ATTACHMENT 05.101

CORE ENERGY – GAS DEMAND FORECAST REPORT

DRAFT DECISION RESPONSE 2025-29

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CORE ENERGY & RESOURCES

ATCO Gas Australia MWGDS AA6

Revised Gas Demand Forecast

5 June 2024

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Glossary

AA or GAA	Access Arrangement; Gas Access Arrangement
AA5	Fifth WA MWSWGDS Access Arrangement
AA6	Sixth WA MWSWGDS Access Arrangement
ABS	Australian Bureau of Statistics
ACQ	Annual Consumption Quantity
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AGA	ATCO Gas Australia
CORE	Core Energy and Resources
D/C	Demand per connection
EDD	Effective Degree Day
ERA	Economic Regulation Authority - Western Australia
GJ	Gigajoule
GSP	Gross State Product
MHQ	Maximum Hourly Quantity
MWSWGDS	Mid-West and South-West Gas Distribution Systems
NIEIR	National Institute of Economic and Industry Research
NGR	National Gas Rules
PJ	Petajoule
R-C	Reverse Cycle
Review Period	The Access Arrangement Period: 1st January 2025 to 31 December, 2029
TJ	Terajoule
WA	Western Australia
ZCM	Zero-Consuming Meter

1. Introduction

1.1. Report Scope

This report has been prepared by Core Energy and Resources Pty Ltd ("**CORE**") for the purpose of providing ATCO Gas Australia ("**AGA**") with a revised independent forecast of gas customers and gas demand for the company's natural gas distribution network in Western Australia ("**WA**"), referred to as the Mid-West and South-West Gas Distribution Systems ("**MWSWGDS**"), for the five year Review Period from 1 January 2025 to 31 December 2029 ("**Review Period**").

This report incorporates a revised forecast prepared by CORE, which includes updated actual data and information for the 2023 calendar year and considers issues addressed in the ERA's draft decision which was released on 24 April 2024.

The projections presented in this report and related forecast models, will form part of AGA's Access Arrangement ("**AA**") submission to the Economic Regulation Authority, Western Australia ("**ERA**").

CORE has taken all reasonable steps to ensure this report, and the approach to deriving the forecasts referred to within the report, comply with Part 9, Division 2 of the National Gas Rules ("**NGRs**"). This division outlines "access arrangement information relevant to price and revenue regulation", including ss 74; 75:

74. Forecasts and estimates

> (1) Information in the nature of a forecast or estimate must be supported by a statement of the basis of the forecast or estimate.
>
> (2) A forecast or estimate:
>
> > (a) must be arrived at on a reasonable basis; and
> >
> > (b) must represent the best forecast or estimate possible in the circumstances.

75. Inferred or derivative information

Information in the nature of an extrapolation or inference must be supported by the primary information on which the extrapolation or inference is based.

In addition to this report, CORE attaches the following confidential models to this report:

- Revised EDD Model
- Revised Weather Normalised Demand Model – B1, B2, B3
- MWSWGDS AA6 Revised Demand Forecast Model

2. Executive Summary

2.1. Introduction

This report has been prepared by Core Energy and Resources Pty Ltd ("CORE") for the purpose of providing ATCO Gas Australia ("AGA") with a revised independent forecast of gas customer numbers and gas demand for the company's natural gas distribution networks in Western Australia ("WA"), referred to as the Mid-West and South-West Gas Distribution Systems ("MWSWGDS"), for the five year Review Period from 1 January 2025 to 31 December 2029 ("Review Period").

The revised forecast addressed within this report incorporates actual data for 2023 and consequential changes to the forecast and considers issues raised within the ERAs draft decision released on 24 April 2024.

2.2. Methodology

CORE has used a methodology which is consistent with its prior report, unless otherwise stated.

2.3. ERA Draft Decision

CORE has reviewed the ERA draft decision and analysed the issues raised within the report released on 24 April 2029. Section 4 of this report presents a summary of CORE's response.

In broad terms CORE notes that a major difference between the ERA draft decision and the CORE forecast relates to the impact of future electrification on all tariff classes between 2025 to 2029. CORE notes further that the ERA draft decision varies materially from the Expected Scenario forecast undertaken by the WA gas market operator, AEMO within its 2023 GSOO (December 2023). This is addressed further in later sections of this report.

2.4. Demand Forecast

COREs revised forecast for the five year AA6 period, is summarised as follows:

Table 2.1 CORE MWSWGDS Demand Forecast (GJ 000)

Forecast Element	2025	2026	2027	2028	2029	Average annual %
Initial A1 ACQ Demand	15,220,828	14,972,673	14,949,598	14,884,434	14,840,908	-0.27%
Revised A1 ACQ Demand	**13,178,431**	**13,378,659**	**13,876,851**	**13,854,511**	**13,821,128**	2.66%
Movement	-2,042,397	-1,594,014	-1,072,747	-1,029,923	-1,019,780	
Initial MHQ Demand	7,272	7,153	7,142	7,111	7,090	-0.27%
Revised MHQ Demand	**4,852**	**4,879**	**4,757**	**4,648**	**4,538**	-1.51%
Movement	-2,420	-2,274	-2,385	-2,463	-2,552	

Initial A2 ACQ Demand	1,933,416	1,919,986	1,915,818	1,910,919	1,906,091	-0.06%
Revised A2 ACQ Demand	**1,899,848**	**1,886,418**	**1,882,250**	**1,877,351**	**1,872,523**	-0.27%
Movement	-33,568	-33,568	-33,568	-33,568	-33,568	

Initial B1 Demand	2,049,800	2,029,902	2,010,197	1,990,683	1,971,358	-0.97%
Revised B1 Demand	**2,153,962**	**2,143,169**	**2,132,430**	**2,121,746**	**2,111,115**	-0.50%
Movement	104,162	113,267	122,233	131,063	139,757	

Initial B2 Demand	1,273,114	1,269,238	1,265,373	1,261,520	1,257,679	-0.30%
Revised B2 Demand	**1,300,823**	**1,291,538**	**1,282,340**	**1,276,486**	**1,273,806**	-0.56%
Movement	27,709	22,300	16,967	14,966	16,127	

Initial B3 Demand	9,574,845	9,382,642	9,214,066	9,066,638	8,934,613	-1.36%
Revised B3 Demand	9,806,466	9,598,916	9,419,879	9,261,974	9,120,188	-1.98%
Movement	231,621	216,274	205,813	195,336	185,575	
Initial total demand	30,052,003	29,574,441	29,355,052	29,114,194	28,910,650	147,006,339
Revised total demand	28,339,531	28,298,700	28,593,751	28,392,068	28,198,761	141,822,809
Movement	-1,712,472	-1,275,741	-761,301	-722,126	-711,889	-5,183,530

The following paragraphs provide a concise overview of CORE's revised demand forecast for each tariff class.

2.4.2. Tariff A1

Tariff A1 ACQ is forecast to increase by an average annual rate of 2.66% during the review period, consistent with customer survey responses and relevant historical trends, adjusted as appropriate for changes in macro and micro industry customer environments (see section 3 – Methodology).

The ACQ demand movement is a function of falling connections and an increase in demand per connection and the MHQ movement is a function of customer contracting requirements based on their assessment of MHQ demand outlook.

Since the submission of the initial forecast CORE has received updated data relating to future ACQ and MHQ demand for several large A1 customers which has resulted a fall in annual absolute demand and MHQ.

Further detail is provided within the accompanying Confidential demand model and Section 8 of this report.

Figure 2.1 A1 Demand, connections, and demand/connection – history and forecast.

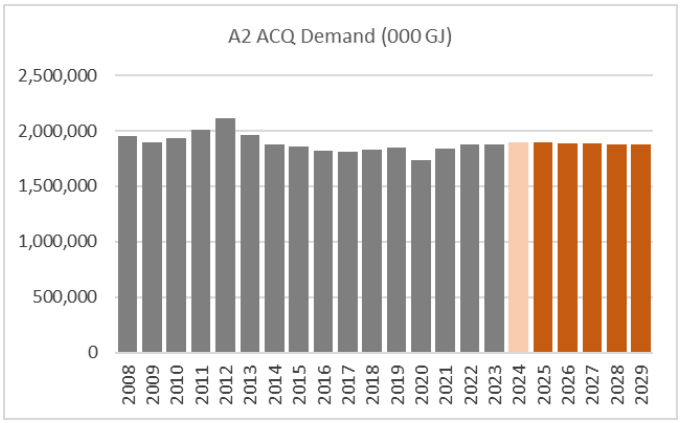
2.4.3. Tariff A2

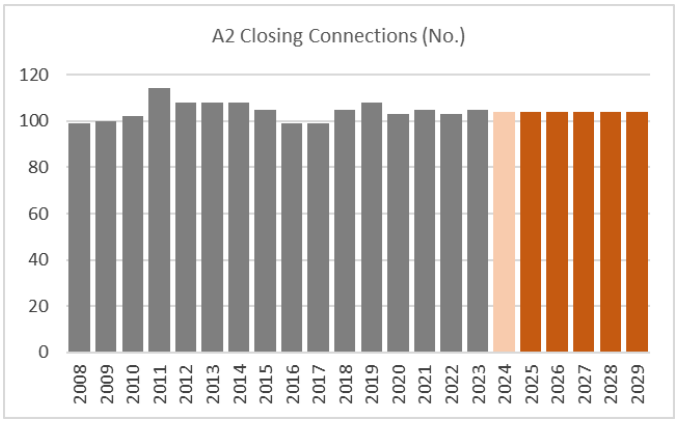
Tariff A2 ACQ is forecast to fall by an average annual rate of -0.27% during the review period, consistent with customer survey responses/known changes and relevant historical trends, adjusted as appropriate for changes in macro and micro industry customer environments (see section 3 – Methodology).

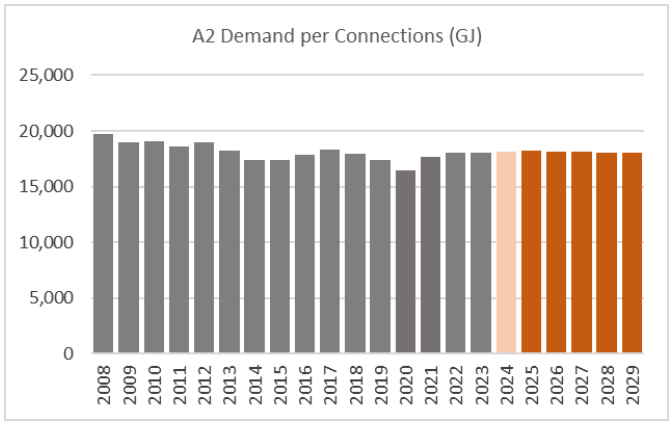
The ACQ demand movement is a function of flat connections and a low reduction in demand per connection.

Since the submission of the initial forecast CORE has received updated data relating to future ACQ demand for several large A2 customers which has resulted a fall in annual absolute demand. Further detail is provided within the accompanying Confidential demand model and section 8 of this report.

Figure 2.2 A2 demand, connections, and demand/connection – history and forecast.







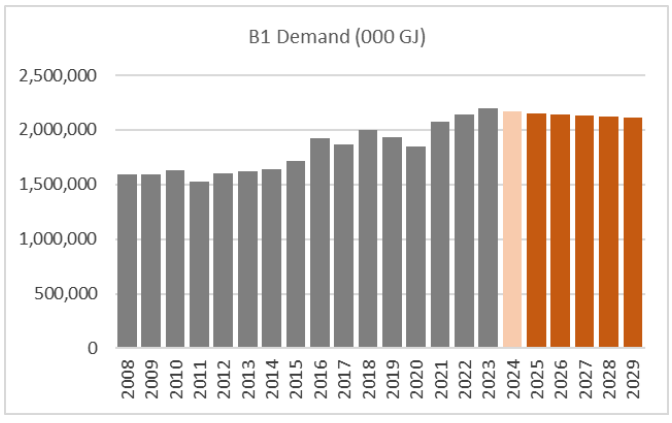
2.4.4. Tariff B1

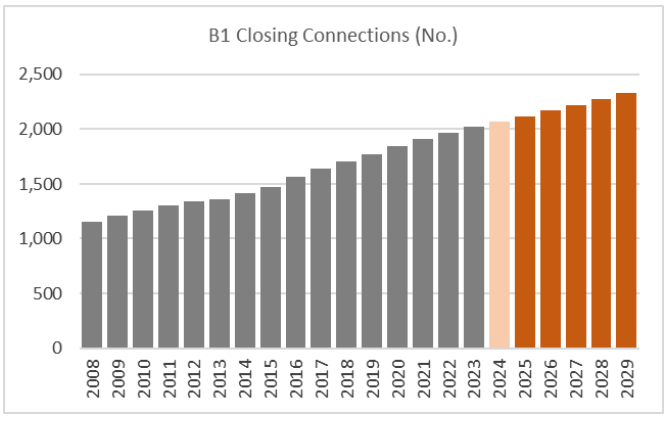
This revised forecast has been developed following receipt of actual 2023 data and consideration of relevant micro and macro factors relating to MWSWGDS B1 customer environments.

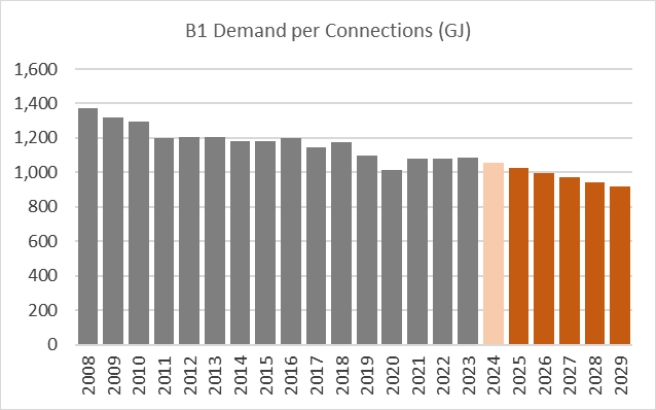
B1 commercial demand is forecast to fall at an annual average rate of -0.50% during the AA6 Period, due to growth in net connections which averages +2.39%, offset by a -2.83% average annual reduction in demand per connection.

The accompanying revised forecast model and Section 7 below address this forecast in further detail.

Figure 2.3 B1 Demand, Connections and Demand/Connection – history and forecast.







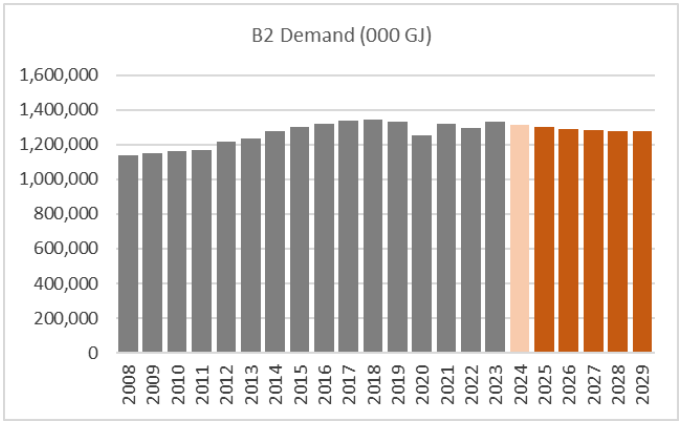
2.4.5. Tariff B2

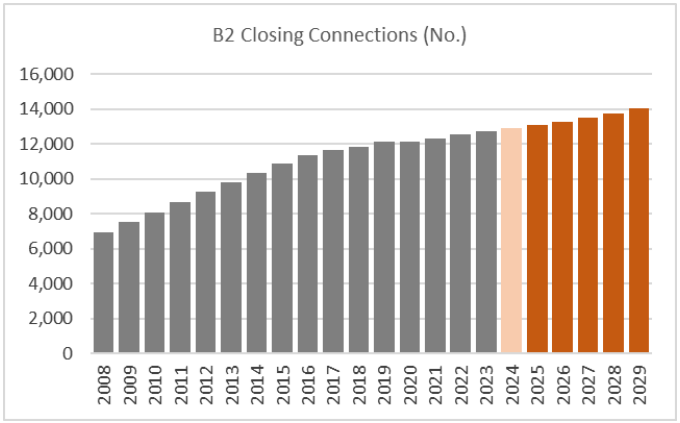
This revised forecast has been developed following receipt of actual 2023 data, consequential changes to the forecast and consideration of relevant micro and macro factors relating to MWSWGDS B2 customer environments.

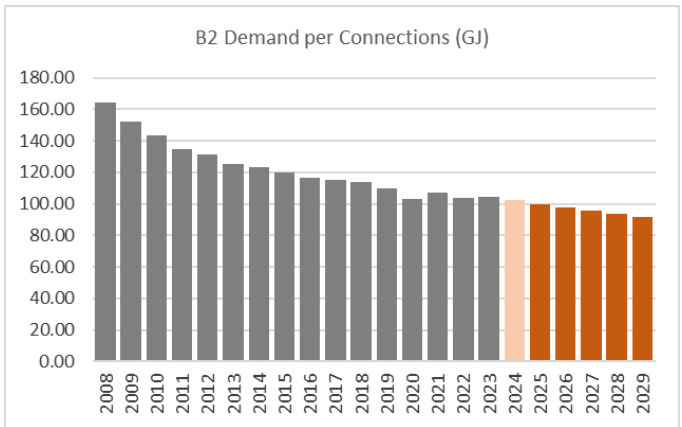
B2 demand is forecast to decrease at an annual average rate of -0.56% during the AA6 Period, due to growth in net connections which averages +1.60%, offset by a -2.16% average annual reduction in demand per connection.

The accompanying revised forecast model and Section 7 below address this forecast in further detail.

Figure 2.4 B2 Demand, Connections and Demand/connection – history and forecast.







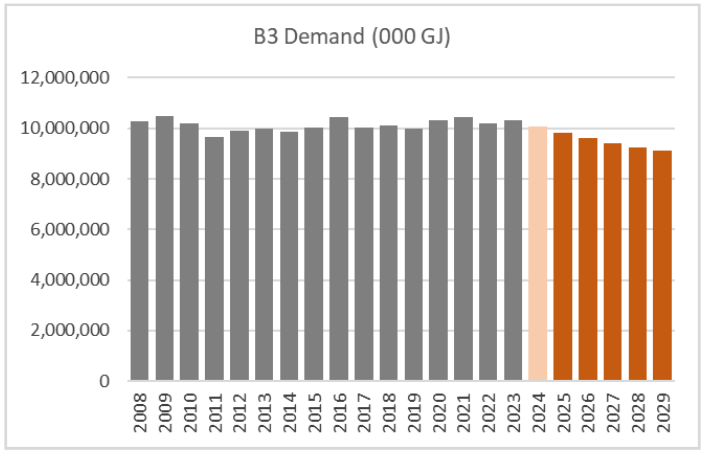
2.4.6. Tariff B3

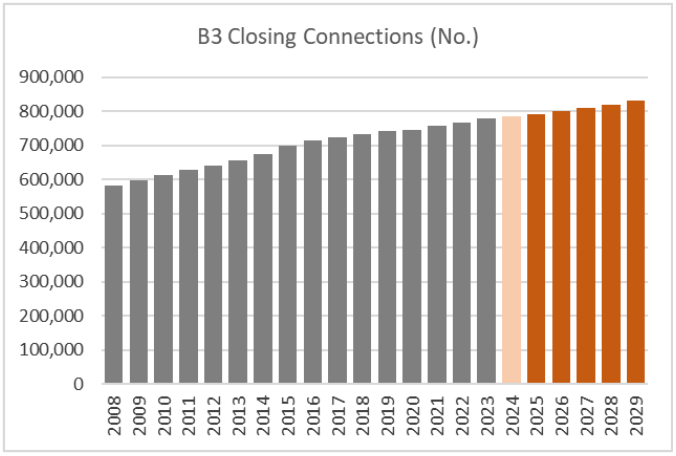
This revised forecast has been developed following receipt of actual 2023 data and consequential changes to the forecast and consideration of relevant micro and macro factors relating to MWSWGDS B3 customer environments.

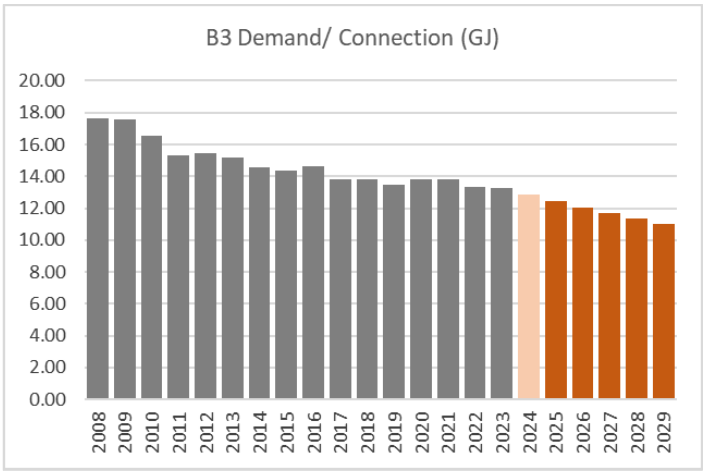
B3 demand is forecast to decrease at an annual average rate of -1.98% during the Review Period, due to a growth in net connections which average +1.15%, offset by a -3.03% average annual reduction in demand per connection.

The accompanying revised forecast model and Section 6 address this forecast in further detail.

Figure 2.5 B3 Demand, Connections and Demand/Connection – history and forecast.







2.5. Ancillary Services

The revised Ancillary Services forecasts are based on B3 customer numbers and forecasts of B3 connections as addressed above, as B3 customers represent approximately 95% of the Ancillary Services activity. That said, CORE has considered the materiality of movements in the tariff classes which impact the remaining 5%, being movements in B1 and B2 connections.

The 2023-24 period for most services is expected to be lower than the subsequent period, due to a recovery of activity levels following COVID, in a transition toward rates observed historically.

Table 2.2 Initial Ancillary Services Forecast

Service	2025	2026	2027	2028	2029
Meter Lock Applications:	8,651	8,737	8,835	8,941	9,050
Meter Lock Removals:	8,454	8,544	8,645	8,750	8,857
Deregistrations:	3,508	3,543	3,582	3,625	3,669
Regulator Removals:	3,696	3,733	3,775	3,820	3,867
Regulator Reinstalls:	3,067	3,098	3,133	3,170	3,209
Special Meter Reads:	102,241	103,258	104,418	105,666	106,956
Cut and Cap:	1,671	2,047	2,120	2,180	2,217

Source: CORE Initial Demand Model

Table 2.3 Revised Ancillary Services Forecast

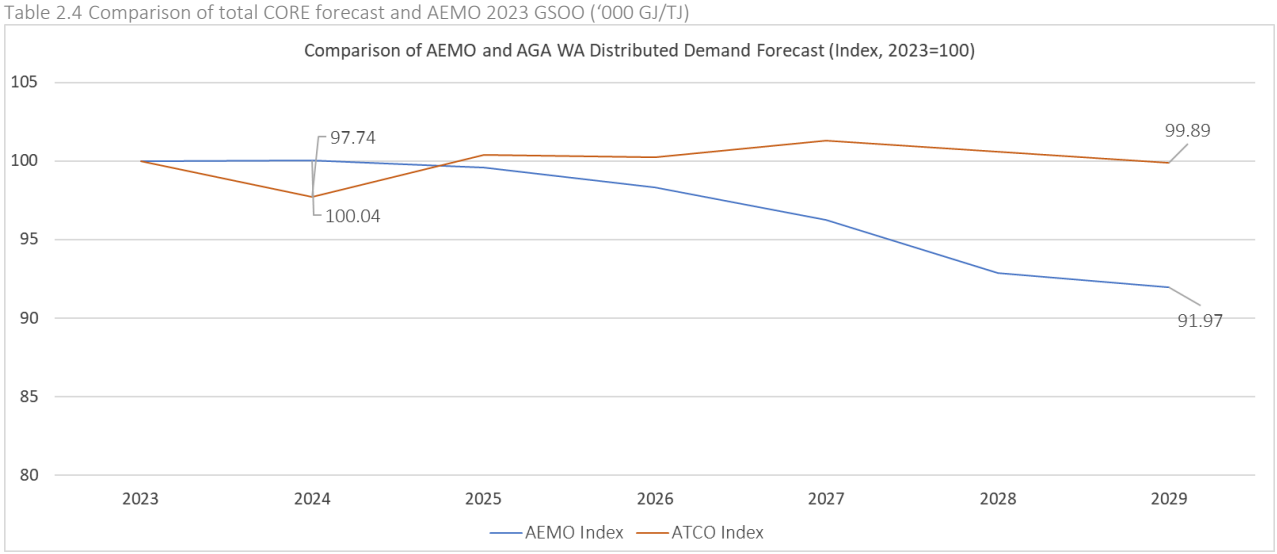
Service	2025	2026	2027	2028	2029
Meter Lock Applications:	9,409	9,504	9,615	9,733	9,855
Meter Lock Removals:	8,474	8,568	8,672	8,781	8,892
Deregistrations:	2,050	2,071	2,095	2,120	2,147
Regulator Removals:	3,153	3,185	3,223	3,262	3,303
Regulator Reinstalls:	3,075	3,106	3,142	3,181	3,221
Special Meter Reads:	102,488	103,527	104,731	106,022	107,356
Cut and Cap:	1,323	1,337	1,352	1,369	1,386

Source: CORE Revised Demand Model

2.6. Validation

As a significant element of a broader validation process, CORE has undertaken a comparison of its forecast with the WA gas distribution Expected Scenario forecast presented by AEMO within its 2023 Gas Statement of Opportunities (GSOO) and supporting data register, as summarised in the following figure.

Table 2.4 Comparison of total CORE forecast and AEMO 2023 GSOO ('000 GJ/TJ)



Source: CORE Demand Model

This figure illustrates that the GSOO forecast (on an index basis) is above the CORE forecast for the 2025 to 2029 period. CORE notes that the industrial survey results – which would most likely not have be known to AEMO at the time, provide evidence of a higher level of demand in 2023 and 2024 before reducing during 2025, which provides a logical explanation for the variance.

CORE considers this validation process to provide strong support of the CORE forecast, indicating that the CORE forecast is conservative – based on a lower expectation of the timing of the impact of electrification of MWSWGDS customers.

3. Methodology

This section is a repeat of the equivalent section included in the initial demand forecast report for ease of reference as elements of this section are referred to in subsequent sections of this report.

3.1. Overview

The methodology adopted by CORE to derive gas demand forecast for the MWSWGDS, which is consistent with the approach adopted for AA5, involves four primary elements. Each element is expanded upon in subsequent sections of this report.

1. An approach to normalising historical demand to remove the impact of abnormal weather (Section 3.2)
2. An approach to deriving a revised forecast of Tariff B3 residential demand (Section 3.3)
3. An approach to deriving a revised forecast of Tariff B1 and B2 commercial demand (Section 3.4)
4. An approach to deriving a revised forecast of Tariff A1 & A2 industrial demand (Section 3.5)

The methodology adopted by CORE takes into consideration all recent AA demand forecast proposals, draft and final decisions, which, together with consideration of approaches adopted by leading national and international organisations engaged in energy forecasting, including AEMO, results in a best-practice approach to gas connections and demand forecasting.

The methodology favours a highly transparent approach, including a demand forecast model that examines all material factors that are considered likely to, or have the potential to, impact normalised demand.

This report sets out material underlying facts and assumptions relied upon to develop the demand forecast gas demand. This includes actual connections and demand data provided by AGA for the period 1 January 2008 to 31 December 2023.

CORE considers this process to be compliant with s 74(2) of the NGRs - Forecasts are constructed on a reasonable basis whilst representing the best forecasts possible in the circumstances.

Further detail on the approach is set out below for residential (B3), commercial (B1 and B2) and industrial (A1 and A2) tariff classes.

3.2. Weather Normalised Demand

Gas consumption is materially influenced by weather, including seasonal winter heating season. Accordingly, the weather impact on historical residential and commercial consumption is normalised to provide an appropriate, ‘normalised’ basis for demand forecasting.

Consistent with AA5 and the initial AA6 forecast report, CORE has adopted a weather normalisation methodology based on AEMO's EDD forecasting guidelines, as the EDD methodology has been demonstrated to provide a more rigorous and accurate approach to normalisation. This approach involves the derivation of an EDD Index and the application of that index to historical actual demand to arrive at normalised historical actual demand.

3.2.1. EDD Index

The weather index selected for weather normalisation was based on AEMO's EDD_{312} methodology which has been approved by the ERA in previous access arrangements ("**AA**") including MWSWGDS AA5 and AA6 initial forecast. The calculation method and resulting parameters are outlined below:

EDD Calculation:

1. Develop an EDD Index Model to calculate the EDD Index coefficients – this model is included as a supporting Confidential document to this report.
2. Use the EDD Model to derive EDD Index coefficients by regressing daily gas demand on climate data, ranging from 01/01/2008 to 31/12/2023 (B1, B2 and B3 only). Consistent with AA5, historical climate data for the Perth Airport weather station was obtained from the Bureau of Meteorology (temperature, wind speed, sunshine hours).
3. Calculate EDD by using the weather normalised demand model and derived EDD index coefficients. The weather normalisation model is included as a supporting Confidential document to this report.

Below are the model structure and coefficients of CORE's EDD_{312} Index:

Daily demand per connection = $b_0 + b_1$*EDD + b_2*Friday + b_3*Saturday +b_4*Sunday.

EDD =	Degree Day ("**DD312**")	temperature effect
	+ **0.0366** * MAX (**19.2900** - Temperature, 0) * Wind speed	wind chill factor.
	- **0.00** * sunshine hours	warming effect of sunshine
	+ Max (**4.2604***2* Cos $\left(\frac{2\pi(\text{day}-190)}{365}\right)$)	seasonality factor

Where DD_{312} is the degree day as calculated by the following table:

DD_{312} =	$T_2 - T_1$ if $T_1 < T_2$	Daily temperature above threshold temperature
	0 if $T_1 > T_2$	Daily temperature below threshold temperature

- T_1 is the average of 8 three-hourly temperature readings (in degrees Celsius) from 3.00am to 12.00am from the Bureau of Meteorology's Perth Airport Weather Station- deemed by CORE to be an appropriate weather station for the MWSWGDS gas network.
- T_2 represents the estimated threshold temperature for gas heating within the MWSWGDS.
- Average wind speed is the average of the 8 three-hourly wind observations (measured in knots) from 3.00am to 12.00am measured at the Perth Airport Weather Station.
- Sunshine hours are the number of hours of sunshine above a standard intensity as measured at the Weather Bureau's Perth Airport Weather Station. CORE notes that the associated coefficient was estimated to be 0 across the sample period. This is not uncommon for gas networks in temperate regions of Australia where maximum temperature statistically captures most of the sunshine impact.
- The seasonality factor models variability in consumer response to different weather. It indicates that residential and commercial consumers more readily turn on, adjust heaters higher or leave heaters on longer in winter than in the shoulder seasons given the same weather or change in weather conditions. For example, central heaters are often programmed once cold weather sets in resulting in more regular use and consumers are potentially in the habit of using heating appliances once the middle of winter is reached. Further, there is evidence of higher level of hot water use in winter, related to extended showers and longer time to heat water to desired temperature, from ambient temperature. This change in consumer behaviour is captured in the Cosine term in the EDD formula, which implies that for the same weather conditions heating demand is higher in winter than in the shoulder seasons or in summer.[1]

3.2.2. Weather Normalised Demand - B1,2,3

CORE developed a model to facilitate weather normalisation analysis which has been used for B1,2 and 3. CORE has not observed a statistically significant relationship between A1,2 demand and weather and therefore no weather normalisation has been undertaken for these segments.

The model used is consistent with the one used for the initial AA6 forecast.

The EDD_{312} Weather Index was then used for regression analysis on AGA's B3, B1 and B2 consumption data.

1. B1, B2, B3 data was regressed on historical EDD data, monthly.
2. The statistical relationship between customer gas demand and weather fluctuations was determined.
3. The regressions were performed with the two main data sets:
   - Monthly sum of EDDs (calculated from the daily EDD series obtained from the first stage)
   - Monthly sum of gas demand (AGA demand data)

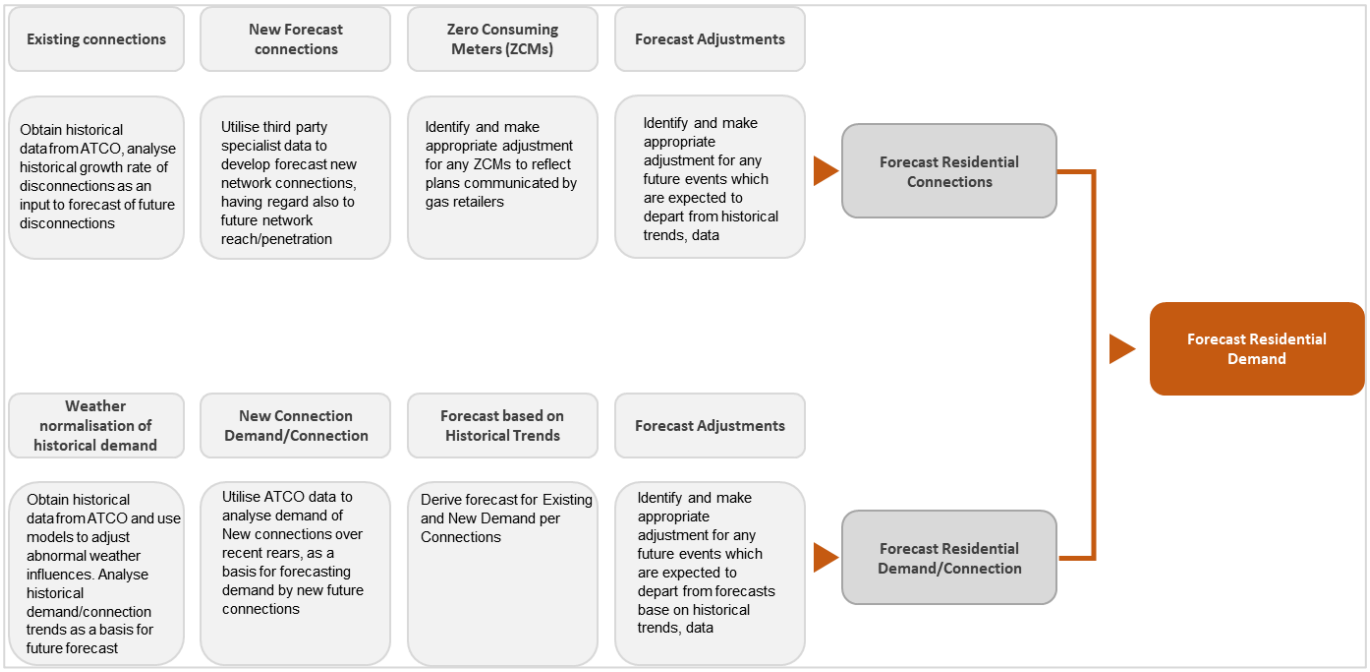
[1] As described in; AEMO, *Victorian EDD Weather Standards – EDD312 (2012)*

CORE considers this process to be compliant with s 74(2) of the NGRs. Forecasts are constructed on a reasonable basis whilst representing the best forecasts possible in the circumstances.

3.3. Tariff Class B3

The methodology adopted by CORE for B3 demand (also defined as residential within this report) forecasting purposes, is outlined in the figure below. This figure shows that residential demand is the product of forecast residential connections and demand per connection.

Figure 3.1 Tariff B3 Demand Forecast Methodology



Source: CORE

3.3.1. Connections

This section details the approach undertaken to derive a best estimate of residential connections.

Due to the different types of dwellings, CORE reconciles bottom-up and top-down approaches. The integration of third-party specialist forecasts is inherent to this approach.

- The bottom-up approach analyses historical trends and major factors which influence gas connections; and
- The top-down approach utilises forecasts completed by specialist third parties. The specific focus here is on dwelling completions within the distribution network.

The results of these two approaches are compared and differences are examined before arriving at a final forecast.

3.3.1.1 Existing Connections

- Residential connection numbers for 2008 to 2023 were compiled by CORE based on data provided by AGA.[2] However, CORE's focus was on data to 2019, and 2023 to eliminate the impact of COVID, and recovery from COVID pandemic, on energy utilisation.
- CORE derived the rates of disconnections from AGA, including updated data for 2023.
- The closing 2023 connections are defined as existing connections for the forecast. The forecast of existing connections for a given year is derived by removing the predicted disconnections in the previous year from the opening number of connections in the previous year. Forecast disconnections are based on the historical average of disconnections as a percentage of the year-opening number of connections, and adjusting for any factors which vary between the forecast and historical periods.
- There are meters on the AGA network for which there is no associated consumption. This situation may occur if a property is vacant or if supply has been cut off because of non-payment. For AA6 no adjustment has been made for Zero Consuming Meters.

3.3.1.2 New Connections

CORE has derived an estimate of new dwelling connections in the 2025 to 2029 period via a four-step process:

1. Estimate new dwellings in WA.
   > CORE has undertaken an extensive literature search and statistical analysis to derive a forecast of WA dwelling completions. In particular CORE has relied upon independent studies completed by the Housing Industry Association("HIA"). CORE considered the use of data from other Providers, and HIA was preferred because its data was most current, provided more detail regarding dwelling types and has been the preferred source of data in other network demand forecasts submitted to the AER, including Victoria and NSW.
2. Estimate number of new dwellings in WA that will be developed within the MWSWGDS area.
   > CORE has undertaken analysis of dwelling completions within the MWSWGDS region relative to total WA.
3. Estimate the number of dwellings within MWSWGDS area that are forecast to be connected to the gas network.
   > CORE has undertaken analysis of the historical MWSWGDS network penetration rate and determined any adjustments based on forecast demographic and other trends.
4. Determine the apportionment of future dwelling connections in the MWSWGDS area that are residential single vs residential cluster dwellings, to enable analysis of the difference in demand per connection between the two dwelling types.
   > CORE has undertaken analysis of the historical average increase of cluster or higher density dwellings relative to single houses and considered future events which may vary from historical trends.

[2] AGA – Volume and Connections History

3.3.2. Demand per Connection

CORE has considered the alternative methodologies that could reasonably be used to forecast residential demand per connection. CORE considers that the most accurate estimate would be formed by analysing the historical annual average growth and then adjusting for the impact of each material factor. Regression analysis was completed for a range of other macroeconomic variables such as household income. Ultimately, no statistical trend fitted to the data set was significant, meaning that weather and price-normalised historical average growth rates were a more reliable alternative. In carrying out this approach, it was ensured that all analysis was rigorous, data of a suitable quality was utilised, the forecast was set out in a transparent fashion and any assumptions, inputs, calculations, and results were displayed.

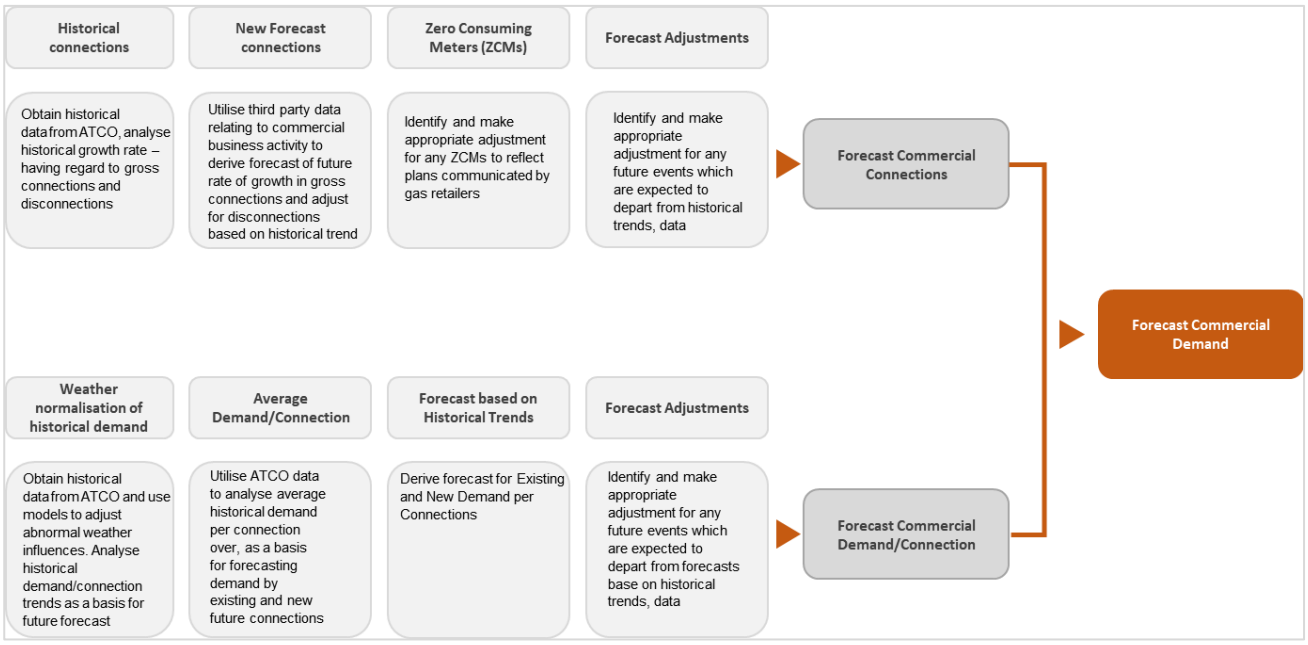
Therefore, the steps taken to arrive at a forecast of demand per connection were as follows:

- Normalise demand per connection for the effects of weather using the process outlined in Section 5.
- Derive the historical annual average growth in demand per connection based on normalised demand per connection between 2008 and 2023 using data provided by AGA.[3]
- Derive a forecast of demand per connection, having regard to major factors which have the potential to influence demand per connection including economic activity, government policy and efficiency trends.

3.4. Tariff Classes B1 and B2

The methodology adopted to derive a forecast of B1 and B2 demand (largely commercial) is similar to the approach used for B3 demand, although different drivers of demand are relied upon. The figure and paragraphs below provide relevant detail of the approach to deriving both Commercial Connections and Demand per Connection which form the basis of the Demand forecast.

Figure 3.2 Commercial Tariff B1 and B2 Demand Forecast Methodology



Source: CORE

[3] AGA – Volume and Connections History

3.4.2. Connections

The following steps were taken to derive a forecast of commercial connections.

- Collate connections data from the 2008 to 2023 period based on inputs provided by AGA.[4] Focus on period to end 2019 and 2022-2023 year to remove impact of COVID period.
- Undertake analysis to arrive at the most appropriate drivers to use as a basis for forecasting future connections.
- Use the selected driver to forecast connections for the bridging year of 2024 and the forecast for the AA6 Review Period

3.4.3. Demand per Connection

The approach used in the residential demand forecast was also adopted for the commercial sector.

- Normalise demand per connection for the effects of weather using the process outlined in Section 5.
- Determine the historical annual average growth in demand per connection based on demand per connection between 2008 and 2023, for both existing and new connections based on inputs provided by AGA.[5]
- Determine the forecast of demand per connection, having regard to the normalised historical annual average growth and the movement in factors that are expected to impact demand per connection. These factors include policy change and appliance trends.

3.5. Tariff Classes A1 and A2

A1 and A2 demand (largely industrial for A1 and some commercial in A2) is forecast by:

1. Identification of the drivers of demand including structural and operational realities
2. analysis of individual customer historical demand trends based on data provided by AGA.
3. customer surveys for largest customers - including customers estimates of forecast ACQ and MHQ
4. research and analysis of third-party data to assess factors that are expected to impact A1 and A2 ACQ demand.
5. for A1 customers that also require an MHQ forecast, the historical ratio with annual demand was reviewed as a basis for the forecast, in addition to any known closures and load changes.

This analysis includes consideration of both Macro and Micro factors which are expected to impact A1 and A2 customers, including but not necessarily limited to:

Macro

- impact of future economic activity on different industry classes
- outlook for construction and related activity gas consumption based on third party estimates of construction activity.

[4] AGA – Volume and Connections History

[5] AGA – Volume and Connections History

- trends in energy efficiency
- scope for government policy to assist large consumers reduce GHG emissions.

Micro

- qualitative evidence of planned initiatives by specific industry sectors as it relates to reduction of energy generally and gas specifically, including:
    - Bricks, construction material and related services
    - Transport
    - Food processing
    - Other manufacturing
    - Government and public services
    - Retailing

4. CORE's response to ERA's draft decision report - Attachment 2 Demand.

4.1. Introduction

CORE has undertaken a detailed review and analysis of all issues raised by NIEIR and ERA in relation to the CORE demand forecast, as summarised within the ERA draft decision, and CORE's response to each issue raised is set out below.

As part of this process, CORE noted that NIEIR and ERA raised issues relating to matters addressed by CORE which they state were unclear or uncertain. CORE believes that the matters referred to were adequately addressed through the combination of report and models submitted to ERA. CORE further, considers it both surprising and unusual that there was no contact with CORE prior to the release of the draft decision to address areas of uncertainty or lacking clarity before arriving at alternative forecasts and issuing a draft decision.

Following the review of the ERA draft decision, NIEIR report, and stakeholder submissions, CORE has not identified any material reason to change its methodology or approach to developing a revised demand forecast for MWSWGDS.

For this revised forecast CORE has addressed the following major items:

- Updating weather normalisation data for B1,B2 and B3 tariff classes.
- Updating AGA connection and demand actual data for the 2023 year.
- Reviewing outlook for A1 and A2 customers specifically to ensure CORE's forecast was up to date.
- Updating base data sourced from HIA as a basis for updating connection forecasts for B3 tariff class.
- Updating analysis of macro-economic factors and micro factors impacting upon future customer connection and demand across all tariff classes.

CORE considers that the ERA and NIEIR forecast do not satisfy NGR requirements in terms of the best estimate under the circumstances as there is clear evidence that the parties do not fully understand the basis for the CORE forecast under consideration, the parties have made a range of significant inaccurate statements/assumption and have not adequately analysed the forecast of the WA market operator, AEMO as addressed in 4.5 and section 10 below.

4.2. Overview

CORE considers that there is significant difference between the level of detail presented by ATCO and CORE and broader transparency in support its forecast and the approach used, and the nature and extent of data and information provided by NIEIR ERA and stakeholders. This makes it difficult for CORE to undertake a full analysis of the approaches used and data relied upon.

CORE notes a significant number of inaccuracies or misunderstandings regarding CORE's analysis within the ERA draft decision report as it relates to NIEIR and ERA interpretations and this may have a material impact of ERAs draft decision.

CORE considers that a number of elements of the ERA/NIEIR approach to deriving forecasts fall short of the NGR requirement as it relates to ss 74 and 75.

The heavy reliance on simplistic econometric modelling does not adequately address the many structural and operational drivers of gas demand, which require more complex analysis and direct interface with customers and broader literature research and analysis, as undertaken by CORE.

CORE has responded to ERA's Draft Decision in line with:

- ERA's references to AEMO GSOO forecast.
- Specific References within ERA's draft decision to Stakeholder Feedback to ATCO's submission
- Specific points of concerns in each tariff class for AA6 Demand forecast.

4.3. Consideration of ERA's Reference to AEMO GSOO forecast.

CORE considers that AEMO holds an important responsibility across the WA gas market as the Market Operator, including maintaining an annually updated forecast of gas consumption both within and outside the WA distribution system.

CORE has undertaken an analysis of the latest GSOO forecast as summarised in 2.6 above (and extended in section 10), which demonstrates that the CORE/ATCO forecast is below that of AEMO, having regard to the significant level of likely/expected increased electrification on future gas demand, across all customer classes.

CORE notes that NIEIR and ERA have placed little to no emphasis on this independent forecast. In fact, the ERA makes inaccurate references to the latest GSOO forecast.

The ERA report states at p. iv: *"The ERA's haulage reference services demand forecast is relatively in line with AEMO's gas demand forecast for its distribution category in 2023 Western Australia Gas Statement of Opportunities December 2023 (2023 GSOO). AEMO has forecast an increase in the gas demand at 0.91 per cent per year during the AA6 period (without significant electrification in the community), compared to the ERA's forecast at 0.34 per cent per year [6]".*

Footnote 6 states *"2023 Western Australia Gas Statement of Opportunities December 2023 (2023 GSOO). Note that AEMO's demand forecast for distribution has been adjusted to include industrial customers in the ATCO's distribution network classified to the industrial category in 2023 GSOO. AEMO noted in 2023 GSOO that the gas demand for the distribution sector would decline at 1.5 per cent per year between 2023 and 2033 if electrification is included. However, AEMO did not provide information on the electrification effects on gas demand for the distribution sector between 2025 and 2029".*

CORE disagrees with the ERA's statement. CORE notes that AEMO did include the impact of future electrification on the distribution network. Further CORE notes that AEMO's Expected Scenario assumes that electrification will impact the distribution network materially through 2025-2029 and beyond. In this regard, AEMO did disclose detail of its expected scenario forecast of the impact of electrification on the distribution network – for both tariff V and tariff D classes separately. The data is provided in the Figure 11 tab of the Data Register which accompanied the GSOO release[6].

[6] https://aemo.com.au/en/energy-systems/gas/gas-forecasting-and-planning/wa-gas-statement-of-opportunities-wa-gsoo

CORE is surprised that NIEIR and/or the ERA did not consult/consult adequately with AEMO in relation to its forecast, given its pivotal role as a gas market data provider in the WA market. CORE's experience with other major Australian jurisdictions, including NSW and Victoria, is that these forecasts are closely scrutinised.

CORE has used AEMO forecasts as a leading forecast of gas use in WA and on this basis considers that the validation process provides strong evidence of the reasonableness of the CORE forecast and potentially a significant degree of conservatism due to an assumption of a slower rate of electrification than assumed by AEMO.

Further analysis of the CORE revised forecast vs AEMO GSOO 2023 forecast is included in Section 10.

4.4. Detailed Response to ERA's Reference to Stakeholder feedback

4.4.1. Introduction

CORE has reviewed all references within its draft decision as it relates to stakeholder feedback. Further CORE has reviewed and analysed the specific submissions listed within the ERA MWSWGDS Access Arrangement online portal.

CORE assumes that stakeholders were provided with access to the CORE report alone, in light of the Confidential nature of the three models provided to the ERA. CORE considers that the reports and models should be read together to gain a full understanding of the basis of the forecasts. For this reason, CORE considers that the stakeholder feedback may be based on only partial information.

Further CORE notes that in general the feedback by stakeholders, as it relates to demand, provide insufficient data and analysis to support the comments made, making it difficult to assess the factual/evidential basis for the comments/statements.

Nevertheless, CORE has addressed specific major issues raised by the ERA in the Stakeholder Feedback section of its draft decision and commented on certain comments by stakeholder with their submissions reports to the ERA.

4.4.1.1 Alinta

ERA report, paragraph 12 *"Alinta Energy (Alinta) did not foresee a significant decrease in gas demand for B3 customers in the short term. It considered ATCO's demand forecast for B3 customers "to be significantly underestimated."*

Given Alinta's significant gas retailing role in WA, CORE has undertaken a full review of the Alinta submission in response to the ATCO/CORE proposal demand forecast. CORE's full response is included as Attachment 2 to this report. A summary of CORE's response follows:

- Alinta's report includes insufficient supporting detail for CORE to determine the validity of its outlook.
- Alinta does not provide detail of its analysis of the impact of electrification on gas use.

4.4.1.2 WA Expert Consumer Panel (WAECP)

CORE notes that the WAECP does not dispute CORE's forecast in absolute reduction in demand, rather it focuses on the fact that penetration rate should decrease over time and disconnection rates should increase over time rather than remain flat across the AA6 period.

As stated in other areas of this report, CORE considers it appropriate to use an average/smoothing approach rather than apply the decline to each year. If CORE was to use a declining approach the penetration rate would fall materially in later years, and the disconnection rate would be materially higher in later years, but the average would be 72%. (71% in revised forecast).

CORE notes the WAECP states on page 8 **"Growth in ATCO's customer base is likely to be lower than forecast by ATCO. Given the introduction of the new National Construction Code and an increasing focus by consumers on emissions reduction and whether to convert their homes to electricity only, we expect the rate of new connections to slow further and disconnections to continue to accelerate"**.

4.4.1.3 Kleenheat

ERA report, paragraph 14 ***"Kleenheat considered that the weather normalised gas usage per connection decline rate proposed by ATCO was high. Kleenheat noted its average customers' usage "is declining at around half the rate of that proposed by ATCO.***

CORE considers the Kleenheat submission to lack sufficient detail to enable CORE to undertake a rigorous analysis, however the following broad comments are made.

CORE's forecasting approach commences with historical trend data for the MWSWGDS as a whole and not Kleenheat average in part. CORE has clearly set out reasons why its forecasts vary from trends, including a reasonable expectation of growth in electrification which is expected to impact both connections (where gas is not connected to all electric homes or businesses) and usage (where one or more gas appliances are replaced by electricity – due to end of appliance life or renovation activity), but some, albeit reduced gas use continues.

CORE notes that the gas market operator AEMO, presents details of the forecast impact of electrification on gas use within the 2025-2029 period and beyond which provides independent support of the CORE forecast trend. More specifically AEMO incorporates a significant reduction in demand due to electrification within its Expected Scenario as detailed in Section 10 of this report.

4.4.1.4 AGL

ERA report, paragraph 16 ***"AGL Energy (AGL) stated that "experience in other jurisdictions (except Victoria) presently show a strong preference for gas by consumers. Without a policy decision (such as Victoria's) impacting gas usage, AGL would expect gas connections and consumption to continue to grow"***.

The quote by ERA is only one element of the AGL response, additionally AGL states:

- Page 2 "The ATCO consumption forecasts are consistent with the AEMO forecasts".
- Page 6
    - "While current projections for customer numbers and demand may be increasing, the potential for a sudden change because of a policy shift can lead to a dramatic downturn (e.g. Victoria). As such, this period

is one for prudent measures to be taken to position the gas network for any of the possible future scenarios, in preparation for a policy shift or a consumer change".

- "AGL notes that this period is one of high uncertainty for Gas Distribution businesses across Australia".
- While there is no policy directed at the Gas Networks, it is reasonable to accept that there will be long term impacts on the network".

4.5. AA6 Demand Forecast

4.5.1. A1 Customers

The ERA's draft decision addresses a range of issues in relation to the A1 Customer class as summarised below.

ERA report, paragraph 27 *" For non-surveyed customers and non-responding surveyed customers, the demand forecast was developed by Core, driven by the forecast for customer numbers and average consumption per customer. Core did not anticipate an increase in customer numbers for the A1 and A2 tariff classes".*

CORE Response: This is an inaccurate statement.

CORE's approach to the forecast of non-surveyed customers and non-responding surveyed customers involved an analysis of the industrial class to which each customer was assigned and applied a growth factor based on the outlook for each industrial class.

Further, CORE's forecast of customer numbers was based on analysis of historical actual trends. Between 2009 and 2023 the annual growth in A1 customers is below 1.

CORE therefore considers that its approach provides a basis for developing a best estimate under the circumstances.

ERA report, paragraph 28 " NIEIR noted that Core did not model customer growth and economic drivers, and it was unclear whether the forecast included new private and public sector projects".

CORE Response: This is an inaccurate statement by NIEIR.

CORE notes that NIEIR made no attempt to discuss any areas of uncertainty with CORE. CORE considers it unproductive to proceed to a draft decision before clarifying any uncertain issues.

CORE did model customer growth based on a significant historical time series and analysis of third party data and broader disclosures, including information relating to public and private projects, including consultation with AGA management closest to markets/customers.

CORE therefore considers that its approach provides a basis for developing a best estimate under the circumstances.

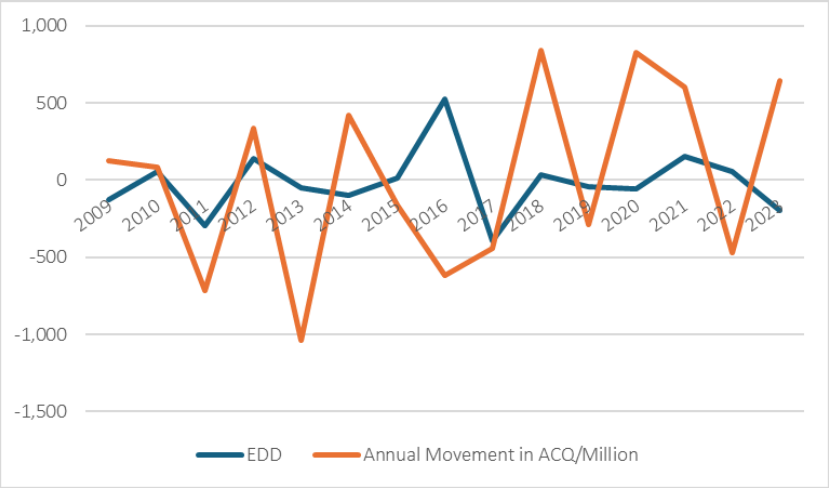
ERA report, paragraph 28 *"The weather normalisation should have been included in the forecast for A1. NIEIR found that A1 and A2 tariff classes are temperature sensitive and included weather normalisation in its forecast".*

CORE Response: CORE disagrees.

CORE undertook analysis of A1 and A2 historical demand and EDD and found a weak statistical relationship (correlation coefficient of 0.02 for A1 and 0.10 for A2 and on that basis determined it was not appropriate to apply weather normalisation to the aggregate of the A1 and A2 customer classes.

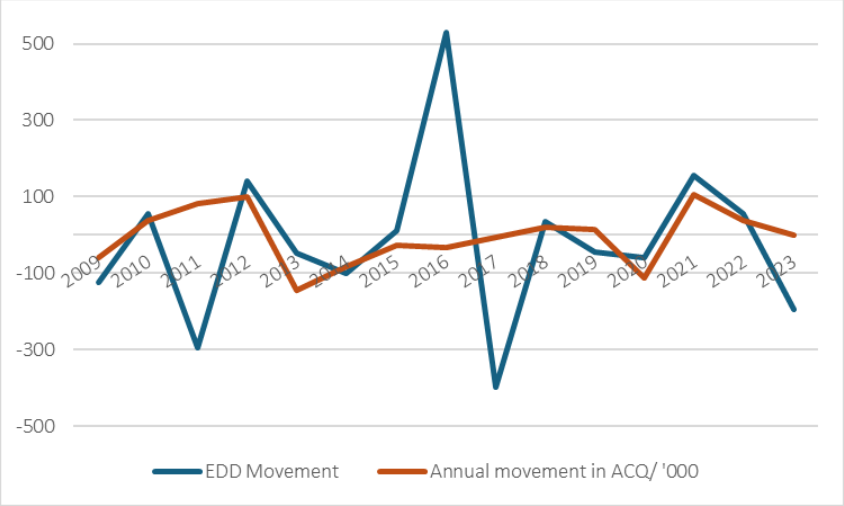
The following figures show the relationship between annual movement in A1 and A2 in aggregate and annual movement in CORE calculated EDD as presented within an EDD index model presented to the ERA.

Figure 4.1 A1 annual movement in demand (ACQ/1 million for chart scale purposes) and EDD



Source: CORE based on actual a1 ACQ and EDD calculated by CORE and presented to ERA

Figure 4.1 A2 annual movement in demand (ACQ/'000 for chart scale purposes) and EDD



Source: CORE based on actual a1 ACQ and EDD calculated by CORE and presented to ERA

CORE notes that the reason for the lack of correlation is that large movements can take place over time, independent of weather and economic activity alone, rather they are due to major operational changes in activities of specific customers – e.g. closures, expansions or contractions in activity and energy use.

CORE also analysed subsets of the A1 customer class but was unable to identify a sufficiently close relationship between A1 and EDD. CORE noted a closer relationship between A1 commercial customers however the impact of normalising weather

was assessed to be immaterial. Instead, CORE focused its analysis on all material drivers of demand by undertaking analysis of likely material movements in each A1 customer and customer class.

CORE notes that NIEIR have aggregated A1,A2, B1, and B2 demand to analyse relationships between weather and what NIER refers to as industrial demand, a grouping that CORE finds extraordinary and in variance from the approach used in any other major gas distribution networks in Australia for weather normalisation analysis purposes[7]. CORE has weather normalised B1 and B2. If B1 and B2 data was removed from the NIER analysis, we consider it most unlikely that there would not be an observable relationship of statistical significance. As CORE has stated the correlation coefficient is 0.02.

CORE considers this grouping to be invalid as a data set to assess weather normalisation of Industrial customers.

ERA report, paragraph 28, *"NIEIR analysed gas price elasticity and economic growth on business activities for industrial groups to derive econometric multipliers, which in turn drive the customer connection and consumption growth".*

CORE Response: CORE disagrees.

Along similar lines addressed in the above paragraph, CORE was unable to identify a significant relationship between price movement or economic activity and movements in demand. Having regard to causal factors CORE was not surprised, as a more detailed analysis of movements by specific customers revealed that major changes were attributable to operational factors and not movements in price or economic activity. To illustrate this further, CORE notes that there have been major announced movements in gas demand in recent months which account for up to 10% of WA gas demand[8] which are attributable to specific operational factors alone – including the closure of the Kwinana alumina operation, major reduction in the CITIC iron operation, and expansions in gold field operations. These movements can only be identified by direct survey or specific company/operation analysis and not a mere application of economic activity or price elasticity factors.

CORE has reviewed NIEIR's gas price elasticity references. It appears to CORE that NIEIR relied on the AEMO analysis of gas demand and supply balance in the period beyond 2024 to derive its estimate of future gas prices – which it forecast to increase by >10%. CORE notes, as referenced above, that there has been a major reduction in demand side pressure following announcements by Alinta and CITIC. These changes are expected by CORE to result in lower gas prices from 2025.

ERA report, paragraph 28 *"NIEIR did not use ATCO's consumption survey results as it considered that the results were not current. Thus, NIEIR applied its forecast method across all customers in the A1 and A2 tariff classes".*

CORE Response: CORE disagrees with NIEIR's approach.

CORE is surprised that NIER ignored the survey data. CORE considers direct customer feedback to be among the most insightful and accurate methods of acquiring data and intelligence about future energy use. The data was dated late 2022 as there are significant lag times before initiating surveys and receiving and clarifying responses.

[7] Separate analysis has been undertaken for commercial and industrial customers for the following access arrangement JGN (NSW), AGN Vic, Multinet (Victoria), and AGN SA (South Australia).

[8] Based on approximately 1,100 TJ of consumption per day and an estimated combined reduction in consumption by Kwinana and CITIC of over 100 TJ/d. see https://news.alcoa.com/press-releases/press-release-details/2024/Alcoa-announces-curtailment-of-Kwinana-Alumina-Refinery-in-Western-Australia/default.aspx and https://citicpacificmining.com/news/68-annual-production-target-at-sino-iron-reduced-legal-action-launched-to-support-mine-continuation

CORE considers that NIEIR's forecast method is unreliable without direct customer input. This is because of the high % of demand which is attributable to a small number of customers – particularly within the A1 tariff class. A material movement in demand by a few specific customers will give rise to a material % movement across the entire tariff class. Such movements will not be identified via econometric modelling alone. In support of this statement, CORE notes that there is strong evidence that less than 10 customers will materially reduce demand within the next two years and others increase temporarily. This data is access through direct market interface and literature research and economic modelling will not identify such specific outcomes. A balance of macro and micro, commercial and market analysis is required.

CORE notes that despite NIEIR's approach, the ERA did consider the survey results.

ERA report, paragraph 29 *"The ERA considers that it is not appropriate to forecast consumption per connection to derive demand as in Core's forecast. This is because both A1 and A2 tariff classes include commercial customers that have a diverse range in business size and nature of business activities. Moreover, the sensitivity towards change in economic conditions and consumer spending varies. Thus, the historical average consumption per connection is not a reliable variable for the demand forecast in A1 and A2 tariff classes.*

CORE Response: This is an inaccurate statement.

CORE did not simply multiply a customer number by average use. CORE carefully analysed survey results and related customer information which covered a large proportion of A1 customers. For customers not surveyed or which did not respond to a survey, CORE allocated customers by industry group and determined a growth rate having regard to a series of factors including, but not limited to economic outlook. For example, CORE also undertook literature search to determine if there were announcements made by large customers and held discussions with AGA management who are closest to customer interface.

ERA report, paragraph 30 *"In the ERA's view, economic growth and gas price elasticity should be considered for demand forecasts. The ERA agrees with NIEIR's method of using econometric variables to forecast customer numbers and gas consumption, which should apply to non-surveyed customers and non-responding surveyed customers. The ERA expects ATCO to update its demand forecast in its response to the draft decision, with a more recent survey result reflecting a revised gas consumption expectation by its customers post 2022".*

CORE Response: CORE disagrees.

CORE did consider economic activity and a range of other factors in determining its forecast as stated within its report and restated above.

Price elasticity was not considered material for reasons addressed above.

CORE does not agree that a simple use of the econometric variables used by NIEIR and relied upon by ERA provide the best estimate under the circumstances, as required by the NGR. This approach lacks rigour in terms of addressing the underlying drivers of energy use by specific large customers and there is expected to deliver an inferior forecast than the more rigorous approach used by CORE.

To suggest that a simple econometric model (which by implication relies on historical data), is likely to deliver superior results which include survey of a large proportion of customers (in late 2022) is illogical from CORE's perspective.

4.5.2. A2 Customers

ERA report, paragraph 33. *"The demand forecast comparison for the A2 tariff class are in Table 2.7 to Table 2.9 below. The total demand forecast by NIEIR and ERA was higher than ATCO by 6.37 per cent and 9.45 per cent".*

CORE Response: CORE disagrees with the approach used.

Consistent with comments in relation to A1 customer forecasts, there appears to be a material difference between ERA and NIEIR forecasts.

CORE considers there to be a high level of risk associated with reliance on econometric variables alone, as shown consistently over time to deliver poor results as they do not adequately address structural and operational changes which are often the major drivers of demand.

CORE considers the approach adopted by NIER to be biased toward top down in nature and lacking in a balance of top down and bottom up approaches.

4.5.3. B1 and B2 customers

4.5.3.1 Introduction

CORE considers there to be a range of deficiencies in the approach adopted by NIEIR and ERA to arrive at the forecasts presented in the draft decision, including but not necessarily limited to:

- Inappropriate reliance on gas price elasticity to support a forecast lower level of demand than forecast by CORE.
- Reliance on top down, simplistic econometric modelling which does not adequately analyse the drivers of consumption behaviour within specific industry segments – i.e. bottom up analysis.
- Insufficient evidence relating to the prospects of increased electrification during the AA6 period.
- Insufficient analysis of comparative analysis of NIEIR/ERA forecast and forecast presented by AEMO.

In following sections of this report CORE has provided further evidence to support its revised B1 and B2 forecasts.

4.5.3.2 Specific issues raised by ERA in draft decision report – Attachment 2

ERA report, paragraph 36. *"NIEIR noted that Core did not model economic drivers, new customer growth was lower than historical growth, and the demand forecast for B1 tariff class seemed lower compared to historical growth. In its demand forecast for B1 and B2 tariff classes, NIEIR analysed gas price elasticity and economic growth on business activities for industrial groups to derive econometric multipliers, which in turn drive the customer connection and consumption growth".*

CORE response: CORE considers the NIEIR approach to be inadequate.

The use of simplistically derived macroeconomic coefficients as applied by NIEIR are inadequate as they do not show clear causal relationships and corresponding reliable coefficients representing consumption drivers and resultant demand.

As addressed above, CORE does not accept that gas price elasticity as applied by NIEIR, will deliver a more accurate forecast, particularly in light of the fact that NIEIR's WA gas contract price outlook is out of date.

ERA report, paragraph 37. *"The ERA notes that Core's customer growth forecast did not explain how the customer growth factor was derived, and the reason for using a lower economic activity assumption was not explained. The ERA considers that it is not appropriate to use consumption per connection to derive demand. The consumption per connection fluctuates widely between the historical years. The ERA considers this fluctuation is attributed to the diverse range in business sizes and the nature of the business activities. Moreover, the commercial customers' sensitivity towards change in economic conditions and consumer spending varies. Thus, the average consumption per connection is not a reliable variable for forecasting demand in B1 and B2 tariff classes".*

CORE response: CORE considers the statement to be inaccurate.

CORE did not rely on demand per consumption to derive a forecast of demand for B1 and B2. CORE's approach involves a rigorous analysis of the historical trends in connections and consumption, adjusted as appropriate to incorporate the impact of future events not adequately represented in historical trends.

CORE did undertake analysis of demand and a range of macroeconomic factors but was unable to identify a statistical relationship that would provide a reliable basis for deriving a forecast which meets the requirements of the NGR. Therefore, CORE favoured an approach which commenced with analysis of historical trend and then adjusted for factors which are expected to give rise to a variance in future trend. The latter variance was determined following careful analysis of a range of factors including customer mix and demand concentration, industry classes and weighting, number of customers per class, literature research and analysis, macroeconomic outlook, and electrification scenario analysis (including consideration of AEMO GSOO analysis).

ERA report, paragraph 38, *"In the ERA's view, economic growth and gas price elasticity should be considered for demand forecasting. The ERA agrees with its consultant's method to use econometric variables to forecast demand and customer numbers".*

CORE response: CORE disagrees that the NIEIR approach will provide a best estimate under the circumstances, for reasons addressed in other paragraphs within this section 4. In particular the elasticity analysis is based on price data which is not current and the econometric modelling is overly simplistic and lacks 'real world' thinking, analysis and insight.

ERA report, paragraph 39, *"The ERA conducted an internal assessment of demand for B1 and B2 tariff classes by adopting data provided by ATCO and applied NIEIR's econometric multipliers to forecast customer connection and consumption growth".*

CORE response: CORE disagrees that the NIEIR approach will provide a best estimate under the circumstances, for reasons addressed in other paragraphs within this section 4. In particular, the multipliers are not representative of the 'real world' drivers of B1 and B2 demand.

4.5.4. B3 Customers

ERA report, paragraph 44. *"Core has forecast new customer connections based on estimated dwelling completions during the AA6 period. Core's dwelling completion forecast did not include multi-unit developments."*

CORE Response*:* This is an inaccurate statement.

CORE considers it important to highlight that its dwelling completion numbers are based on independent forecasts developed by the Housing Industry Association who offer a specialist, regularly updated service relating to housing commencements in NSW (and nationally) which can be readily translated to completions by use a simple lag factor/s. This has been a source used historically by CORE for all gas distribution networks throughout Australia and accepted by regulatory authorities as meeting NGR requirements[9].

CORE's forecast did consider all multi-unit developments and included multi units other than larger blocks of multi units on the basis that those blocks are most likely to have a single meter and a larger use which would take it outside the B3 customer class.

CORE notes that the ERA ultimately adopted CORE's completion estimate as a basis for its draft decision (paragraph 49).

Paragraph 44. *Additionally, Core did not use actual dwelling completions to perform trend analysis, which would affect the robustness of the connection penetration analysis. Core applied a connection penetration rate on the forecast dwelling completions to forecast new connections. The connection penetration rate was based on an average rate over a five-year period between 2017 and 2021 at 79.6 per cent. This rate aimed to illustrate the historical decline in the gas connection penetration, but it disregarded the historical decline observed from 2014 to 2016. Core reduced the five-year average penetration rate between 2017 and 2021 (79.6 per cent) by a historical trend factor of 6.6 percentage points. The reasons for this further reduction are unclear and the reduction seems high compared to the average decline rate of 2.48 per cent per year between 2014 and 2021. Also, Core did not explain a further reduction in its forecast penetration rate of 1 percentage point based on non-trend factors. Core used a flat penetration rate of 72 per cent to forecast new connections over the AA6 period, without considering the potential for a gradual connection decline, which is evidenced by a historical declining penetration trend between 2014 and 2021".*

CORE Response: CORE disagrees.

CORE did use extensive actual/historical completion data in deriving its historical average and forecast penetration rates which is clearly set out in the CORE demand forecast model.

CORE undertook an analysis of penetration rates since 2009, and after careful analysis determined that the most appropriate historical data series to use was the data for a recent five year period to capture most recent trend data based on an observation that penetration rates had stepped down materially since 2016, and therefore it was not appropriate to include prior year penetration rates.

[9] This is evidenced in the methodology used for the latest access arrangement demand forecasts for JGN NSW, Multinet (Victoria), AGB Vic (Victoria) and AGN SA (South Australia).

CORE analysis highlighted that the penetration rate has declined by an aggregate (not annual) close to 7% (6.6%) between the average of 2009-2016 of 87% and the average of the 2016-19 of 80% and that is reasonable and analytically defendable to assume that this rate of reduction would continue in to the future, particularly at a time that there is a global, national and WA State push toward decarbonisation, including increased electrification. CORE notes that the ERA compared the 6.6% reduction to an average rate which is not appropriate as the 6.6% movement relates to an extended time series and not an annual movement.

Having regard to the significant uncertainty associated with forecasting the precise allocation of new trend based data for each year during the AA6 period, given factors such as labour and materials challenges faced by the construction industry, CORE deemed it more prudent to use an average/smoothed number of 72% over time (for initial proposal and 71% in revised forecast), but has reassessed whether it can develop a best estimate of timing of reductions per annum in developing the revised forecast.

CORE notes that the ERA ultimately accepted CORE's completion estimate as a basis for its draft decision (paragraph 49). However, the ERA relied upon a flat penetration rate of 79.6% which CORE considers lacking adequate rigour and ignores clear evidence that penetration rates have reduced materially in the past and are reasonably expected to be lower in the future.

ERA report, Paragraph 46. *"Core has forecast a decline rate of 2.80 per cent for consumption per customer during the AA6 period. The forecast did not account for the difference in the gas consumption profile between legacy customers and new customers. Core assumed that the consumption per customer for all customers would decline at the same rate. However, historical consumption data between 2012 and 2022 showed a different trend. The consumption per customer for legacy customers declined overtime. In contrast, the consumption per customer for new customers remained stable once consumption ramped up, typically from the third or fourth year of the connection".*

CORE Response: This is an inaccurate statement.

CORE notes that the historical data series upon which its analysis was based included a mix of existing or legacy customers and new customers (to 2022 for initial proposal and to 2023 for revised forecast). For the purposes of its forecast CORE used this blended decline rate as a best estimate of future decline in average consumption for both existing and new customers.

CORE's forecast did include the ramp up of new customers over time and this was reduced only partially by the decline rate applied, yielding a net increase in demand per new customer (i.e. the ramp up rate used for new completions is higher than the rate of decline in consumption/completion). As set out in the accompanying model, CORE used a base assumption of 10.5 GJ for a new customer and the ramp up was 25% in year 1, 87% in year 2 and 100% in year 3.

ERA report, paragraph 56. *"ATCO's [B3] demand forecast should incorporate the following change:*

The demand forecast for new customers in B3 tariff class should use the historical trend of actual dwelling completions, and connection penetration should be based on historical trends between 2014 and 2021. ATCO needs to provide evidence if it considers that the decline in the connection forecast is faster than the historical trend".

CORE Response: CORE disagrees with the approach called for by ERA.

CORE considers that dwelling completions should be based on a independent forecast which addresses future drivers of dwelling completions which may not be consistent with trends in historical completions. CORE has therefore used a lag of HIA commencements as a proxy for completions, consistent with approaches used for demand forecasts relied upon by JGN NSW, AGN Vic and Multinet Victoria and AGN SA – which represent the majority of residential demand in eastern Australia.

CORE does not agree that the historical 2014-2021 trend will result in the best estimate under the circumstances as required by the NGR. The 2009-2023 total time series provides evidence that penetration rates have changed over time, as addressed above, and it is reasonable to expect that reductions in penetration rate will be experienced in the future, as acknowledged in the response by the WA Expert Consumer panel in their stakeholder response.

4.6. ERA Demand Summary Statement

ERA report, paragraph 56. *"ATCO's demand forecast should incorporate the following changes:*

- *The demand forecast for A1, A2, B1 and B2 tariff classes should be based on econometric variables, taking into account the demand profile of the industrial and commercial customers.*

  CORE response: Addressed above.

- *The demand forecast for A1 and A2 tariff classes should be updated with a more recent customer demand survey result reflecting a revised gas consumption expectation.*

CORE response: Addressed above.

- *Weather normalisation should be incorporated into the demand forecast for A1 and A2 tariff classes.*

CORE response: Addressed above.

- *The demand forecast for new customers in B3 tariff class should use the historical trend of actual dwelling completions, and connection penetration should be based on historical trends between 2014 and 2021. ATCO needs to provide evidence if it considers that the decline in the connection forecast is faster than the historical trend.*

CORE response: Addressed above.

- *For B3 tariff class, the effect of permanent disconnections and temporary disconnections on the disconnection forecast should be assessed, and a robust trend analysis including, but not limited to, a separate forecast for legacy customer connections and new customer connections".*

CORE response:

CORE has undertaken an analysis of historical disconnections in total as a percentage of opening connections (for the 2009-2019 and 2009 to 2023 periods) to arrive at a base level of forecast disconnections during 2024 and the AA6 period of 0.36%. COREhas then undertaken scenario analysis to determine the expected impact of electrification trends on future disconnection rates, to arrive at an estimated smoother average disconnection rate of 0.46% between 2024 and 2029. CORE confirms that disconnections forecast are permanent disconnections.

- *For B3 tariff class, a robust trend analysis is required to forecast consumption separately for legacy customers and new customers, and econometric variables such as household disposable income and gas price elasticity should be incorporated into the consumption forecast".*

CORE response: Addressed above.

ERA report, paragraph 57 " If ATCO proposes a revised demand forecast in response to this draft decision, then the ERA would require that it incorporates new information that affects gas demand during AA6, including 2023 actual demand.

CORE response: A revised forecast has been undertaken.

The following sections of this report summarise the basis for CORE's revised forecast of gas demand for all MWSWGDS tariff classes. CORE's revised forecast does include a range of new data, including new connection and demand data for 2023.

CORE addresses each point included within paragraph 56 of the ERA draft decision report within the relevant sections of this report.

4.6.1. Ancillary Services

ERA report, Paragraph 60. "The ERA considers that the level of ancillary reference services should revert to pre-COVID levels from 2024. The forecast for the AA6 period should use the average service rate between 2015 and 2019."

CORE response: CORE disagrees with proposed approach.

CORE notes ERA's Broad acceptance of the basis used by CORE to derive the forecast of Ancillary services, however there are differences between CORE and ERA forecasts due to differences in underlying B3 forecasts and different assumptions relating to the service rate to be applied from 2025-2029, for each service.

However, CORE does not consider the average service rates experienced between 2015 and 2019 to provide a basis for the best estimate under the circumstances as drivers of service levels vary between each service and each service has a varying level of maturity. Therefore, CORE considers better practice to include an analysis of drivers for each service and analysis of historical service levels, adjusted for expected changes in service under expected B# demand scenario.

CORE addresses its revised forecast of Ancillary services in section 9 of this report.

5. Weather Normalised B1,2,3 Demand

5.1. Introduction

CORE's analysis of historical demand is based on normalised data to remove abnormal fluctuations caused by weather factors.

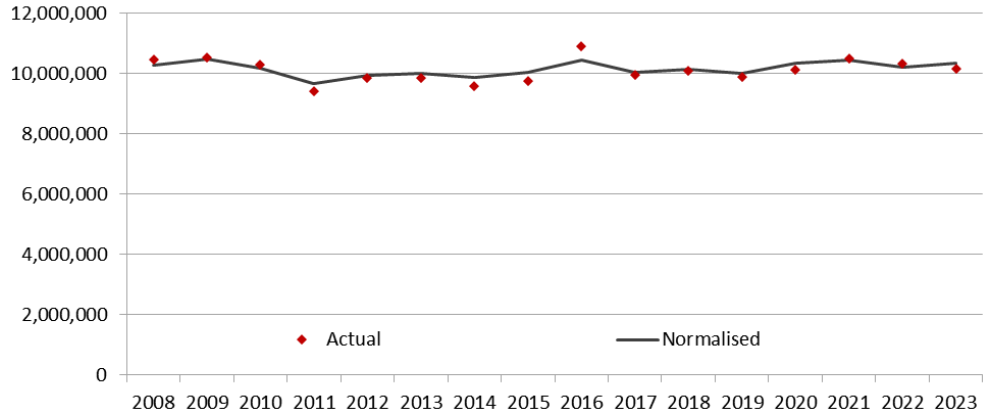
The following paragraphs summarise the results of the weather normalisation process. CORE's proprietary EDD index model and weather normalised demand model should be read in conjunction with this report. These models have been submitted to AGA and form a confidential attachment to AGA's Access Arrangement Information.

5.2. EDD Index

Historical demand data was normalised to remove the impact of weather on demand and demand per connection for the Tariff B1, B2 and B3 customer groups.

The EDD Index presented in the following figure and tables were used to normalise Tariff B1, B2 and B3 demand. As part of this process, the long-term, linearised trend of EDD is compared to the annual fluctuations in weather. Actual EDD greater than the EDD trend, implies that weather in this year was colder than normal and vice versa. Colder weather induces higher demand per connection, as more gas is required for heating (space and water).

Figure 5.1 EDD Index



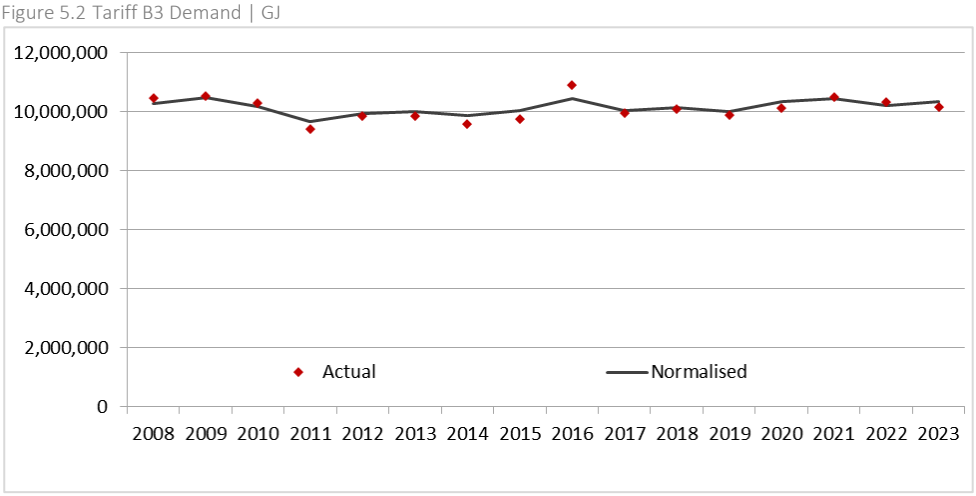
Source: CORE based on revised EDD model

5.3. Weather Normalised Demand Results | Tariffs B1, B2, B3

5.3.1. B3

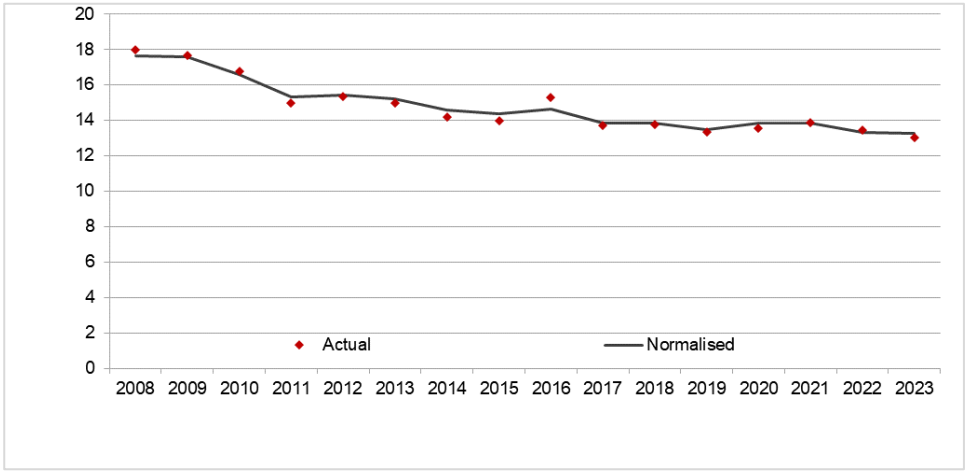
For the B3 customer group, total demand has remained relatively flat (due to impact of connections offsetting D/C), whereas historical normalised demand per connection exhibits a steady declining trend.

Figure 5.2 Tariff B3 Demand | GJ



Source: CORE based on weather normalisation model

Figure 5.3 Tariff B3 Demand per Connection | GJ



Source: CORE based on revised weather normalisation model

5.3.2. B1

Normalised B1 demand has experienced an upward trend on average, with a decline in demand per connections offset by connection growth.

Figure 5.4 Tariff B1 Demand | GJ

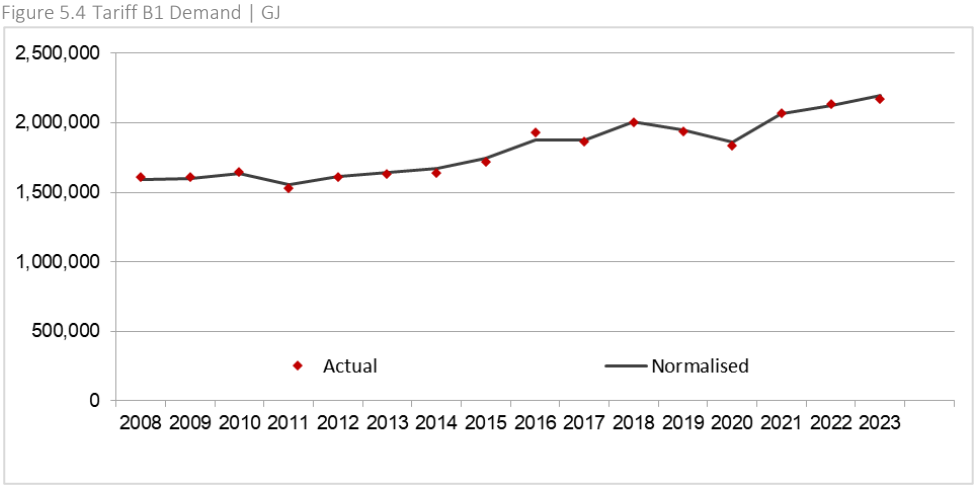
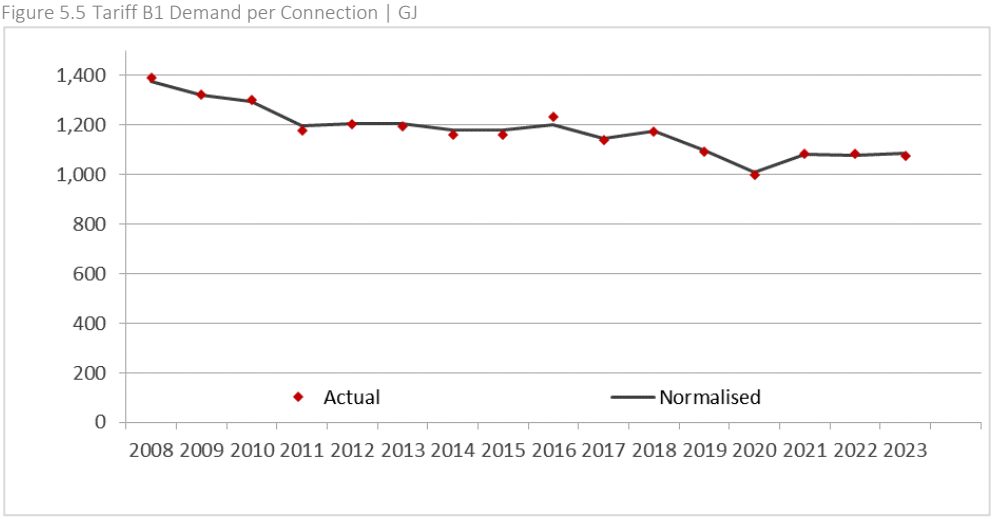


Figure 5.5 Tariff B1 Demand per Connection | GJ



5.3.3. B2

Normalised B2 demand has experienced lower growth since 2016, with a significant decline in volume per connections partially offset by connection growth.

Figure 5.6 Tariff B2 Demand | GJ

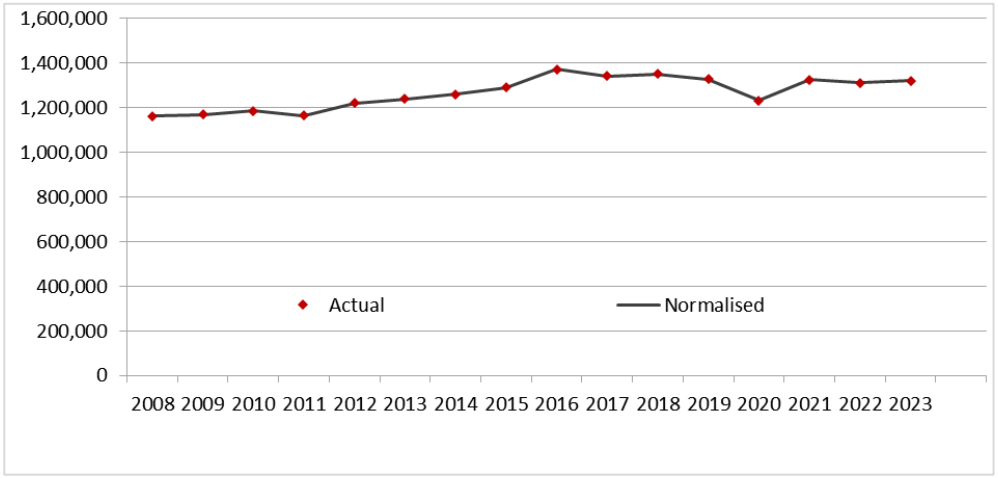


Figure 5.7 Tariff B2 Demand per Connection | GJ

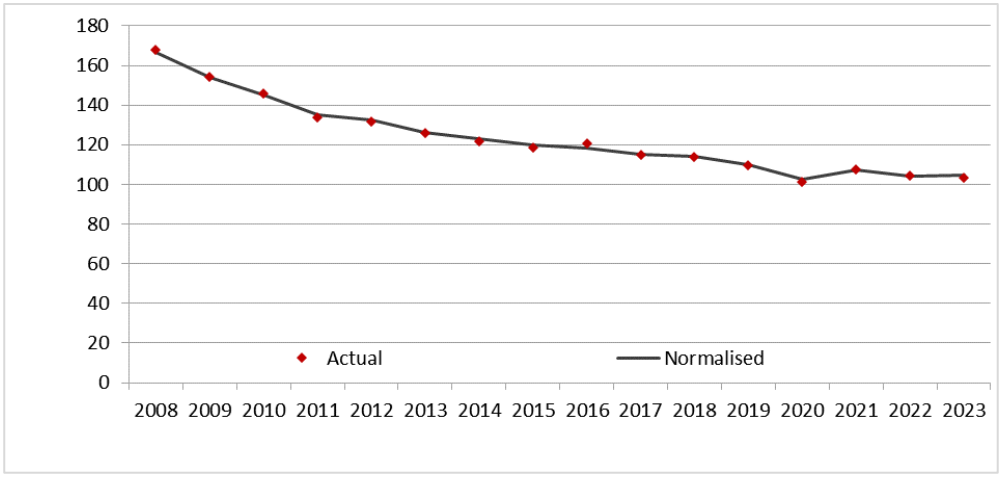


Table 5.1 Summary of EDD, Historical actual demand and weather normalised demand and demand per connection

Year		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
EDD																	
Linearised EDD	(°C)	2,468.6	2,462.5	2,463.1	2,463.7	2,471.1	2,465.0	2,465.6	2,466.2	2,473.6	2,467.5	2,468.1	2,468.8	2,476.1	2,470.0	2,470.6	2,471.3
EDD	(°C)	2,628.6	2,502.9	2,557.6	2,263.7	2,405.0	2,357.3	2,257.1	2,269.5	2,797.8	2,400.9	2,436.5	2,390.7	2,331.3	2,486.6	2,543.2	2,346.7
Difference	(°C)	160	40	95	(200)	(66)	(108)	(209)	(197)	324	(67)	(32)	(78)	(145)	17	73	(125)
B3 Residential																	
Tariff Residential normalised demand	(GJ)	10,267,074	10,487,107	10,176,880	9,651,192	9,915,732	9,986,998	9,850,157	10,024,743	10,428,114	10,028,686	10,126,791	9,984,526	10,329,927	10,453,622	10,204,752	10,325,306
Tariff Residential actual demand	(GJ)	10,455,396	10,539,649	10,295,438	9,410,070	9,837,077	9,852,557	9,579,987	9,761,803	10,890,457	9,938,339	10,083,600	9,873,287	10,115,359	10,481,430	10,318,413	10,136,256
Difference	(GJ)	188,322	52,541	118,558	(241,122)	(78,655)	(134,441)	(270,170)	(262,940)	462,343	(90,347)	(43,191)	(111,239)	(214,569)	27,807	113,661	(189,050)
Tariff Residential normalised demand per connection	(GJ/no.)	17.64	17.56	16.57	15.33	15.44	15.19	14.57	14.37	14.62	13.84	13.82	13.47	13.84	13.82	13.30	13.26
Tariff Residential actual demand per connection	(GJ/no.)	17.96	17.65	16.76	14.94	15.32	14.99	14.17	13.99	15.27	13.72	13.76	13.32	13.55	13.86	13.45	13.02
Difference	(GJ)	.32	.09	.19	(.38)	(.12)	(.20)	(.40)	(.38)	.65	(.12)	(.06)	(.15)	(.29)	.04	.15	(.24)
B1 Commercial																	
Tariff B1 Commercial normalised demand	(GJ)	1,588,072	1,601,777	1,631,991	1,557,840	1,615,969	1,643,098	1,668,411	1,743,725	1,877,283	1,877,581	2,004,895	1,950,388	1,861,621	2,066,738	2,121,439	2,199,445
Tariff B1 Commercial actual demand	(GJ)	1,606,857	1,607,679	1,644,214	1,532,391	1,607,901	1,628,203	1,639,897	1,715,500	1,929,142	1,867,632	2,000,489	1,937,515	1,835,672	2,070,665	2,136,323	2,174,770
Difference	(GJ)	18,786	5,902	12,222	(25,449)	(8,067)	(14,896)	(28,514)	(28,224)	51,858	(9,950)	(4,406)	(12,873)	(25,949)	3,926	14,884	(24,675)
Tariff B1 Commercial normalised demand per connection	(GJ/no.)	1,375	1,319	1,294	1,199	1,208	1,206	1,180	1,181	1,201	1,147	1,177	1,099	1,011	1,081	1,078	1,088
Tariff B1 Commercial actual demand per connection	(GJ/no.)	1,391	1,324	1,304	1,180	1,202	1,195	1,160	1,162	1,234	1,141	1,174	1,092	997	1,083	1,086	1,076
Difference	(GJ)	16.26	4.86	9.69	(19.59)	(6.03)	(10.93)	(20.17)	(19.12)	33.18	(6.08)	(2.59)	(7.26)	(14.10)	2.05	7.56	(12.21)
B2 Commercial																	
Tariff B2 Commercial normalised demand	(GJ)	1,153,579	1,165,317	1,177,856	1,174,079	1,222,983	1,243,777	1,273,886	1,304,380	1,343,536	1,344,545	1,351,145	1,334,060	1,244,105	1,321,446	1,304,091	1,329,339
Tariff B2 Commercial actual demand	(GJ)	1,161,746	1,168,145	1,183,588	1,162,513	1,219,310	1,236,778	1,259,008	1,289,504	1,370,643	1,339,445	1,348,688	1,327,431	1,230,700	1,323,014	1,310,949	1,318,200
Difference	(GJ)	8,166	2,828	5,732	(11,566)	(3,673)	(6,999)	(14,877)	(14,876)	27,107	(5,100)	(2,457)	(6,629)	(13,406)	1,568	6,858	(11,139)
Tariff B2 Commercial normalised demand per connection	(GJ/no.)	166	154	145	135	132	126	123	120	118	115	114	110	102	107	104	104
Tariff B2 Commercial actual demand per connection	(GJ/no.)	168	154	146	134	132	126	121	118	121	115	114	110	101	107	105	104
Difference	(GJ)	1.18	.37	.71	(1.33)	(.40)	(.71)	(1.44)	(1.37)	2.39	(.44)	(.21)	(.55)	(1.10)	.13	.55	(.88)

Source: CORE based on EDD and weather normalisation models

6. Tariff B3 Demand and Connections - History and Forecast

6.1. Introduction

This section of the report presents detail of CORE's approach to derivation of the revised Tariff B3 demand forecast, having regard to new 2023 data and other data and information accessed by CORE since the initial forecast was submitted as part of the ATCO AA proposal.

B3 revised demand is derived using a bottom-up approach: the product of forecast connections and demand per connection, consistent with the approach used for the initial forecast.

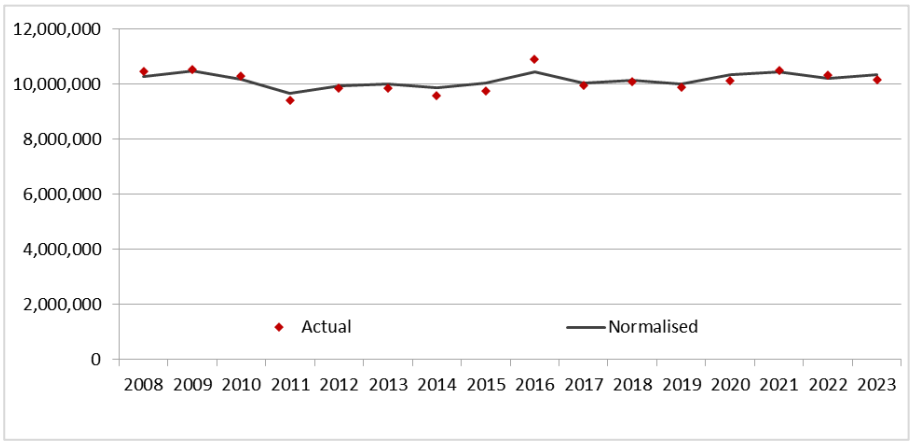
CORE's approach takes into consideration historical trends as well as expectations of future drivers of demand which are not present in the historic data/trends – both macro and micro in nature. For the avoidance of doubt, this includes the consideration of economic activity drivers as addressed in the Methodology and other paragraphs of this report.

The demand data and forecasts presented in this section are weather normalised.

6.2. Historical Trend Analysis

The approach to deriving a forecast of B3 demand commences with analysis of historical connections and demand per connection, on a weather normalised basis.

Figure 6.1 B3 Actual and weather normalised demand to 31 December 2022 | GJ



Source: CORE based on EDD, Weather normalisation model

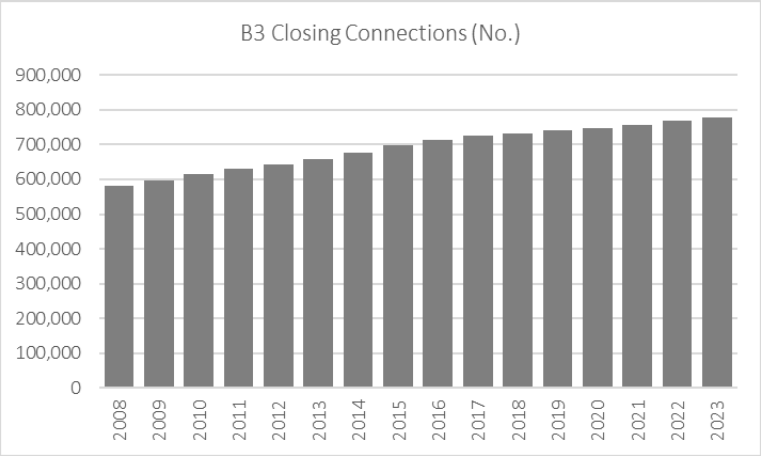
The key point to note is that normalised demand has fallen by an average of -0.23% between 2008 and 2019 (excluding COVID impacted years of 2020-21. Demand has fallen since COVID restrictions have been relaxed, in both 2022 and 2023.

Historical normalised demand is analysed at a connections and demand per connection level as set out below.

6.2.2. Historical Connections

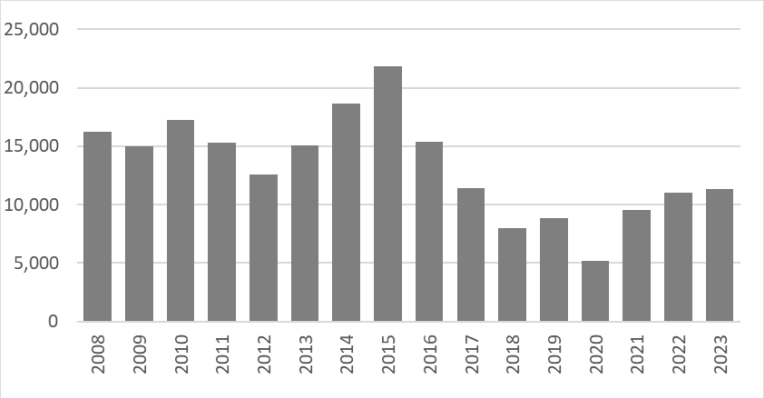
The following figures include actual closing connections to 31 December 2022 and annual movement in connection. These figures highlight the material reduction in net connections and rate of net connection growth since 2015.

Figure 6.2 B3 Closing Connections



Source: CORE based on AGA data

Figure 6.3 B3 Net Connections Growth (No.)



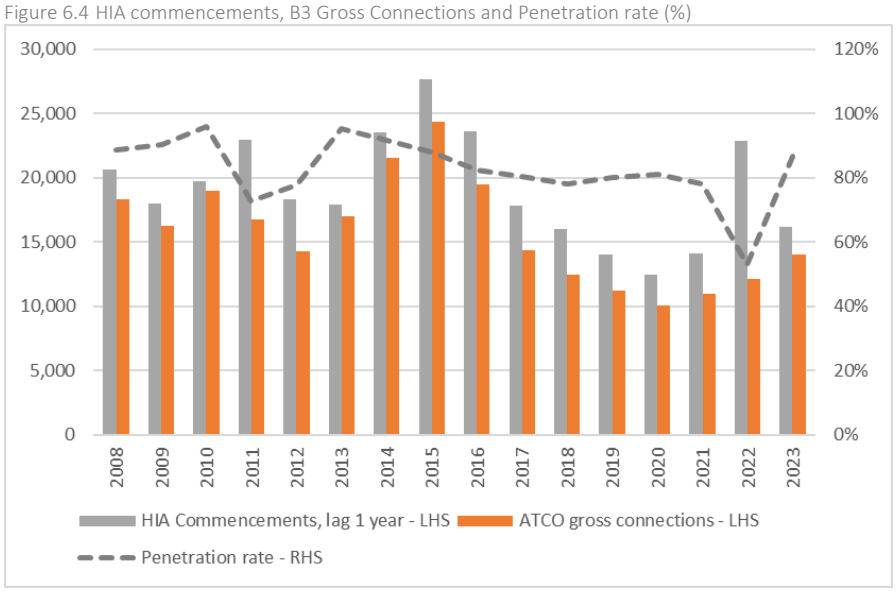
Source: CORE based on AGA data

Net connections are a function of gross connections (new connections within a year) less disconnections (existing connections which were disconnected within a year). The following paragraphs address these elements.

6.2.2.1 Gross Connections

The following chart summarises latest 2024 HIA dwelling commencements (lagged 1 year to estimate completions), and ATCO gross B3 connections, together with the network penetration rate.

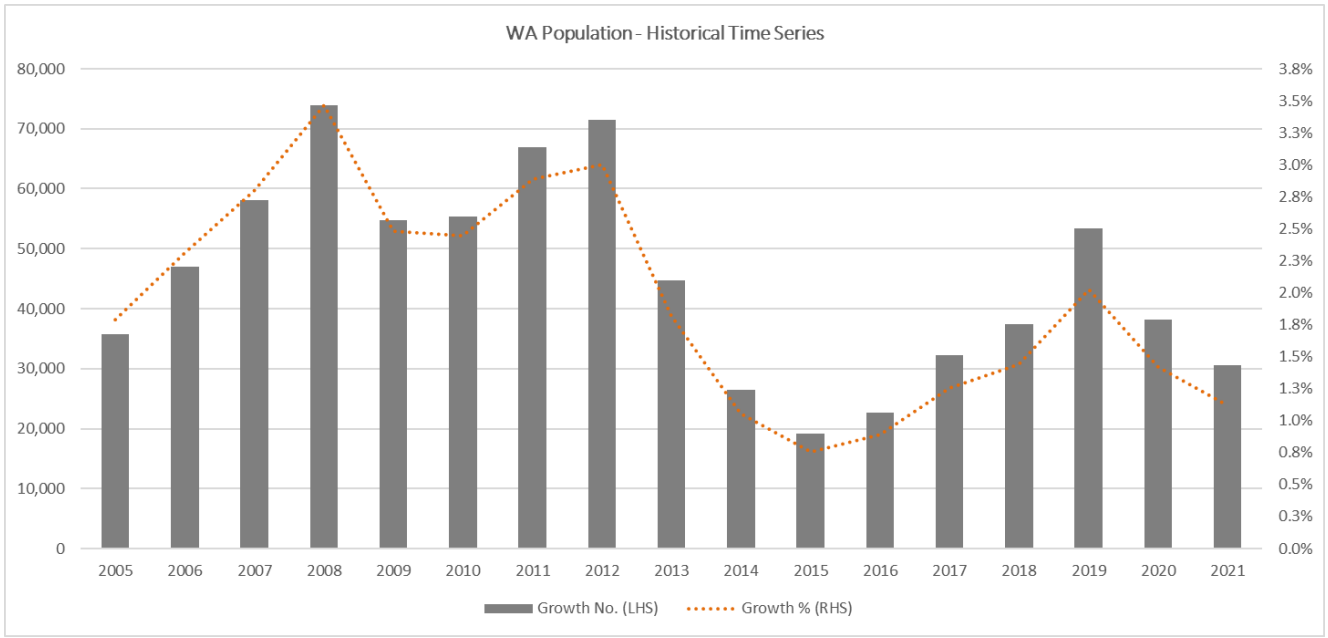
Figure 6.4 HIA commencements, B3 Gross Connections and Penetration rate (%)



Source: CORE based on AGA data to 2023, HIA data and CORE model thereafter

The material reduction in HIA commencements and MWSWGDS gross connections from 2015 is largely attributable to reductions in population growth from 2012, together with delayed impact due to level of existing housing stock at 2013 and 1-2 year completion and connection lags, relative to population, beyond 2013.

Figure 6.5 Population growth and annual growth rate (%)



Source: CORE based on ABS 3101

The key points to note in relation to the penetration rate are as follows:

1. The rate averaged high 80s % before 2014.
2. The rate has fallen by approximately 10%, below 80% during 2017-2019 (pre COVID period) and 2022-23 post COVID period.
3. The low rate in 2022 is attributable to COVID impacted resourcing challenges and construction delays, with 2022 commencements to result in completion in 2023 vs 2022.

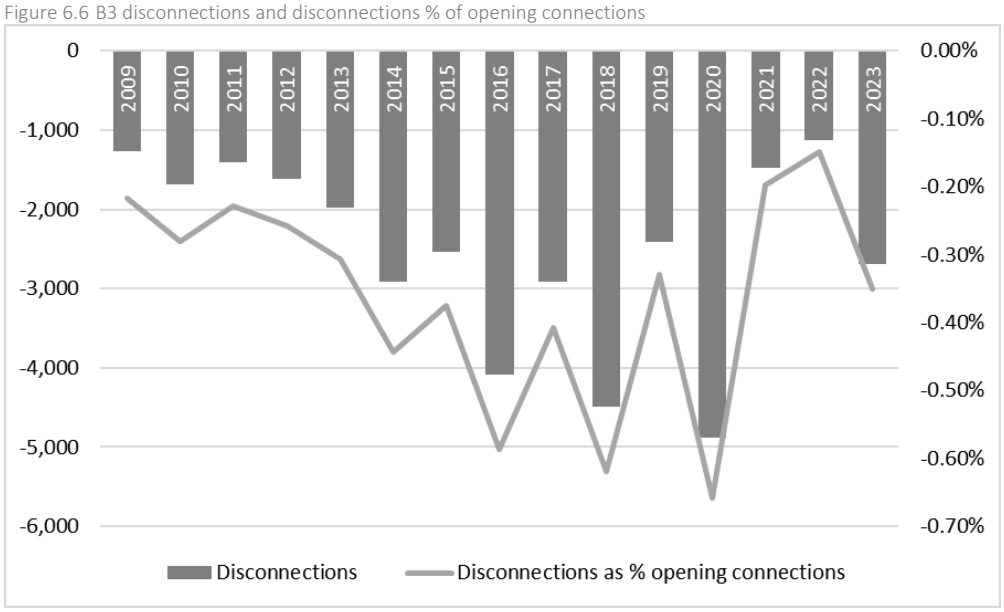
The fall in penetration rate is largely a function of an increase in 100% electrified homes vs dual fuel and a growth of dwelling activity in areas outside the MWSWGDS network area.

6.2.2.2 Disconnections and Net Connections

Net connections are Gross connection less disconnections within a year.

The following chart summarises the annual disconnections and annual disconnections as a % of opening connections for each year.

Figure 6.6 B3 disconnections and disconnections % of opening connections

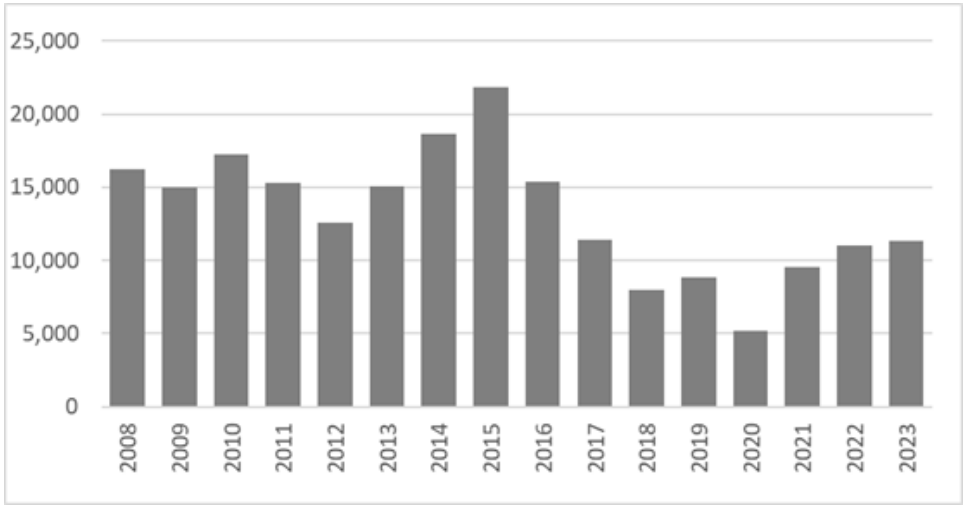


Source: CORE based on AGA data to 2022, CORE model thereafter

A key point to note is that the average rate of disconnections has increased significantly beyond 2015 (prior to COVID impacted years) from an average close to 2,000 before end 2015 and closer to 3,500 in the period to 2020 and trending toward pre COVID level in 2023.

The following chart summarises the resulting net connections (gross connections less disconnections)

Figure 6.7 B3 net connections



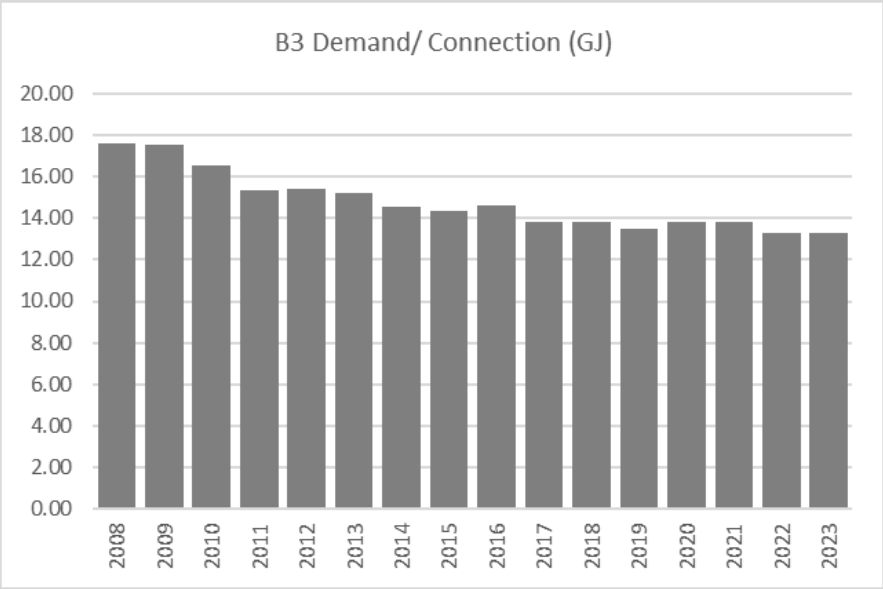
Source: CORE based on AGA data to 2022, CORE model thereafter

The key point to note is the material reduction in net connections from above 15,000 per year prior to 2016 and averaging materially below or close to 10,000 in later years.

6.2.3. Demand/Connection (D/C)

The following figure presents a summary of the historical trend in B3 customer normalised demand/connection between 2008 and 2023.

Figure 6.8 B3 Demand/connection



Source: CORE based on AGA data to 2022, CORE model thereafter

This figure highlights a consistent downward trend in D/C until 2019 (a reduction of 26.22% at an average annual rate of -2.38%), with a flattening out during 2020 and 2021. CORE notes that the 2020-21 period is materially influenced by COVID, which caused a stepped increase in household focused personal and business-related activity and consequential increased use of energy, including gas. The D/C has fallen below 20220-21 levels in 2022 and 2023, restoring a trend observed in the pre COVID time series.

The reduction in demand per connection is related to a combination of influences, including:

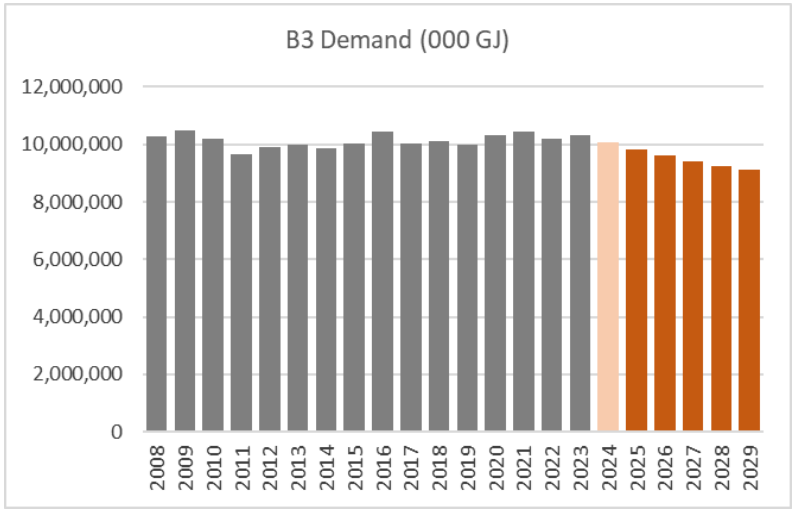
- Improved gas appliance efficiency
- Improved dwelling energy efficiency
- Changes in consumer behaviour and price response
- Trend in substitution away from gas central heating (large gas use) to R-C air-conditioning and some substation toward solar water heating – impacting both newer dwellings and replacements in other dwellings.

6.3. B3 Forecast Demand

6.3.1. Demand Summary

Based on the methodology outlined in Section 3 above, CORE has derived a forecast of B3 demand, which is summarised in the following figure, together with historical normalised demand.

Figure 6.9 B3 Demand – history and forecast.



Source: CORE based on AGA data to 2022 and CORE Demand model thereafter

The following figure summarises the underlying data for the period from 2019 to 2029.

Table 6.1 B3 Demand – history and forecast.

	2023	2024	2025	2026	2027	2028	2029
Demand							
Normalised (GJ)	10,325,306	10,068,968	9,806,466	9,598,916	9,419,879	9,261,974	9,120,188
Actual (GJ)	10,136,256						
Difference (GJ)	-189,050						
Calculations							
Normalised Growth (GJ)	120,554	-256,338	-262,502	-207,551	-179,037	-157,905	-141,786
Normalised Growth (%)	1.17%	-2.51%	-2.64%	-2.14%	-1.88%	-1.69%	-1.54%
Normalised Growth (Average %) 2008-19							
Normalised Growth (Average %) 2008-19 + 202	-0.31%						
Growth (Average %) 2025-29							-1.98%

The primary reasons for the trend reduction in B3 demand from 2023 are as follows:

- A forecast reduction in dwelling completions activity, based on independent HIA data.
- The continuation of a trend reduction in MWSWGDS network penetration rate
- The continuation of a long-standing trend reduction in demand/connection

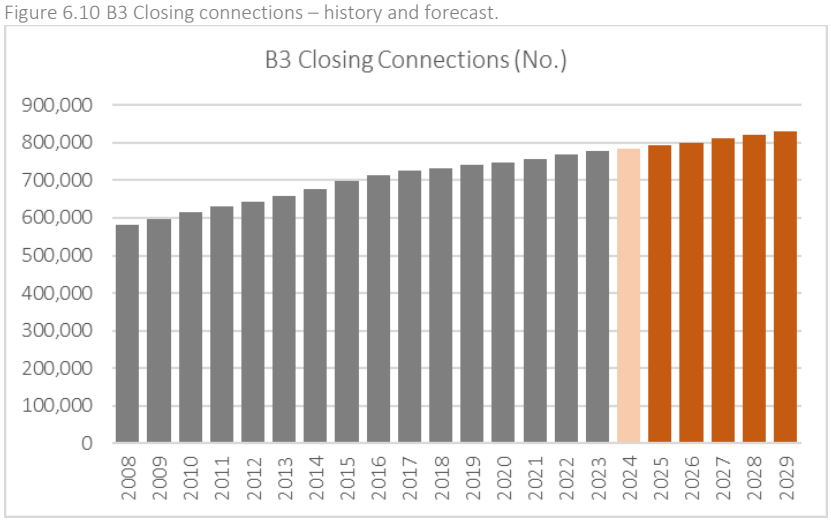
The two primary elements of the B3 Demand forecast - forecast average annual connections and annual demand per connection are addressed in the following paragraphs.

6.3.2. B3 Connections

CORE has derived a forecast of B3 closing connections, based on the methodology outlined in Section 3. The resulting forecast is summarised in the following figure.

Growth in closing connections has slowed from an annual average rate of 2.63% during the 2009-2015 period to 1.26% average during 2017-2023, and annual rates of 1.46% and 1.47% in 2022 and 2023.

Figure 6.10 B3 Closing connections – history and forecast.



Source: CORE based on AGA data to 2022 and CORE Demand model thereafter

Table 6.2 B3 Closing Connections – history and forecast.

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Connections											
Opening	732,627	741,437	746,639	756,154	767,161	778,476	784,780	791,959	800,769	810,484	820,622
Net Movement	8,810	5,202	9,515	11,007	11,315	6,304	7,179	8,810	9,715	10,138	10,382
Closing	741,437	746,639	756,154	767,161	778,476	784,780	791,959	800,769	810,484	820,622	831,004
Average Connections				761,658	772,819	781,628	788,369	796,364	805,627	815,553	825,813

Source: CORE based on AGA data to 2022 and CORE Demand model thereafter

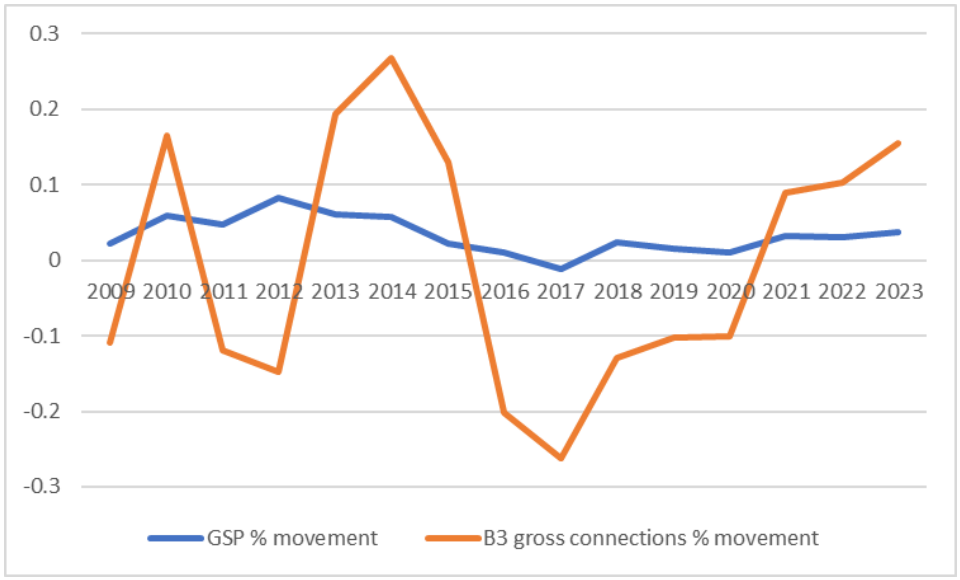
The Closing Connection results are used to derive Average Connections based on the formula: Average = (opening + closing)/2.The average forecast connections are summarised in the above table.

As previously stated, the Closing Connection forecast (basis for average forecast) is the result of forecast growth in gross connections, less forecast annual disconnections, to derive an annual net movement in connections. These elements are addressed in the following paragraphs.

6.3.2.1 B3 Gross Connections

CORE analysis indicates that of a range of drivers of B3 connections, the most statistically significant factors impacting gross connections is the growth in dwelling completions and the MWSWGDS penetration rate. CORE has considered movements of GSP between 2008 and 2023, which is summarised in the figure below. However, CORE observed a stronger relationship with dwelling completions, which is also supported by CORE's qualitative "causal analysis".

Figure 6.11 Historical WA GSP and B3 gross connections



Source: Various WA Government Sources

Following CORE analysis of alternative approaches, Gross connections have been derived by forecasting the total number of WA dwellings to be completed over the forecast period and applying a Network Penetration rate. Large multi-unit blocks have been excluded on the basis that they are unlikely to meet criteria for the B3 tariff class.

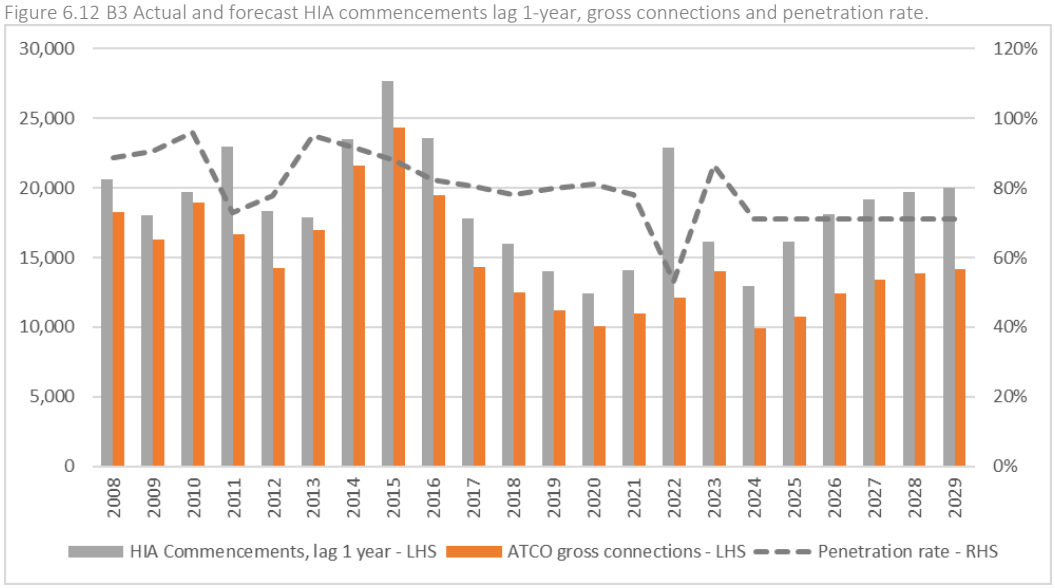
The forecast of WA dwelling completions is based on HIA forecast commencement data dated March 2024 which is lagged by one year (with adjustment beyond 2023 to lag 30% a further two months to reflect expected future lags due to resourcing constraints), to estimate the timing of dwelling completions. The results are summarised in following figure 6.12.

The Penetration rate is based on the historical actual penetration and trend, adjusted for additional factors expected to influence future connections, which are not reflected in the historical trend – primarily consumer sentiment of remaining customers who are demonstrating a preference for some gas in housing energy mix.

Factor	Impact on penetration rate
Recent historical Penetration Rate – per demand model 2016-2023	78%
Less: historical trend reduction (2009-15 av of 87.4%) – (2016-23 av of 77.5%)	-10% absolute points, (11% relative to base 87.4%.
Add: assumed lower average decline due to remaining customer preferences	+3%
Forecast Penetration rate	**71%**

The forecast gross connections and Penetration rate are summarised in the following figure.

Figure 6.12 B3 Actual and forecast HIA commencements lag 1-year, gross connections and penetration rate.



Source: CORE based on AGA data to 2022 and CORE Demand model thereafter

In support of the forecast reduction in penetration rate CORE notes that there is an increasing trend tin developers pursuing large projects without gas connection:

- Development WA, the State Government's central development agency's OneOneFive in Hamilton Hill will not have gas reticulated
- Stockland is developing Wildflower in Piara Waters, which will not have gas and has released a focused program to reduce emissions in future developments including reduction in use of fossil fuels.
- Hesperia is currently developing Rivermark in Viveash, which will not have gas.

6.3.2.2 B3 Forecast Disconnections and Net Connections

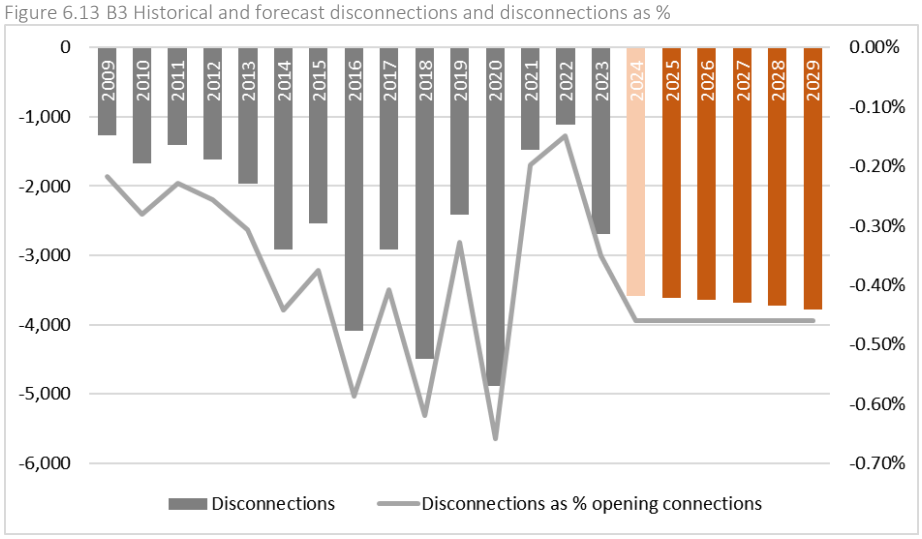
Annual disconnections are deducted from gross connections to derive net annual connections.

The number of disconnections in absolute terms has been increasing since 2009 climbing to 4,093 in 2016, 4,490 in 2018 and 4,880 in 2020. In addition, the percentage of disconnections has also been increasing to 0.62% in 2018 and 0.66% in 2020.

In absolute terms the number of disconnections is expected to return toward COVID levels before AA6. During AA6 the number of disconnections is expected to rise but not at the same levels observed between 2009 and 2019 and 2023, excluding the two outlier years of 2016 and 2018 (which was attributable to a meter removal campaign undertaken by Alinta, due to inactive customers, including customers no longer wanting gas supply).

The disconnection forecast rate of a smoothed average of -0.46% is reduced from -0.56% in the initial proposal. The revised forecast is based on the 2023 actual average disconnection rate and having regard to the range observed in recent years excluding COVID (a period which represents a clear departure from rates experienced in the vast majority of earlier years).

Figure 6.13 B3 Historical and forecast disconnections and disconnections as %



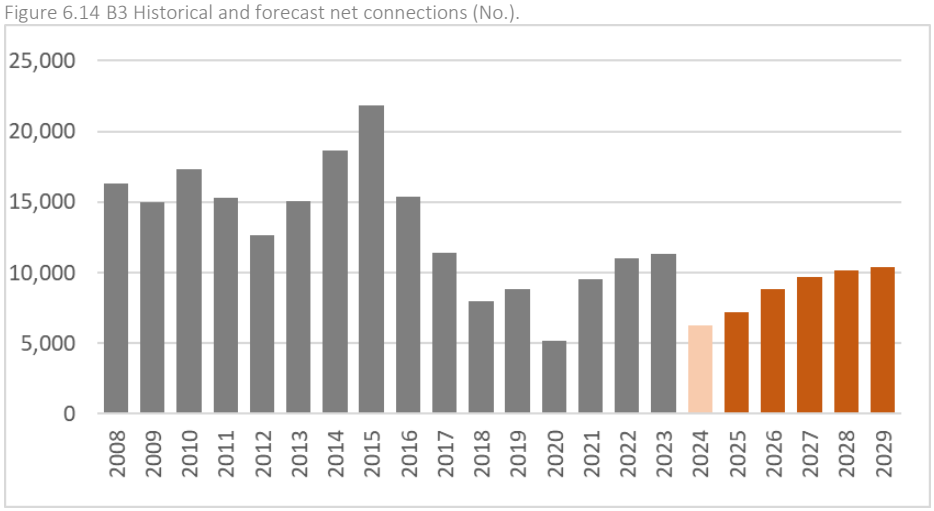
Source: CORE based on AGA data to 2022 and CORE Demand model thereafter

Deducting disconnections from gross connections results in net connections, as presented in the following figure.

Net connections in absolute terms have peaked in 2015 and have decreased below 50% of levels observed in of 2015 between 2017-23.

Future levels, based on independent HIA data, less disconnections are forecast to be between 2017-18 actual levels.

Figure 6.14 B3 Historical and forecast net connections (No.).



Source: CORE based on AGA data to 2022 and CORE Demand model thereafter

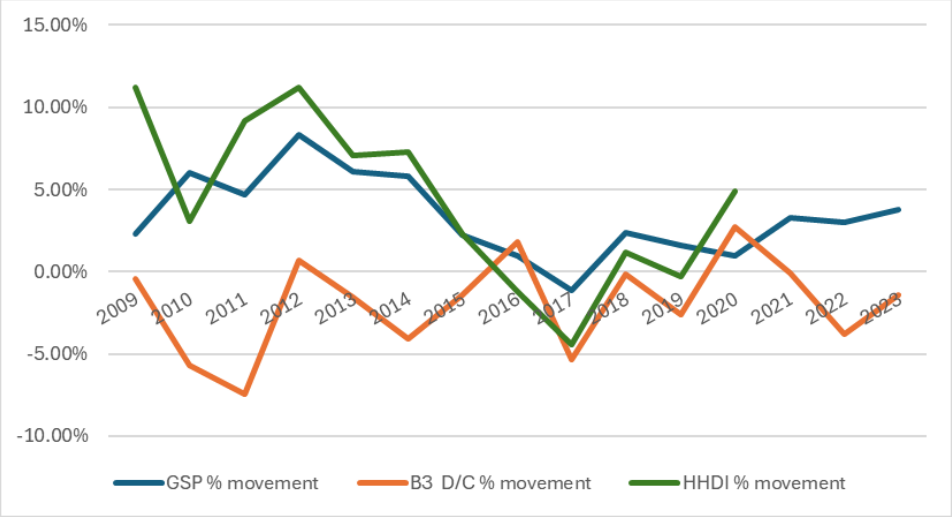
6.3.3. B3 Demand per Connection

CORE has developed a forecast of B3 demand per connection having regard to

- historical annual trend across the total B3 customer base since 2008 (excluding the COVID years)
- historical movements within B3 consumption bands – across low, mid, and higher consuming connection bands
- economic, demographic, and other factors which are expected to influence future demand per connection.

In particular, CORE has considered whether there is a statistically significant relationship between B3 D/C and GSP (-0.21 correlation coefficient) and Household disposable income and CORE was unable to observe a relationship which would provide a useful basis for forecasting future B3 D/C. The absolute trends are shown below.

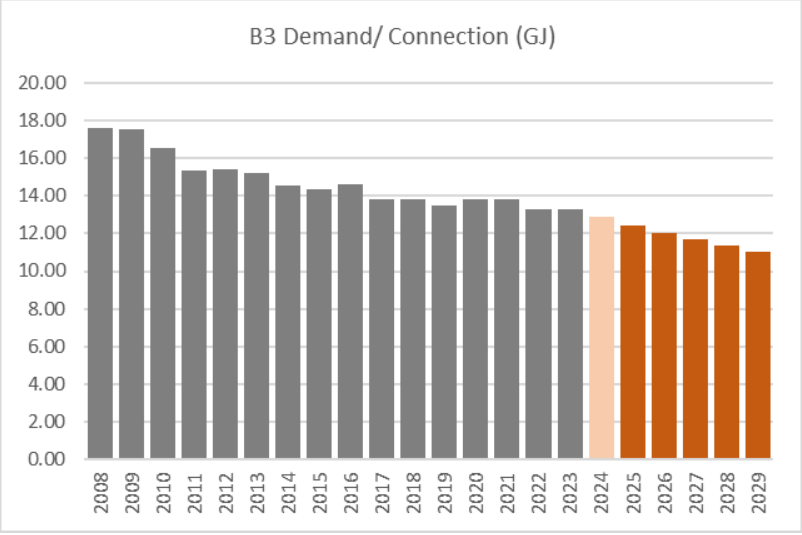
Figure 6.15 B3 Historical D/C, GSP, add HHDI (ABS to 2020 only due to lack of consistent data since that date.)



CORE considers that the average historical annual rate of movement in demand per connection between 2008 and 2019 (pre COVID) of -2.38%, provides the best base to use to derive the rate of decline of future demand per connection. CORE has applied a modest further decline to this base to account primarily for an expected increase in the rate of partial electrification of the existing customer base. The resultant average annual decline in D/C between 2025 and 2029 is 3.03%.

The resulting forecast is summarised in the following figure.

Figure 6.16 B3 Historical and forecast demand per connection.



Source: CORE based on AGA data to 2022 and CORE Demand model thereafter

6.4. Supporting Qualitative Analysis

In addition to the quantitative analysis presented above, CORE has undertaken research of publicly released studies which address future scenarios of household energy, including gas demand/use. Once such study for the Federal Government titled

Every Building Counts, was undertaken by Green Building Council of Australia and Australian Property Council of Australia, was released in 2023.

This study focuses on a pathway to decarbonisation of buildings, including residential dwellings by 2050 by implementing change in dwelling design/structure and appliances, with a focus on electrification delivered by zero/low emission sources.

Recommended actions include:

- a move to all electric appliances in new residential developments under a 2025 National Construction Code
- phase out sale of gas appliances.
- introduction of a plan to phase out fossil gas use in existing residences.
- a retrofit program focused on lower income and vulnerable households – moving to electrical appliances.
- focus on skills and resources and technological advancement to support large scale electrification.

7. Tariff B1 and B2 Demand and Connections – History and Forecast

7.1. Introduction

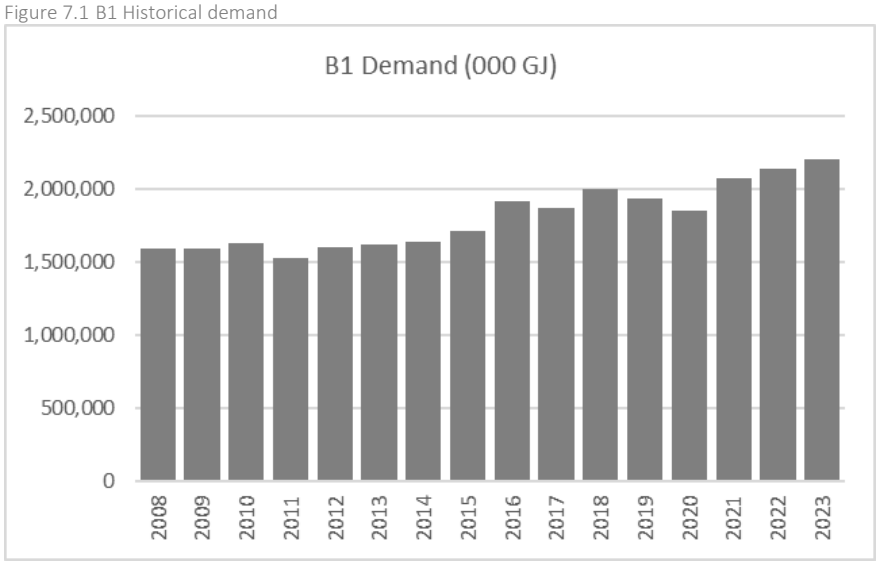
The MWSWGDS Tariff B1 and B2 revised demand forecast is derived using a bottom-up approach, as the product of forecasts of connections and demand per connection. These forecasts take into consideration historical trends as well as best estimates of future drivers of demand (both macro and micro in nature), which are not observed in the historical data/trends.

7.2. B1 and B2 historical demand overview

The following figures summarise historical normalised demand for B1 and B2.

7.2.1. B1

Figure 7.1 B1 Historical demand

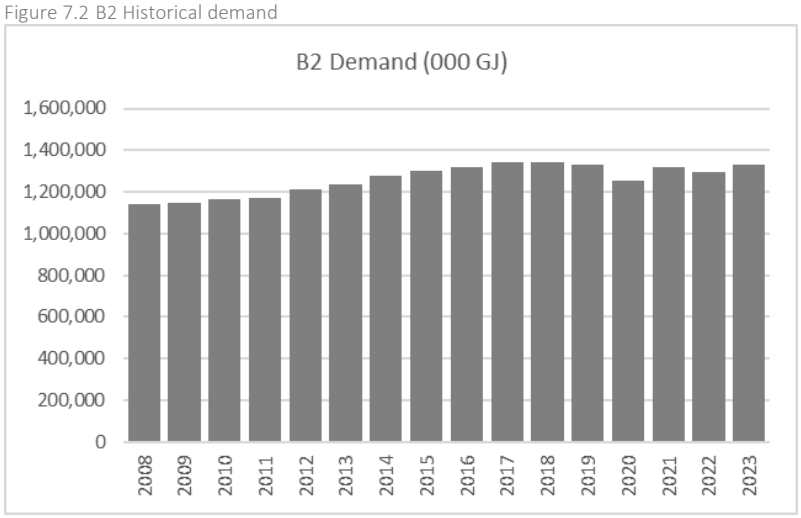


Source: CORE based on AGA data.

The B1 average annual normalised demand has fallen significantly from +2.32% during 2009-2016 to +1.31%, for the period 2017-2023, excluding the 2020-21 COVID impacted years.

7.2.2. B2

Figure 7.2 B2 Historical demand



Source: CORE based on AGA data.

B2 average annual growth of normalised demand has declined materially from +1.91% during 2009-2015 to +0.47% between 2016-2023, excluding the 2020-21 COVID period.

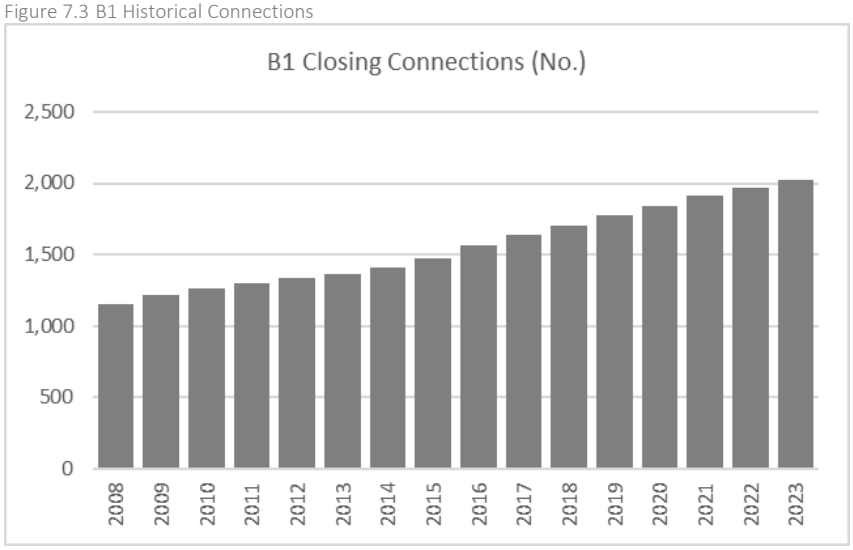
The primary drivers of historical demand are addressed in the following paragraphs.

7.2.3. Connections

Historical actual connections are summarised in the following figures.

7.2.3.1 B1

Figure 7.3 B1 Historical Connections

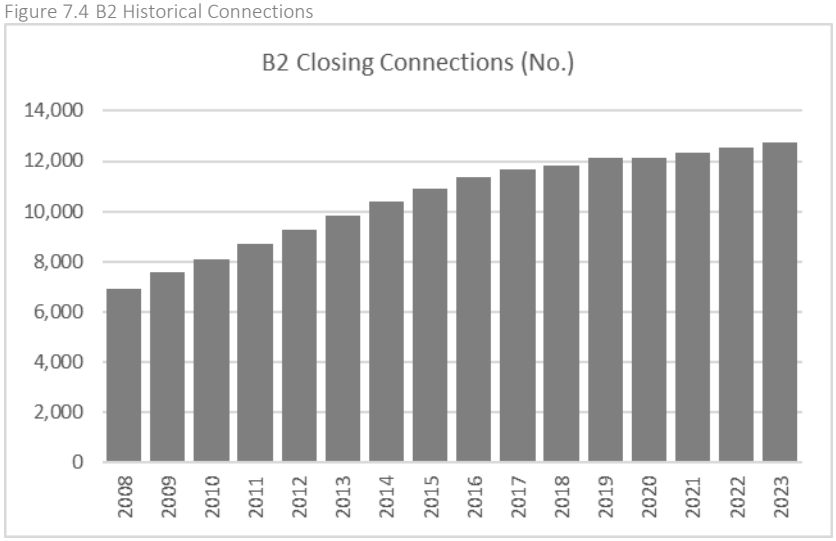


Source: CORE based on AGA data

The average B1 Connections growth rate between 2008 and 2019 was +3.98% and this rate has fallen to +2.93% in the first year following COVID, i.e. 2022 and to 2.69% in 2023.

7.2.4. B2

Figure 7.4 B2 Historical Connections



Source: CORE based on AGA data

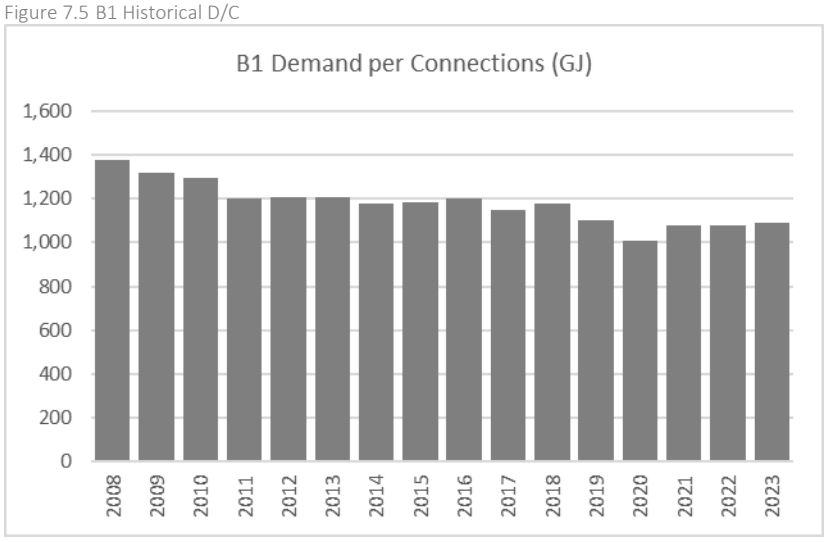
The average B2 Connections growth rate was +2.23% during the 2017-2019 period and this rate has fallen to +1.80% in the first year following COVID, i.e. 2022 and +1.48% in 2023.

7.2.5. Demand/Connection

Historical actual demand/connection is summarised in the following figures:

7.2.5.1 B1

Figure 7.5 B1 Historical D/C

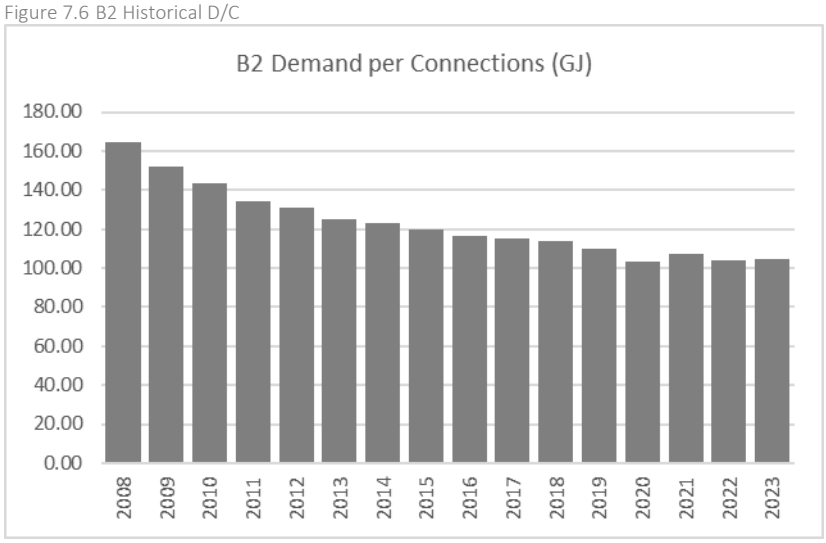


Source: CORE based on AGA data

The average B1 decline in D/C between 2009 and 2019 (pre COVID) was -1.96%, falling between 2016 and 2019 to -1.70%.

7.2.5.2 B2

Figure 7.6 B2 Historical D/C



Source: CORE based on AGA data

The average B2 decline in D/C between 2009 and 2019 was -3.60%, falling between 2016 and 2019 to -2.16%.

7.3. Tariff B1 and B2 Demand and Connections Forecast

7.3.1. Demand Forecast

CORE's approach to deriving a forecast of demand includes an analysis of historical trends and drivers and analysis of all material factors which were not evident in historical trends, but which are expected to influence future demand. Such factors include:

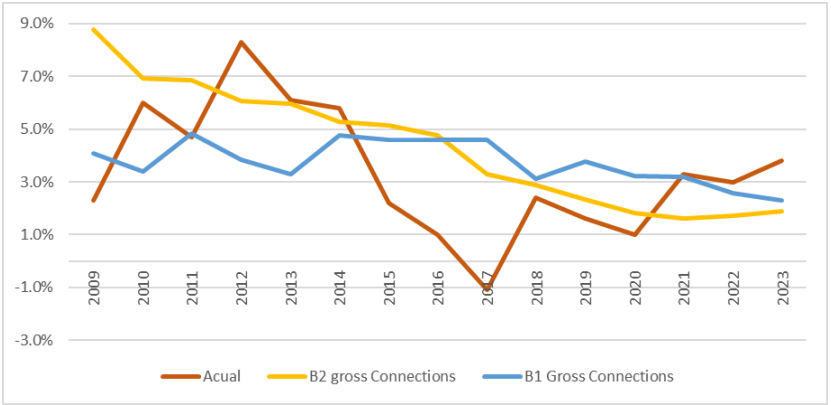
- Economic circumstances as they relate to business formation.
- Business mix of WA economy and MWSWGDS specifically – as it relates to types of business that will favour all electricity or electricity and gas use.
- Government policy, including Government preference to favour electricity over gas.
- Cost/price considerations – capital cost of appliances and operating costs, and price/bill to consumer

CORE notes that it has undertaken analysis of the relationship between B1 and B2 demand, connections and demand per connection and single demand drivers. This analysis indicates that no single factor provides a statistically reliable basis for forecasting purposes. Further CORE has observed a lack of consistent third party data series to facilitate rigorous statistical analysis. For this reason, CORE has favoured an analysis of historical actual trend and adjusting these as appropriate to account for future influences which vary from history.

One factor CORE considered in detail is WA GSP, which is summarised in the following figure. Whilst average rates over time do indicate a degree of relationship with growth in connections – the relationship varies between B1 and B2 and between years, as summarised in the following figure. Correlation analysis indicates the absence of a statistically robust relationship which can be relied upon for forecasting purposes (the B1 coefficient is low and the B2 is modestly negative, which is counter intuitive).

CORE notes that the WA GSP growth rate averaged above 5% between 2009 and 2015 and has averaged 2% between 2016 and 2023. Further the 2023-24 WA Government mid-year financial projections statement includes an average annual GSP growth forecast of 3.25%.

Figure 7.7 Historical annual % movement in WA GSP, and annual % movement in B1 and B2 Connections



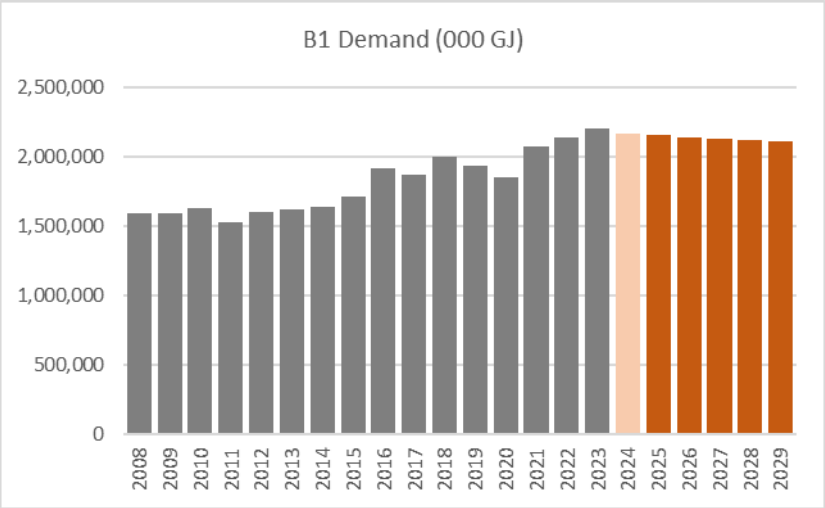
Source: WA Treasury, CORE model

Having regard to all factors considered, CORE has derived the following forecasts.

7.3.1.1 B1

B1 demand is forecast to fall by an average rate of -0.50%, based on an average growth in connections of 2.39% and an annual reduction in demand per connection of -2.83%

Figure 7.8 B1 Historical and forecast demand.

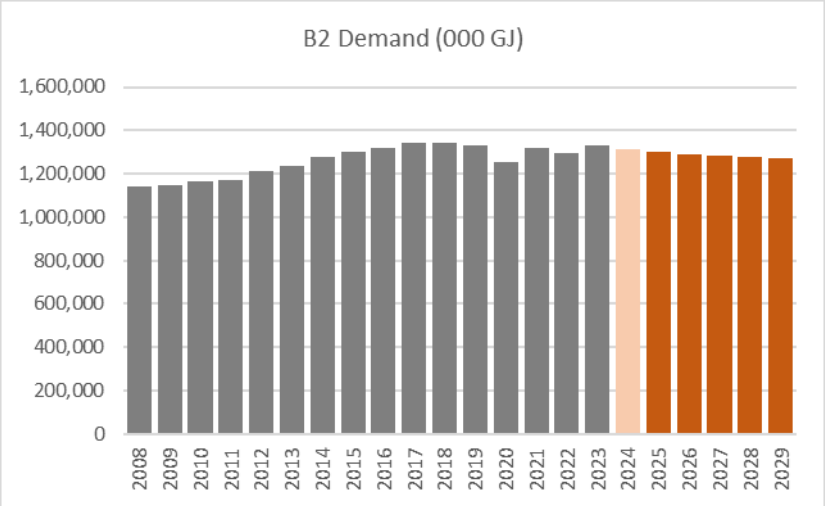


	2024	2025	2026	2027	2028	2029
Demand						
Normalised (GJ)	2,164,480	2,153,962	2,143,169	2,132,430	2,121,746	2,111,115
Plus (Transfer from A2)	1,300	1,300	1,300	1,300	1,300	1,300
	2,165,780	**2,155,262**	**2,144,469**	**2,133,730**	**2,123,046**	**2,112,415**

7.3.1.2 B2

B2 demand is forecast to fall by an average rate of -0.56% during the AA6 period, based on an average growth in connections of 1.6% and an annual reduction in demand per connection of -2.16%

Figure 7.9 B2 Historical and forecast demand.



	2024	2025	2026	2027	2028	2029
Demand						
Normalised (GJ)	1,310,198	1,300,823	1,291,538	1,282,340	1,276,486	1,273,806

7.3.2. B1 and B2 Connections Forecast

7.3.2.1 B1

The B1 annual closing gross connections growth rate has reduced from historical highs in 2011 and 2014 of +4.8% to +2.3% in 2023.

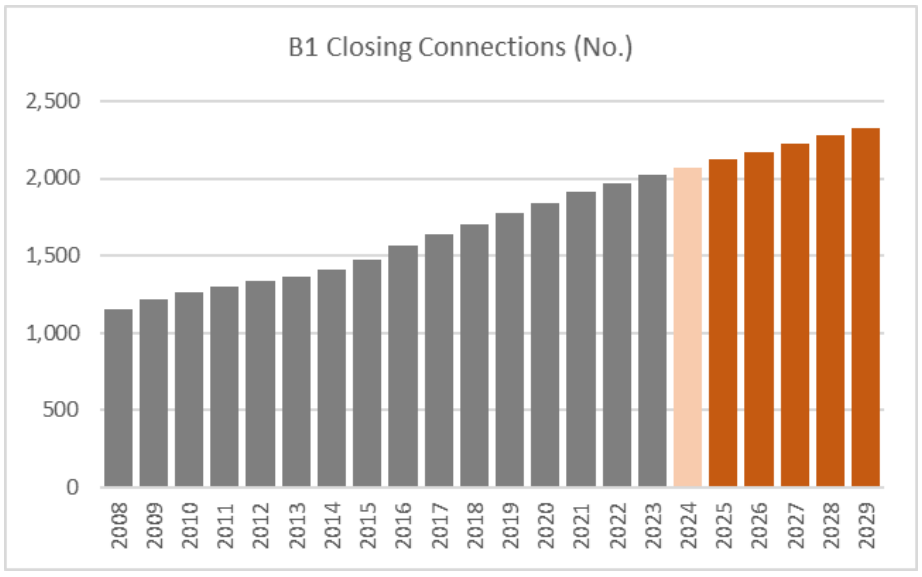
The continued slowing of growth in connections is projected to continue into AA6 at an average annual rate of +2.39%

Key influences on this assessment were:

- the actual 2023 increase of 2.69%
- The average annual increase for 2022 and 2023 (post COVID years) of 2.81%
- the continued slowing in annual average growth from +5.11% in 2009 to +2.69% in 2023 results in an average annual decline of 0.16% per annum.
- Lower forecast growth rates in GSP than the majority of the historical period considered by CORE.
- The fact that growth in GSP is focused on specific sectors which will not have equal multiplier impact on B1 customer industry segments.

CORE's forecast is based on the average rate observed in 2022 and 2023 of +2.81% and is reduced to and average of 2.39% during 2025-2029, reflecting a forecast trend in electrification, a trend supported by the latest AEMO GSOO forecast.

Figure 7.10 B1 Connections



	2023	2024	2025	2026	2027	2028	2029
Connections							
Opening	1,968	2,021	2,070	2,120	2,170	2,222	2,275
Gross Connections	45	43	42	42	43	43	44
Disconnections/reconnections	8	6	8	9	9	10	10
Net Movement	53	49	50	51	52	53	54
Closing	**2,021**	**2,070**	**2,120**	**2,170**	**2,222**	**2,275**	**2,330**
Average Connections (Forecast)	**1,995**	**2,046**	**2,095**	**2,145**	**2,196**	**2,249**	**2,303**

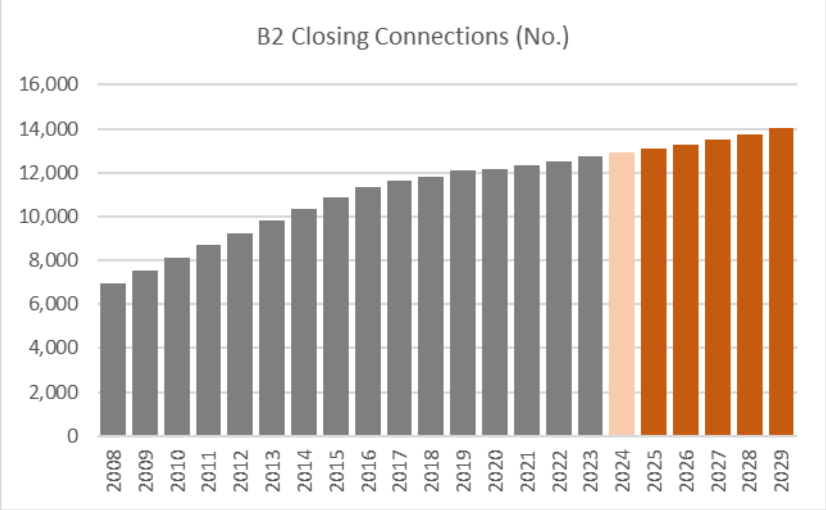
7.3.2.2 B2

The B2 annual growth rates for closing connections has reduced from historical highs of 9.22% in 2009 falling to a materially lower 4.22% by 2016 and 2.47% by 2019 (pre COVID). This trend in reduced growth has continued post COVID at a rate of 1.8% in 2022 and 1.48% in 2023.

This trend in falling rates of growth in connections is forecast by CORE to continue into AA6 at an average annual rate between 2025 and 2029 of 1.6%. This average rate (smoothed average for AA6 period) is based on the average rate observed during 2017-2019 of 2.23% and the average rate observed during 2022-23 of 1.64%, and CORE's forecast of a continued reduction in growth due to electrification, a trend which is supported by AEMO in its latest GSOO analysis.

A smoothed average rate is preferred due to the significant uncertainty associated with accurately forecast growth for each year between 2024 and 2029.

Figure 7.11 B2 Historical and forecast closing connections.



	2023	2024	2025	2026	2027	2028	2029
Connections							
Opening	12,540	12,725	12,913	13,104	13,299	13,496	13,766
Gross New	240	244	248	252	256	260	264
Disconnections/Reconnections	-55	-56	-57	-58	-59	10	10
Net Movement	185	188	191	194	197	270	274
Closing	12,725	12,913	13,104	13,299	13,496	13,766	14,040
Average Connections (Forecast)		12,819	13,009	13,202	13,397	13,631	13,903

7.3.3. B1 and B2 Demand per Connection Forecast

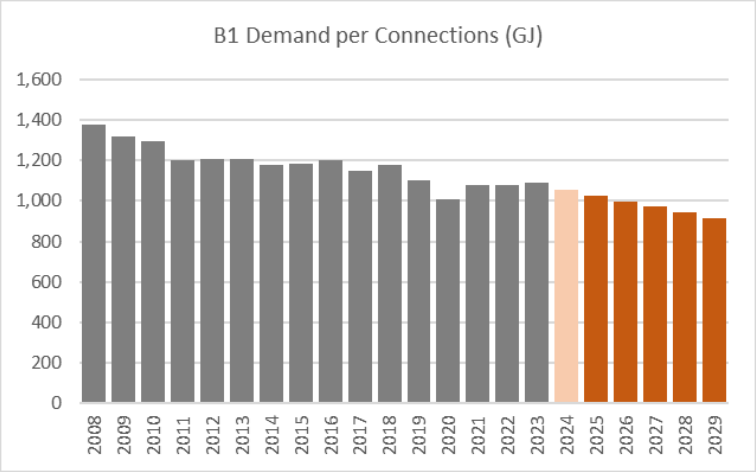
7.3.3.1 B1

Core's revised B1 demand per connection forecast summarised in Figure 7.12 below represents an average annual reduction between 2025 and 2029 of -2.83%.

Key influences on this assessment were:

- the average reduction between 2009 and 2019 of -1.96% and reduction between 2017 and 2019 of -2.83%., with CORE applying a conservative smoothed average of -2.83% over the AA6 period.
- a national policy environment which is favouring a reduction in fossil fuels, including gas through increased electrification
- material gap between electrical heat pump appliance efficiency (higher efficiency for hot water and R-C air conditioning) and gas appliances.
- price considerations – possible perceptions that gas prices may increase faster than electricity given the observations of movements in eastern Australia.
- an increasing tendency for businesses to promote programs which reduce emission intensity.
- reduced GSP growth outlook relative to historical highs

Figure 7.12 B1 Historical and forecast demand per connection.



	2023	2024	2025	2026	2027	2028	2029
Demand per Connection							
Normalised (GJ)	1,088	1,058	1,028	999	970	943	916
Actual (GJ)	1,076						
Difference (GJ)	-12.21						
Normalised Movement (GJ)	10.33						
Normalised Movement - %	0.96%						
Forecast smoothed average %		-2.83%	-2.83%	-2.83%	-2.83%	-2.83%	-2.83%
Average Normalised Movement - % 2009-2019	-1.96%	**Note: above is a smoothed average for the AA6 period**					
Average Normalised Movement - % 2017-2019	-2.83%						

7.3.3.2 B2

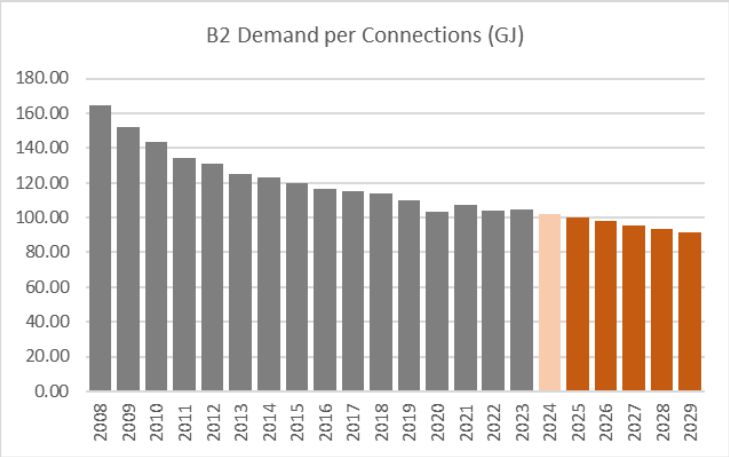
CORE's revised B2 demand per connection forecast summarised in Figure 7.13 below represents an average annual reduction between 2025 and 2029 of -2.16%.

The B2 average annual demand per connection has been slowing from a high range during 2009-19 of -3.60% to lower average during the pre-COVID 2016-2019 period of -2.16%.

Key influences on this assessment are consistent with factors considered for B1, including:

- the average reduction between 2009 and 2019 of -3.6%, with CORE applying a conservative smoothed average of -2.16% over the AA6 period.
- a national policy environment which is favouring a reduction in fossil fuels, including gas through increased electrification
- material gap between electrical heat pump appliance efficiency (higher efficiency for hot water and R-C air conditioning) and gas appliances.
- price considerations – possible perceptions that gas prices may increase faster than electricity given the observations of movements in eastern Australia.
- an increasing tendency for businesses to promote programs which reduce emission intensity.
- reduced GSP growth outlook relative to historical highs

Figure 7.13 B2 Historical and forecast demand per connection.



	2023	2024	2025	2026	2027	2028	2029
Demand per Connection							
Normalised (GJ)	104.47	102.21	100.00	97.83	95.72	93.65	91.62
Actual (GJ)	103.59						
Difference (GJ)	-0.88						
Normalised Movement	0.47	-2.26	-2.21	-2.16	-2.12	-2.07	-2.03
Normalised Movement (%)	0.45%	**-2.16%**	**-2.16%**	**-2.16%**	**-2.16%**	**-2.16%**	**-2.16%**
Normalised Movement - % 2009-2019	-3.60%						
Normalised Movement - % 2009-2023	-3.18%						
Normalised Movement - % 2016-2019	-2.16%						
Normalised Movement - % 2025-2029							-2.16%

8. Tariff A1 and A2 Demand and Connections - History and Forecast

8.1. Historical Demand

8.1.1. A1 Tariff Class

The MWSWGDS includes larger industrial customers (A1) that are reasonably anticipated to consume more than 35,000GJ per annum. In the Greater Perth region this typically includes manufacturing operations, construction, chemicals, or minerals processing and gas fuel transport operations. These customers generally require gas for process heat.

Smaller A1 customers are more likely to consume gas for large-scale space heating and water heating including shopping centres, hotels, hospitals and other large public buildings.

For the A1 customer group, CORE has forecast annual consumption volumes (ACQ) and capacity (measured by GJ of MHQ).

The following figure summarises the trend in A1 demand between 2008 and 2023 calendar years. In general terms A1 customer demand in aggregate exhibited a downward trend between 2010 and 2017, due primarily to a net decline in manufacturing activity, increased energy efficiency and change in energy intensity of economic activity.

Whilst this trend appears to have changed from 2017, more detailed analysis highlights that a downward trend continued for most sectors and customers, with these declines offset by a few major customers in the mining and mineral processing sectors.

Figure 8.1 A1 actual ACQ demand (GJ)

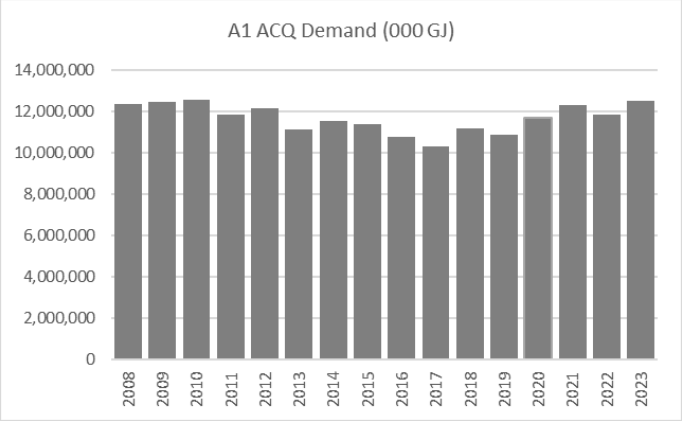
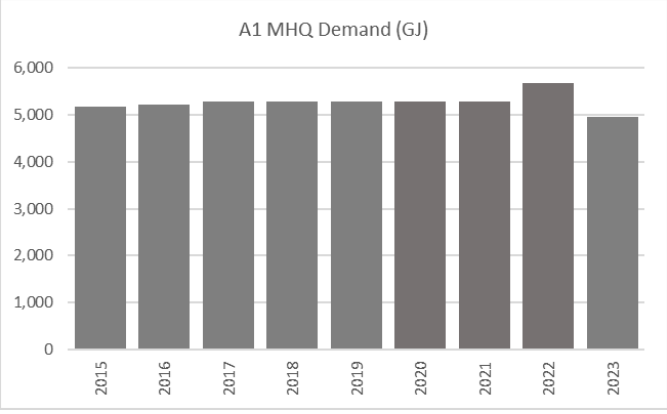


Figure 8.2 A1 Recent years actual MHQ demand (GJ)

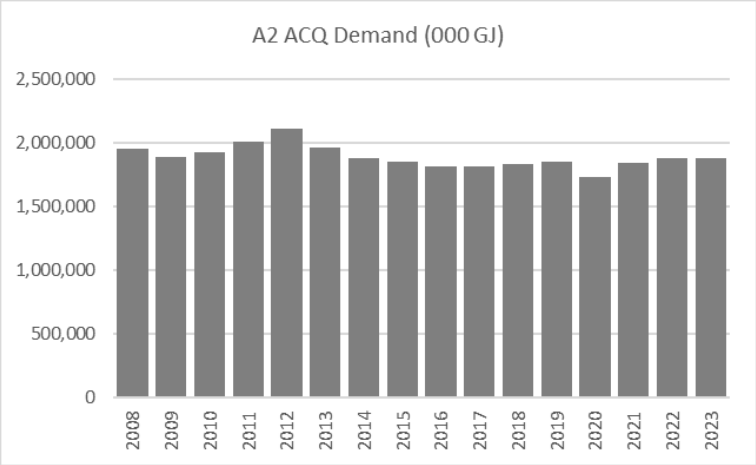


8.1.2. A2 Tariff Class

For the smaller A2 customer group, CORE has forecast annual consumption volumes (ACQ) but not MHQ given that A2 tariffs do not include an MHQ component. Historical ACQ is presented below.

The following figure summarises a moderate decline in demand between 2012 and 2017, a slight increase in 2018 and 2019, with the 2020-21 years impacted by COVID. CORE notes that the post COVID period of 2022-2023 has seen demand return to levels close to those observe in the 2018-2019 pre COVID period, and not materially above those levels.

Figure 8.3 A2 actual ACQ demand (GJ)



8.2. Forecast Demand

Two broad approaches were used to forecast A1 ACQ and MHQ and A2 ACQ:

- The first involved the completion and analysis of individual customer surveys.
- The second, for non-survey customers, involved an analysis of historical trends, at both individual customer and industry segment levels.

The following table summarise the use of these two approaches.

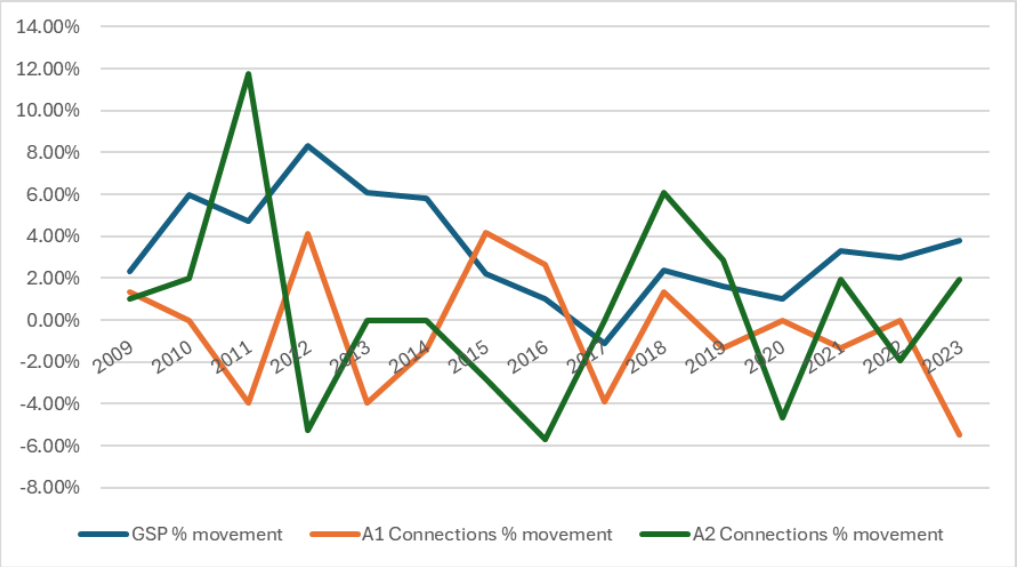
Survey Type	Description	A1 Forecast	A2 Forecast	Combined
Surveyed customers	MHQ and ACQ forecast based on individual customer surveys	42% No. 67% Volume	48% No. 44% Volume	64% Volume
Average Trend Customers	For customers who were not surveyed ACQ was forecast according to observed historical trend consideration of others factors as set out below	58% No. 34% Volume	52% No. 56% Volume	36%

Since the initial survey period CORE has undertaken further analysis of forecast movements in A1 ACQ and MHQ and A2 ACQ, based on consultation with AGA staff closest to customer interface and updated analysis of major forecast customer movements. Including surveyed and known future changes (via AGA/customer interface) – over 50% of both A1 and A2 forecast are based on customer reported forecast, following review by CORE.

CORE has undertaken an analysis of the correlation between annual movements in A1 and A2 demand and annual movements in GSP and has the statistical relationship is weak. These relationships are shown below.

CORE has calculated the A1 correlation coefficient to be 0.044 for A1 and 0.1 for A2.

CORE has also assessed the correlation between movements in A1 and A2 connections and movements in GSP. Again, the statistical relationships are week.



CORE has calculated the A1 correlation coefficient to be 0.04 for A1 and -0.53 for A2.

8.2.1. A1 Demand Forecast

A1 ACQ and MHQ are forecast to increase in 2023-25 but falling beyond the 2025 period. This is largely influenced by specific survey responses from 3 large customers and the forecast trend for 1 non-survey customer and closure of 1 non-survey customer.

CORE's forecast has relied upon:

- the 42% of survey responses by no. and 66% by volume, which include customer forecasts of both ACQ and MHQ for 2025 to 2029
- 58% of customers by no. and 34% by volume, not surveyed - analysis of historical trend in demand per connection (given net connections are forecast to remain constant – consistent with the recent trend), to derive a forecast of -0.93% on average between 2025 to 2029.
- A revision of customer demand for customers not surveyed where new information about customer forecasts has become known by AGA, through customer consultation.
- MHQ forecast for 58% of customers not surveyed - analysis of historical relationship between ACQ and MHQ which resulted in application of a factor of 0.0048% against forecast ACQ to derive forecast MHQ.

Figure 8.4 A1 ACQ demand (GJ)

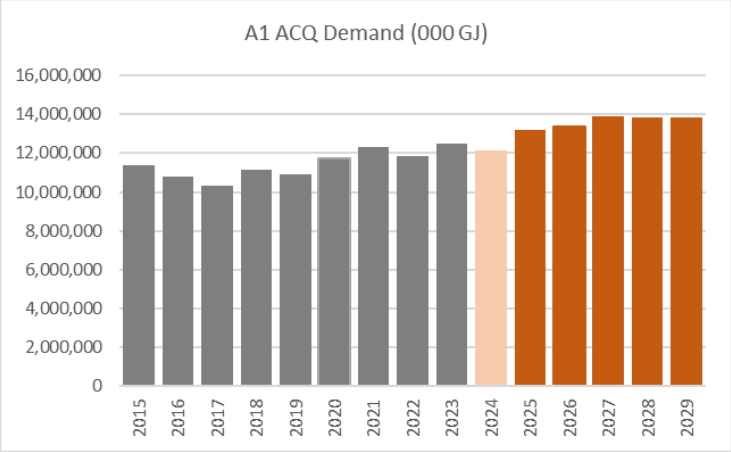


Figure 8.5 A1 MHQ demand (GJ)

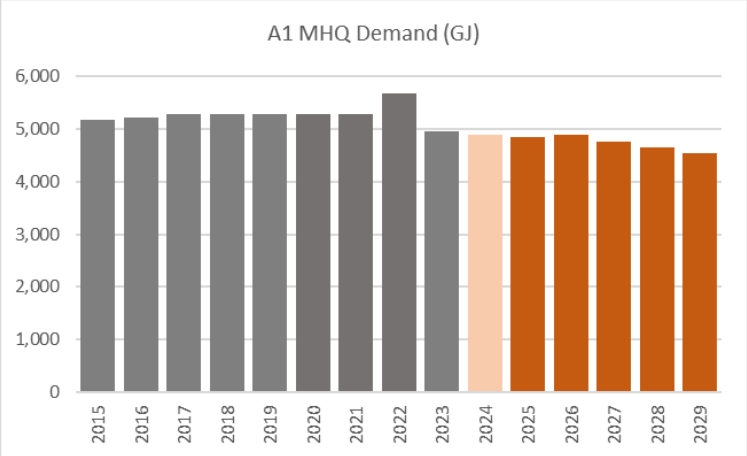


Figure 8.6 A1 Connections

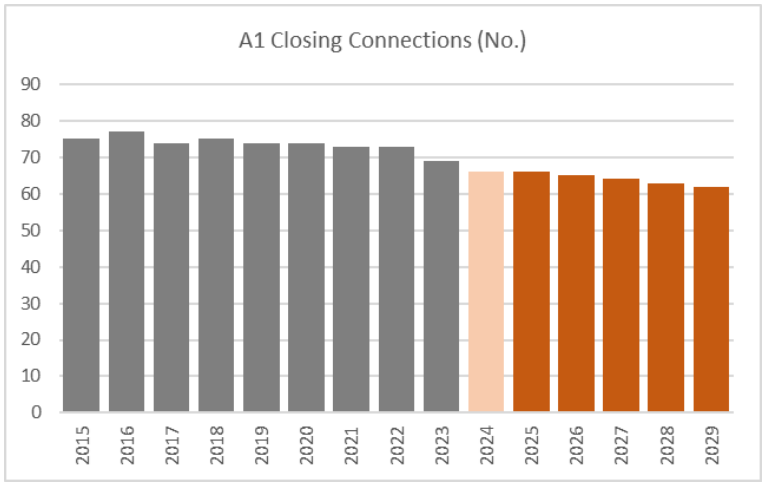
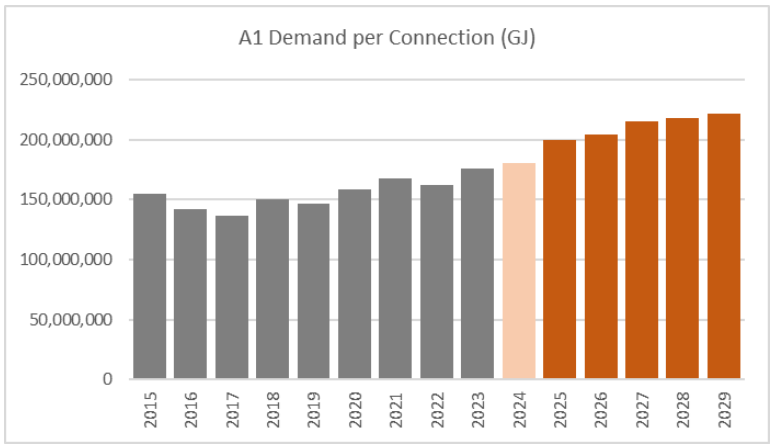


Figure 8.7 A1 Demand per Connection



8.2.2. A2 Demand Forecast

A2 ACQ is forecast to follow a relatively consistent trend from 2023 to 2029.

CORE's forecast has relied upon:

- the 48% of survey responses by no. which include ACQ forecasts for 2024 to 2029, an updated analysis of major forecast movements, including online literature research and analysis.
- 52% of customers by no. not surveyed - analysis of historical trend in demand per connection (given connections are forecast to remain constant), to derive a forecast of -1.12% on average between 2025 to 2029, based on the average actual annual movement between 2008 and 2019 as presented below.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Demand per Connection												
ACQ	19,717,907	19,009,604	19,108,416	18,626,382	19,010,240	18,196,003	17,413,919	17,408,719	17,842,389	18,327,813	17,985,974	17,359,072
ACQ/1000	19,718	19,010	19,108	18,626	19,010	18,196	17,414	17,409	17,842	18,328	17,986	17,359
Movement		-708,303	98,812	-482,034	383,859	-814,238	-782,084	-5,199	433,669	485,424	-341,839	-626,903
Movement (%)		-3.59%	0.52%	-2.52%	2.06%	-4.28%	-4.30%	-0.03%	2.49%	2.72%	-1.87%	-3.49%
Movement - % 2008-2019												**-1.12%**

Figure 8.8 A2 ACQ Demand (GJ)

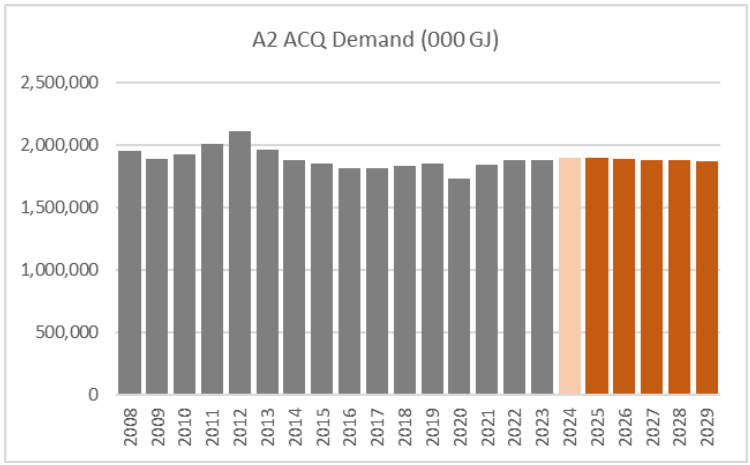


Figure 8.9 A2 Connections

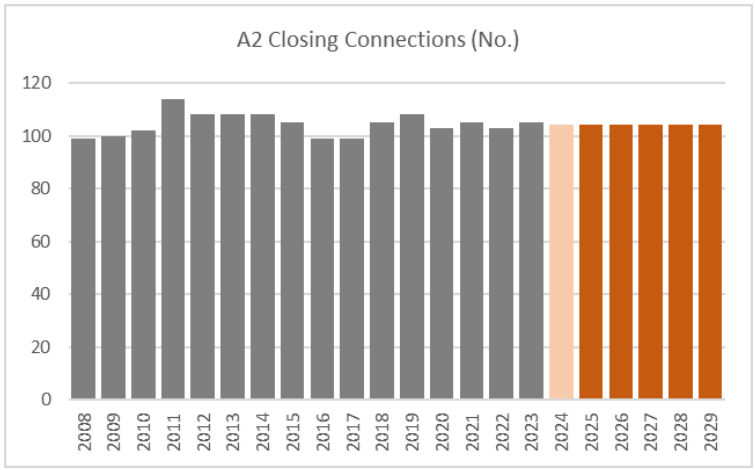
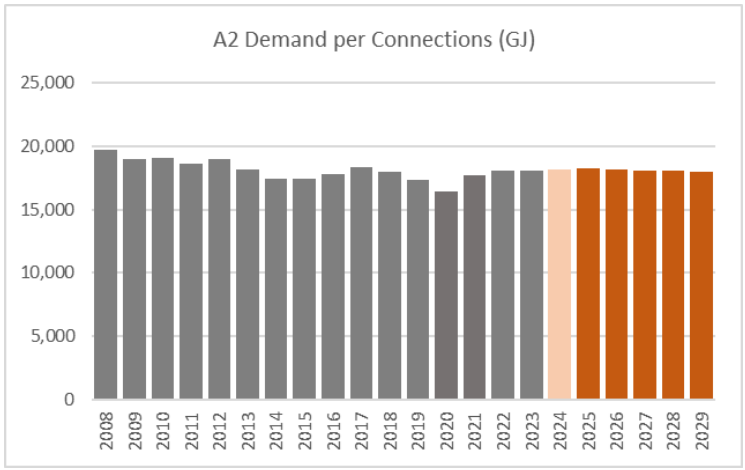


Figure 8.10 A2 Demand per Connection



9. Ancillary Services Forecast

9.1. Introduction

CORE has considered alternative approaches to developing a forecast of each Ancillary service. Having regard to the fact that most of each service relate to the B3 Tariff class (>95%), CORE considers that the best approach is to analyse the historical relationship between services and B3 connections and to apply an appropriate factor against forecast B3 connections, to arrive at forecasts of each ancillary service. More specifically, CORE has focused on the average rate between 2015 and 2019 to assess the expected average rate of growth, excluding impact of COVID period and first recovery year 2022.

Due to the significant impact of COVID on certain ancillary services (such as MLA's, MLR's and Deregistrations), and uncertainty relating to the timing of future recovery/growth, CORE has consulted with AGA management to discuss scenarios before arriving at an appropriate forecast.

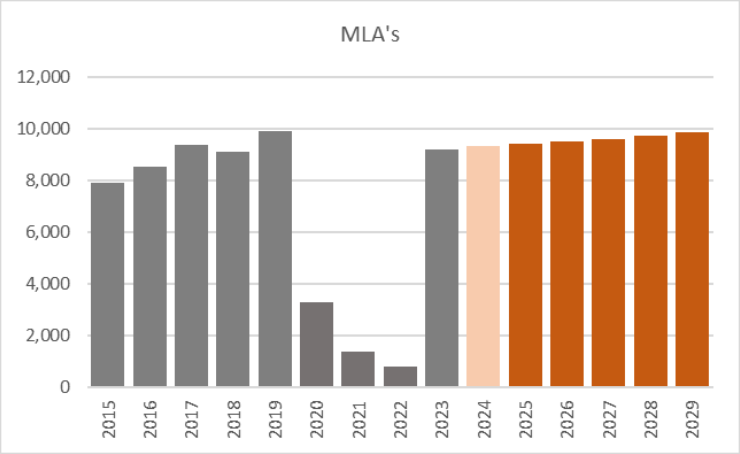
9.2. Ancillary Service history and forecast

9.2.1. Meter Lock Applications (MLA's)

The CORE forecast of MLA's has been derived by applying a factor which represents the % of B3 opening connections which are expected to result in future MLA's.

CORE considers that the best estimate of future MLA's is a continuation of the 2023 % of B3, on the basis that 2023 has returned to pre COVID levels.

Figure 9.1 Historical and Forecast MLA's



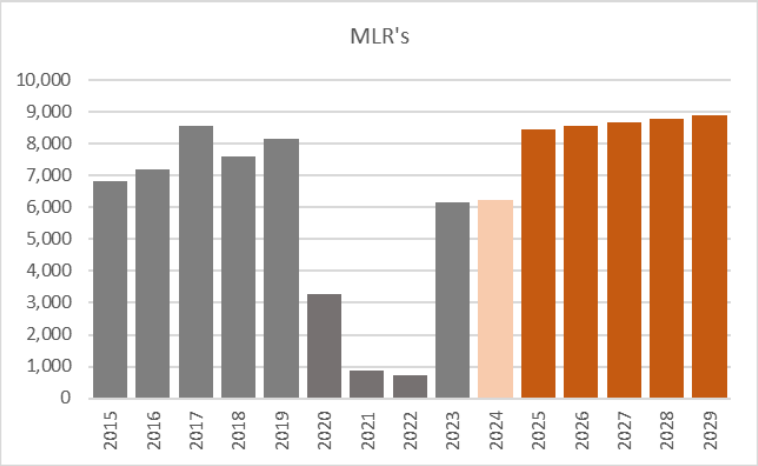
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
B3 Connections															
Closing	697,831	713,194	724,627	732,627	741,437	746,639	756,154	767,161	778,476	784,780	791,959	800,769	810,484	820,622	831,004
Average	686,911	705,513	718,911	728,627	737,032	744,038	751,397	761,658	772,819	781,628	788,369	796,364	805,627	815,553	825,813
Meter Lock Application (MLA)															
Actual/Forecast	7,923	8,549	9,364	9,109	9,906	3,305	1,367	813	9223						
CORE Forecast										9,328	9,409	9,504	9,615	9,733	9,855
% Average B3		1.15%	1.21%	1.30%	1.25%	1.34%	0.44%	0.18%	1.19%	1.19%	1.19%	1.19%	1.19%	1.19%	1.19%

9.2.2. Meter Lock Removals (MLR's)

The CORE forecast of MLR's has been derived by applying a factor which represents the % of B3 opening connections which are expected to result in future MLR's.

CORE considers that the best estimate of future MLR's is a a continuation of the 2023 % of B3 in 2024 before increasing to pre COVID levels from 2025.

Figure 9.2 Historical and Forecast MLR's



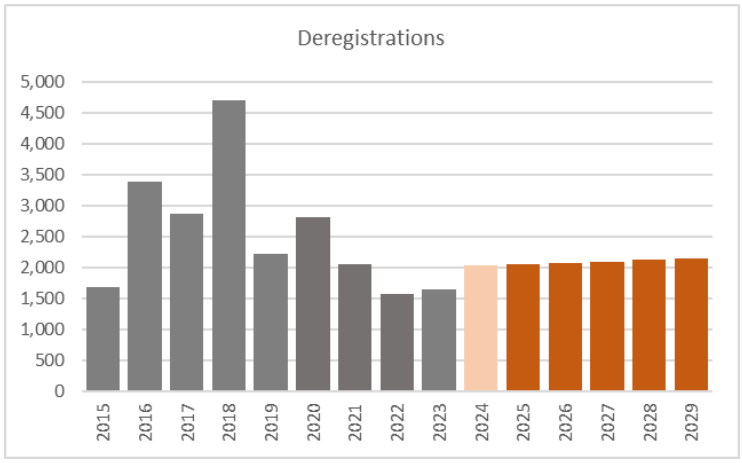
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Meter Lock Removal (MLR)															
Actual	6,839	7,205	8,578	7,613	8,158	3,263	872	720	6159						
CORE Forecast										6,253	8,474	8,568	8,672	8,781	8,892
% Average B3		1.02%	1.19%	1.04%	1.11%	0.44%	0.12%	0.09%	0.80%	0.80%	1.07%	1.07%	1.07%	1.07%	1.07%

9.2.3. Deregistrations

The CORE forecast of Deregistrations has been derived by applying a factor which represents the % of B3 connections which are expected to result in future Deregistrations.

CORE considers that the best estimate of future Deregistrations is based on an increase in 2024 to B3% level of 0.26%, with that level remaining flat thereafter. The 0.26% is below historical average based on the low rate observed in 2023.

Figure 9.3 Historical and Forecast Deregistrations



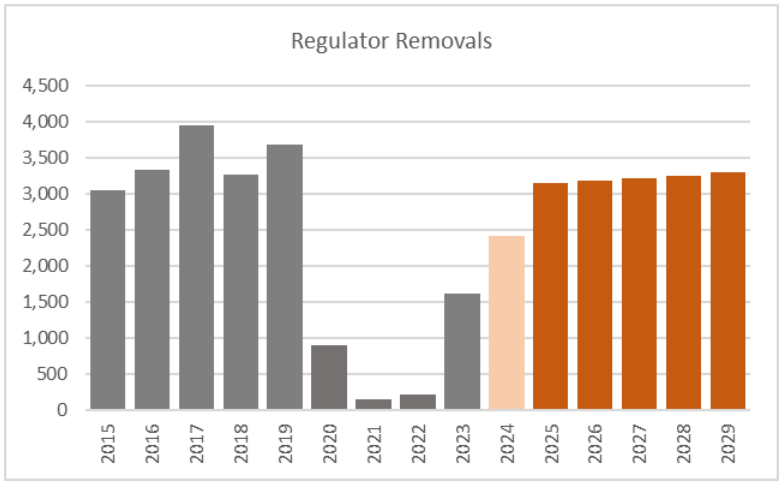
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Deregistrations															
Actual	1,689	3,388	2,872	4,704	2,222	2,802	2,048	1,570	1653						
CORE Forecast										2,032	2,050	2,071	2,095	2,120	2,147
% Average B3		0.48%	0.40%	0.65%	0.30%	0.38%	0.27%	0.21%	0.21%	0.26%	0.26%	0.26%	0.26%	0.26%	0.26%

9.2.4. Regulator Removals

The CORE forecast of Regulator Removals has been derived by applying a factor which represents the % of B3 connections which are expected to result in future Regulator Removals.

CORE considers that the best estimate of future Regulator Removals is an increase to B3% levels of 0.4% in 2024, with that level remaining flat thereafter. The 0.4% is below historical average based on the low rate observed in 2023.

Figure 9.4 Historical and Forecast Regulator Removals



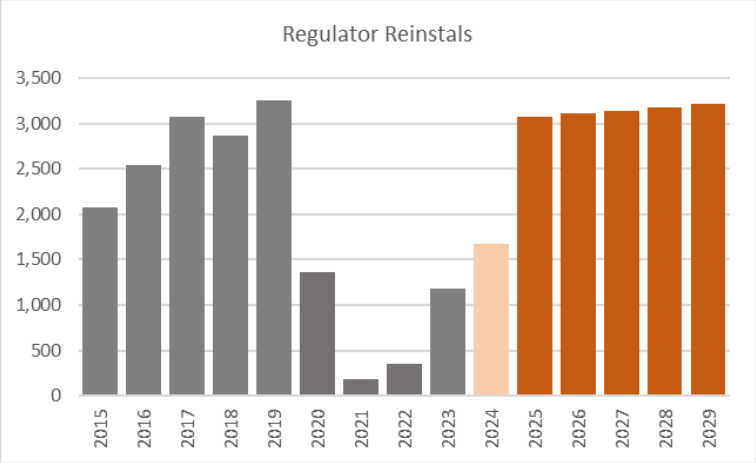
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Regulator Removals															
Actual	3,063	3,344	3,949	3,267	3,695	911	163	219	1630						
CORE Forecast										2,423	3,153	3,185	3,223	3,262	3,303
% Average B3		0.47%	0.55%	0.45%	0.50%	0.12%	0.02%	0.03%	0.21%	0.31%	0.40%	0.40%	0.40%	0.40%	0.40%

9.2.5. Regulator Reinstallations

The CORE forecast of Regulator Reinstals has been derived by applying a factor which represents the % of B3 connections which are expected to result in future Regulator Reinstals.

CORE considers that the best estimate of future Regulator Reinstals is a further growth in B3 % levels in 2024 to 0.21% before reaching an average annual rate of 0.39%.

Figure 9.5 Historical and Forecast Regulator Reinstals



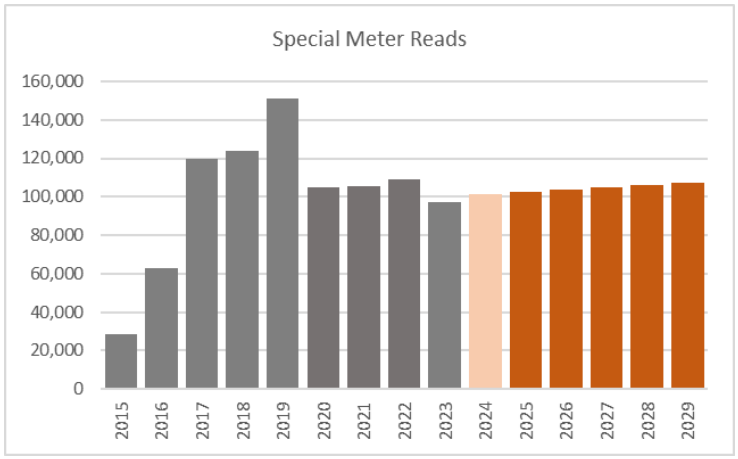
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Regulator Reinstals															
Actual	2,074	2,535	3,074	2,870	3,255	1,357	182	357	1,186						
CORE Forecast										1,678	3,075	3,106	3,142	3,181	3,221
% Average B3			0.43%	0.39%	0.44%	0.18%	0.02%	0.05%	0.15%	0.21%	0.39%	0.39%	0.39%	0.39%	0.39%

9.2.6. Special Reads

The CORE forecast of Special Reads has been derived by applying a factor which represents the % of B3 connections which are expected to result in future Special Meter Reads.

CORE considers that the best estimate of future Special Reads is a small increase in 2024 to 0.13% of B3 connections, based on historical average rates but reduced due to the lower actual levels observed in 2023 relative to all rears since the service matured in 2017.

Figure 9.6 Historical and Forecast Special Meter Reads



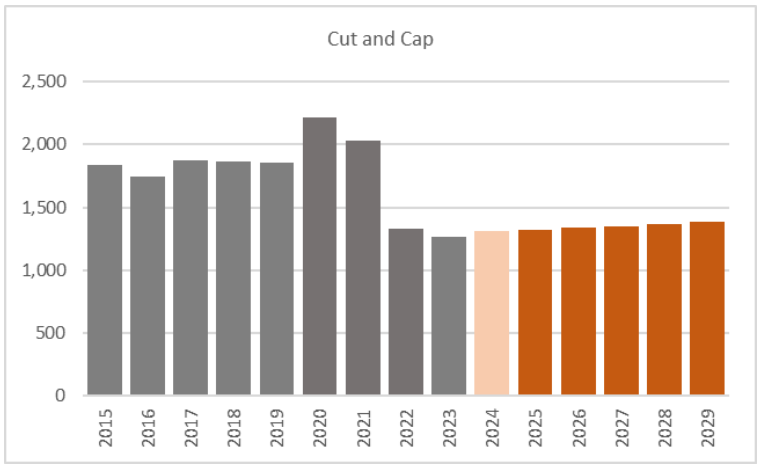
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Special Meter Reads															
Actual	28,772	63,077	119,622	123,645	151,050	104,837	105,295	108,797	97,453						
CORE Forecast										101,612	102,488	103,527	104,731	106,022	107,356
% Average B3		8.94%	16.64%	16.97%	20.49%	14.09%	14.01%	14.28%	12.61%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%

9.2.7. Cut and Cap

The CORE forecast of Cut and Cap has been derived by applying a factor which represents the % of B3 connections which are expected to result in future Cut and Cap services.

CORE considers that the best estimate of future Cut and Cap is a slight increase in B3% to 0.168% and remaining flat thereafter on the basis that this is the average of service in the 2022-23 post COVID period and were the lowest levels observed since 2015.

Figure 9.7 Historical and forecast Cut and Cap



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cut and Cap															
Actual	1,839	1,743	1,876	1,864	1,857	2,216	2,031	1,332	1,262						
CORE Forecast										1,312	1,323	1,337	1,352	1,369	1,386
% Average B3		0.244%	0.259%	0.254%	0.250%	0.297%	0.269%	0.174%	0.162%	0.168%	0.168%	0.168%	0.168%	0.168%	0.168%
% Average 2022-23									**0.168%**						

10. Validation

CORE has undertaken a review of all third party WA gas demand forecasts data and information available within the public domain, with a view to comparison of such data and information against CORE's independent forecast summarised within this report. The objective of this process is to ensure that CORE is satisfied that its forecast addresses all relevant, material issues addressed in third party data and analysis, and to allow a comparison of results .

CORE considers the latest GSOO released by AEMO to be the most complete and highest quality WA forecast available within the public domain. Further CORE notes that the GSOO gas forecast includes a specific forecast of gas for the WA gas distribution network as a significant element of the WA gas system, which allows direct comparison against the CORE forecast.

CORE considers that the AEMO forecasting methodology is broadly consistent with the approach adopted by CORE.

The latest GSOO was released on 14 December 2023, and this forecast has been reviewed by CORE and used for comparison and validation purposes.

The GSOO **"Expected Scenario"** is made up of the following elements:

Figure 10.1 AEMO Figure 11, data register, GSOO - Domestic gas demand forecasts by usage category, Expected scenario, 2023 to 2033 (TJ/day)

Sector	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Minerals Processing	296	331	353	354	354	354	354	354	354	354	353
Electricity Generation	248	244	239	222	209	221	221	235	321	359	345
Mining	283	317	316	327	325	325	319	311	312	313	313
Industrial	162	165	168	169	162	277	277	277	277	275	275
Distribution	76	78	80	81	81	80	82	83	84	85	86
Electrification (Tariff D)	0	0	0	0	0	0	-2	-10	-23	-28	-27
Electrification (Tariff V)	0	-2	-4	-6	-8	-9	-12	-14	-16	-18	-20
Distribution (including electrification)	**76**	**76**	**76**	**75**	**73**	**71**	**70**	**69**	**68**	**67**	**66**
Total (net of electrification)	1,066	1,133	1,153	1,147	1,124	1,249	1,241	1,237	1,310	1,340	1,325

CORE notes that AEMO includes a forecast for gas distribution which includes three elements to arrive at its ***"expected scenario"*** : distribution before electrification, Tariff V electrification and Tariff D electrification as summarised in the following figure.

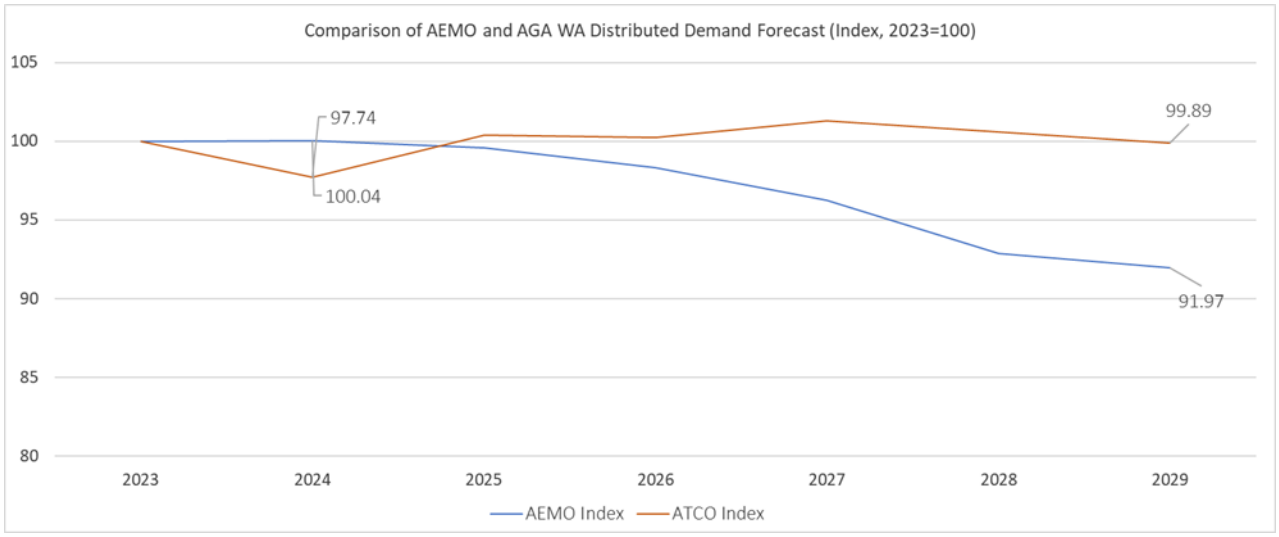
Figure 10.2 Actual 2023 and forecast gas distribution demand 2024-2033

Sector	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Distribution	76	78	80	81	81	80	82	83	84	85	86
Electrification (Tariff D)	0	0	0	0	0	0	-2	-10	-23	-28	-27
Electrification (Tariff V)	0	-2	-4	-6	-8	-9	-12	-14	-16	-18	-20
Distribution (including electrification)	**76**	**76**	**76**	**75**	**73**	**71**	**70**	**69**	**68**	**67**	**66**

Source: AEMO GSOO, December 2023, supporting data register.

CORE has used the above forecast to compare against the CORE forecast for the period to 2029, as an index, with 2023=100. The results are shown in the following figure (detail available via the confidential forecast model).

Figure 10.3 Actual 2023 and forecast gas distribution demand 2024-2029 – ATCO vs AEMO, Index, 2023=100



Source: Core revised MWSWGDS gas demand forecast model

Figure 10.2 illustrates the following:

- there is some variance between the two forecasts in 2024. CORE analysis indicates that this is attributable to differences in Tariff D/Industrial customer forecasts. CORE considers that direct data received by a number of large customers explains this variance – with ATCO data being more current than AEMO data.
- The 2025 forecast (which is the first year of AA6) is materially the same for the two forecasts.
- Between 2026 and 2029, AEMO forecasts a far greater reduction in demand than CORE, due to expected electrification/gas substitution.

This analysis indicates that COREs opening position in 2025 is reasonable and that CORE has taken a more conservative approach than AEMO in forecasting the reduction in gas demand which is attributable to electrification/other drivers.

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A1. Terms of Reference

Scope and Context

CORE has been engaged to deliver a revised gas demand forecast for MWSWGDS AA6 pursuant to the terms contained herein. The forecast addresses the level of demand arising from the residential, commercial, and industrial sectors as well as forecasting customer numbers for these sectors. The methodology reviews the leading approaches to forecasting demonstrated by previous AAs and other experts in the field. The opinions formed are based entirely on quality statistical analysis, economic theory, and industry experience. The analysis forecasts the customer numbers and total demand for each connection type, within each sector and under each tariff class. The approach is quantitative whenever appropriate although qualitative analysis will also be required to justify the methodology and results of the forecast. The context of the forecast and report is that of an independent expert. Accordingly, the methodology and output are a best-practice approach that complies with the *NGRs*.

Relevant Considerations

Consideration and analysis of elements listed below. The relevant time frame for the forecast includes the period leading up to the Review Period as well as all years contained within the period.

- Annual gas demand for new and existing users within the MWSWGDS distribution network.
- Quantity and capacity-based demand for industrial users within the network.
- The historical trends in gas demand and customer numbers. The relevance of these trends should also be examined.
- The various drivers and variables that create movements in average gas usage.
- The suitability and reliability of each statistical method used for the forecast.
- Appliance trends and policies driving appliance efficiency changes.
- Macroeconomic analysis such as population growth, GSP.

Output

The following deliverables:

- Revised EDD Model
- Revised Weather normalisation model
- Revised Demand model
- Revised Report

Upon completion of the ERA Report, all results, forecasts, and assumptions are clearly set out. All methodology is revealed and explained. The findings are adequately justified and compliance with the *NGRs* is shown.

A2. Full Response to Alinta's Submission

1. Introduction

CORE has reviewed the concerns and arguments presented by Alinta regarding ATCO/CORE's AA6 demand forecast. These arguments have been summarized in five specific key points outlined below and addressed individually below.

Alinta's full submission can be accessed through the link: https://www.erawa.com.au/cproot/23779/2/Alinta-Energy-public-submission.PDF.

- Underestimated B3 Demand Forecast: Alinta Energy considers ATCO's B3 demand forecasts to be significantly underestimated as it does not foresee a pronounced decrease in the short term which is consistent with their internal gas demand forecast for the Alinta Energy B3 customer base.
- Population growth: Population growth in WA will play a significant role in increasing demand.
- Industrial activity: Rising industrial activity in WA is expected to increase natural gas demand.
- Use of historical data: Alinta agrees with ATCO's approach in using historical data to forecast future demand.
- Alternative forecasting approaches and developing multiple scenarios: Upcoming uncertainties in the market warrants the need for the development of multiple scenarios through the use of Monte Carlos simulation.

2. CORE's Detailed Response:

2.1 Underestimated B3 Demand Forecast:

CORE believes Alinta's analysis is an inadequate basis for discounting CORE's forecast. CORE's transparent and consistent approach, accepted by ERA and AER for major Australian gas networks, aligns closely with AEMO's methods.

CORE notes it was not provided with access to the details which underpin Alinta's inhouse forecast nor the methodologies used for forecasting purposes and therefore is unable to provide informed view of the reasonableness of that forecast and variances between the Alinta and CORE's forecast.

CORE disagrees with Alinta's approach of using historical results to drive a linear extrapolation. This approach falls short of delivering the most accurate estimate given the circumstances, for several reasons discussed below.

1. Extrapolations which focus on history alone do not take adequate account of expected differences in drivers of future demand.

2. Linear extrapolations of history data at aggregate do not take adequate account of the relationship between each individual driver and forecasts which can be demonstrated to vary materially.

3. Alinta's analysis is based on actual results and weather normalised forecasts which is inconsistent. Weather normalised demand data should be used.

4. A significant portion of variances between historical actual and forecast is attributable to extraordinary climatic factors. CORE used a widely accepted EDD methodology to firstly weather normalise historical demand and ultimately develop its forecasts.

5. The removal of one year's results from a data series across a short timeframe is not considered by CORE to be good practice as it introduces bias. It is at least interesting to note that if the extrapolation commenced in 2016 and excluded 2015, the extrapolation would be far closer to CORE's forecast. That said history alone is not relied upon by CORE, rather CORE used a balanced analysis of history and future drivers – consistent with approached used by AEMO and other leading forecasters of energy demand.

CORE also undertakes analysis of forecasts released by AEMO and other organisations (who provide full support of their analysis) to validate/cross check CORE forecasts and to ensure material variances are reasonable, having regard to differences in the circumstances under which each forecast is derived and the timing of those forecast and supporting data.

CORE's forecasts are based on major drivers of demand. These drivers have been demonstrated to have a strong correlation to demand fluctuations and our future projections of these drivers are based on ABS, Oxford Economic and other independent 3rd party sources.

2.2 Population Growth

CORE agrees with Alinta that the impact of population growth on future gas demand is relevant and would like to note that population growth has been adequately considered by CORE in deriving its forecast, along with a wide range of other factors that influence demand. The latter includes independent specialist input from HIA. This method has been historically used for all gas distribution networks throughout Australia and accepted by regulatory authorities as meeting NGR requirements.

CORE has considered ABS and Government historical and forecast populations data in deriving its estimate of future gas consumption across all customer segments, with a particular focus on the impact of population growth on Residential and Commercial gas demand.

The methodology applied by CORE for AA6 is consistent with the methodology which has been accepted by both the ERA and AER, as a basis for deriving a best estimate under the circumstances. It's important to highlight that CORE has also utilized independent forecasts of residential dwelling growth provided by HIA, which incorporate HIA's own assessment of population growth outlooks.

Reference is made to the latest release of WA Government "Western Australia Tomorrow Population Report No. 12" – 'Band B' forecast (B is defined as a best estimate scenario) shows that future population growth beyond 2024 is expected to be below 2019-24 levels.

2.3 Industrial activity

CORE disagrees with Alinta's argument that forecasted increase in industrial activity will drive natural gas demand. CORE believes such an argument lacks a robust methodology and contradicts recent industry announcements of significant reductions in aggregate demand, thus it is unlikely to provide the most accurate estimate given the circumstances.

CORE considered the relationship between GSP and industrial demand carefully using widely accepted regression techniques. A correlation coefficient (r) of 0.04 for A1, and 0.10 for A2 was observed against WA GSP and indicating a weak relationship between industrial demand and GSP alone. This is primarily because movements in W.A. GSP are driven by activity outside of the Perth metropolitan region i.e. driven by the extraction and processing of minerals which occurs outside of the Perth metropolitan area therefore not impacting the Gas Distribution Network.

Furthermore, the demand outlook by specific customers have been considered, including use of surveys which receive direct input from customers. The methodology applied by CORE for AA6 is consistent with the methodology which has been accepted by both the ERA and AER as a basis for deriving a best estimate under the circumstances.

CORE notes demand by industrial customers is affected by a wide range of factors including global commodity prices, cost of labour, and cost of other inputs including energy. As an illustration ALCOA has announced its intention to curtail production from its Kwinana operation in 2024, which consumed approximately 40 PJ of gas in 2023, despite there being a positive GSP growth outlook. Further, CITIC have stated that it is likely to reduce production by approximately a third in 2024 which is expected to result in a significant reduction is gas consumption.

2.4 Use of historical data

CORE accepts the importance of historical data as part of the set of inputs to derive forecasts. However, CORE notes the careful consideration of future events is also critical to ensure the total data set and robust approaches are used to develop best estimates under the circumstances.

2.5 Alternative forecasting approaches and developing multiple scenarios

CORE agrees that it is prudent to consider the full range of forecasting methodologies which, in isolation or in combination, are expected to deliver the best estimate under the circumstances, including the two approaches outlined by Alinta. However, CORE notes there are many other approaches which also deserve consideration.

CORE considers the approach used to derive its AA6 demand forecast is the best estimate of gas demand within the MWSWGDS, under the circumstance.

CORE notes that it required by the NGR to submit a single forecast which is the best estimate under the circumstances. The CORE forecasts are based on independent and published 3rd party data on drivers of demand. Whilst multiple scenarios could be developed, ATCO is required under NGR74 2 (b) to present a best forecast or estimate possible in the circumstances.

For over 20 years CORE has adopted an extensive range of forecasting techniques including scenario-based forecasting and Monte Carlo simulation. CORE's experience and that of AEMO, and decisions of the ERA and AER, is that the combination of approaches used by CORE in AA6 and many other access arrangement determinations, across Australia, supports the development of best estimates under the circumstance (i.e. as it relates to the specific factors impacting future demand within Australian State-based gas distribution networks).

CORE's approach includes a wide range of inputs from leading third-party organisations/industry participants:

- Commonwealth and WA Governments – Population, GSP, demographic influences, policy scenarios – including those focused on GHG emission reduction/emission targets, government energy sector support schemes, reviews of energy efficiency et al.
- WA Parliamentary Inquiry – Domestic gas market, including commentary on outlook and demand/supply scenarios and prices.
- AEMO – cross check forecasts, review of underlying inputs and scenarios
- ABS - wide range of energy and gas data, trend analysis
- Gas customers – direct surveys
- HIA – dwelling forecasts
- Energy Ratings - Energy efficiency trend analysis

A3. WA Energy and Gas Use Trends

The following paragraphs provide additional details relating to factors that continue to drive demand per connection. Data available for these factors is not suitable to quantify each factor individually; however, the combined effect is considered in arriving at the historical annual average growth rates. The qualitative and quantitative evidence for these factors is presented below and supports why CORE considers it likely for the combined effect of these factors to maintain these trends experienced since 2008.

Western Australia Energy Use Trends

The most significant uses of gas for Australian households are space heating, water heating and cooking.

Data released by the ABS and other third-party sources shows that gas appliances are being substituted for electricity and solar energy in space heating and water heating.[10]

As previously noted, the trends between 2008 and 2015 and post 2015 vary materially in several areas, therefore CORE has analysed data within these two periods.

2008-15

Gas Substitution in Room/Space Heating

Gas room heating is the highest of the main areas of gas use – Room/Space heating, water heating and cooking appliances.

The table below illustrates the significant increase in the number of Western Australian households that used electricity for their heating purposes. Between the years 2011 and 2014, the market share of electricity for space heating increased by 2.5%. The market share for gas heating appliances fell by 7.1% over the same period. This is likely due to the increase in R-C air-conditioning use for heating purposes. Among several forces, consumers are favouring the convenience of a single appliance that has two functions, cooling and heating.

Figure 10.4 Western Australian Energy Use | % of Households 2008 to 2014

Energy Use	2008	2011	2014
Electricity main source for heating	30.0	35.9	38.4
Gas main source for heating	35.1	36.0	28.9

Source ABS, 2008, 2011, 2014

A study titled 'Are We Still Cooking with Gas?' conducted by the Alternative Technology Association ("ATA") and supported by the energy market's Consumer Advocacy Panel found that houses already connected to the gas network could steadily withdraw from using gas for space heating in favour of using reverse cycle air conditioners, on economic grounds.

[10] ABS, *4602.0.55.001 - Environmental Issues: Energy Use and Conservation.*

Appliance Efficiency

A further factor influencing gas use is the efficiency of the room heating appliance. For example, analysis shows that space gas heating appliance efficiency can improve by 20% by moving from 4 start to 6 star rating.

Dwelling energy efficiency

A further influence on gas room heating is the thermal efficiency of dwellings. The use of insulation and more efficient buildings through initiatives such as double glazing, reduce the level of heating activity and thus use of gas. The number of WA homes with insulation increased from 69% to 75% from 2008 to 2014. A continuation of this insulation trend is expected to reduce gas space heating requirements of households.

2015-2022

Gas Substitution

The National Construction Code (NCC) has introduced a seven-star rating for dwellings, effective beyond 2023. As gas heating appliances do not have a seven-star series available, gas heating will need to combine with solar facilities to meet the requirement.

The above requirement is expected to cause certain developers and customers to favour all electricity, or all electric room/space heating, due to economic impact of this change in requirement.

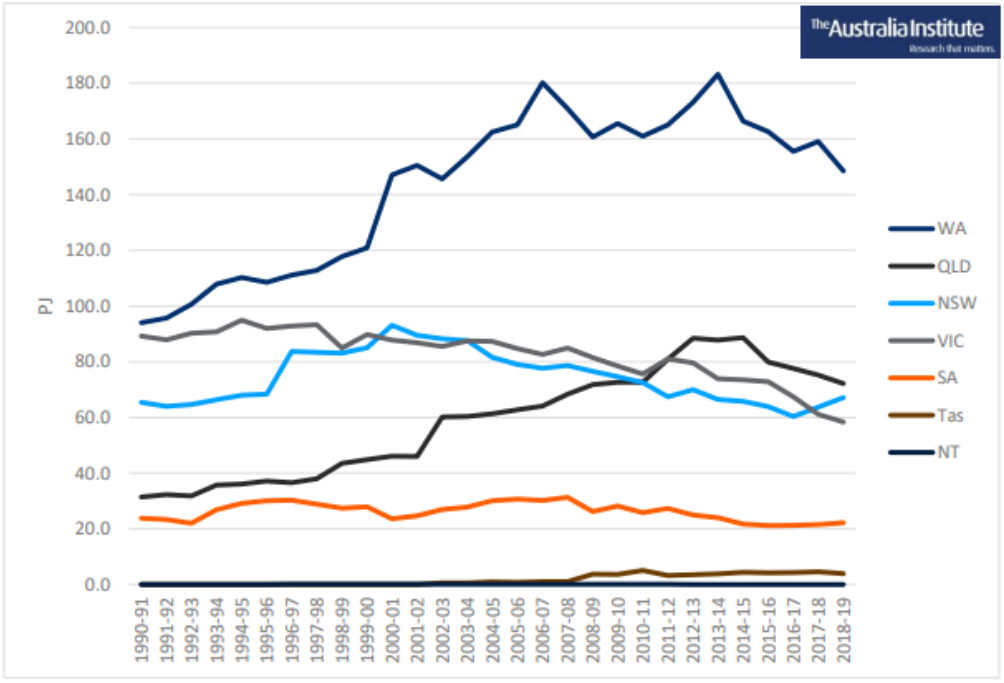
Appliance Efficiency

As referenced above, a trend toward higher rating gas appliances is expected to result in a lower use of gas as:

- new dwellings are connected with high rating appliances.
- existing dwelling appliances are replaced with higher rating appliances (approximately every 12-15 years).
- Renovations cause certain appliances to be replaced early.

Continuing reduction in Manufacturing gas consumption

Use of gas by manufacturing activities has fallen materially since 2015, return to near 2002 levels as illustrated below.



Source: Department of Industry, Science, Energy and Resources (2019) *Australian Energy Update 2020,* Table F, https://www.energy.gov.au/publications/australian-petroleum-statistics-2020

A4. WA Energy Policy

CORE is not aware of any specific, quantified targets for reduction in gas use, under WA Government policy, as has been defined in other jurisdictions such as Victoria. Therefore, CORE has summarised broad statements made by the WA Government, related agencies or regulatory bodies.

WA Climate Policy :

- Net zero greenhouse gas emissions by 2050 - The policy underscores commitment to adapting to climate change and to working with all sectors of the economy to achieve the target.
- Government Leadership - Requiring the development of net zero emissions transition plans for government agencies and government trading enterprises (GTEs).
- Distributed Energy Resources Roadmap - which targets enhanced integration of Solar PV and battery storage.
- Household Energy Efficiency Scheme - Aids households, including those in energy retailer hardship programs, to enhance energy efficiency and reduce energy costs.
- Green industry transformation - Identify the policy, regulatory and infrastructure requirements to unlock the transformational potential of large-scale, low-cost renewable energy projects and stimulate new energy-intensive and clean manufacturing industries.
- Distributed Energy Buyback Scheme - introduces payments for energy exported to the grid from eligible home batteries and electric vehicles to support their uptake which could favour electricity over future gas use
- Support microgrids which will reduce gas use within network areas – Horizon energy is active in this area
- Net zero industrial estates - Through Development WA's Industrial Lands Authority, plan, design and deliver industry land and infrastructure, including Technology Precincts, to support those industry estates move towards net zero emissions by 2050.
- School Virtual Power Plants