial demand forecasts produced by Core for the east coast market have been based on surveys. Unless ATCO can demonstrate that the approach adopted (an uninformed linear trend) reflects the expected future consumption of the large industrial customers (with no expected closures or reductions in consumption) then we would consider this a material error, particularly given the lack of

[1] ACIL Allen Report to AEMO, Gas Consumption Forecasting – A Methodology, 24 June 2014.

acknowledgement of the potential impact of lower economic growth over the forecast period.

Other points of similarity (and difference include):

- ACIL Allen notes that use of a weather factor (EDD or HDD) is important. Core has utilised an EDD approach which is the preferred approach as it incorporates more than just temperature into the analysis.
- ACIL Allen recommends developing forecasts for different market segments (residential, industrial, etc). Core's segments are based on ATCO's tariff structure.
- ACIL Allen notes that a price elasticity of demand of -0.3 was accepted by the AER in 2012 (and has been proposed for residential customers by Core) but there is some possibility that using this value could double count the impact of price increases – if customers are changing their baseline consumption patterns due to price changes (e.g. by installing more energy efficient appliances and thereby reducing average consumption) then the price elasticity should be reduced to reflect the modified behavioural response. However, over the short time horizon of the forecasts (and the slow moving nature of behavioural change), and Core's model not including behavioural change variables such as the uptake of energy efficient appliances for existing customers, we do not expect this to have a material impact on the forecasts.
- ACIL Allen suggests that economic activity (measured by Gross State Product (GSP)) and population are typically the most relevant drivers of gas demand. Core has not explicitly included economic activity in its forecast.

The ACIL Allen methodology raises the possibility of using post-modelling adjustments where there is a reason to believe that historic relationships are likely to change in future. ACIL Allen notes that two key candidates for post-model adjustment are the shift from gas to electricity for space heating, and increases in the price of gas, in particular relative to the price of electricity, although in both cases ACIL Allen cautions that post-modelling amendments may not be the theoretically best way to approach the task. Core has not explored the impact of gas to electricity switching.

The key issues which we consider as having a (potential or actual) material impact on the forecasts are discussed further in subsequent sections. Our main concerns around transparency are with inputs supplied to Core's modelling, particularly inputs on marketing and business development impacts.

2.2 Weather normalisation

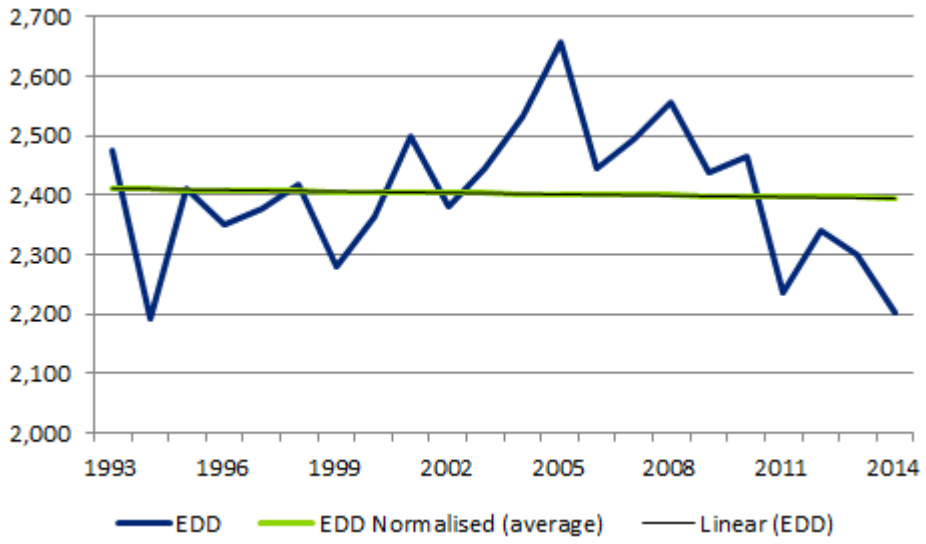
Consistent with industry standards, Core first develops a weather normalised historical consumption series for each tariff. The purpose of normalising historical consumption is to remove the effect of fluctuations in weather from the consumption trend, ensuring that the forecasts are, in effect, weather neutral.

The approach Core adopts to normalise consumption is the Effective Degree Day (EDD). In contrast to the more basic measure of Heating Degree Days (HDD), EDD takes into consideration other weather factors expected to influence gas consumption, including wind velocity, sunshine and seasonal factors. Implementation of the EDD approach is based on a regression analysis, as developed by the AEMO for the Victorian gas industry.

The EDD regression analysis reveals a higher 'threshold' temperature at which ATCO's customers (on average) begin using gas heating compared with their Victorian counterparts – 22.4 degrees versus 18 degrees, respectively. Core's explanation that WA's relatively hotter climate may mean that ATCO's customers are less accustomed to cooler temperatures (and therefore turn on the heating at a higher temperature) is reasonable.

Core's approach to utilising the constructed EDD series to normalise historical consumption is based on the average of EDD over history (1993 to 2014) rather than the trend in EDD (which is generally the preferred approach). As Chart 2.1 illustrates however, the EDD normalised series based on the average (the green line) is not statistically significantly different from the trend line (the black line). So although our preference would be to use the trend line, the use of the average EDD to normalise consumption is reasonable.

Chart 2.1: EDD series



Source: Core

Overall, the approach adopted by Core to normalise historical consumption for weather is both reasonable and transparent.

2.3 Economic conditions as a driver of gas demand

Core has not explicitly included an assessment of the impact of economic conditions on gas demand (for residential, commercial and industrial). Indeed there was no mention of economic conditions in the forecasting sections of Core's report. Therefore, and when combined with the points below, we would consider this a material error.

In its 2012 gas demand forecast prepared for Envestra's Victorian and Albury networks[2] Core included an economic activity parameter in its forecasts and, as noted above, ACIL

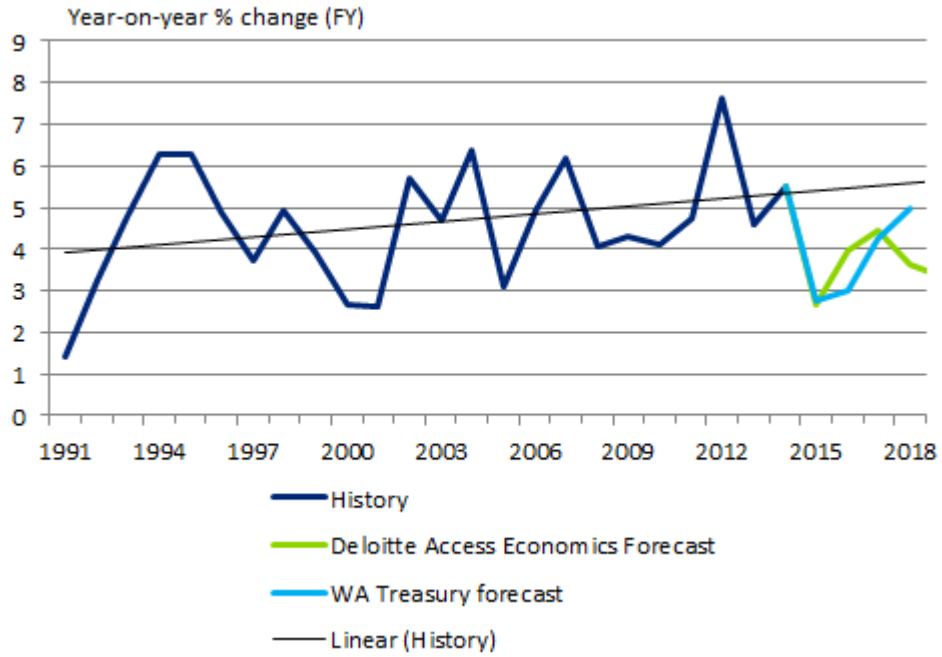
[2] Core Energy, Demand, Energy and Customer Forecasts, Envestra Limited – Gas Access Arrangement Review Victoria and Albury Networks (2013 to 2017), March 2012

Allen has identified that GSP is one of the two most relevant drivers of gas consumption. Indeed, in Core's March 2012 gas demand forecast for Envestra in Victoria, GSP was explicitly included in the forecasts, noting that *Core has identified GSP as being a primary driver of future commercial and industrial gas demand. As such projections of GSP are used as a basis for projected demand per connection.* [3]

Furthermore, Core acknowledged that economic activity had the potential to impact on gas demand across Jemena's NSW network. In this case, however, Core did not include GSP as an explanatory variable, noting that although it is possible some statistical correlation may exist between gas usage and GSP in the current period, many other factors – the decline of manufacturing, changing energy policies, more efficient houses, the installation of solar panels, etc. – were logically likely to have a more material impact. This explanation was not accepted by the Australian Energy Regulator (AER) and replacement forecasts incorporating economic activity were subsequently developed by Deloitte Access Economics.

As Chart 2.2 illustrates, economic activity in WA over the next five years is expected to be below trend, with both Deloitte Access Economics and the WA Treasury forecasting this outcome. As such, Core's implicit assumption that economic activity is not expected to deviate from trend over the forecast period (this is due to the nature of time-series modelling, whereby forecasts are driven by historical trends) is not reasonable.

Chart 2.2: Western Australian Gross State Product



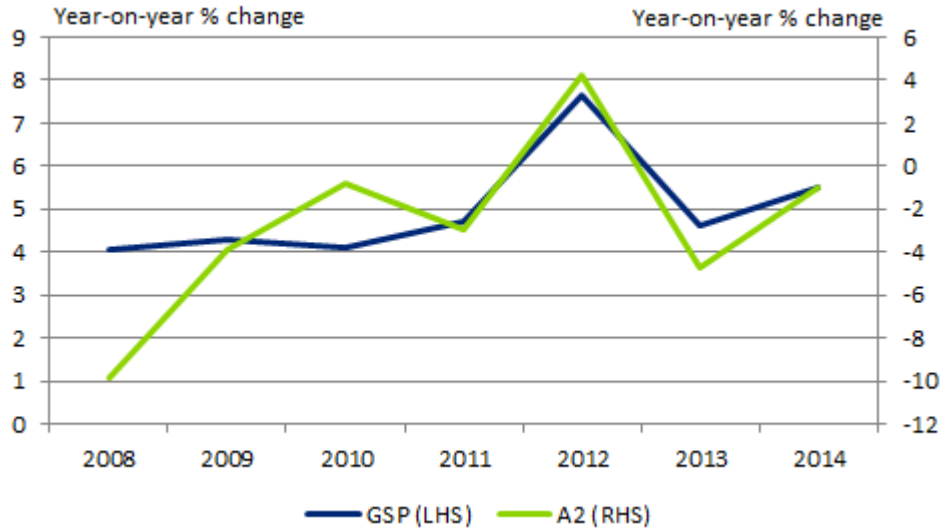
Source: ABS, Deloitte Access Economics, WA Government Budget Paper 3 (2014-15)

Chart 2.3 presents a comparison of WA's GSP growth and Tariff A2 (weather normalised) demand per connection growth between 2008 and 2014. While correlation does not equal causation, the clearly visible relationship between the two series highlights the importance

[3] Ibid., p. 33.

of including economic activity in forecasts of gas consumption, particularly industrial and commercial consumption.[4] We would reasonably expect an econometric analysis of the relationship between Tariff A2 demand per connection and economic activity to reveal a statistically significant relationship.

Chart 2.3: Comparison of GSP and A2 demand per connection growth



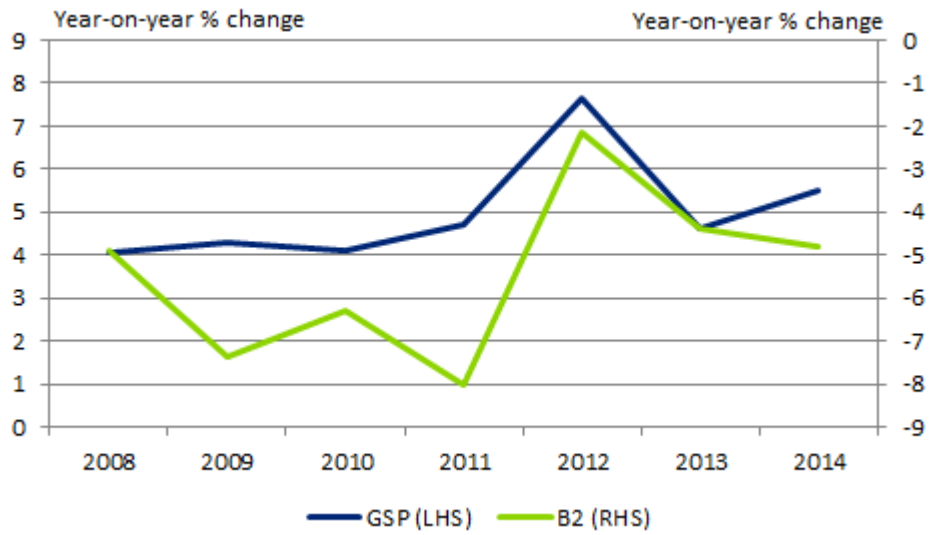
Note, GSP is in financial years while demand is in calendar years.

Source: ABS, Core (ATCO data)

Similarly, Chart 2.4 presents the comparison of GSP growth and Tariff B2 (weather normalised) demand per connection growth between 2008 and 2014. The strong increase in GSP growth between 2011 and 2012 and the subsequent moderation in 2013 are also reflected in trends in B3 demand per connection.

[4] Changes in household income are also expected to have an impact on *residential* gas consumption; however, GSP is usually used as a proxy due to the lack of regular data releases on household income. In this case, however, there are insufficient data points in the residential gas demand series to test this relationship.

Chart 2.4: Comparison of GSP and B2 demand per connection growth



Note, GSP is in financial years while demand is in calendar years.

Source: ABS, Core (ATCO data)

Inclusion of GSP and/or some measure of average household income is considered standard practice in energy demand forecasting and as the charts above demonstrate, exclusion of this variable from the forecasting equation may be producing inconsistent estimates. We would reasonably expect economic conditions to be a statistically significant driver of gas demand in WA.

As a minimum, economic conditions should be empirically tested as potential driver of gas consumption. We therefore consider it a material error that the forecasting methodology does not incorporate GSP (or a relevant proxy with high correlation) as an independent variable. Its omission is likely to result in an overestimate of future demand for gas in WA.

2.4 Prices

In assessing the impact of retail prices movements on customer demand, Core have first projected the changes in retail price for each tariff class and then adjusted demand (for each tariff class) based on a long term price elasticity factor.

In projecting the changes in retail prices for each tariff class, Core segments the retail price into its three main components being distribution, retail and production and transmission. The proportion of the three price components vary across tariff classes reflecting the differences in the cost to serve (assumed to be correct).[5]

In developing retail price forecasts for each tariff class, Core assume that there is no change in the price of distribution and retail components, and consequently they focuses on forecasting the price of production and transmission. Finally core adjusts retail prices for the repeal of the carbon tax.

[5] Based on market knowledge – we have not checked these proportions specifically for gas customers in ATCO's region.

2.4.1 Forecasting production and transmission prices

Production and transmission prices comprise of wholesale gas price and the price of gas transmission.

Core first forecast the market price of wholesale gas and then assumes a transition to market prices based on the wholesale gas contracts of Synergy and Alinta, the two main retailers of gas in WA.

Core forecast the market price of wholesale gas to be $7.5 per GJ based on literature review, linkages to the LNG netback prices and the general supply and demand for gas in WA.

Our review suggests that the most important factor in setting the wholesale price of gas in WA (for new contracts) would be the linkages to LNG netback prices given the dominance of LNG suppliers and the current domestic gas reservation policies.

LNG prices in the Pacific Basin are set with reference to Brent. With the current medium term price forecasts of Brent between USD 75 to USD 80 per barrel, LNG Netback prices are estimated to be $7 to $8 per GJ (assuming exchange rates of between 0.75 to 0.8 AUD to USD).

On that basis we agree that $7.50 per GJ represents a good estimate for wholesale gas market price over the forecasting period.

Core has assumed that the legacy gas contracts of the two main retailers, Synergy and Alinta are repriced to reflect the market price of wholesale gas as follows:

- Alinta's purchase most of its gas from North West Shelf (NWS). The contract has a price review in 2014 that would result in increasing the legacy price to $7.50 per GJ.
- Synergy's wholesale gas contract with NWS has a price review in 2015 that results in a price of $7.50 per GJ. In addition Synergy starts purchasing gas from Gorgon that is priced at market.

Based on our market knowledge and research, we agree with Core that legacy contract prices will reflect market prices upon price reviews.

2.4.2 Adjusting for the carbon price

Core correctly adjusts for the reduction in retail gas prices as a result of the repeal of the carbon tax.

2.4.3 Price elasticity of demand

The price elasticity factors as applied by Core are in line with those applied by the AER and on that basis we accept Core's analysis.

We note that Core has not applied a cross price elasticity (electricity) factor in their analysis (in contrast to their work for Jemena's NSW gas demand forecasts). In WA, electricity prices for residential customers are subsidised and prices are expected to increase as government

unwinds these subsidies. This could make gas more attractive and potentially have an upward impact on gas consumption in the residential segment.

2.4.4 Conclusion

We agree with Core's estimate of wholesale gas price forecast and the price elasticity factors. We note that Core has not adjusted the retail price of gas for movements in the price of distribution. Core has assumed that distribution prices are projected to remain flat in real terms over the forecast period. This is contrary to ATCO's model that projects real price increases in distribution prices.

In response to our questioning of this assumption, ATCO replied in an email dated 16/02/2015 that "given the current Western Australian Government regulation of retail gas prices for small users there is no direct correlation between distribution tariff changes and retail gas prices. As a result the CORE model has not included network price changes and has instead incorporated the lagged impacts of changes to wholesale gas prices. " With this further information we accept Core's assumption of no price changes over the forecast period.

2.4.5 Annualising mid-year price changes

We note that Core has utilised annualised mid-year price changes for both residential and non-residential tariffs as the basis of the price series used in the modelling. The approach adopted to transform mid-year changes into calendar year changes is based on the number of months in a year that fall under the previous year's price change and the number of months that fall under the current year's price change (where applicable). For example, if an Y% price change occurred on 30 June 2009 and a Z% price change occurred on 30 June 2010, then the 2010 calendar year price change is calculated as [(Y% x 6/12) + (Z% x 6/12)].

While the approach adopted is simple, it is and broadly consistent with our expectations on how this would be conducted. However, a key limitation of this approach is that price impacts are likely to be larger than in reality, with price impacts expected to moderate actual demand in the quarters following the price increase and not the year (and in some cases, years) following.

After reviewing the calculations underlying the annualisation of mid-year price changes we note that there appears to be some calculation errors in the years post-2010. Table 2.1 presents the revised price series, while Table 2.2 presents the revised consumption forecasts based on the revised price series.

Table 2.1: Revised calendar year price change series

	2010	2011	2012	2013
Core residential	15.9%	5.9%	11.4%	6.5%
Revised residential	10.6%	8.2%	8.9%	7.2%
Core non-residential	8.5%	5.8%	11.4%	6.5%
Revised non-residential	6.7%	8.0%	8.9%	7.2%

Source: Deloitte Access Economics calculations based on Core's (Excel) model

Table 2.2: Revised consumption forecasts

	Tariff	2015	2016	2017	2018	2019	CAGR
B1	Commercial	1,669,800	1,702,873	1,748,698	1,801,393	1,856,960	2.4%
B2	Commercial	1,248,387	1,240,230	1,238,849	1,239,457	1,239,041	-0.2%
B3	Residential	9,842,088	9,972,849	10,133,202	10,297,701	10,434,871	1.3%

Source: Deloitte Access Economics calculations using Core's (Excel) model

Note that following questioning of these calculations ATCO acknowledged the calculation error and modified Core's Excel model accordingly.

2.5 Marketing and business development

Note that Deloitte's scope only covers an assessment of the marketing and business development demand assumptions and how this impacts on the forecasts of aggregate demand, and not the NPV implications.

ATCO have submitted the calculations underlying six marketing and business development initiatives they intend to roll out over the forecast period. The majority of assumptions underlying the estimates of additional connections and consumption per connection were not adequately explained in the original documentation. A series of clarifying questions were sent to ATCO to gain further explanation of the assumptions underlying the marketing calculations and the methodology used to incorporate the impact of the marketing initiatives into the demand forecasts.

As Table 2.3 outlines, ATCO's documentation provided the number of additional connections expected from each initiative and the consumption profile expected of each new customer. Following further questioning, ATCO explained the methodology underlying these figures.

Infill:

- New customers: Email from ATCO dated 12/02/15 "The uptake rate for the NPV assessment is 10% of households receiving the mail out based on the learning's from an AGA earlier incentive program, the Capricorn Estate Infill Project. The Capricorn Estate Infill Project achieved a 32% rate with a rebate value of $1,000 per connection. The key assumption was that by entering an older and established suburb with a significantly lower incentive there was likely to be fewer of people acting on the incentive offer, than those who are in new suburbs presented with a higher dollar value rebate offer. The reduced uptake rate was assumed to be proportionate to the reduction in the value of the incentive. It was therefore estimated that approx 10% of those who received information about the incentive program would take up the offer."
    - Deloitte Access Economics' response: there is a dearth of publicly available analyses exploring the take-up rates of mail-out offers such as this. We therefore do not have sufficient evidence to conclude that ATCO's assumptions are materially incorrect. In saying that, however, ATCO's reliance on a single estate – with no mention of the comparability of the Capricorn estate with future targeted estates beyond the age of the estate – is rudimentary and not transparent.

- Volumes per customer per year: new customers from infill areas have been assumed to adopt the same forecast consumption profile as existing customers, modified for the effect of 6 star building standards. Note that ATCO acknowledged an error in their calculations whereby the impact of 6 star buildings has been double counted. ATCO notes that "the impact of this overstatement is small and equates to less than $0.4 impact per customer. As a result of overstating the impact of the 6-Star Building Standard on B3 volumes, the NPV outcome has been understated."
    - Deloitte Access Economics' response: while we would broadly expect infill customers' consumption to resemble forecast trends in existing customers' consumption, this approach does not account for potential differences between the two customer bases. Further analysis could have been done on the average consumption of recent connections versus older connections. We do not, however, to expect this to have a material impact on the forecasts.

HWS Infill

- New customers: Email from ATCO dated 13/02/15 "As AGA has outlined in its response to the [Infill question] the uptake rate of 15% of households receiving information in regards to an incentive program is based primarily on the learning form the pilot program, the Capricorn Estate Infill Project. This assumption has also been supported in a recently conducted survey Domestic Gas Market: Review of Marketing Strategies which was conducted in November 2014 which was supplied to the ERA in January 2015. The HWS infill rebate offered a larger rebate than the new customer infill rebate so a larger uptake was assumed."
    - Deloitte Access Economics' response: refer to Infill, above.
- Volumes per customer per year: HWS Infill customers are assumed to have an annual consumption profile consistent with the national average (based on 4 occupants) consumption from a 5 star hot water system.
    - Deloitte Access Economics' response: while it is reasonable to adopt the expected consumption profile of the appliance (in this case, the hot water system), we would recommend further exploration of the consumption of average Western Australian households (i.e. with fewer than 4 residents per household and more moderate temperatures than, say, Victorian) and how this compares with the average across Australia..[6]

Existing customer HWS

- New customers: this is based on the annual rebate limit of the program; that is, the maximum number of rebates available within the program's budget.
    - Deloitte Access Economics' response: no justification has been given as to why ATCO expects this program (and indeed all its proposed programs) to be fully subscribed each year. While we have no evidence to contradict this assumption, for the sake of transparency and robustness ATCO should refer to experiences from previous marketing initiatives to justify this assumption.

[6] Elgas reports that an 'average' 5 star hot water system has annual energy consumption of 20.8GJ. See www.elgas.com.au/blog/450-star-ratings-for-gas-hot-water-heater-systems

- Volumes per customer per year: HWS Infill customers are assumed to have an annual consumption profile consistent with the national average (based on 4 occupants) consumption from a 5 star hot water system.
    - Deloitte Access Economics' response: refer to HWS Infill, above.

Appliance

- New customers: email from ATCO dated 13/02/15 "AGA has determined the penetration rates based on analysis of the potential size of the market and an assessment of the likelihood of incentive uptake.

  AGA has analysed 2011/12 Western Australian building approvals data from the HIA to determine the potential size of the market. This analysis involved segmentation of the building approval data according to the new build value of the yet to be constructed home. In order to determine the number of existing appliances in each new home segment, AGA has relied on the industry experience of its staff and publically available builder specifications indicating the natural gas appliance inclusions.

  For example, an entry level newly built home ($0-$250,000) would be expected to have 2 gas appliances installed as this is commonly offered as a standard building package in natural gas reticulated suburbs.

  AGA's assumptions for existing appliances in new builds are as follows:

  $0 - $250,000 (representing 66% of the potential market) would have 2 gas appliances

  $250,000 - $500,000 (representing 20% of the potential market) would have between 2-4 gas appliances

  $500,000 - $1 million (representing 9% of the potential market) would have between 2-5 gas appliances

  $1 million + (representing 5% of the potential market) would have between 2-5 gas appliances

  These assumed existing levels of included gas appliances have been used to develop the penetration rates for additional appliance uptake. The assumed penetration rates are:

  3 appliances (65%)

  4 appliances (15%)

  5 appliances (15%)

  6 + appliances (5%)

  AGA has assumed that new homes across all value segments will have at least 2 gas appliances. It is expected that builders will require little incentive to add 1 additional appliance (such as an external BBQ connection), particularly at the lower end of this market segment. The large proportion of homes in this lower value segment has driven the high penetration rate for 3 appliances as it is expected that the monetary incentive offered will be attractive to this segment.

  At the upper end of the market AGA would expect that the new homes would already have a high number of gas appliances included in the builder's specifications, servicing the common applications of gas. As a result, it would be necessary to incentivise builders to install gas appliances for niche applications, for which the cost would likely exceed the incentive offered. At this end of the market it is also likely that the monetary incentive offered will be less attractive to induce householder investment in additional gas appliances."

- Deloitte Access Economics' response: this explanation appears reasonable as it, appropriately, takes into consideration the expected differences in consumption profiles across different segments of the housing market. Care should be taken to ensure that the expected additional customers under the appliance program are not double counted under the greenfields calculations (i.e. they are targeting the same market).

- Volumes per customer per year: this is based on an average of the annual usage of 3, 4, 5 and 6 appliances, weighted by the expected take-up rate of 3, 4, 5 and 6 appliances.
  - Deloitte Access Economics' response: this is a reasonable approach.

GPAC

- New customers: email from ATCO dated 13/02/15 "A cap of 32 rebates for the entire GPAC initiative (16 B1 and 16 B2 customers) exists to ensure that the program will remain within the allocated budget each year. As described in section 6.2.3.2 of the Response to the Draft Decision, the rebates have been designed to vary depending on the size of the air condition unit installed. To ensure that the initiative is not oversubscribed a maximum site cap of $25,000 is also in place."
  - Deloitte Access Economics' response: refer to existing customer HWS, above. ATCO has not justified why it expects this program to be fully subscribed each year (i.e. why they have not reached market saturation).
- Volumes per customer per year: this is based on the average annual usage of air-conditioning units.
  - Deloitte Access Economics' response: this is a reasonable approach – the annual gas demand of new customers under the GPAC scheme will be the average annual usage of the air-conditioning unit.

Generation

- New customers: email from ATCO dated 16/02/15 "As detailed in the NPV Assumptions for Incentive programs provided to the ERA on 19 December 2014, ATCO has an annual rebate cap of $[redacted] for the generation program. To ensure that this budget is not exceeded ATCO has capped each individual rebate at $25,000.

  Assuming that the maximum rebate of $25,000 will be paid there are [redacted] rebates available each year. For modelling purposes these [redacted] rebates have been split between the A2 and B1 tariff classes. These tariff classes have been targeted as these are the customers most likely to invest in natural gas generation as an alternative energy solution. The customers in these tariff bands have energy requirements at levels where the incentive offered may reduce the up-front capital cost barrier by enough to induce them to invest in generation technology.

  In the NPV modelling A2 customers have been allocated a smaller number of rebates as some customers in this tariff band have energy requirements such that the rebate offered would not be significant enough to induce them to invest in the generation technology."
  - Deloitte Access Economics' response: the justification of the split between A2 and B1 Tariffs appears reasonable; however, as with existing customer HWS and GPAC, no explanation has been given for the expectation that this program will be fully subscribed each year.

- Volumes per customer per year: this is based on the consumption profile of existing A2 and B1 Tariff customers.
    - Deloitte Access Economics' response: as with Infill, above, while we would broadly expect new A2 and B1 customers' consumption to resemble existing customers' consumption, this approach does not account for potential differences between the two customer bases. Further analysis could have been done on the average consumption of recent connections versus older connections. We do not, however, to expect this to have a material impact on the forecasts.

Table 2.3: Marketing and business development assumptions

Tariff	Component	Initiative	Value	Description / Assumptions
B3	New customers	Infill	600 (one off)	6,000 targeted in one area x 10% take-up rate
		HWS Infill	3,417 (over 5 years)	Annual mail-out size x 15% take-up rate
		Existing customer HWS	1,500 (over 5 years)	[redacted]
		Appliance	2,500 (over 5 years)	[redacted]
	Volumes per customer per year	Infill	~ 13GJ/ connection/year	Average consumption profile of B3 customers
		HWS Infill	20.8GJ/ connection/year	Annual usage of 5 star hot water system
		Existing customer HWS	20.8GJ/ connection/year	Annual usage of 5 star hot water system
		Appliance	7.7GJ/ connection/year	Average usage of 3, 4, 5 and 6 appliances, weighted by the expected take-up rate of 3, 4, 5 and 6 appliances
B1	New customers	GPAC	80 (over 5 years)	[redacted]
		Generation	20 (over 5 years)	Based on the annual rebate cap of $[redacted] for the generation program and a maximum individual rebate of $25,000. Split between B1 and A2 Tariffs.
	Volumes per customer per year	GPAC	303GJ/ connection/year	Average annual usage of different sized units
		Generation	~ 1,130GJ/ connection/year	Average consumption profile of B1 customers
B2	New customers	GPAC	80 (over 5 years)	[redacted]
	Volumes per customer per year	GPAC	303GJ/ connection/year	Average annual usage of different sized units

Tariff	Component	Initiative	Value	Description / Assumptions
A2	New customers	Generation	10 (over 5 years)	Based on the annual rebate cap of $[redacted] for the generation program and a maximum individual rebate of $25,000. Split between B1 and A2 Tariffs.
	Volumes per customer per year	Generation	~18,000GJ/ connection/year	Average consumption profile of A2 customers

Source: ATCO

Furthermore, in the documentation provided to the Authority, ATCO did not explain the methodology used to transform the information in Table 2.3 into annual connection and consumption increases over the forecast period. Core's Excel model has these as hardcoded entries.

Table 2.4 presents Deloitte Access Economics' interpretation of the *methodology* used to incorporate ATCO's estimates of the impact of marketing and business development initiatives (but not the assumptions underlying volumes and customer numbers, as above). Our comments are as follows.

- The approach (but not the assumptions underlying the increase in A2 consumption, see above) adopted to incorporate the expected increases in the A2 Tariff appears reasonable, in that there are two additional connections per year over the forecast period.[7]
- The approach adopted for the B1 Tariff appears reasonable, except the increase in consumption due to the GPAC incentive (in Core's model) does not reconcile with ATCO's Financial Evaluation Model for this incentive. Specifically, it appears that the increase in consumption in 2015 in Core's model is based on 24 additional connections and not the 16 in ATCO's model.
- The approach adopted for the B2 Tariff appears reasonable, except the increase in consumption due to the GPAC incentive (in Core's model) does not reconcile with ATCO's Financial Evaluation Model for this incentive (as with B1). Specifically, it appears that the increase in consumption in 2015 in Core's model is based on 24 additional connections and not the 16 in ATCO's model.
- The approach adopted for the B3 Tariff has not been adequately explained by ATCO, even after we questioned how ATCO's estimates of new connections and consumption per connection were translated into estimates in Core's model (these figures were hardcoded in the model). Without this explanation, we do not see why ATCO expects the existing customer HWS and appliance incentives to increase *average consumption across all B3 connections*.

Table 2.4: Methodology for incorporating marketing and business development

Tariff	Approach
A1	No change (no incentives)

[7] This is only a comment on the methodology used to add the additional A2 consumption into the broader model, and not a comment on the assumptions underlying the consumption figure (volumes and customer numbers).

Tariff	Approach
A2	2 connections per year added to total A2 connections due to Generation incentive (and therefore increasing total consumption, with the new connections adopting the same consumption profile as existing connections)
B1	4 connections per year added to total B1 connections due to Generation incentive (and therefore increasing total consumption, with the new connections adopting the same consumption profile as existing connections) AND Additional consumption per year added to total B1 consumption due to GPAC incentive (i.e. it incorporates the additional connections *and* the different consumption profile of the additional connections into *one* annual increase in consumption)
B2	Additional consumption per year added to total B2 consumption due to GPAC incentive (i.e. it incorporates the additional connections *and* the different consumption profile of the additional connections into *one* annual increase in consumption)
B3	Additional connections per year added to total B3 connections due to Infill incentives (and therefore increasing total consumption, with the new connections adopting the same consumption profile as existing connections) AND Additional consumption per year *for all B3 connections* due to existing customer HWS incentive and appliance incentive

Moreover, as Table 2.5 demonstrates, the marketing initiatives (and calculations) put forward by ATCO can be seen to impact the consumption forecasts, increasing consumption across A2, B1, B2 and B3 by over 2% in 2019.

Table 2.5: Impact of marketing and business development on consumption forecasts

Tariff	Incl. marketing	Excl. marketing	Impact of marketing in 2019
A1			nil
A2	2,400,155	2,232,868	7.5%
B1	1,866,278	1,819,523	2.6%
B2	1,245,362	1,218,670	2.2%
B3	10,530,472	10,431,445	0.9%
Total (A2, B1, B2, B3)			**2.2%**

Source: DAE calculations using Core's results

In summary, our conclusions on the marketing initiative assumptions and calculations are as follows:

- Infill: adopting a basic modification of the take-up rate of a previous infill project is simplistic and not transparent. Similarly, assuming new infill customers adopt the same consumption profile as existing customers – without justification – is simplistic, but is not expected to have a material impact on the forecasts. However, without evidence to contradict these assumptions we are not in a position to call them material errors.
- Infill HWS: as with Infill, the expected 15% take-up rate is largely unsubstantiated and, in the absence of a sensitivity analysis, not transparent. The expected annual consumption is reasonable.
- Existing customer HWS: as with GPAC and generation, the expected number of new customers each year due to the existing customer HWS program is based on the maximum number of rebates ATCO will provide each year. This makes the

unsubstantiated assumption that ATCO's rebates are fully subscribed. The expected annual consumption is reasonable.

- Appliance: the assumptions underlying the appliance program appear reasonable.
- GPAC: as explained under existing customer HWS, the basis for the forecast additional customers is the maximum number of rebates on offer. No explanation has been given as to why the market is expected to take up all rebates on offer. The expected annual consumption of new customers is reasonable.
- Generation: as explained under existing customer HWS and GPAC, the additional customers gained from the generation program is based on the number of rebates on offer. The generation program is expected to increase consumption in the A2 Tariff by 7.5% by 2019, representing a material impact on the forecast results. Explanation should be provided as to why ATCO expects the value of the rebate to be sufficient to increase demand by this amount.
- Approach to incorporating marketing and business development programs for the B3 tariff: ATCO have assumed that the existing customer HWS and appliance programs will increase consumption per year *for all B3 connections*. No justification has been provided as to why ATCO expects these two initiatives to increase all residential consumption and not just those who subscribe to the specific rebates.

2.6 Greenfields

As ATCO considers its existing market is 'mature', the majority of new connections over the forecast period are expected to come from greenfield sites.[8] This section provides a specific review of the consumption per connection forecasts for greenfield customers. A review of the new connection forecasts is provided in chapter 4 (customer number forecasts).

B3 Tariff

We agree with the findings of the review of ATCO's original approach to estimating consumption per connection of greenfield customers – using average consumption of existing customers (rather than new customers) is not correct and will bias the forecasts upward. However, we note that in ATCO's Response to the Draft Decision this approach has been revised to reflect the consumption profile of new connections.

Specifically, ATCO's revised approach to forecasting consumption per connection of greenfield customers is as follows:

- Take the average (weather adjusted) consumption profile of *existing* connections (which was the basis of the original forecasts); and
- Remove the estimated effect of 6 star energy rated buildings (the 'adjustment for new connections'), that is 1.098GJ per year (see section 3.1 for a more detailed discussion of this assumption). This is to establish the consumption profile of new connections.

This is illustrated in Table 2.6.

[8] Indeed the only new infill connections are expected to arise from marketing programs.

Table 2.6: Greenfield consumption per connection, B3 Tariff

	2014	2015	2016	2017	2018	2019
B3 – average consumption	14.67	14.45	14.32	14.25	14.21	14.16
B3 – adjustment for new connection	-1.10	-1.10	-1.10	-1.10	-1.10	-1.10
B3 – average new consumption	13.58	13.35	13.22	13.15	13.11	13.06

Source: ATCO Response to ERA Draft Decision – 23 December 2014, p. 143

Overall, the revised approach adopted by ATCO to forecast greenfield consumption per connection for the B3 Tariff is reasonable and transparent. It is, correctly, based on the weather normalised historical consumption series and accounts for the expected lower average consumption of greenfield sites due to improvements in building standards. This is consistent with the general, industry standard, approach adopted for forecasting consumption of new customers. As we note on page 20, reference should be given to the changing profile of houses versus flats over the forecast period (rather than assuming a static split), but this is not expected to have a material impact on the forecasts.

B2 Tariff

Table 2.7 presents ATCO's estimated consumption per connection profile of B2 greenfield customers. This profile is the same as Core's forecast consumption per connection of existing B2 customers (see sections 3.2 and 4.2 for a review of the approach used to forecast this series).

Table 2.7: Greenfield consumption per connection, B2 Tariff

Average consumption	2014	2015	2016	2017	2018	2019
B2 – new connections	124GJ	119GJ	114GJ	111GJ	108GJ	106GJ

Source: ATCO Response to ERA Draft Decision – 23 December 2014, p. 145

As these commercial premises will be located in greenfield areas (i.e. they will be new builds), it could be reasonably expected that these buildings will be subject to higher building standards and will therefore have, on average, a lower consumption profile than existing customers. No explanation was provided as to why B3 greenfield customers will have, on average, lower consumption, but B2 greenfield customers will not. While we accept that the removal of AL10 customers will increase average consumption per connection across B2, this should not be universally applied to both existing and new customers.

3 Consumption forecasts

This section presents an overview of the approach used to develop the consumption (per connection) forecasts and the findings from these forecasts.

3.1 Residential Tariff B3

Approach and forecast

Core notes the primary steps to developing the consumption forecasts for Tariff B3 as:

1. Normalise total demand for the effects of weather using EDD;
2. Divide total demand by average connections to determine demand per connection;
3. Adjust demand per connection for the effect of historical price increases which impacted particular years only;
4. Use regression analysis to determine the historic trend in demand per connection;
5. Forecast demand per connection by applying the historic trend to existing demand per connection;
6. Adjust demand per connection forecasts for factors not present in the historic trend, which include:
    - The lagged effect of historic increases in retail gas prices, as well as any future changes in price resulting from:
        - the introduction of a price on carbon in July 2012;
        - the repeal of the carbon tax in July 2014 and;
        - forecast wholesale gas price increases;
    - The effect of 6-Star Building Standards – introduced in May 2012, but not accounted for in the historic trend; and
    - New planned marketing initiatives.

Key findings in relation to Core's forecast of residential demand for the forecast period include:

- Increase in total connections – at a compound annual growth rate (CAGR) of 2.2%;
- Decrease in demand per connection – at a CAGR of 0.7%;
- Increase in total demand – at a CAGR of 1.5%.

Table 3.1 presents the consumption per connection forecasts for the B3 Tariff. Between 2014 and 2019, consumption per connection is estimated to decrease by 0.7% per annum (CAGR). In contrast, between 2009 and 2014 consumption per customer decreased by 3.8% per annum (CAGR).

Table 3.1: B3 consumption per connection forecasts

	2014*	2015	2016	2017	2018	2019
Demand per connection (GJ)	14.67	14.45	14.32	14.25	14.21	14.16

* History (estimated)

Source: Core 2014

Discussion

Overall, the approach adopted for forecasting B3 consumption per customer is reasonable, except for the omission of economic activity from the forecasting equation (which we have previously found to be a statistically significant explanator of residential consumption).

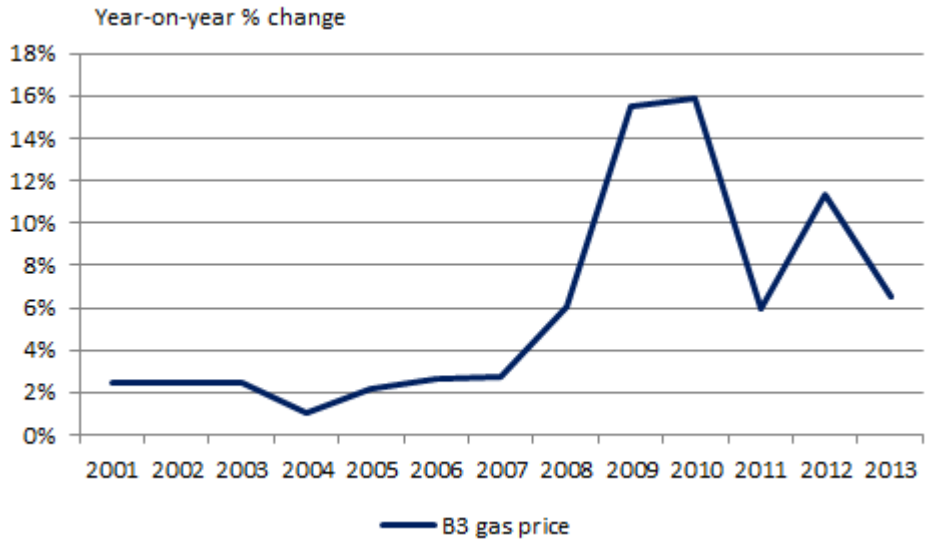
However, the approach adopted for forecasting B3 consumption per connection was not transparent, with the separate forecasts for existing and new (split by new builds and marketing) connections not provided. As such, it was difficult to assess the reasonableness of the new versus existing customer profiles of forecast consumption per connection.

Table 3.2 provides an overview of the approach adopted for each B3 customer type. The average of the annual percentage change in B3 consumption per connection between 2011 and 2014 – adjusted for the impact of price – was used as the basis of the forecasts for the three customer types. The trend analysis was restricted to three years due to what was described by ATCO as a "fundamental change in B3 demand over recent years". In response to ERA Question DA02 ATCO explained that the "the fundamental change relates to the large retail tariff price increases in July 2009 and April 2010, which cumulatively increased residential tariffs by 30% in 10 months. This resulted in a step change in average residential usage which did not normalise until 2011."

In light of the steep price increases in 2009 and 2010 (as seen in Chart 3.1, using Core's historical gas price series), Deloitte Access Economics considers this a reasonable methodological adjustment. [9]

[9] This is still the case even after adjusting for the calculation errors underlying the price series (see section 2.4.5).

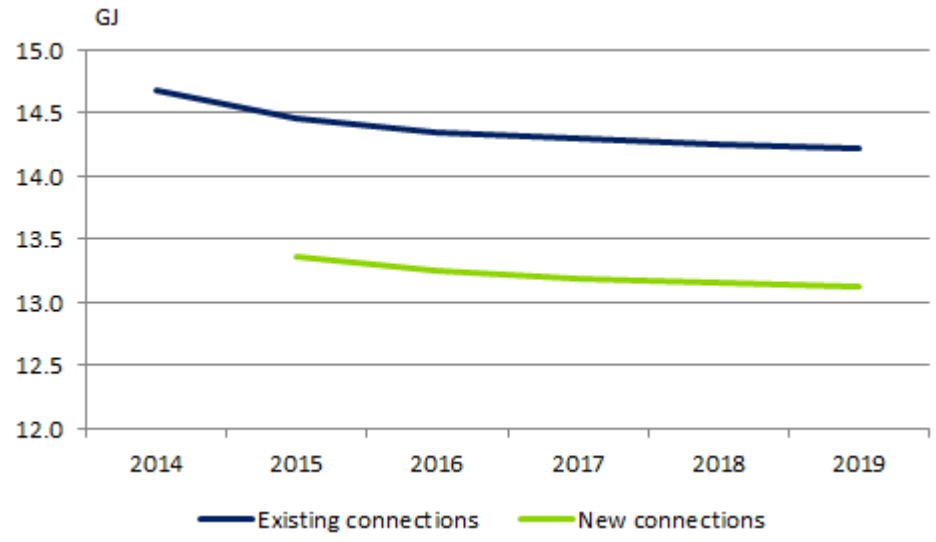
Chart 3.1: B3 historical gas price



Source: Core (Excel model)

New connections (that is, buildings that satisfy the 6 star building standard rating criteria) are the only customer type to be adjusted for efficiency improvements. The estimated demand reduction from 6 star buildings (new builds) – split by house, townhouse and flat – was sourced from CIE (2009). This saving was multiplied by the (static) proportion of new buildings expected to be houses, townhouses and flats, creating a weighted average demand reduction of 1.098GJ. This static figure was deducted off the consumption per connection forecast for existing customers each year of the forecast period. Chart 3.2 illustrates the consumption profile of new and existing B3 connections.

Chart 3.2: Consumption profile of new versus existing B3 connections



Source: Deloitte Access Economics calculations using Core's Excel model

Ideally, the changing profile of houses versus flats (sourced from HIA and used in the connections forecasts) should be used to modify the annual proportion of new buildings expected to be houses/flats; however, this is not expected to have a material impact on the forecasts.

Table 3.2: B3 consumption per connection forecast assumptions

	Underlying trend	Post-trend adjustment	
		Price	Efficiency
Existing	Average of % change p.a. in consumption per connection between 2011 and 2014 -3.35% p.a.	Own-price elasticity x price change	No adjustment
New build	*Same as existing*	*Same as existing*	Weighted average efficiency improvement: proportion (house/town-house/flat) x GJ impact on household demand (house/town-house/flat) 1.098GJ reduction in forecast consumption per connection each year (does not vary over time)
Marketing	*Same as existing*	*Same as existing*	*Same as existing*

3.2 Commercial Tariffs B1 and B2

Approach and forecast

Core notes the primary steps to developing the consumption forecasts for Tariffs B1 and B2 as:

1. Normalise total demand for the effects of weather using the EDD approach;
2. Divide total demand by average connections to determine demand per connection;
3. Adjust historical demand per connection for the effect of historical price increases which impacted particular years only;
4. Use regression analysis to determine the historic trend in demand per connection;
5. Forecast demand per connection by applying the historic trend to existing demand per connection;
6. Adjust demand per connection forecast for factors not present in the historic trend, including:
    - The lagged effect of historic increases in retail gas prices, as well as any future changes in price resulting from: [10]
        - the introduction of a price on carbon in July 2012;

[10] Where, consistent with industry standards, the price elasticity of commercial tariffs is consistent with the AER's Final Decision Envestra Limited Access Arrangement Proposal for the SA Gas Network 1 July 2011 – 30 June 2016 and the price changes are sourced from the non-residential tariff WACOSS Information Sheet - Utility Price Rises 2006-2011.

- the repeal of the carbon tax in July 2014 and;
- forecast increases in wholesale gas price.

(The impact of new planned marketing initiatives was missed off this list (p.35 of Core's report) (by accident we presume)).

Key findings in relation to Core's forecast of commercial demand, Tariff B1 for the forecast period include:

- Increase in total connections – at a CAGR of 3.5%;
- Decrease in demand per connection – at a CAGR rate of 0.94%; and
- Increase in total demand – at a CAGR of 2.5%.

Key findings in relation to Core's forecast of commercial demand, Tariff B2 for the forecast period include:

- Increase in total connections – at a CAGR of 4.4%;
- Decrease in demand per connection – at a CAGR of 3.1%; and
- Decrease in total demand – at an average rate of 0.09%.

Table 3.3 and Table 3.4 present the forecasts for Tariffs B1 and B2 consumption per connection, respectively. Both commercial tariffs are forecast to decline each year from 2014.

Table 3.3: B1 consumption per connection forecasts

	2014*	2015	2016	2017	2018	2019
Demand per connection (GJ)	1,185	1,162	1,146	1,138	1,134	1,131

* History (estimated)

Source: Core 2014

Table 3.4: B2 consumption per connection forecasts

	2014*	2015	2016	2017	2018	2019
Demand per connection (GJ)	124	119	114	111	108	106

* History (estimated)

Source: Core 2014

Discussion

The key omission from the analysis is the potential for declining economic conditions to impact on commercial gas consumption over the forecast period – we would expect this to have a statistically significant impact on gas demand in WA. At the very least, this relationship should be statistically tested.

3.3 Industrial Tariffs A1 and A2

Approach and forecast

Core notes the primary steps to developing the consumption forecasts for Tariffs A1 and A2 as:

1. Normalise total demand for the effects of weather using EDD;
2. Divide total demand by average connections to determine demand per connection;
3. Adjust demand per connection for the effect of historical price increases which impacted particular years only;
4. Use regression analysis to determine the historic trend in demand per connection;
5. Forecast demand per connection by applying the historic trend to existing demand per connection;
6. Adjust demand per connection forecasts for factors not present in the historic trend, which include:
    - The lagged effect of historic increases in retail gas prices, as well as any future changes in price resulting from:
        - the introduction of a price on carbon in July 2012;
        - the repeal of the carbon tax in July 2014 and;
        - forecast wholesale gas price increases; and
    - New planned marketing initiatives (A2 only).

Key findings in relation to Core's forecast of A1 demand for the forecast period include:

- Increase in total connections – at a CAGR of 0.09%;
- Increase in demand per connection – at a CAGR of 1.2%; and
- Increase in total demand – at a CAGR of 1.3%.

Key findings in relation to Core's forecast of A2 demand for the forecast period include:

- Increase in total connections – at a CAGR of 4.0%;
- Increase in demand per connection – at a CAGR of 0.59%; and
- Increase in total demand – at a CAGR 4.6%.

Table 3.5 and Table 3.6 present the forecasts for A1 and A2 consumption per connection, respectively. In contrast to the residential and commercial tariff classes, consumption per connection for A1 and A2 is forecast to increase between 2015 and 2019.

Table 3.5: A1 consumption per connection forecasts

	2014*	2015	2016	2017	2018	2019
Demand per connection (GJ)	158,146	157,570	158,732	161,180	164,434	168,013

* History (estimated)

Source: Core 2014

Table 3.6: A2 consumption per connection forecasts

	2014*	2015	2016	2017	2018	2019
Demand per connection (GJ)	17,966	17,856	17,861	18,007	18,239	18,503

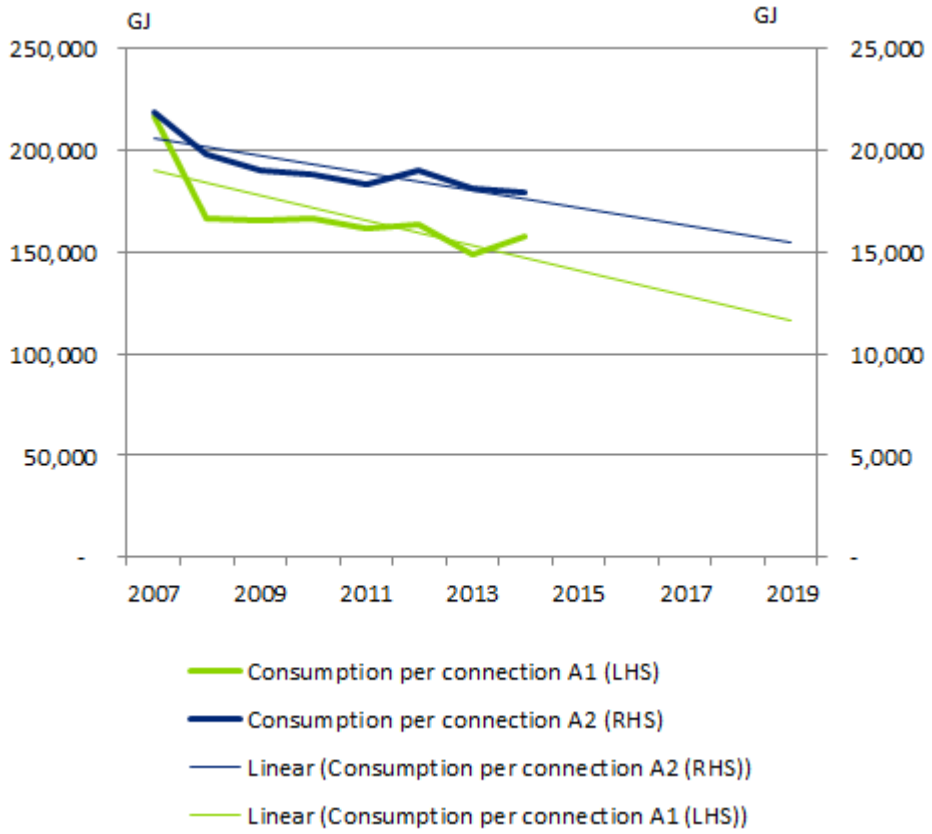
* History (estimated)

Source: Core 2014

Discussion

As Chart 3.3 highlights, actual industrial consumption per connection has been declining over recent years (for both A1 and A2). This highlights the impact of Core's assumptions around the price elasticity of demand: for example, *actual* A1 consumption per connection declined at an average annual rate of 1.4% between 2007 and 2014, but once the estimated price impacts are removed, this trend becomes an average annual *increase* of 2.2%. Therefore, in the (assumed) absence of future price rises the trend is forecast to reverse. ATCO confirmed that they do not expect any price changes over the forecast period (beyond the lagged impact of previous wholesale gas prices) in an email dated 16/02/15.

Chart 3.3: Trends in industrial consumption per connection (unadjusted historical data)



Source: Deloitte Access Economics using Core's Excel model

Overall, the absence of the impact of economic activity on industrial consumption has the potential to overstate the forecasts for A1 and A2, particularly in light of Chart 2.3. The 2012 spike in consumption per customer is aligned with the 2012 spike in WA's GSP (7.6% year-on-year growth). Furthermore, it is a generally accepted industry standard that a

survey be used to inform demand forecasts for large customers (i.e. Tariff A1). Core has not provided an explanation as to why this has not been the approach adopted in this instance. A survey would provide a more accurate picture of demand from ATCO's largest tariff by incorporating known future expansions and shutdowns – a planned future slowdown in demand by one or two key customers could have a material impact on the forecasts.

4 Customer number forecasts

This chapter sets out the ATCO assumptions regarding customer connections and disconnections and our recommendations for preparing alternative forecasts.

The connection number forecasts utilise assumptions, calculations and forecasts prepared by Core and Economic Consulting Services. In this section we refer to all calculations and forecasts for connection numbers as ATCO's forecasts.

4.1 Residential Tariff B3

4.1.1 Approach and forecast

The ATCO forecast for residential customer numbers focuses on Tariff B3. The B3 Tariff includes all detached houses and medium density developments where gas can be provided to individual dwelling units.

Core's methodology for developing its forecast of residential connections included the following steps:

1. Obtain historical connection trend from data provided by ATCO
2. Obtain forecasts of new connections prepared by Economics Consulting Services
3. Determine the historic disconnection rate using data provided by ATCO
4. Forecast connections by applying new connection forecasts and the historic disconnection rate to average connection trend
5. Adjust connections for the impact of new planned marketing initiatives and the impact of new "AL 10" metering classifications (discussed in section 2.5).

New connections have been separated into three categories:

- New houses – this category mostly applies to single detached houses but can include duplexes.
- Cluster connections – this category mostly applies to low density developments from triplexes up and may include group housing of up to around seven dwelling and low rise apartments and flats, and aged care estates.
- Established houses.

4.1.2 New houses

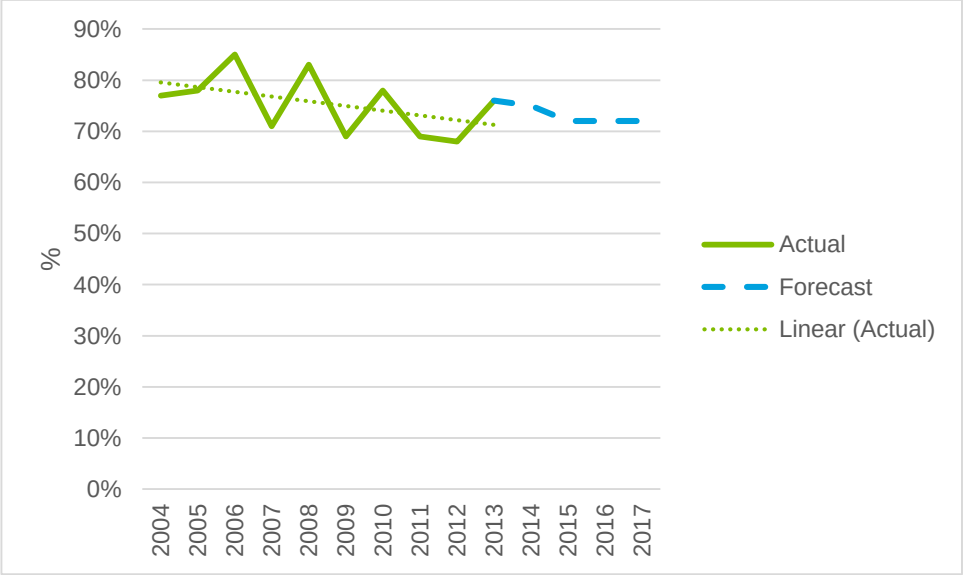
The number of new Tariff B3 connections to new houses is forecast by ATCO to be 75% of forecast new homes completed in WA in 2015, declining to 72% thereafter until 2019.

Forecast proportion of new homes connecting to gas

Chart 4.1 shows the historical proportion of Tariff B3 connections to new homes completed in WA, and ATCO's forecast. The forecast of 75% for 2015 for the proportion of Tariff B3 connections to new dwellings is equal to the actual average over the period 2004 to 2013. While there has been a discernible downward trend since 2007, it does not seem an unreasonable assumption, particularly in light of the fact that the figures reversed this downward trend in 2013 with a jump from 68% to 76%.

The decrease to 72% thereafter reflects the view that the gas supply market will be exposed to increasing competitive pressures. While the forecast is above the linear trend line, it is consistent with actual outcomes in more recent years; from 2009 to 2013 the average was 72%. However we note that, if competitive pressures are expected by ATCO to increase, it might be expected that the forecast will decrease to below the historical average. On the other hand, it is difficult to identify what a more reasonable forecast taking into account increasing competitive pressures might be. On balance, we consider the ATCO forecast to be reasonable, albeit at the higher end of the range.

Chart 4.1: Proportion of new homes completed in WA that are connected to gas



Forecast number of new homes

New homes completed is assumed to be the forecast dwelling starts for a year, less accumulation of backlog (i.e. where starts exceeded completions in a given year) or plus completion of historical backlog.

For 2013-14, the forecast dwelling starts is assumed to be the Housing Industry Association (HIA)'s forecast[11]. After 2013-14, the forecast dwelling starts is assumed to be the mid-point between:

- The HIA's forecast of dwelling starts (HIA Economics May 2014)

[11] Adjusted from the HIA's financial year basis to TACO's calendar basis.

- The Housing Industry Forecasting Group (HIFG)'s forecast of dwelling commencements (Housing Industry Forecasting Group, April 2014)

This mid-point approach is used to reflect the significant difference between the two forecasts after 2015. The HIA forecast is more optimistic about the medium to longer term than the HIFG forecast, with the HIFG pointing to a softening in employment, poor housing affordability and a drop in consumer confidence as some of the reasons behind its weak long term outlook.

The two forecasts are shown in Table 4.1 and Table 4.2.

Table 4.1: HIA forecast of dwelling starts

Year	2013	2014	2015	2016	2017	2018
	Actual	Forecast				
HIA forecast dwelling starts ('000)	26.206	26.881	25.168	24.352	23.227	22.200

Note: mid-point of forecast

Source: *ATCO Gas Australia Connection Forecast Economics Consulting Services (ECS) June 2014*, Appendix 4.3, June 2014, p.11.

Table 4.2: HIFG forecast of dwelling commencements

Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
	Actual		Forecast			
HIFG forecast of dwelling commencements, WA ('000)	24.01	27.00	25.00	21.00	21.00	-

Note: mid-point of forecast

Source: *ATCO Gas Australia Connection Forecast Economics Consulting Services (ECS) June 2014*, Appendix 4.3, June 2014, p.11.

Table 4.3 shows the forecast dwelling starts based on the mid-point between the HIA and HIFG forecasts. It then converts dwelling starts to forecast dwelling completions taking into account the addition or subtraction of forecast backlog[12]. This additional backlog is assumed to be accumulated in 2014, with the backlog assumed to be eliminated by the end of June 2017.

Table 4.3: Dwelling starts based on the mid-point approach

Year	Starts ('000)	Completions ('000)	Backlog ('000)
June 2013	12.10	8.66	
December 2013	14.15	11.87	5.72
June 2014	13.25	12.00	6.97

[12] The backlog shown in 2013 is sourced by Economics Consulting Services from the ABS Catalogue No. 8752.0. Thereafter the backlog is calculated by subtracting to completions from starts and adding the result to the accumulated backlog.

Year	Starts ('000)	Completions ('000)	Backlog ('000)
December 2014	13.00	12.00	7.97
June 2015	12.30	12.50	7.77
December 2015	11.80	12.50	7.07
June 2016	11.20	13.00	5.27
December 2016	11.25	13.00	3.52
June 2017	11.25	13.50	1.27
December 2017	11.25	12.52	0
June 2018	11.25	11.25	0
December 2018	11.25	11.25	0
June 2019	11.25	11.25	0
December 2019	11.25	11.25	0

Source: *ATCO Gas Australia Connection Forecast Economics Consulting Services (ECS) November 2014*, Appendix 4.3, June 2014, p.12.

We note that since the connection number forecasts were updated in June 2014, there have been further economic updates published by both the HIA and HIFG, as well as release of actual dwelling starts data for 2014. This updated data is shown in Table 4.4 and Table 4.5. The key difference is much higher actuals and forecasts in 2014. We recommend that the calculation for forecast new connections be updated to reflect these most recent actuals and forecasts.

Furthermore, in relation to the 2013/14 forecast, we recommend that the number of dwellings connected be based on actual connection numbers recorded by ATCO, rather than a forecast based on assumptions.

Table 4.4: HIA updated

Year	2013	2014	2015	2016	2017	2018
	Actual	Forecast				
HIA forecast dwelling starts ('000	26.120	30.210	26.370	24.350	23.230	22.200

Note: mid-point of forecast
Source: HIA

Table 4.5: HIFG updated

Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
	Actual		Forecast			
HIFG forecast of dwelling commencements, WA ('000)	24.01	28.966	25.000	22.500	21.000	21.000

Note: mid-point of forecast
Source: HIFG

Two points are worth comment, the first being the use of the mid-point between the HIA and HIFG forecasts. Both forecasts show that a declining trend is expected in dwelling starts after 2014, with the HIFG more pessimistic than the HIA forecast. Deloitte agrees that new dwelling starts and completions are likely to decline in the short to medium term from

current levels. Deloitte's own private housing investment forecasts out to 2018-19 are consistent with this view, although at a more conservative rate than both the HIA and HIFG forecasts. We consider that the mid-point approach is not necessarily unreasonable, as it utilises reputable, independent forecasts.

In contrast, we have concerns about the somewhat arbitrary manner by which it appears dwelling starts have been converted to dwelling completions. Rather than the 'backlog' reduction approach adopted by ATCO, our preference is to use independent forecasts of dwelling completions (for example, as prepared by BIS Shrapnel).

4.1.3 Cluster connections

Cluster connections are forecast to be 22% of the forecast number of new houses (discussed in section 4.1.2). This assumption reflects the following:

- The average proportion of new dwellings that are "other dwellings" over the period 2004 to 2013 is 20%
- Affordability issues and strong apartment construction is continuing in central areas.

We agree with ATCO that an increasing proportion of new connections are likely to be cluster connections. We note that the latest HIA forecast for multi-unit developments in WA is 23.6% for the period 2014/15 to 2017/18, which we consider not to represent a significant divergence from ATCO's forecast. However, to ensure that the forecasts are based on the most up-to-date information available, we recommend using HIA's forecast of 23.6%

4.1.4 Established houses

The forecast of connections of established houses is stable at 800 per year, which reflects a view that the gas supply market in the metropolitan area is mature. The proportion of established houses being connected to gas has been gradually declining over the years 2002 to 2012 and on the basis of anecdotal evidence is believed to have reached a plateau. In 2004, 20% of new connections were to established houses. Since December 2009, the proportion has been 8% or less in all six month periods. ATCO also expects to face increasing competitive pressures to maintain market share, with the incentive to switch some energy use to gas declining.

The forecast of 800 established houses being connected each year reflects that there are some infill areas where connections are still likely to occur. We note that the forecast of 800 established houses being connected represents a proportion of between 4% and 5% of total new connections (non-marketing) over the forecast period 2015 to 2019. This appears to be slightly lower than the proportion in recent years (8% or lower as reported by ATCO), yet appears reasonable on the basis that the gas supply market is becoming more mature and is subject to strong competitive pressures.

4.1.5 Disconnection rate

From 2008 to 2014, the disconnection rate has ranged from a low of 0.06% (381 disconnections) to a high of 0.59% (3,462 disconnections). ATCO has forecast a rate of disconnection equal to the historical average from 2008 to 2014. It is possible that factors

such as possible stepped price rises over the 2015 to 2019 period, or changes in the economy, may impact on the disconnection rate.

For example, Table 4.6 shows the B3 residential historical disconnection rate as well as B3 residential tariff changes over the period 2008 to 2013. It is possible that the significant increase in the disconnections rate in 2010 represents a lagged effect of the price increase that occurred in 2009. We note that there was also a significant increase in the fixed tariff rate in 2012 which may have impacted on the disconnection rate in the following year. The disconnection rate also rose significantly following the price increase in 2012. However, no such increase is apparent in the data in 2011 following the price increase in 2010 (assuming any potential impact is lagged rather than immediate). The disconnection rate was also at a high level in 2008 following relatively low price increases.

Overall, it seems that it would be quite difficult to identify particular factors impacting the disconnection rate without significance further research and modelling, for which we do not believe the benefits of doing so would outweigh the costs. Price is just one factor. Other possible factors include the broader economic environment, the hardship policy of the retailer and the culture of the retail in operating the hardship policy. Without undertaking significant further work, we consider that the 0.37% forecast disconnection rate is not unreasonable.

Table 4.6: B3 residential disconnection rate versus price increases

	2006	2007	2008	2009	2010	2011	2012	2013
Disconnection rate (as % of previous year's average connections no.)			0.56%	0.30%	0.59%	0.06%	0.14%	0.59%
Utility price rises	3%	3%	6%	16%	16%	6%	11%	7%

4.2 Industrial and Commercial Tariffs

4.2.1 Approach and forecast

The methodology used to arrive at the forecast of connections for commercial and industrial connections is described as follows:

1. Use regression analysis to determine the historic trend in connection growth
2. Forecast average connections by applying the historic trend in connection growth
3. Forecast average connections by applying the historic trend in connection growth
4. Adjust connections for the impact of new planned marketing initiatives (discussed in section 2.5)

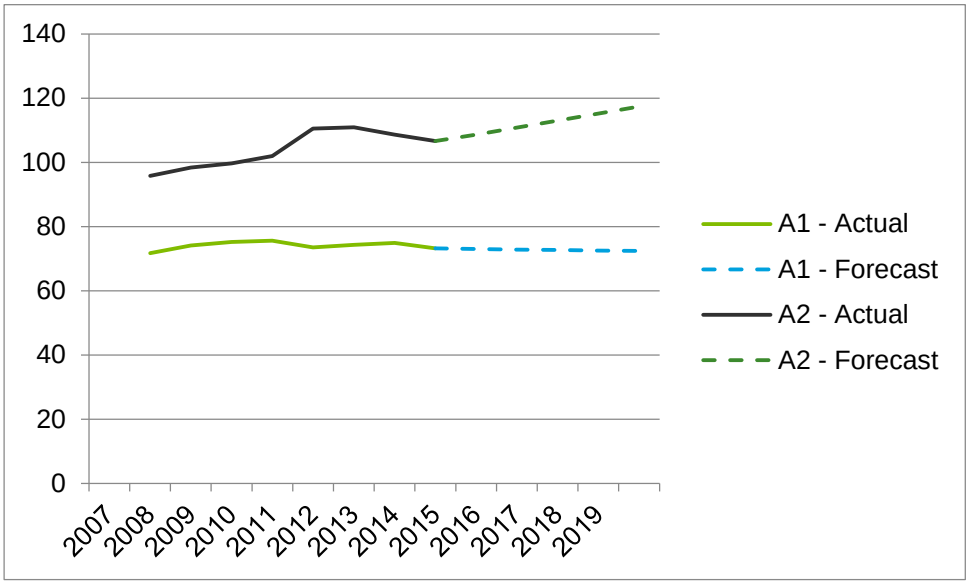
4.2.2 Industrial Tariff A1 and A2

For Industrial Tariffs A1 and A2, the average growth rate from 2007 to 2014 is used. The historical and forecast data is shown in Chart 4.2.

Use of the average historical growth of connections over the period 2007 to 2014 seems reasonable when forecasting connections for the A1 Tariff, because the time series is extremely stable.

For the A2 tariff however, the spike in connections in 2011 is followed by a decrease in 2013 and 2014. The key issue is whether only the recent historical average should be used or whether it is reasonable to include the impact of the spike. We would expect that a model that included economic conditions would, at least in part, account for this spike within the model and therefore remove the need to exclude this data point from the analysis.

Chart 4.2: Connection numbers for Industrial Tariffs A1 and A2



Source: Core's Excel model

4.2.3 Commercial Tariff B1 and B2

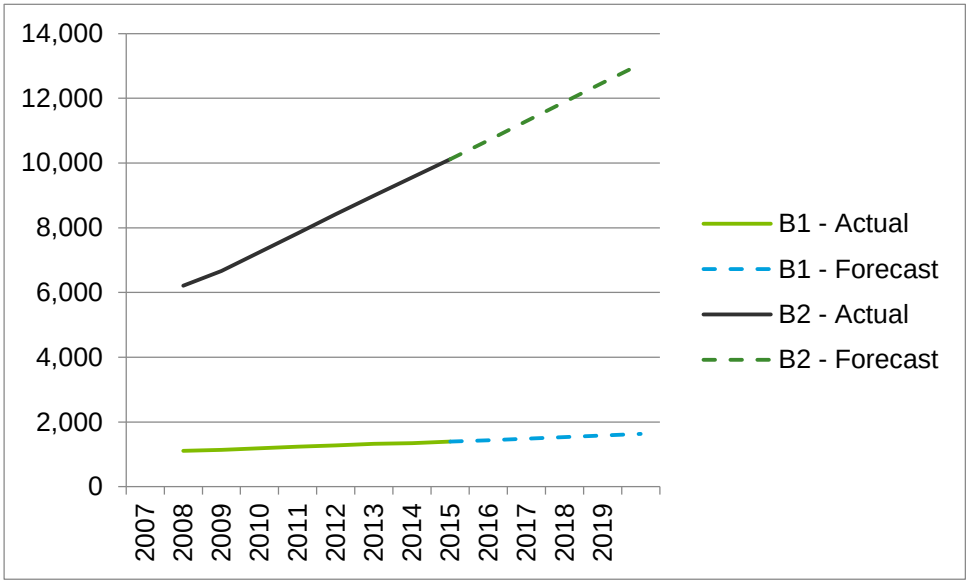
The connection numbers for the Commercial Tariff B1 is forecast on the same basis as Tariffs A1 and A2, using the average growth rate from 2007 to 2014. While it could be argued that factors such as forecast GSP could impact commercial connection numbers, we believe that it would be difficult to model this.

Use of the average historical growth of connections over the period 2004 to 2014 seems reasonable when forecasting connections for the B1 Tariff, because the time series is extremely stable.

For Commercial Tariff B2, we note that the growth rate is assumed to increase at a non-linear rate (a positive growth rate that declines over the forecast period), which is different from the approach used for Tariffs A1, A2 and B1.

The historical and forecast data is shown in Chart 4.3.

Chart 4.3: Connection numbers for commercial Tariffs A1 and A2



Source: Core's Excel model

In response to a query on this approach, ATCO has advised that "for each individual tariff class Core has estimated a function that best fits historic data as a predictor of future connection rates – a regression. Although the best fit for the B3, B1, A2 and A1 connection is linear one, the statistical best fit for B2 connections is not. This is all based on historical trends, rather than stated future factors. The B2 tariff class analysis results in a function that, based on the historic trend, forecasts a declining rate of new connection."

We note that over the forecast period of five years the use of a linear versus quadratic has only a minor impact on the forecasts. The impact of the functional form would not be expected to be seen well past the end of the forecast period. This, combined with ATCO's explanation (above) gives us reason to conclude this is not a source of material error.

Limitation of our work

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