Deloitte Access Economics

Revision 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
GDS	Gas Distribution System
GJ	Gigajoules
GSP	Gross State Product
HDD	Heating Degree Days
HHDI	Household Disposable Income
WA	Western Australia

Executive Summary

Deloitte Access Economics has been engaged by the Economic Regulation Authority (the Authority) to develop a revised set of gas consumption forecasts for ATCO Gas Australia's (ATCO) Mid-West and South-West Gas Distribution System (GDS). This builds on our previous work for the Authority providing a review of the gas consumption forecasts for ATCO's GDS.

In undertaking this work we were asked to:

- Recommend forecasting approach to improve the reliability, accuracy and robustness of GDS demand estimates.
- Recommend adjustments to ATCO's GDS demand forecast assumptions, separately identifying demand forecast assumptions in relation to greenfield projects and business development and marketing initiatives.
- Updated GDS demand forecast, covering the following:
  - Customer numbers across A1, A2, B1, B2 and B3 tariff classes, broken down by existing and new customers, and identifying customer disconnections.
  - Average consumption by customer for existing and new customers across the B2 and B3 tariff classes.
  - Total consumption broken down across A1, A2, B1, B2 and B3 tariff classes.
- Identify key drivers and sensitivity analyses in relation to updated GDS demand forecast.

Table i presents a summary of the assumptions, recommendations and subsequent revised approach to forecasting consumption.

Table i: Review of assumptions, recommendations and revised approach

Assumption	Review and recommendations	Revised approach
Weather normalis-ation	The approach adopted is consistent with industry standards and has been transparently applied.	No change.
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 do not consider this a reasonable approach to take. Given the strong correlation of Gross State Product (GSP) with A2 demand per connection, in particular, we would expect economic 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 adjusted to*	Economic conditions included in B3, B2 and A2 forecasts of consumption per customer.

Assumption	Review and recommendations	Revised approach
	reflect the responsiveness of gas demand to declining economic conditions over the forecast period.	
Prices	Core's estimate of wholesale gas price forecast and the price elasticity factors are reasonable. We note that Core has not adjusted the retail price of gas for movements in the distribution price – 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 factor.	No change.
Marketing and business develop-ment	Overall, the approach to estimating the impact of marketing programs is not transparent and, in some cases, is simplistic. While we have insufficient evidence to conclude that the underlying assumptions are incorrect, we note that the programs are expected to materially increase total consumption across affected tariffs by 2.2% by 2019 (increasing to 7.5% for the A2 Tariff). *To develop a best estimate of the impact of marketing and business development ATCO should have undertaken 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 have included 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 business development activities will have on consumers' decisions to install gas.* *Furthermore, ATCO's proposed Access Arrangement documentation should have provided substantiating information on the assumption that the existing customer HWS and appliance incentives increase average consumption across all existing B3 connections. ATCO did provide a response to additional questioning about this assumption, although the response was received 28 days after questioning.* • Infill: Core's approach of 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 – is simplistic, but is not expected to have a material impact on the forecasts. • Infill HWS: as with Infill, the expected 15% take-up rate is	Revised approach to incorporating additional B3 consumption due to Existing HWS and Builder Appliance incentives.

Assumption	Review and recommendations	Revised approach
	largely unsubstantiated and, in the absence of a sensitivity analysis, not transparent. The expected annual consumption appears 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 have been 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. ATCO did not initially provide sufficient explanation 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 have been 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 has assumed that the existing customer HWS and appliance programs will increase annual consumption for all B3 connections. No justification was initially 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	No change.

Assumption	Review and recommendations	Revised approach
	connections. *ATCO should have provided 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.*	
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, we agree that there is a clear change in consumption per connection between 2009 and 2011, pre-2009 and post-2011. Therefore, we consider this approach reasonable when basing the forecasts on a linear trend through history. *The omission of statistical analysis of the potential for changing economic circumstances to impact on WA residential gas demand is not reasonable..* 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 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*	Future trend in B3 consumption per customer based on household disposable income rather than a simplistic linear trend. Future B3 connections based on BIS Shrapnel's forecasts for WA dwelling completions rather than ECS' methodology based on the dwelling back-log. Revised impact of 6-star building standards to reflect BIS Shrapnel's forecasts for houses/flats/townhouses.

Assumption	Review and recommendations	Revised approach
	recommend directly 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 fixed 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, consistent with approaches generally adopted elsewhere we consider that using the historic 0.37% disconnection rate is reasonable.	
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-calculating the forecasts to account for declining GSP.* Connection forecasts for B1 use the average growth rate from 2007 to 2014. This 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 function 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 unreasonable.	Future trend in B2 consumption per customer based on WA Gross State Product rather than a simplistic linear trend.
A2	As with the forecasts for commercial consumption per connection, we consider the omission of economic conditions from the forecast equation to be unreasonable. *We therefore recommend econometrically testing for this relationship and, if necessary, re-doing the forecasts to account for declining GSP.* Connection forecasts for A1 and A2 use the average growth rate from 2007 to 2014.	Future trend in A2 consumption per customer based on WA Gross State Product rather than a simplistic linear trend.
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. *To develop a best estimate for the A1 Tariff (ATCO's largest tariff) ATCO should have adopted a more tailored approach to forecasting A1 consumption. To this end, discussions with the retail suppliers to A1 customers could have provided*	No change.

Assumption	Review and recommendations	Revised approach
	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

This report presents revised consumption forecasts for ATCO Gas Australia's (ATCO) Mid-West and South-West Gas Distribution System (GDS). The revised forecasts build on earlier work conducted by Deloitte Access Economics (Deloitte) in respect of the forecasts, as well as additional comments from the ERA.

1.1 Assessment of ATCO's consumption forecasts

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) consumption 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. The forecasts were largely prepared by the Core Energy Group (Core).

In undertaking the review 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.

We concluded that the lack of consideration of the impact of economic activity (through its omission from the forecasting equations) is not a reasonable approach to gas consumption forecasts. Economic activity has previously been found to have a statistically significant impact on gas consumption 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 considered the forecasts to be an overestimate.

The ERA subsequently asked Deloitte to prepare an alternative forecast. To do so we have used the same general framework as Core, and indeed have used the Excel model provided by Core to calculate the alternative forecast.

1.1.1 Scope and approach

In light of the recommendations from our review, Deloitte has been asked to produce a revised set of forecasts. In particular we were asked to:

- Recommend forecasting approach to improve the reliability, accuracy and robustness of GDS demand estimates.
- Recommend adjustments to ATCO's GDS demand forecast assumptions, separately identifying demand forecast assumptions in relation to greenfield projects and business development and marketing initiatives.
- Updated GDS demand forecast, covering the following:
  - Customer numbers across A1, A2, B1, B2 and B3 tariff classes, broken down by existing and new customers, and identifying customer disconnections.
  - Average consumption by customer for existing and new customers across the B2 and B3 tariff classes.
  - Total consumption broken down across A1, A2, B1, B2 and B3 tariff classes.
- Identify key drivers and sensitivity analyses in relation to updated GDS demand forecast.

1.2 Limitations

In preparing our alternative demand forecast we have assumed that the information provided to us in the course of this assignment is accurate and complete.

Further, we have used the Excel model provided by Core as the basis for our re-forecast. We have not undertaken an 'audit' or any other assurance review of the information provided, including in relation to the integrity of the Excel model.

1.3 Structure of this report

This report presents the alternative methodology and alternative forecasts produced. The remainder of this report is structured as follows:

- Chapter 2 provides an overview of the approaches used to forecast gas consumption, the approach adopted by Core and the approach recommending by Deloitte. Chapter 2 also discusses marketing and greenfield assumptions;
- Chapter 3 presents the alternative customer number forecasts;
- Chapter 4 presents the alternative consumption per customer forecasts; and
- Chapter 5 presents the alternative total consumption forecasts.

In general this report focuses on the major assumptions and approaches used by Core, as well as those areas where we believe an alternative approach has merit. As a result it does not dwell on all aspects of the forecast, including areas where we are satisfied with the approach adopted. This includes the weather normalisation undertaken (both in terms of historic normalisation).

2 Approach and marketing assumptions

This Chapter first provides an overview of the alternative methodologies utilised to develop the forecasts of gas consumption. It then summarises the approach used by Core to prepare its forecast of consumption. An overview of Deloitte Access Economics' preferred approach is then put forward, with the implications for the forecasts also discussed. The Chapter concludes with the approach to including marketing and greenfield incentives.

2.1 Approach to forecasting gas consumption

There is no single accepted approach to forecasting gas usage in Australia. However, there have been two broad approaches adopted in recent years – a linear trend approach (as adopted by Core) and an econometric approach. When the expected drivers of gas consumption (such as prices and economic conditions) are likely to follow a similar path as that experienced in recent history, then the trend approach provides a simple, parsimonious approximation of future consumption. However, when these trends are not expected to be maintained over the forecast period (due to, for example, a revival in economic conditions) then the trend approach will not produce accurate forecasts. In this instance, an approach which incorporates forecasts of the expected drivers of gas consumption is preferred (i.e. an econometric regression).[1]

In June 2014 ACIL Allen Consulting (ACIL Allen) prepared a report for the Australian Energy Market Operator (AEMO) proposing a methodology for forecasting gas consumption in eastern and south eastern Australia.[2] The methodology proposes using an econometric approach to forecast consumption by residential, business and small industrial consumers, and use of a survey approach for large industrial consumers. While the forecasting methodology is designed for a specific purpose – the preparation of the inaugural National Gas Forecast Report – we believe it is also largely appropriate for the purpose of preparing demand forecasts for Access Arrangements.

Specifically, ACIL Allen notes that an econometric approach to forecast consumption should involve the following steps.

- Identify the likely drivers of gas consumption and obtain forecasts of these drivers (split by customer numbers and usage per customer). These variables should be selected on the basis of the theoretical relationships with gas consumption, such as gas price, economic activity and population.
- Develop regression models to explain historical consumption using the identified drivers. The final specification of variables, lags and functional forms should be chosen empirically.

[1] We note that Core did include price effects as a post-model adjustment and while this is not the preferred approach, it is an improvement over a pure trend approach.

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

- Utilising the results of the regression analysis, produce a set of baseline forecasts based on the forecasts of the drivers of consumption. However, this assumes that the relationship between gas consumption and its drivers will be consistent with what was observed over the historical period.
- Make post-model adjustments (as appropriate) to incorporate the impact of known changes in consumption that were not present in history. 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.

ACIL Allen also 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).

2.1.1 Core's approach to forecasting

Core's approach to forecasting gas usage by is summarised below:

- The market was segmented into Tariff B3 residential, Tariff B1 and B2 commercial and Tariff A1 and A2 industrial groups.
- Historic demand was normalised to remove the impact of weather and to derive a per customer forecast based on historic trends (i.e. where demand is primarily a function of demand in the previous year plus a trend factor)
- Because Core considered historic trends will not be exactly replicated going forward historic trends were adjusted. These adjustments primarily related to the impact of changes in gas prices and, for Tariff B3, the expected reduction in average annual usage of new customers due to 6 star building efficiencies.

2.1.2 Deloitte Access Economics' conclusion on the forecasting approach and our subsequent revised assumptions

In our view Core's use of a simplistic linear trend approach to forecasting future gas consumption has resulted in forecasts that are too high and do not take into account all of the factors influencing gas usage. In particular, Core's forecasts do not reflect the forecast moderation in the WA economy.

The starting point for forecasting future gas consumption should be to undertake an econometric modelling exercise to identify the exogenous factors that have influenced historical gas consumption. We accept that there can be data issues with econometrics which, in some cases, may warrant reverting to a simplistic trend based forecast (on the basis of the principle of parsimony). However, the justification for this approach should be documented (including details on the regressions run and reasons for rejection) and the impact of this simplification should be discussed.

We recognise that in reality many of the factors impacting gas consumption are relatively fixed over short periods – such as building efficiency and the number of gas appliances installed in a home – and are therefore likely to be adequately captured by a trend. However, there are two other key exogenous influences that are expected to impact gas demand but are subject to short term fluctuations not picked up through a trend – namely

price and economic conditions. We accept Core's incorporation of price impacts as a post-model adjustment as the price elasticity of gas consumption has proved difficult to ascertain statistically (although the use of quarterly consumption data could go some way to rectifying this). However, by omitting any analysis (or even discussion) of the potential impact of economic conditions on consumption we do not consider Core's approach to be robust.

These issues are explained in more detail below.

The use of econometrics

As discussed above, Core's approach to developing the forecasts is based on a simple trend model, with future consumption driven by trends over the last decade, adjusted (off-model) for prices. As explained above, by developing the forecasts using a simple trend model, we are concerned that Core has not adequately controlled for the expected changes in the drivers of gas consumption over the forecast period.

In particular, during the historical period used to support the trend analysis (2007 to 2014), WA gas consumption was subject to the considerable economic changes brought on by the mining construction boom; going forward, however, the construction boom is expected to moderate, as will economic conditions. By not explicitly accounting for the effect of moderating economic conditions on gas demand, Core's trend model has likely over-forecast consumption over the Review period.[3]

In contrast, the econometric analysis adopted by Deloitte (in this report, and elsewhere) to develop a revised set of forecasts is based on a structural model of consumption, with prices and economic conditions included within the econometric model, with the preferred model selected empirically. The modelling was applied to consumption per customer for each customer type and model selection was based on standard model-fit and specification tests.

We contend that the outputs of any modelling method – be it econometric or trend – should be subjected to a test against expectations. Are the results reasonable, consistent with economic theory and do not produce biased forecasts? Furthermore, the arguments used for justification of one assumption must be consistent with assumptions elsewhere in the modelling.

We recognise that with the limited degrees of freedom available for the regression analysis – due to the use of annual data by Core – the resultant models are subject to limitations such as sensitivity of the coefficients to the years included in the analysis. However, where the statistical significance of a coefficient is stable and the magnitude of the coefficient is consistent with expectations, we consider that the additional explanatory capability afforded by regression modelling (based on economic conditions) is preferable to a simple trend model with no consideration of economic conditions.

Going forward, the limitations imposed by the length of the historical series can be overcome with the use of quarterly data. The use of annual data by Core reduced the

[3] By basing the forecasts on years where economic conditions were considerably stronger than usual, the forecasts will not account for the expected moderation in economic activity over the Review period.

number of data points available by a factor of four. Arguably, annual data does not adequately capture the impact of changing drivers on gas consumption – for example, it would be expected that the impact of rising prices would change short term consumption behaviours within 6 months (allowing for billing cycle lags). The use of annual data reduces these relationships to medium to long terms trends. Given the five year forecast period for Access Arrangements, short term impacts should be considered.

Economic conditions as a driver of gas demand

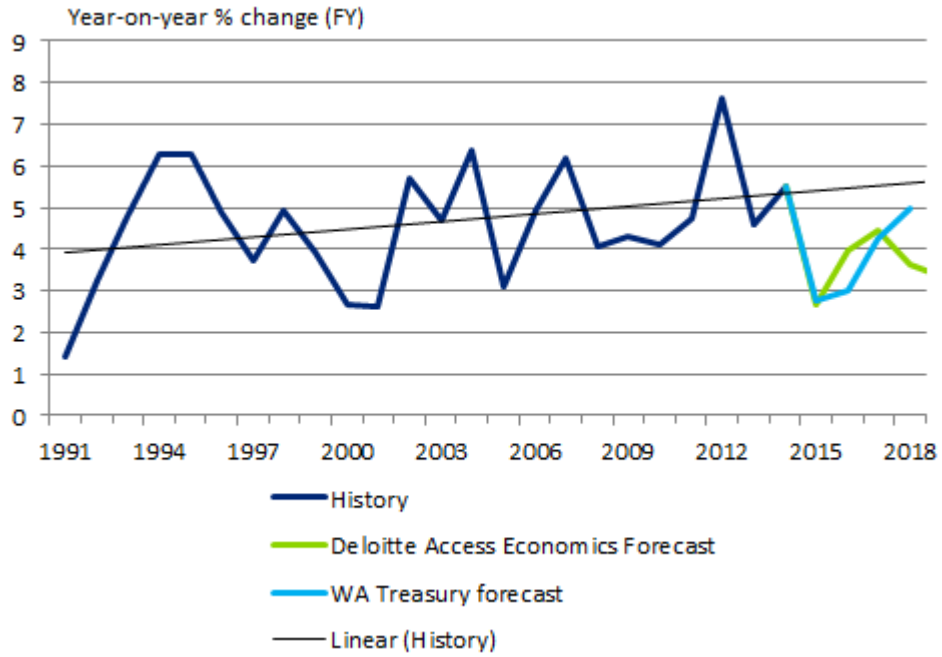
In its 2012 gas demand forecast prepared for Envestra's Victorian and Albury networks[4] Core included a GSP-driven parameter in its forecasts and, as noted above, ACIL Allen has identified that GSP is one of the two most relevant drivers of gas consumption (the other being price). Core also took this view in its March 2012 gas demand forecast for Envestra in Victoria where it explicitly included GSP 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.*[5]

The risk is that by not including economic activity, forecasts of consumption may be overstated as forecasts of WA GSP growth are generally more muted than recent outcomes, particularly as the historical trend included the impact of the WA mining industry's construction boom. As Chart 2.1 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.

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

[5] Ibid., p. 33.

Chart 2.1: Western Australian Gross State Product

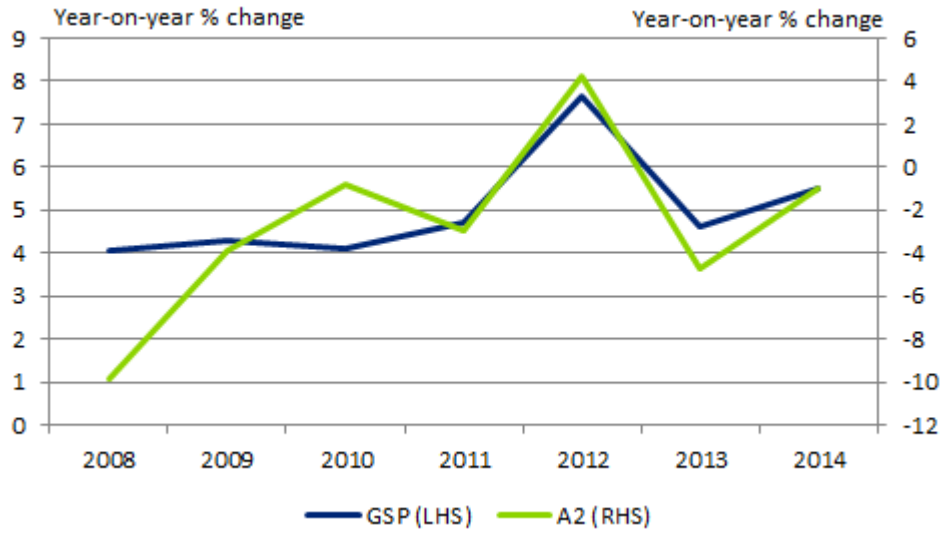


Source: ABS, Deloitte Access Economics, WA Government Budget Paper 3 (2014-15)

Chart 2.2 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 of including economic activity in forecasts of gas consumption, particularly industrial and commercial consumption.[6] 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.

[6] 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 2.2: Comparison of GSP and A2 demand per connection growth

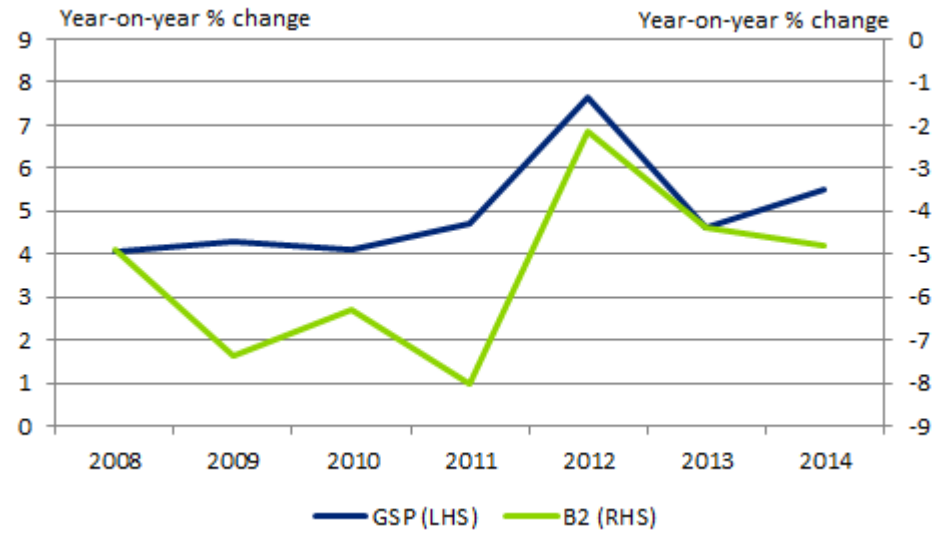


Note, GSP is in financial years while demand is in calendar years.

Source: ABS, Core (ATCO data)

Similarly, Chart 2.3 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 B2 demand per connection.

Chart 2.3: 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 unreasonable 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.

2.2 Marketing and greenfield assumptions

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 submitted the calculations underlying six marketing and business development incentives 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 incentives into the demand forecasts.

We are satisfied that the modelling techniques used to forecast additional connections and consumption due to marketing and greenfield initiatives (except for B3 consumption, see below) should not have resulted in double counting if ATCO does not target the same groups for different incentives (as ATCO are contending). And while we maintain that ATCO's approach to forecasting additional connections on the basis of the maximum number of rebates ATCO is willing to provide each year is simplistic – and heavily reliant on assumptions about take-up rates and the expectation that all incentives will be fully subscribed – without robust evidence in opposition of ATCO's modelling assumptions we are not in a position to contend that ATCO's forecasts are unreasonable. As such we have not adjusted the forecasts for new connections due to marketing and greenfield incentives or the forecasts for consumption for each new connection (except for infill initiatives targeting B3 customers, see below).

Following the application for, and receipt of, further information from ATCO on the expected B3 consumption impacts from the Existing HWS and Builder Appliance incentives, we have adjusted Core's modelling (originally included as hard-coded cells in the Excel model). Rather than adopting Core's approach of estimating the cumulative impact on all B3 customers, we have directly incorporated the expected additional consumption from just the customers from the two marketing incentives (provided by ATCO). The table below compares the two results.

Table 2.1: Expected additional B3 volume due to marketing incentives

	2015	2016	2017	2018	2019
Deloitte (numbers provided by ATCO)	5,045	20,180	30,270	40,360	50,450
Core	6,829	20,981	28,633	43,763	51,987

3 Consumption per customer forecasts

This chapter reviews the Core approach to establishing per customer consumption forecasts and sets out the methodology we have used to calculate our alternative forecast.

Note that the forecasts for the second half of 2014 have not been revised.[7] *The estimates in Core's Excel model are hard-coded and, as such, we are unable to assess the reasonableness of the assumptions and calculations underlying these forecasts.*

3.1 Residential Tariff B3

3.1.1 Core's approach

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[8];
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:

[7] It is our understanding that Core was supplied with data up until October 2014 and was required to estimate consumption for the remaining months of 2014.

[8] In this instance, Core has used regression analysis to determine the relationship between consumption per customer and a time trend (i.e. a linear trend).

- 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

3.1.2 Revised approach

Three broad steps were taken to develop a revised forecast for Tariff B3 residential consumption:

1. We undertook an econometric analysis of the relationship between B3 consumption per customer and factors expected to affect consumption, namely gas prices and economic conditions
   - On the basis of the econometric analysis we ascertained that household disposable income had a statistically significant relationship with B3 consumption per customer between 2008 and 2014. The price of gas was not found to be statistically significant.
2. We are not aware of any robust forecasts of household disposable income, which necessitated the development of a proxy forecast over the review period.
   - The Wage Price Index (WPI) was found to have a high correlation with household disposable income over the historical period and was therefore used as the basis of the forecast for household disposable income (via a linear forecast equation). A conservative estimate of the growth path of WPI was selected – that is, the mid- point between Deloitte Access Economics' forecasts and WA Treasury's forecasts.
3. The revised forecast trend (now based on economic conditions) was inserted into Core's model of B3 consumption. Core's post-model adjustment for the impact of residential gas prices on historical and future consumption was retained.

Each of these steps is explained in greater detail below.

Step 1 – econometric analysis

As explained earlier in this report, there is a strong argument that forecasts of gas consumption take into account the impact of changes in future economic conditions. With economic activity in WA expected to moderate in future in comparison to history, it is even

more important to ensure that the gas consumption forecasts allow for economic conditions, rather than being based on simple linear trends.

While our first preference would be to base the gas consumption forecasts on a structural econometric model which includes all of the expected drivers of gas consumption, the limited number of data points available limits the power of econometrics to accurately capture these relationships. However, Deloitte Access Economics is of the opinion that the first step in developing gas consumption forecasts should be to econometrically test for the relationship between consumption per customer and the critical factors which are expected to be, *a priori*¸ determinants of consumption. Consequently, our first step was to test whether the two factors we expected to be related to consumption per customer – namely price and economic conditions – were statistically significant and therefore suitable for ascertaining future trends. This contrasts to Core's approach of basing expectations for the future trend on the simple linear growth in consumption per customer over the historical period.

Chart 3.1 presents the annual difference in B3 consumption per customer and the two variables expected to have a relationship with consumption – WA gross household disposable income per capita (which determines the household's budget constraint) and gas prices[9]. The annual difference was selected as the basis of the analysis due to the non-stationarity of both consumption and household disposable income – both variables were statistically determined as being first difference stationary. The annual difference highlights that in the years where household disposable income grew strongly/less strongly, so too did B3 consumption per customer (although in the case of consumption per customer "grew strongly" means declined at a slower rate). Gas prices, on the other hand, are not quite so strongly correlated with (the annual difference in) B3 consumption per customer, particularly after 2010.

[9] Annual difference is calculated as the value of the variable in this period minus the value of the variable in the last period.

Chart 3.1: Annual difference – B3 consumption per customer and potential regressors

Source: ABS State Accounts (5220.0) released 21/11/2014 and Core's (Excel) model

Table 3.1 presents the output of the regression of (the first difference) of household disposable income on B3 consumption per customer. As the output shows, household disposable income was found to have a statistically significant relationship with B3 consumption per customer. Note that the small magnitude of the coefficient is due to the relative magnitude of household disposable income (in the tens of thousands) versus consumption per customer (in the tens).

Table 3.1: Tariff B3 residential – econometric regression results

Variable	Coefficient	p-value
Constant	-1.84	0.0144**
Gross household disposable income per capita	0.000466	0.0374**
R-squared	0.6127	
F-statistic (p-value)	0.04**	

*Denotes statistical significance at the 10% level of confidence; ** Denotes statistical significance at the 5% level of confidence.
Source: Deloitte Access Economics

Step 2 – forecasting household disposable income

While it is acknowledged by industry practitioners[10] that household disposable income is the preferred measure of economic conditions to include in a residential consumption equation, the difficulty arises that household disposable income is not often forecast (robustly). According to the ABS, household disposable income comprises "gross household

[10] For example, ACIL Allen, Core, Frontier Economics and HoustonKemp

income less income tax payable, other current taxes on income, wealth etc., consumer debt interest, interest payable by unincorporated enterprises and dwellings owned by persons, net non-life insurance premiums and other current transfers payable by households."[11] As such, forecasting this series requires strong assumptions about not only future income, but changes in fiscal policy (affecting taxes and welfare payments) and monetary policy (affecting mortgage payments and other debt interest).

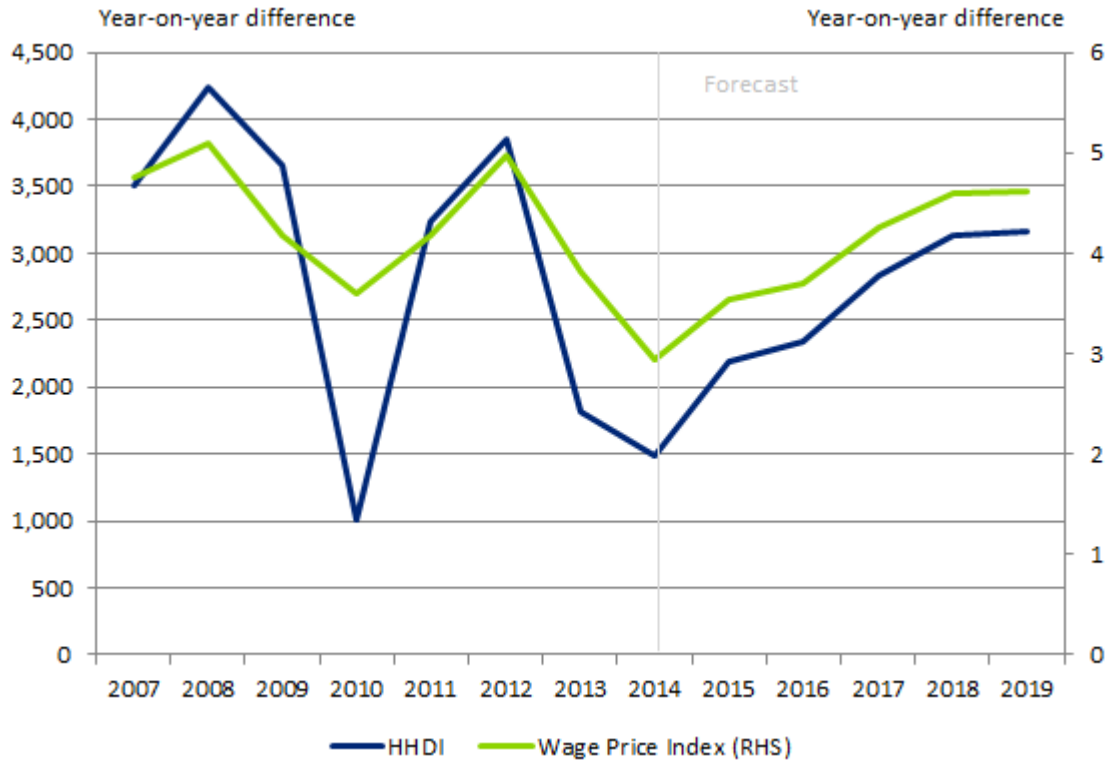
Consequently, we have adopted Core's approach of making post-model adjustments for known drivers of consumption which, due to the lack of statistical relationship, cannot be explicitly included in the baseline forecasts. We examined a number of alternative series to be used as a proxy for household disposable income, including GSP, SFD, average weekly earnings, private consumption, private housing investment, retail turnover, employment and the wage price index (WPI). While each variable has its strengths and weaknesses, the WPI was found to have the strongest correlation with household disposable income (in first differences to remove the impact of strong linear upward trends) and, as a primary driver of income, has a theoretical link with household disposable income.

The forecast of household disposable income was therefore derived using the linear relationship between household disposable income and the WA WPI. Given the fluctuations in household disposable income – which are not appropriately captured in a forecast of WPI[12] – we have adopted a conservative approach to forecasting household disposable income whereby we used the mid-point of Deloitte Access Economics' WPI forecast for WA and WA Treasury's WPI forecast in the latest budget (expected to be revised in the next two months). Chart 3.2 presents the forecast household disposable income series used as the basis of the B3 consumption per customer forecasts.

[11] http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/5216.0Glossary12014?OpenDocument

[12] Macroeconomic forecasts do not generally include the fluctuations experienced in reality – this is because the drivers of these fluctuations are extremely varied and notoriously difficult to forecast ahead of time. As such, macroeconomic forecasts tend to be much smoother than historical macroeconomic conditions.

Chart 3.2: WA household disposable income and WPI



Source: ABS State Accounts (5220.0) released 21/11/2014 and Deloitte Access Economics

The table below compares the 'trend' used by Core with that adopted by Deloitte, which reflects changes in economic conditions. Note that these are the trends before the historical effect of gas price changes had been removed.

Table 3.2: Tariff B3 residential – change in consumption per customer forecast (before price impacts)

	2015	2016	2017	2018	2019
Deloitte trend	-6.7%	-5.7%	-4.9%	-3.6%	-3.1%
Core trend	-3.4%	-3.4%	-3.4%	-3.4%	-3.4%

Source: Deloitte Access Economics

Step 3 – revised forecast of B3 consumption per customer

The final step involved incorporating the trend based on economic conditions (as per the table above) into Core's Excel model. Table 3.3 presents the final trend forecasts after adjusting for the effect of gas prices on the historical consumption trend (still utilising Core's approach[13]). As can be seen (and is reflected in Chart 3.3), the expected moderation in WA's economic conditions in 2015 and 2016 results in a clear deviation between our forecast trend and Core's.

[13] Core's post-model adjustment for the effect of gas prices is two-fold, namely they first remove the effect of prices from the historical trend (i.e. the average historical impact) and then they remove the effect of (expected) future price changes from the forecasts (i.e. the contemporaneous impact).

Table 3.3: Tariff B3 residential – change in consumption per customer forecast (after price impacts)

	2015	2016	2017	2018	2019
Deloitte trend	-3.6%	-2.6%	-1.8%	-0.5%	0.0%
Core trend	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%

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

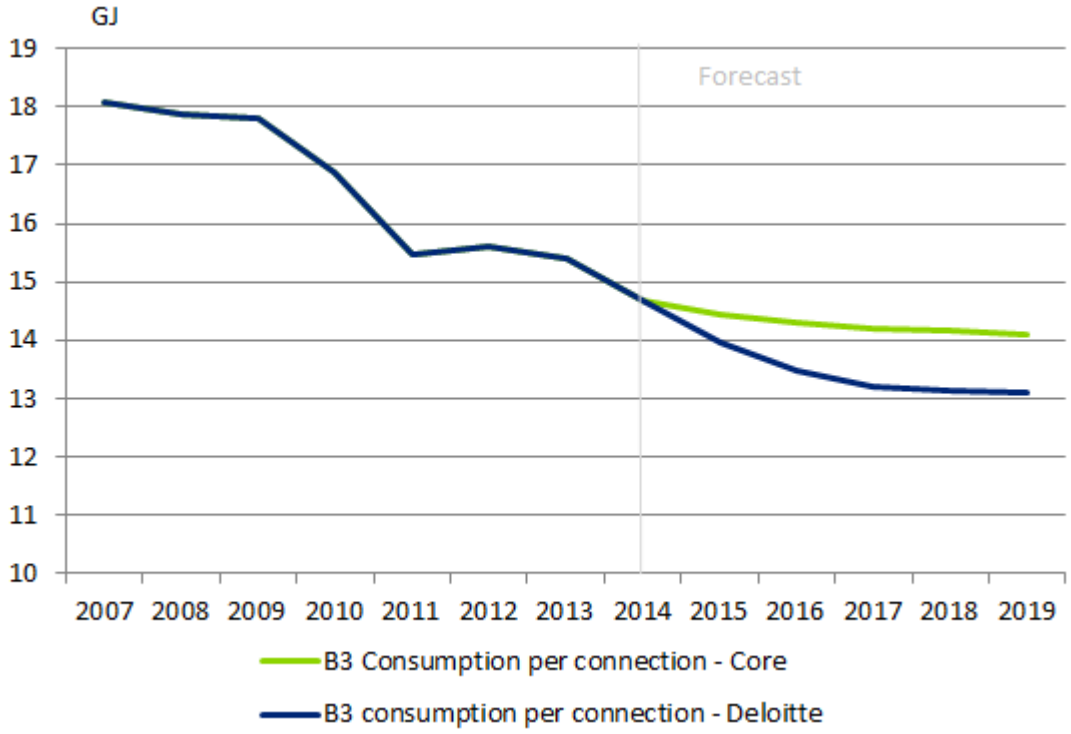
The calculation underlying the modified consumption profile of new B3 customers – namely the effect of 6-star building standards – was modified to reflect BIS Shrapnel's forecasts for the proportion of new dwellings expected to be houses/townhouses/flats. Core's original approach was a fixed proportion (over time) based on the composition of dwellings in 2011 (ABS; 4602.0.55.001 - Environmental Issues: Energy Use and Conservation; Mar 2011). The table below illustrates the differences between the original and revised series.

Table 3.4: Impact of 6-star building standards on the average consumption of new B3 customers (GJ)

	2013	2014	2015	2016	2017	2018	2019
Deloitte	1.097	1.099	1.099	1.099	1.099	1.097	1.097
Core	1.098	1.098	1.098	1.098	1.098	1.098	1.098

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

Chart 3.3: B3 consumption per customer forecast



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

3.2 Commercial Tariffs B1 and B2

3.2.1 Core's approach

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[14];
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: [15]
        - the introduction of a price on carbon in July 2012;
        - 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%.

[14] In this instance, Core has used regression analysis to determine the relationship between consumption per customer and a time trend (i.e. a linear trend).

[15] 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.

Table 3.5 and Table 3.6 present the forecasts for Tariffs B1 and B2 consumption per connection, respectively. Both commercial tariffs are forecast to decline each year from 2014.

Table 3.5: 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 3.6: 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

3.2.2 Revised approach

As with residential consumption per customer, the starting point for estimating future commercial consumption per customer was to ascertain, through an econometric analysis, whether price and economic conditions had statistically significant relationships with consumption over the historical period.

Three broad steps were taken to develop a revised forecast for commercial consumption per customer:

1. We undertook an econometric analysis of the relationship between B2 and B1 consumption per customer and factors expected to affect consumption, namely gas prices and economic conditions
    - On the basis of the econometric analysis we ascertained that Gross State Product (GSP) had a statistically significant relationship with B2 consumption per customer between 2008 and 2014. While the coefficient on GSP in the B1 regression equation was reasonable it was not statistically significant over the 2008 to 2014 time period.[16] The price of gas was not found to be statistically significant in either regression.
2. The forecast trend in B2 consumption per customer was revised to reflect the relationship with GSP. As B1 was not found to have a statistically significant relationship with economic conditions we reverted to using Core's simple linear trend approach for this customer group.

[16] Due to the limited number of data points available the regression analysis was not strong enough to conclude statistical significance at the 10% level of confidence (with a p-value of 0.12 the coefficient was just outside this cut-off). We would expect the addition of more data points – through the use of quarterly data – to address this limitation.

3. The revised forecast trend for B2 (now based on economic conditions) was inserted into Core's model of B2 consumption. Core's post-model adjustment for the impact of non-residential gas prices on historical and future consumption was retained.

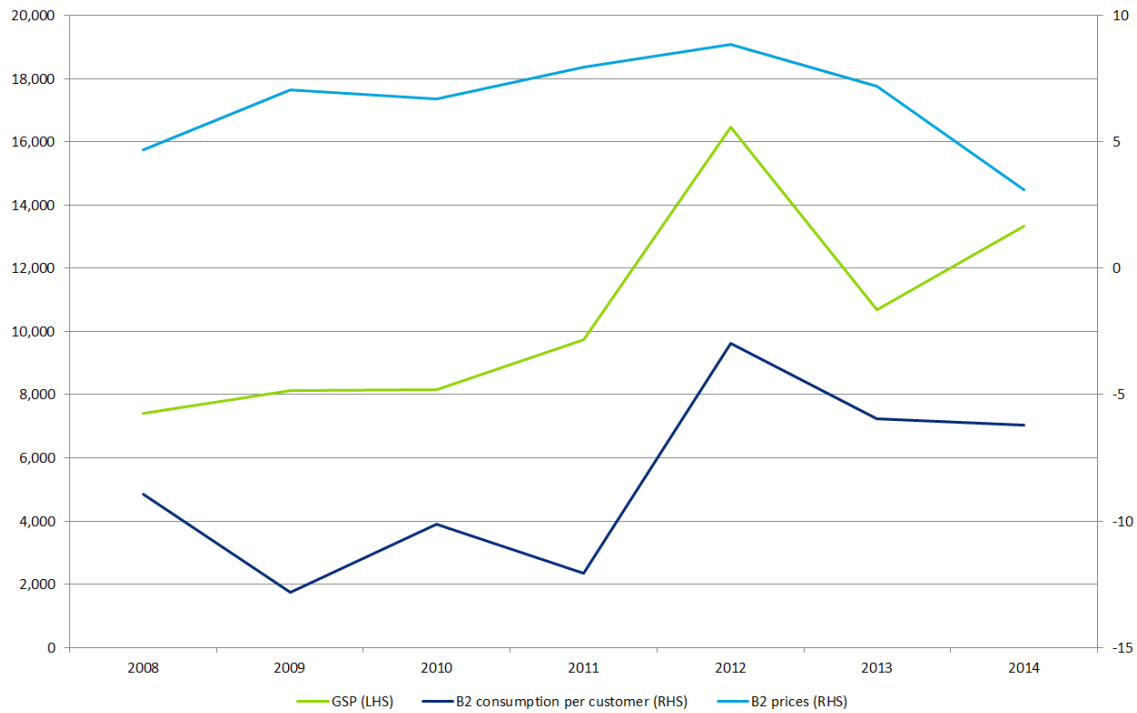
Each of these steps is explained in greater detail below.

Step 1 – econometric analysis

Chart 3.4 presents the historical B2 consumption per customer, WA GSP and non-residential gas price series (in annual differences to remove the effects of non-stationarity). The chart below highlights a similar pattern to B3 – in the years where economic conditions were relatively strongly, so too was B2 consumption per customer (although in the case of consumption per customer "relatively strong" means declined at a slower rate). Gas prices, on the other hand, do not appear to high a close correlation with (the annual difference in) B2 consumption per customer.

Note that the price series has been scaled up to fit on the same chart (for visual purposes).

Chart 3.4: Annual difference – B2 consumption per customer and potential regressors



Source: ABS State Accounts (5220.0) released 21/11/2014 and Core's (Excel) model

Table 3.7 presents the output of the regression of (the first difference) of GSP on B2 consumption per customer. As the output shows, GSP was found to have a statistically significant relationship with B2 consumption per customer. Note again that the small magnitude of the coefficient is due to the relative magnitude of GSP (in the hundreds of thousands (of millions)) versus consumption per customer (in the hundreds).

Table 3.7: Tariff B2 commercial – econometric regression results

Variable	Coefficient	p-value
Constant	-17.89	0.0020**
Real GSP	0.000895	0.0226**
R-squared	0.6794	
F-statistic (p-value)	0.02**	

*Denotes statistical significance at the 10% level of confidence; ** Denotes statistical significance at the 5% level of confidence.
Source: Deloitte Access Economics

Step 2 – revised trend for B2 consumption per customer

The table below compares the 'trend' used by Core with that adopted by Deloitte, which reflects changes in economic conditions (as per Step 1). Note that these are the trends before the historical effect of gas price changes had been removed.

Table 3.8: Tariff B2 commercial – change in consumption per customer forecast (before price impacts)

	2015	2016	2017	2018	2019
Deloitte trend	-10.8%	-8.3%	-7.3%	-7.5%	-10.6%
Core trend	-5.7%	-5.7%	-5.7%	-5.7%	-5.7%

Source: Deloitte Access Economics

Step 3 – revised forecast of B2 consumption per customer

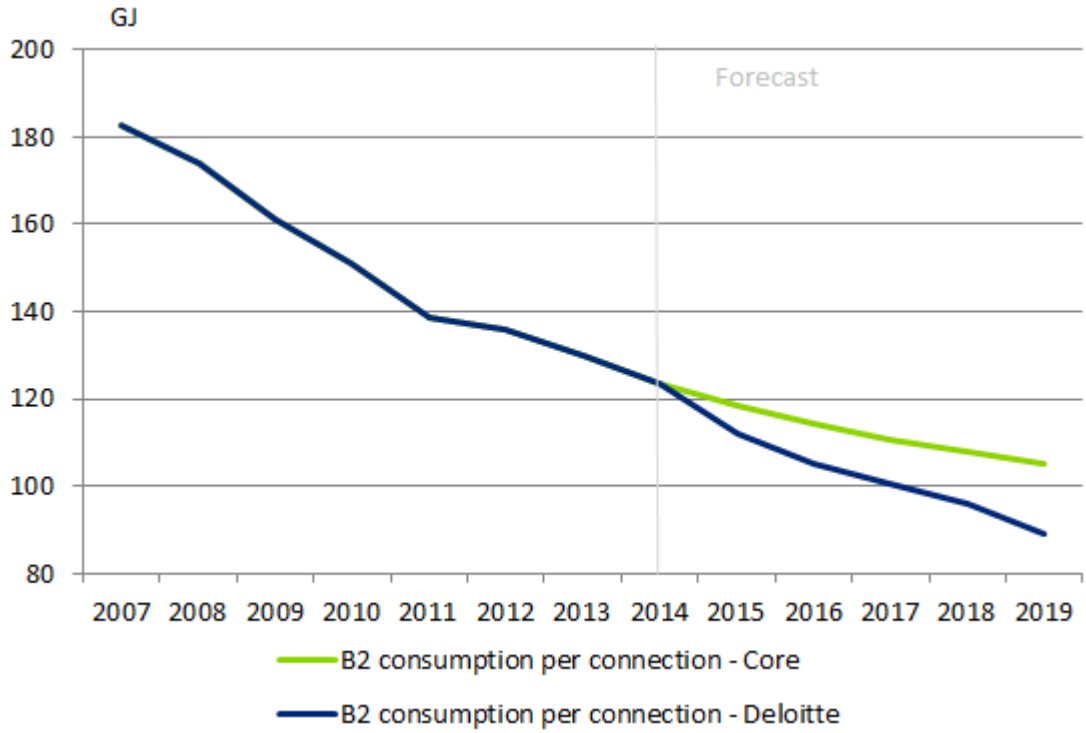
The final step involved incorporating the trend based on economic conditions (as per the table above) into Core's Excel model. Table 3.9 presents the final trend forecasts after adjusting for the effect of gas prices on the historical consumption trend (utilising Core's approach). As can be seen, the expected moderation in WA's economic conditions in 2015 and 2016 results in a clear deviation between our forecast trend and Core's (see Chart 3.5).

Table 3.9: Tariff B2 commercial – change in consumption per customer forecast (after price impacts)

	2015	2016	2017	2018	2019
Deloitte trend	-8.0%	-5.4%	-4.5%	-4.7%	-7.8%
Core trend	-2.9%	-2.9%	-2.9%	-2.9%	-2.9%

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

Chart 3.5: B2 consumption per customer forecast



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

We note that due to the transition of half of new Tariff B2 customers (on AL10 meters) out of the B2 Tariff and into the B3 Tariff ATCO expects an uplift in the average consumption of B2 customers over the forecast period[17]. Given these customers would be consuming less than the average we consider this a reasonable expectation. However, an adjustment for this expected uplift in B2 consumption was not made in Core's model. Without data on the average consumption of AL10 customers versus the remainder of B2 customers we do not have the means for adjusting the consumption per customer forecasts to reflect this. As such, we acknowledge that the revised forecasts are likely to be an underestimate of actual B2 consumption per customer.

3.3 Industrial Tariffs A1 and A2

3.3.1 Core's approach

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;

[17] ATCO's Response to Draft Decision, p. 27, paragraph 133

4. Use regression analysis to determine the historic trend in demand per connection[18];
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 3.10 and Table 3.11 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 3.10: 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 3.11: 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

[18] In this instance, Core has used regression analysis to determine the relationship between consumption per customer and a time trend (i.e. a linear trend).

3.3.2 Revised approach

As with residential and commercial consumption per customer, the starting point for estimating future Tariff A2 consumption per customer was to identify and estimate the relationship between consumption per customer, price and economic conditions.

Three broad steps were taken to develop a revised forecast for Tariff A2 consumption per customer:

1. We undertook an econometric analysis of the relationship between A2 consumption per customer and factors expected to affect consumption, namely non-residential gas prices and economic conditions
    - On the basis of the econometric analysis we ascertained that Gross State Product (GSP) had a statistically significant relationship with A2 consumption per customer between 2008 and 2014. Own price was not found to be statistically significant in either regression.
2. The forecast trend in A2 consumption per customer was revised to reflect the relationship with GSP.
3. The revised forecast trend for A2 (now based on economic conditions) was inserted into Core's model of A2 consumption. Core's post-model adjustment for the impact of non-residential gas prices on historical and future consumption was retained.

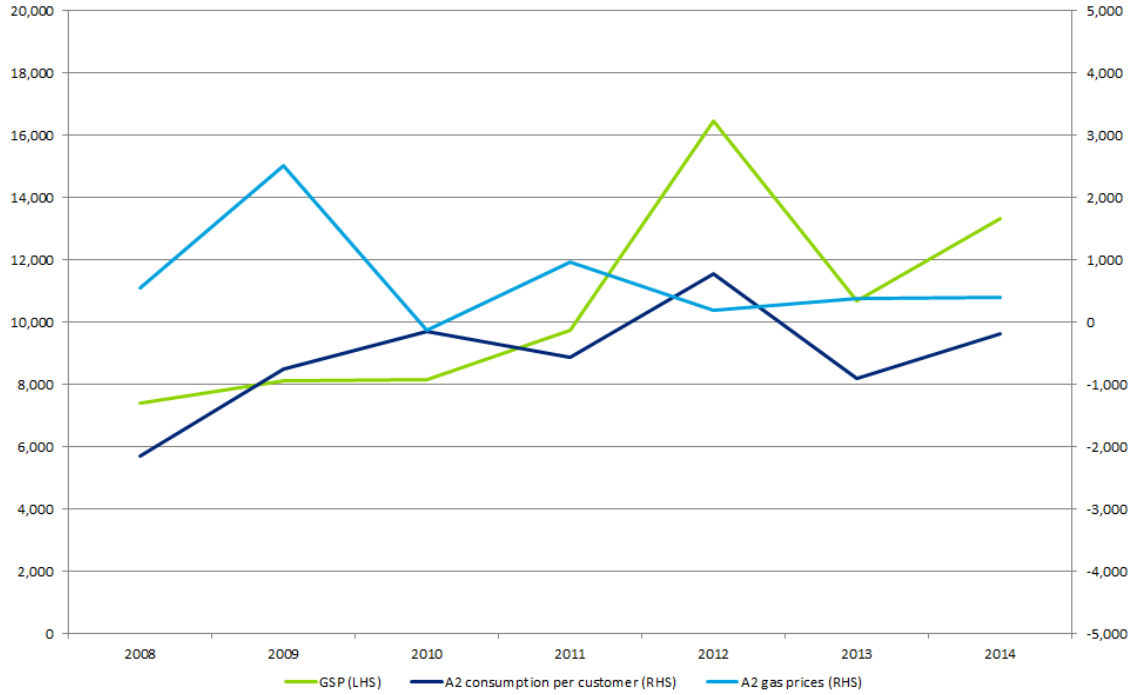
Each of these steps is explained in greater detail below. Note that the forecasts for A1 have not been revised as we consider a survey of customers to be the most appropriate approach to estimating future A1 consumption.

Step 1 – econometric analysis

Chart 3.6 presents the historical A2 consumption per customer, WA GSP and non-residential gas price series (in annual differences to remove the effects of non-stationarity). The chart below highlights the similar pattern identified in residential and commercial consumption whereby the years where economic conditions were relatively strongly correlated with years where A2 consumption per customer was stronger (although in the case of consumption per customer relatively strong means declined at a slower rate). Gas prices, on the other hand, do not appear to high a close correlation with (the annual difference in) A2 consumption per customer.

Note that the price series has been scaled up to fit on the same chart (for visual purposes).

Chart 3.6: Annual difference – A2 consumption per customer and potential regressors



Source: ABS State Accounts (5220.0) released 21/11/2014 and Core's (Excel) model

Table 3.12 presents the output of the regression of (the first difference) of GSP on A2 consumption per customer. As the output shows, GSP was found to have a statistically significant relationship with A2 consumption per customer. Note that the small magnitude of the coefficient is due to the relative magnitude of GSP (in the hundreds of thousands (of millions)) versus consumption per customer (in the tens of thousands).

Table 3.12: Tariff A2 industrial – econometric regression results

Variable	Coefficient	p-value
Constant	-2,735.22	0.0251**
Real GSP	0.2056	0.0477**
R-squared	0.5767	
F-statistic (p-value)	0.05**	

*Denotes statistical significance at the 10% level of confidence; ** Denotes statistical significance at the 5% level of confidence.
Source: Deloitte Access Economics

Step 2 – revised trend for A2 consumption per customer

The table below compares the 'trend' used by Core with that adopted by Deloitte, which reflects changes in economic conditions (as per Step 1). Note that these are the trends before the historical effect of gas price changes had been removed.

Table 3.13: Tariff A2 industrial – change in consumption per customer forecast (before price impacts)

	2015	2016	2017	2018	2019
Deloitte trend	-9.4%	-4.4%	-2.1%	-1.6%	-4.9%
Core trend	-2.2%	-2.2%	-2.2%	-2.2%	-2.2%

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

Step 3 – revised forecast of A2 consumption per customer

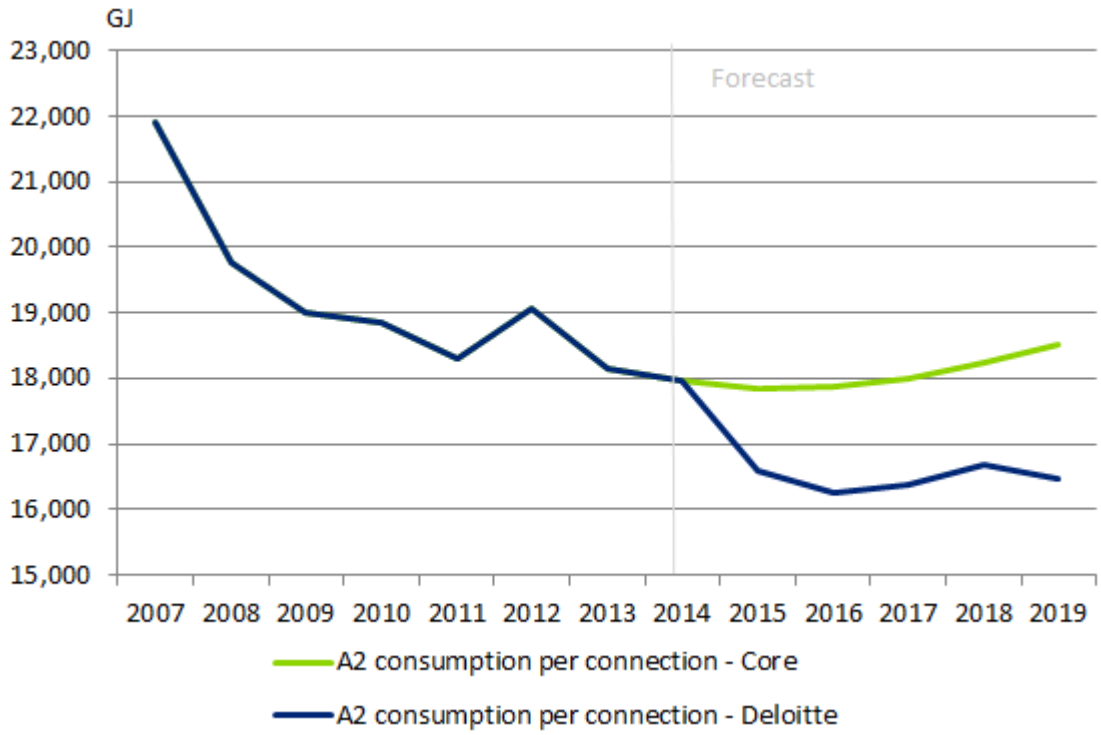
The final step involved incorporating the trend based on economic conditions (as per the table above) into Core's Excel model. Table 3.14 presents the final trend forecasts after adjusting for the effect of gas prices on the historical consumption trend (still utilising Core's approach). As can be seen, the expected moderation in WA's economic conditions in 2015, 2016 and 2019 results in a clear deviation between our forecast trend and Core's (see Chart 3.7).

Table 3.14: Tariff A2 industrial – change in consumption per customer forecast (after price impacts)

	2015	2016	2017	2018	2019
Deloitte trend	-5.7%	-0.7%	1.6%	2.1%	-1.2%
Core trend	1.5%	1.5%	1.5%	1.5%	1.5%

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

Chart 3.7: Tariff A2 consumption per customer forecast



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

3.4 Revised consumption per customer forecasts

The following tables present the revised forecasts, original Core forecasts and the difference between the two for B3, B2 and A2 consumption per customer. Note that B1 and A1 consumption per customer forecasts have not been changed.

Table 3.15: Tariff B3 residential – consumption per customer forecast

	2013	2014H1	2014H2	2015	2016	2017	2018	2019
Actual	15.4	6.52						
Deloitte forecast			8.15	13.9	13.5	13.2	13.1	13.1
Core forecast			8.15	14.4	14.3	14.2	14.2	14.1
Difference (%)			*0%*	*-3%*	*-6%*	*-7%*	*-7%*	*-7%*

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

Table 3.16: Tariff B2 commercial – consumption per customer forecast

	2013	2014H1	2014H2	2015	2016	2017	2018	2019
Actual	129.9	59.6						
Deloitte forecast			62.9	112.1	105.1	100.4	96.0	89.0
Core forecast			62.9	118.4	114.1	110.7	107.8	105.1
Difference (%)			*0%*	*-5%*	*-8%*	*-9%*	*-11%*	*-15%*

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

Table 3.17: Tariff A2 industrial – consumption per customer forecast

	2013	2014H1	2014H2	2015	2016	2017	2018	2019
Actual	18,151	8,545						
Deloitte forecast			9,275	16,604	16,244	16,390	16,687	16,479
Core forecast			9,275	17,856	17,861	18,007	18,239	18,503
Difference (%)			*0%*	*-7%*	*-9%*	*-9%*	*-9%*	*-11%*

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

4 Customer number 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.

This chapter sets out the ATCO's assumptions regarding customer connections and disconnections and the approach we have adopted in preparing our alternative forecast.

Note that we consider Core's forecasts for commercial (B1 and B2) and industrial (A1 and A2) customer numbers to be reasonable and hence have not made any changes.

Note that the forecasts for the second half of 2014 have not been revised.[19] The estimates in Core's Excel model are hard-coded and, as such, we are unable to assess the reasonableness of the assumptions and calculations underlying these forecasts.

4.1 Residential Tariff B3

4.1.1 ATCO's approach

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. 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.

[19] It is our understanding that Core was supplied with data up until October 2014 and was required to estimate consumption for the remaining months of 2014.

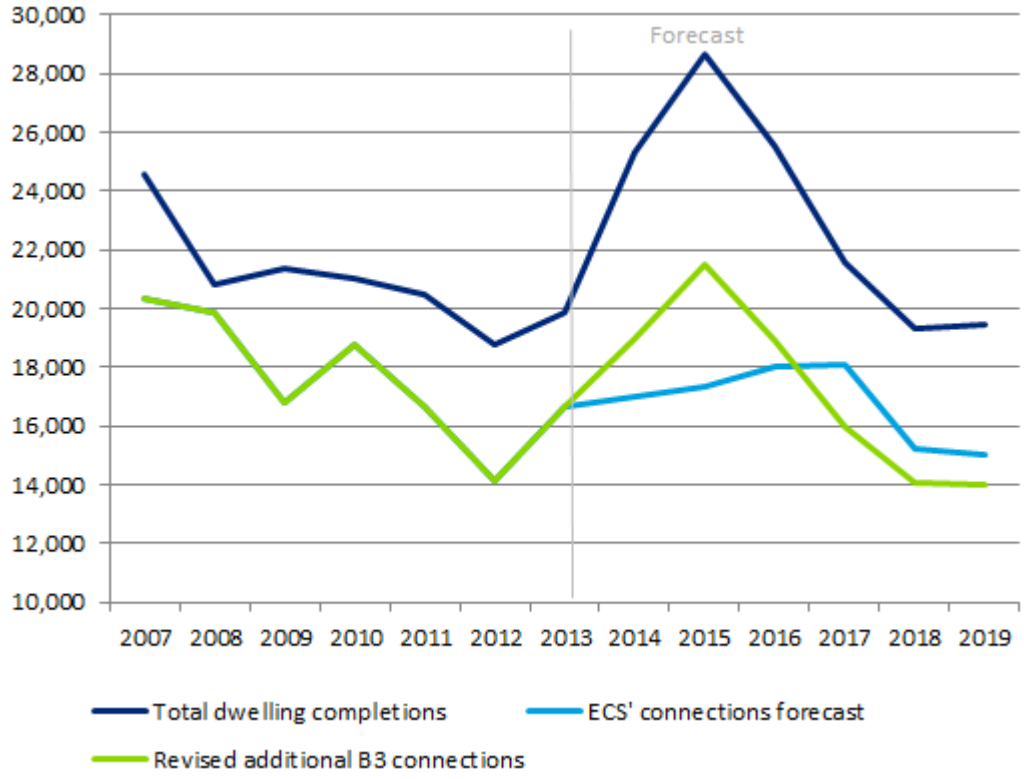
- Cluster connections – this category mostly applies to low density developments from triplexes up and may include group housing of up to around seven dwelling and low rise apartments and flats, and aged care estates. Cluster connections are forecast to be 22% of the forecast number of new houses.
- Established houses. The forecast of connections of established houses is stable at 800 per year.

4.1.2 Revised approach

Consistent with the approach adopted in other Australian jurisdictions, Deloitte Access Economics revised the Tariff B3 residential customer number forecasts to be based on BIS Shrapnel's dwelling completions forecasts. ATCO's forecasts, produced by ECS, were based on assumptions about the time lag between starts and completions (the 'backlog'); in contrast, our starting point is BIS Shrapnel's forecasts for WA dwelling completions. ECS' assumption about the expectation for the percentage of completed dwellings connecting to gas has been retained at 75% in 2014-2015, 74% in 2016-2017 and 73% in 2018-2019.

Chart 4.1 presents the original and revised B3 customer number forecasts, as well as BIS Shrapnel's dwelling completions forecasts.

Chart 4.1: B3 customer number forecast



Source: BIS Shrapnel, ECS and Deloitte Access Economics' calculations

4.2 Revised customer number forecasts

The following table presents the revised forecast, original Core forecast and the difference between the two for B3 customer numbers. Note that B1, B2 and A1 customer number forecasts have not been changed.

Table 4.1: Tariff B3 residential – year-end customer number forecast

	2013	2014H1	2014H2	2015	2016	2017	2018	2019
Actual	657,322	662,164						
Deloitte forecast			671,425	694,598	711,933	726,261	738,661	750,965
Core forecast			671,425	690,459	706,919	723,375	736,934	750,222
Difference (%)			*0%*	*1%*	*1%*	*0%*	*0%*	*0%*

Note the 2014H1 and 2014H2 figures are period-end customer number forecasts

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

5 Revised consumption forecasts

The following tables present the revised forecast, original Core forecast and the difference between the two for B3, B2 and A2 total consumption. Note that B1 and A1 forecasts have not been changed.

Table 5.1: Tariff B3 residential – total consumption forecast

	2013	2014H1	2014H2	2015	2016	2017	2018	2019
Actual	10,000,135	4,314,104						
Deloitte forecast			5,473,378	9,544,238	9,486,314	9,497,998	9,614,043	9,768,072
Core forecast			5,473,378	9,849,232	9,989,597	10,160,703	10,336,120	10,484,456
Difference (%)			*0%*	*-3%*	*-5%*	*-7%*	*-7%*	*-7%*

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

Table 5.2: Tariff B2 commercial – total consumption forecast

	2013	2014H1	2014H2	2015	2016	2017	2018	2019
Actual	1,240,855	594,780						
Deloitte forecast			644,679	1,181,866	1,143,225	1,123,671	1,103,966	1,049,638
Core forecast			644,679	1,248,316	1,240,307	1,239,172	1,240,003	1,239,809
Difference (%)			*0%*	*-5%*	*-8%*	*-9%*	*-11%*	*-15%*

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

Table 5.3: Tariff A2 industrial – total consumption forecast

	2013	2014H1	2014H2	2015	2016	2017	2018	2019
Actual	1,970,872	907,189						
Deloitte forecast			992,470	1,843,789	1,903,018	1,987,975	2,093,987	2,137,616
Core forecast			992,470	1,982,745	2,092,394	2,184,157	2,288,724	2,400,155
Difference (%)			*0%*	*-7%*	*-9%*	*-9%*	*-9%*	*-11%*

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

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