A review of ATCO's gas demand and customer numbers for the sixth Access Arrangement period (AA6)

NIEIR DEMAND AND CUSTOMER NUMBER FORECASTS – ATCO NETWORK

FINAL REPORT

A report for the
ECONOMIC REGULATION AUTHORITY

Prepared by
National Institute of Economic and Industry Research

MARCH 2024

A report for
ECONOMIC REGULATION AUTHORITY (ERA)

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While the National Institute endeavours to provide reliable forecasts and believes the material is accurate it will not be liable for any claim by any party acting on such information.

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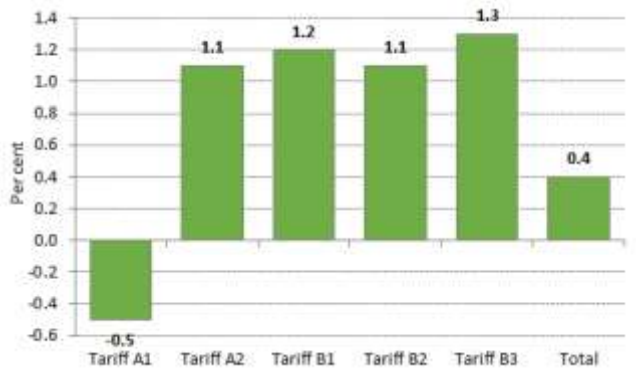
Executive summary

This report presents NIEIR's forecasts of customer numbers and volumes for the Mid-West and South-West Gas Distribution System (MWSWGDS) operated by ATCO. This report was commissioned by the Economic Regulation Authority, Western Australia, to assist in the review for the sixth Access Arrangement period (AA6).

Figures E.1 to E.5 summarise the outlook for volumes, customers and average usage between 2024 and 2029. NIEIR has forecast closing customer numbers.

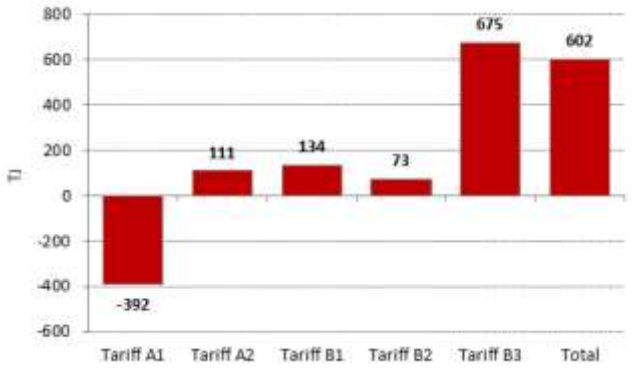
Table E.1 provides volume, customer and average usage projections prepared by NIEIR between 2022 and 2029. This table covers the AA6 period (2025-2029) and the last three years of the AA5 period (2022-2024).

Figure E.1: Gas volumes by tariff group – ATCO – 2024 to 2029
Compound average growth rate (%)



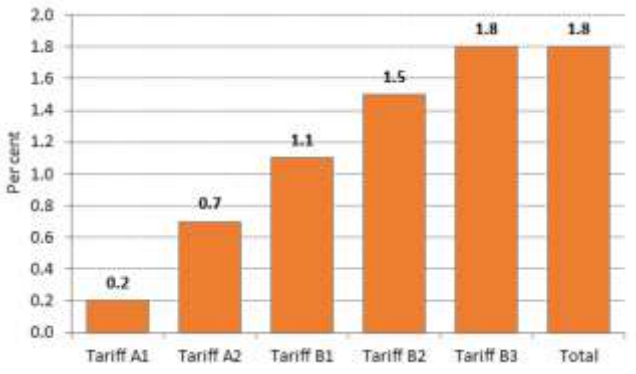
Source: NIEIR forecasts.

Figure E.2: Gas volumes by tariff group – ATCO – 2024 to 2029
Volume growth (TJ)



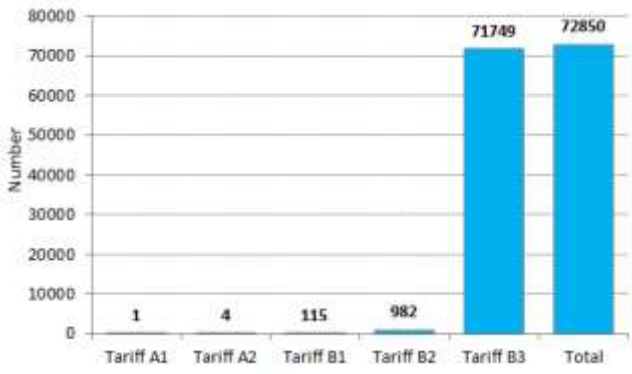
Source: NIEIR forecasts.

Figure E.3: Customers by tariff group – ATCO – 2024 to 2029
Compound average growth rate (%)



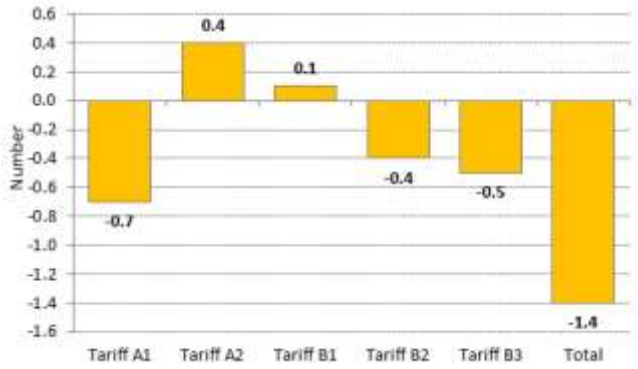
Source: NIEIR forecasts.

Figure E.4: Customers by tariff group – ATCO – 2024 to 2029
Customer growth (no.)



Source: NIEIR forecasts.

Figure E.5: Average usage by tariff group – ATCO – 2024 to 2029
Compound average growth rate (%)



Source: NIEIR forecasts.

Table E.1 Gas volumes, customer numbers and average usage

Year	2022	2023	2024	2025	2026	2027	2028	2029	Compound annual growth (%) 2024 to 2029
Gas volumes – terajoules – Weather normalised (TJ)									
Tariff A1	11,820	12,612	15,041	15,197	15,422	15,575	14,915	14,649	-0.53
Tariff A2	1,915	1,894	1,962	1,981	2,013	2,038	2,054	2,073	1.10
Tariff B1	2,120	2,158	2,177	2,199	2,231	2,259	2,284	2,312	1.21
Tariff B2	1,305	1,320	1,327	1,336	1,353	1,370	1,385	1,400	1.08
Tariff B3	10,227	10,367	10,467	10,578	10,727	10,874	11,014	11,142	1.26
Total	**27,387**	**28,351**	**30,975**	**31,290**	**31,746**	**32,114**	**31,652**	**31,577**	**0.39**
Gas customers (number)									
Tariff A1	73	74	77	77	77	78	77	77	0.16
Tariff A2	103	103	105	106	106	107	108	109	0.70
Tariff B1	1,968	1,999	2,015	2,033	2,060	2,084	2,106	2,130	1.11
Tariff B2	12,540	12,730	12,826	12,943	13,175	13,394	13,596	13,807	1.49
Tariff B3	767,161	774,706	783,820	795,727	810,688	825,648	840,609	855,570	1.77
Total	**781,845**	**789,612**	**798,843**	**810,885**	**826,106**	**841,311**	**856,496**	**871,693**	**1.76**
Average usage per customer									
Tariff A1 (TJ)	161.9	170.0	196.4	197.8	199.6	200.8	193.2	189.8	-0.68
Tariff A2 (TJ)	18.6	18.5	18.7	18.8	18.9	19.0	19.0	19.1	0.40
Tariff B1 (GJ)	1077.2	1079.6	1080.5	1081.5	1082.9	1083.9	1084.6	1085.5	0.09
Tariff B2 (GJ)	104.1	103.7	103.5	103.2	102.7	102.3	101.8	101.4	-0.40
Tariff B3 (GJ)	13.3	13.4	13.4	13.3	13.2	13.2	13.1	13.0	-0.50
Total	**35.0**	**35.9**	**38.8**	**38.6**	**38.4**	**38.2**	**37.0**	**36.2**	**-1.35**

Note: All data in the NIEIR ATCO model are expressed as real number, not integers. This may produce small rounding errors in per cent changes and absolute changes.

Source: ATCO and NIEIR. ATCO (2022 actuals), NIEIR forecasts (2023-2029).

Tariff A1

Tariff A1 is the largest tariff group by volume and consisted of 73 large usage customers in 2022. ATCO conducted a survey at the end of 2022 on individual customer intentions and planned gas usage to 2029.

NIEIR is concerned that the survey is outdated from late 2022, particularly given the changed economic conditions including domestic interest rates.

The NIEIR Tariff A1 takes account of the ATCO and CORE Energy increased volumes by 2024 (in the absence of any better advice), but then allows for NIEIR's forecasts to impact Tariff A1 through the 2025 to 2029 period.

Total volume change in Tariff A1 between 2024 and 2029 is a fall of 392 terajoules, or 0.5 per cent per annum.

Tariff A2

Tariff A2 was originally set up to accommodate the larger B1 customers. There were 103 Tariff A2 customers with a total volume of 1,922 terajoules in 2022. Tariff A2 increases by 111 terajoules between 2024 and 2029, or 1.1 per cent per annum. Customer growth over the period is 4 customers.

Tariff B1

Tariff B1 had 1,968 customers and a total volume of 2,141 terajoules in 2022. Tariff B1 is dominated by commercial customers. Commercial use represents around 84 per cent of total Tariff B1 gas usage.

Tariff B1 volumes are forecast to increase by 134 terajoules between 2024 and 2029, or 1.2 per cent per annum.

Tariff B2

Tariff B2 has a larger number of smaller customers. Total Tariff B2 volumes were 1,314 terajoules in 2022 with some 12,540 customers. Overall, volume growth between 2024 and 2029 is 73 terajoules and average annual growth is 1.1 per cent per annum. Customer growth is 1.5 per cent per annum, or 982 customers over the same period.

Tariff B3

Tariff B3 represents mostly residential customers, with a total volume of 10,227 terajoules and 767,161 customers in 2022. Total Tariff B3 volumes are projected to rise by 675 terajoules between 2024 and 2029, or by 1.3 per cent per annum.

Tariff B3 customer growth between 2024 and 2029 is 71,749 customers, or an average 1.8 per cent growth per annum. Average usage per customer falls from 13.4 gigajoules in 2024 to 13.0 gigajoules in 2029, a fall of 0.4 gigajoules, or 0.5 per cent per annum over the period.

The NIEIR report for the ERA includes forecasts for the 10 years to 2033. This is our standard forecasting horizon.

This report is structured as follows:

- Chapters 3 and 4 outline the economic outlook for Australia and Western Australia;
- Chapter 5 provides the regional-based economic outlooks;
- Chapter 6 provides further details on the modelling methodologies employed by NIEIR; and
- Chapter 7 presents the NIEIR forecasts for ATCO, while Chapter 8 compares the NIEIR forecasts with the ATCO forecasts prepared by CORE Energy.

1. Introduction

The Economic Regulation Authority (ERA), Western Australia, accepted the National Institute of Economic and Industry Research's (NIEIR's) proposal to review and assess ATCO's Haulage and Ancillary services gas demand forecasts for the sixth Access Arrangement (AA6) period.

The background and terms of reference for the work is reproduced below.

1.1 Background

The Economic Regulation Authority (ERA) is responsible for regulating third-party access to gas pipelines in Western Australia. There are currently three fully regulated pipelines in Western Australia that require a service provider to propose and submit an access arrangement to the ERA for approval on a periodic basis, typically every five years. One of those pipelines is the Mid-West and South-West Gas Distribution Systems (GDS) which is a gas distribution network that services areas such as Geraldton, Eneabba, Bunbury, Busselton, Harvey, Pinjarra, Kemerton, Capel and the greater Perth metropolitan area including Mandurah.

An access arrangement details the terms and conditions, including prices, under which third-party users, such as gas retailers, can access the regulated pipeline to transport and receive gas.

On 1 September 2023, ATCO Gas Australia, operator of the Mid-West and South-West gas distribution systems submitted its access arrangement proposal to the ERA for review. The ERA is required to invite submissions from stakeholders to provide comments on ATCO's proposal and take these submissions into account in making a draft decision on ATCO's proposal. A further consultation period occurs following the draft decision and allows for ATCO to revise its proposal based on the ERA's draft decision before the ERA makes a final decision.[1]

1.2 Overall project requirements

The ERA needs to review the demand forecasts proposed by ATCO for the sixth Access Arrangement period (AA6) and the remaining years in the fifth Access Arrangement period (AA5), which are used for setting tariffs and inputs in other matters such as the expenditure forecasts required to operate the GDS.

The consultant is required to review the GDS gas connection and consumption (together 'haulage demand'), and Ancillary services forecast for:

- the remaining years in AA5 from 2023 to 2024; and
- AA6 from 2025 to 2029.

The consultant is required to complete its independent analysis of the forecast, with consideration of the relevant reports and supplementary information underlying its access arrangement submission provided by ATCO to the ERA. The ERA will provide all supporting documents (listed under the Stage 1 section) submitted by ATCO to the consultant upon commencement of the task.

ATCO transports natural gas to:

- industrial customers: in haulage class A1 and A2;
- commercial customers: in haulage class B1 and B2; and
- residential customers: in haulage class B3.

Details of the above haulage classes are set out in ATCO's Access Arrangement Information document (pages 77-78).[2]

ATCO also provides Ancillary services and a forecast of the level of these services is required. Details of the ancillary reference services are set out in ATCO's Access Arrangement Information document (pages 78-79).[3]

The consultant is required to:

- review forecast total gas consumption volume and connections by all haulage classes, including the methodology used by ATCO;
- review the Ancillary services forecast, including the methodology used by ATCO;

[1] Further details on the access arrangement review process can be found in the ERA's Gas Access Arrangement Guideline, available on the ERA's website.

[2] ATCO, 2025-29 Plan, 1 September 2023, pp 77-78, available on the ERA's website.

[3] ATCO, 2025-29 Plan, 1 September 2023, pp 78-79, available on the ERA's website.

- identify any errors in ATCO's proposed Haulage and Ancillary services demand forecast; and
- provide revised forecasts of the Haulage and Ancillary services demand based on the findings of its review.

The consultant should be aware that under rules 74(1) and 74(2) of the National Gas Rules (NGR), a forecast or estimate must be supported by a statement on the basis of the forecast or estimate. In addition, a forecast or estimate must be arrived at on a reasonable basis and must represent the best forecast or estimate possible. Under rule 75 of the NGR, the result of an extrapolation or inference must be supported by the primary information on which the extrapolation or inference is based.

At any time during the engagement, if the consultant requires further information or clarification on the forecasts provided by ATCO, it should notify the ERA as soon as possible after commencement and this information or clarifying questions will be requested from ATCO. Allowance of at least five business days should be made to obtain information and responses from ATCO.

The consultant is required to perform the review and analysis in two stages.

1.3 Review and analysis of ATCO's 2023 demand forecasts

The Haulage and Ancillary service demand forecasts were done by CORE Energy for ATCO. The ERA will provide the following documentation for the assessment:

- Access Arrangement Information (ATCO Gas 2025-2029 Plan) (public) – 273 pages, including Section 7 Demand Forecast – 12 pages;[4]
- Gas Demand Forecast report by CORE Energy (public) – 60 pages;[5]
- Supporting information workbook by CORE Energy (confidential);
- EDD index model by CORE Energy (confidential);
- Weather Normalisation model by CORE Energy (confidential); and
- Demand Forecast model by CORE Energy (confidential).

Utilising the above listed documents and models, the consultant is required to review and assess whether:

- the forecast is developed, and the results are derived using reasonable methodologies;
- the forecast model structure is sound and without calculation errors;
- ATCO has applied consistent justification of the assumptions in the forecast;
- the following input assumptions are reasonable and applied to the forecast correctly:
    1. assumptions and key drivers that affect the gas consumption forecast for A1, A2, B1, B2, and B3 customers, for the existing and new connections;
    2. assumptions and key drivers that affect new connection forecast for A1, A2, B1, B2, and B3 customers;
    3. assumptions and key drivers that affect disconnection forecast for A1, A2, B1, B2, and B3 customers;
    4. assumptions and key drivers that affect Ancillary services.
- the historical trends were appropriate, reasonable, and applied to the forecast correctly;
- the regression analysis is sound, noting that CORE Energy's statement "*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*." (p. 18 CORE ENERGY - GAS DEMAND FORECAST report).

Based on the assessment of ATCO's forecast, the consultant is required to provide an adjusted Haulage and Ancillary services demand forecast using its own assumptions and analysis. The adjusted forecast should incorporate all recommended changes, and in the consultant's opinion, be consistent with the intent of rules 74 and 75 of the NGR. The consultant's analysis should consider (amongst other relevant matters):

- the economic growth, key government policies and market drivers that affect connection/ disconnection, gas usage and ancillary service forecasts in each haulage class;

[4] ATCO, 2025-29 Plan, 1 September 2023, pp 83-94, available on the ERA's website.

[5] CORE Energy, Gas Demand Forecast, 1 September 2023, available on the ERA's website.

- any trends inherent in the demand profile including but not limited to population growth, weather normalised demand, gas penetration rate, usage per connection, and economic/non-economic parameters;
- price elasticity assumptions for each haulage class;
- any statistical and/or probabilistic analysis that may improve the quality of the forecast; and
- any relevant gas forecasts for consistency, for example the WA Gas Statement of Opportunities.

The consultant is required to provide to the ERA by 22 January 2024:

- a detailed written final report on the assessment of ATCO's demand forecast, including its methodology, and the consultant's revised forecast for Haulage and Ancillary services demand in accordance with the requirements listed above; and
- supporting information, a demand model and assumptions that are used to derive the revised Haulage and Ancillary services demand forecast.

The final report and demand model should be transparent and easy to read/use.

The final report will be provided to ATCO for review a few weeks before publication of the draft decision. The Consultant will be required to update its advice for any factual errors and provide a redacted version removing confidential information from its advice for publication on the ERA's website within a timeframe to be agreed with the consultant post award.

1.4 ATCO Pipeline services – Haulage and Ancillary services

The following tables list the pipeline services available on the Mid-West and South-West Gas Distribution Systems (excludes ATCO's Albany and Kalgoorlie networks) by ATCO.

Table 1.1 Haulage reference services

Service	Description
A1	Major industrial customers using >35 TJ of gas per year.
A2	Large customers using between 10 and 35 TJ of gas per year.
B1	Medium sized customers using <10 TJ of gas per year, at medium or low pressures.
B2	Small-use customers with a standard meter with capacity from 12 m3/h to less than 18 m3/h, typically commercial or large residential, supplied at medium or low pressures.
B3	Small-use customers with a standard meter capacity less than 12 m3/h, typically residential or small business customers, supplied at medium or low pressures.

Table 1.2 Ancillary reference services

Service	Description
Disconnections for retailer credit control	
Applying a Meter Lock	Attaching a lock to the valve that comprises part of the standard delivery facilities to prevent gas from being received at the delivery point. This service is available at delivery points receiving the B2 or B3 Haulage service subject to the suitability of the meter control valve.
Remove regulator	Physically disconnecting a delivery point to prevent gas from being delivered to the delivery point. This service is available at delivery points receiving the B2 or B3 Haulage service.
Reconnections for retailer credit control	
Removing a Meter Lock	Removing the lock that was applied to a valve comprising part of the standard delivery facilities to prevent gas from being received at the delivery point. This service is available at delivery points receiving the B2 or B3 Haulage service.
Re-install regulator	Reconnecting a delivery point to allow gas to be delivered to the delivery point. This service is available at delivery points receiving the B2 or B3 Haulage service.

Table 1.2 Ancillary reference services (continued)	
Service	**Description**
Deregistration	
Deregistering a delivery point	A delivery point is permanently deregistered by: (i) Removing the delivery point (as per the Retail Market Procedures); (ii) Removing the delivery point from the Delivery Point Register; and (iii) For delivery points receiving the B2 or B3 Haulage service, removing the meter (where ATCO considers necessary). For delivery points receiving the A1, A2 or B1 Haulage service, removal of the meter set is a separate service (refer to the "Remove meter set and make safe" service below).
Meter reading services	
Special read	An out-of-cycle meter reading of a manually read meter additional to meter readings mandated under the Retail Market Procedures. This service is available at delivery points receiving the B1, B2 or B3 Haulage service.

Note: The AA6 period will include an additional ancillary reference service known as 'permanent disconnection service'.

ATCO also offers other ancillary non-reference services, covering:

- disconnections and reconnections for retailer credit control;
- other special reads;
- altering delivery services; and
- other meter services.

Further details are provided by ATCO.

Source: https://www.atco.com.content/class/web/atco-australia/for-business/documents/2023%pipeline%services%published%20february%2027.pdf.

2. Overview of ATCO's 2023 gas demand and Ancillary services forecast

This section provides a brief overview of the methodologies employed to prepare gas demand forecasts for the MWSWGDS.

ATCO employed CORE Energy and Resources Pty Ltd (CORE Energy) for the purpose of providing ATCO with forecasts of gas demand and customers for the five year period from calendar 2025 to 2029, and the interim years of 2023 and 2024.

2.1 Overview of modelling approach – CORE Energy

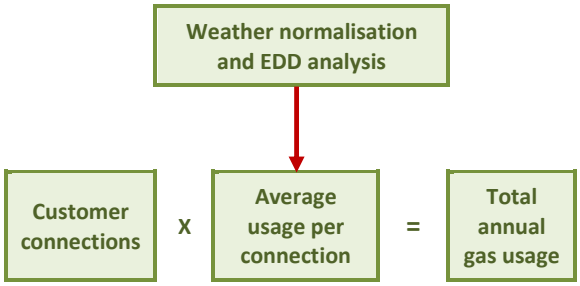
CORE Energy identified four key components in developing gas demand and customer forecasts for the ATCO MWSWGDS.

1. Weather normalised demands.
2. Tariff B3 customers and demand.
3. Tariff B1 and B2 customers and demand.
4. Tariff A1 and A2 customers and demand.

CORE Energy used historical data provided by ATCO from 1 January 2008 to 31 December 2022. NIEIR was also provided with this data to assist in reviewing and verifying the forecasts.

Figure 2.1 summarises CORE Energy's overall approach by major ATCO tariff class.

Figure 2.1: ATCO (CORE Energy) gas demand forecasts – Summary of approach



Drivers	Connections	Average usage (WN)
Tariff A1 and A2	No change (constant)	■ Survey of customers. ■ Analysis of historical individual customer use ■ Other research.
Tariff B1 and B2	Historical average annual growth rates.	Historical average annual growth rates.
Tariff B3	Housing Industry Association forecasts plus adjustments for area of gas distribution network, take-up rates for gas.	Historical average annual growth rates.

Source: CORE Energy and NIEIR case.

2.2 Weather normalisation

CORE Energy adopted a weather normalisation process using the Effective Degree Day (EDD) index. The EDD index is a weather index and is required as gas consumption is impacted by weather through its influence on space and area heating loads.

The EDD index comprises the following elements:

- temperature measured in three hourly intervals;
- a wind chill factor;
- the warming effect of sunshine; and
- a seasonality factor.

CORE Energy used data from the Bureau of Meteorology's (BOM) Perth Airport for Temperature, wind speed and sunshine hours.

CORE Energy then estimated regression models which regressed Tariff B class daily gas demand against the EDD and selected weekly dummy variables (Friday, Saturday, Sunday).

Monthly regression models were used to allocate the weather impact across the three tariff classes, B1, B2 and B3.

2.3 Tariff B3 customers and demand (gas consumption)

For Tariff B3, total demand is the product of forecast B3 connections and average demand per connection.

Existing Tariff B3 connections were supplied by ATCO. CORE Energy adjusted existing connections for predicted disconnections, the latter based on historical average disconnections.

New connections were derived by the following process as described by CORE Energy:

- an estimate of dwelling completions by the Housing Industry Association (HIA);
- an adjustment to completions to account for the proportion of new dwellings in the MWSWGDS area;
- an adjustment to completions to account for the gas take-up rate; and
- an adjustment for high density dwellings relative to detached houses, which are more likely to have a gas connection.

As for the average demand per connection for Tariff B3, CORE Energy stated it considered regression analysis for a range of macroeconomic variables, such as household income. CORE Energy, however, then noted these regressions were not significant (statistically). CORE Energy then stated the normalised historical growth rates were a more reliable alternative for forecasting Tariff B3.

2.4 Tariff B1 and B2 customers and demand (gas consumption)

CORE Energy states that the approach to deriving demand forecasts for Tariffs B1 and B2 is similar to the approach used for Tariff B3.

Tariff B1 and B2 connection forecasts were based on historical trends or annual growth rates. Growth in customer connections for Tariff B2 slowed through the COVID-19 impacted years. CORE Energy incorporated a slowing growth in B2 connections over the 2025 to 2029 period.

Average demand forecasts per connection for Tariffs B1 and B2 were again based on assessed historical annual average growth rates.

2.5 Tariff A1 and A2 customers and demand (gas consumption)

The larger Tariffs A1 and A2, comprising of large commercial and industrial customers, was forecast by CORE Energy by considering the following:

- Individual customer historical trends;
- Customer surveys covering forecast annual demands and maximum hourly quantities (MHQ); and
- Other research and analysis.

For Tariff A1 customers, a MHQ forecast was also required by CORE Energy. The MHQ was forecast using the historical ratio to annual gas demand.

Customer connections for Tariffs A1 and A2 were adjusted in 2023 and 2024, however, they remain constant thereafter between 2025 and 2029.

2.6 Summary of NIEIR comments on CORE Energy forecasts for ATCO

Some key findings in respect to the review of the CORE Energy forecasts for ATCO are summarised below.

Component	Comment
Weather normalisation	NIEIR found that while the CORE Energy approach to weather normalisation is good practice, some aspects are counter-intuitive. CORE Energy inherently assumes that the temperature sensitivity is constant over time (2008 to 2019). NIEIR found evidence that the temperature sensitivity is changing over time. CORE Energy assumes Tariffs A1 and A2 are temperature insensitive. NIEIR found evidence that Tariffs A1 and A2 should be weather normalised. Revisions to the weather normalisation methodology could materially impact on observed trends in total and average gas usage by Tariff group (A1, A2, B1, B2 and B3).

Component	Comment
Tariffs A1 and A2	CORE Energy assumes there is no customer growth post-2024 in Tariffs A1 and A2. Economic drivers have not been modelled for Tariffs A1 and A2 by CORE Energy. It is unclear whether CORE Energy incorporated publically announced projects (e.g. WA Budget Papers) into the Tariff A1 and A2 forecasts.
Tariffs B2 and B3	CORE Energy customer growth forecasts for Tariff B1 appear reasonable, although they are simply based on historical average annual growth rates. The connections forecast for Tariff B2 are lower than historical growth over the 2012 to 2022 period. The volume forecast for Tariff B1 by CORE Energy looks too low, even compared to historical growth rates. Again, the CORE Energy modelling for Tariffs B1 and B2 does not include any economic drivers.
Tariff B3	The Tariff B3 volume forecast by CORE Energy seems materially low in the context of observed historical changes in average gas usage. The Tariff B3 modelling does not provide a framework to assess the impact of household disposable income growth or prices on average Tariff B3 gas use.

3. The Australian economic outlook

3.1 Introduction

NIEIR has prepared a standard 10 year forecast for its economic outlook. This section summarises the economic outlook for Australia to 2032-33. A baseline or "most likely" economic outlook has been prepared. The national, state and regional outlooks impact on the outlook for ATCO's volume and customer forecasts to 2029.[6,7]

3.2 The outlook for the world economy

The world economy is forecast to be subject to three years of relatively low growth for the 2023 to 2025 period. The average rate of growth for the world economy is expected to be 2.2 per cent per annum. However, for the developed world, namely Europe and the United States, the expected average annual growth rate is approximately 1.0 per cent per annum. At the end of this period the policy authorities will have established a satisfactory long-term inflationary environment that, by itself, will largely be responsible for the recovery in growth.

For the remainder of the projection period, the average annual growth rate for the world economy is modest by historical standards at 2.7 per cent per annum.

This is due to:

(i) the long-term trend in the decline in the marginal productivity of capital;

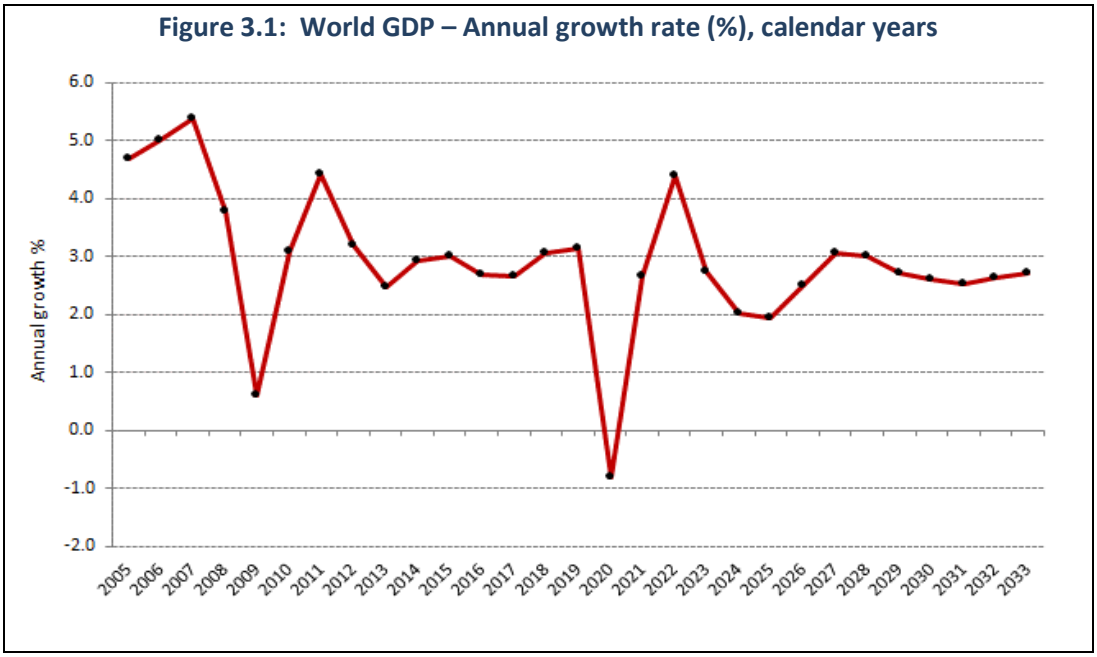
(ii) the diversion of investment resources from capacity expansion to decarbonisation of economies; and

(iii) high public sector debts forcing both relatively high long-term interest rates and constraints on the levels of public expenditures.

The Gross Domestic Product (GDP) profile in Figure 3.1 over the 2023 to 2025 period is heavily influence by the Chinese economy continuing to grow at between 4.0 and 5.0 per cent and emerging/developing economies maintaining an average growth rate of around 3.6 per cent per annum. The main cause of the decline in world GDP growth will be the decline in developed or mature economies' average annual growth to 1.0 per cent per annum. The Euro Area growth over this period is expected to be 0.7 per cent per annum and the United States a little above 1.0 per cent per annum.

Longer term, that is, over the balance of the 2020s and into the 2030s, the United States is projected to have a GDP growth, on average, of 1.5 per cent per annum, or two-thirds of its average annual growth rate of the 2011 to 2019 period. The Euro Area growth rate is projected at 0.9 per cent per annum.

Figure 3.1: World GDP – Annual growth rate (%), calendar years



[6] NIEIR has over 30 years' experience in economic forecasting at the National, State and Regional levels. Refer to www.nieir.com.au.

[7] The economic forecasts were prepared in November 2023. Some economic and financial data may have been revised.

3.3 The outlook for the Australian economy

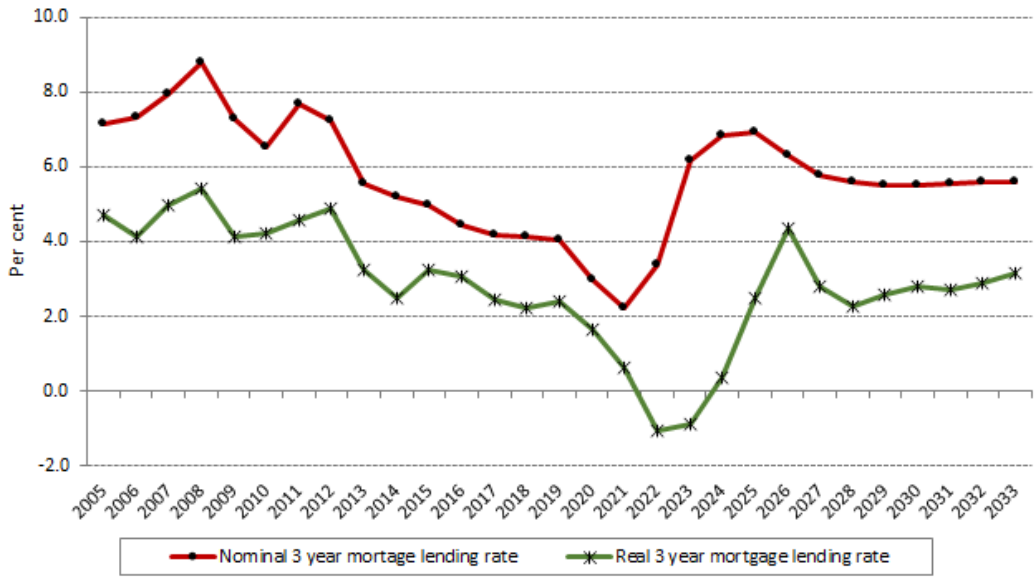
The Australian economy will experience relatively low rates of growth for 2023-24 and 2024-25. The average rate of GDP growth over these two years is projected at 0.9 per cent per annum. The average rate of CPI inflation for the two years is projected to be between 4.0 and 5.0 per cent. The nominal wage rate, in terms of the $ per hour worked indicator, for the economy as a whole is projected to accelerate to an average of 5.5 per cent, compared to 3.0 per cent for 2022-23. In part this will reflect the impact of the recent Minimum Wage decision.

3.3.1 The interest rate cycle

Between the June quarter 2023 and the June quarter 2024, a key interest rate, namely the three year fixed mortgage lending rate, increases by 0.6 percentage points. This implies two more interest rate increases of at least 0.25 percentage points. Alternatively, because of the importance of overseas interest rates in determining Australia's medium-term domestic rates, due to the reliance of Australian banks on wholesale funding from foreign capital markets, the profile is also consistent with further interest rate increases in the United States and Europe from current levels forcing an increase in Australian rates independently of what the Australian monetary authorities may decide (Figure 3.2).

Over 2025, the expectation forms that long-run inflationary pressures will ease by, firstly, actual inflation rates returning to within acceptable bounds, that is less than 3.0 per cent and the outcome of 5.0 per cent plus unemployment rates will ensure nominal wage rate increases will be consistent with inflation stability. The three year mortgage lending rate will start to decline, reaching 6.3 per cent by the end of 2025 and then reach the long-run stable level of 5.5 per cent by the middle of 2026. That is the nominal interest rate is held at near this level for the remainder of the projection period.

Figure 3.2: Australia – Key interest rates (%)



3.3.2 Wages and inflation

In terms of the short-term outlook for the Australian inflation rate, little improvement can be expected over the next 6 to 12 months. This reflects the impact of a number of factors. Firstly, the lagged adjustment of prices to the cost increases over the past year. The best example of this is the increases in gas and electricity prices which will add a 1.0 per cent increase to the September quarter 2023 CPI. Also, the increase in housing costs reflecting, in part, the increase in past interest rates will add a 0.8 per cent increase in the CPI over the 2023-24 fiscal year.

For the core or underlying CPI, price adjustments to the cost pressures, including wage cost increases in 2022-23 and 2023-24, can be expected to add 3.5 per cent to the increase in the CPI over 2023-24. In all, the 2023-24 increase in the CPI is expected to be in the vicinity of 6.0 per cent (Figure 3.3).

What happens after 2023-24 is going to depend on what happens to wages. The recent minimum wage decision increased the minimum wage from $21.4 to $23.2 an hour in the September quarter 2023. That is, an increase of 8.4 per cent. Figure 3.4 shows the outcome for the ratio of $ per hour for the non-primary sector to the minimum wage.

For the balance of the projection period, that is, for the 2029 to 2033 period, the average rate of increase in the CPI is 2.7 per cent per annum, while the average rate of increase in $ per hour worked is 3.9 per cent per annum, giving an average rate of increase in real $ per hour worked of 1.1 per cent per annum.

Figure 3.3: Australia – Wages and inflation (% annual change)

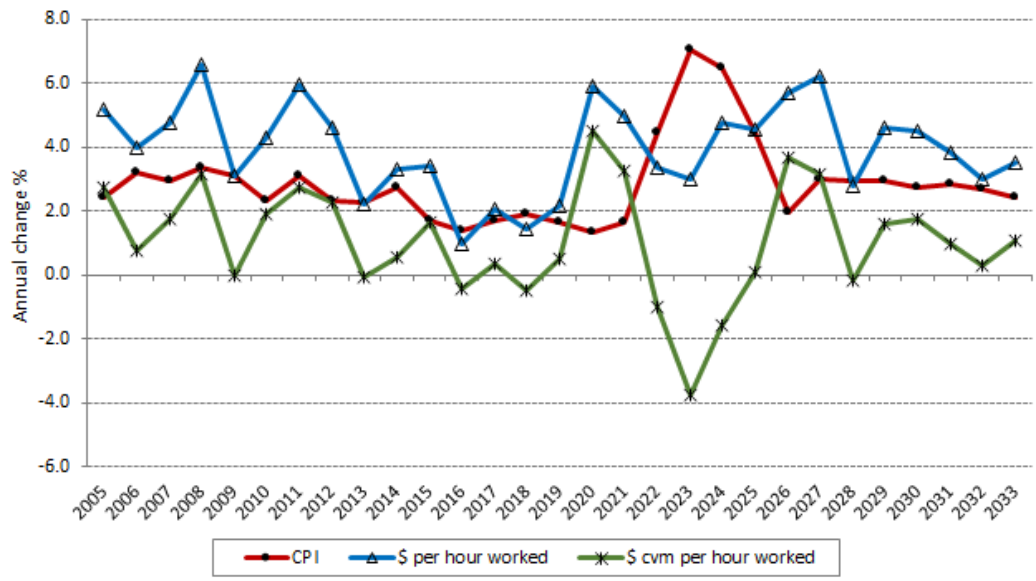
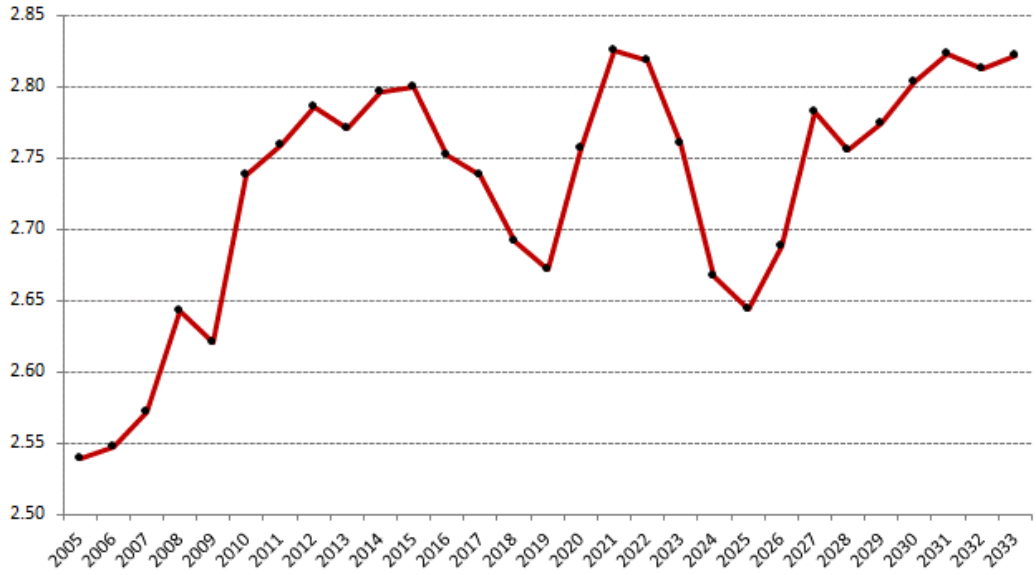


Figure 3.4: Ratio of non-primary $ per hour to minimum wage



3.3.3 The national labour market

Similar to the developed economies, Australia's unemployment rate at 3.5 per cent remains well below the average levels of the past and therefore is considered by policy makers to be too high to be consistent with long-run satisfactory inflation outcomes. However, this is expected to increase significantly as will the 3.0 per cent productivity potential associated with current labour hoarding practices and other COVID/post-COVID productivity distorting measures are unwound over the next two years.

Between the March quarter 2023 and the end of 2024, non-primary gross domestic product is predicted to increase by 1.3 per cent, or by 0.2 per cent per quarter. Under the impact of constrained high net international immigration, the population aged 15 and over is expected to expand by 3.4 or 0.5 per cent per quarter. Non-primary productivity, non-primary GDP per hour worked, is projected to expand by 3.0 or 0.4 per cent per annum. This means the reduction in hours worked will be 0.2 per cent per quarter, or 1.8 per cent between March quarter 2023 and December quarter 2024. This suggests that the combination of increased labour supply and reduced labour demand would lead to a 3.0 percentage point increase in the unemployment rate between the two quarters.

The actual projected increase in the unemployment rate is 1.8 percentage points, Figure 3.5, due to offsets from:

- reduction in hours worked per person employed; and
- reduction in the participation rate.

Post-2024, however, the unemployment rate, from Figure 3.5, is projected to continue to increase, reaching 5.9 per cent by the December quarter 2025. After this point the unemployment rate will stabilise at around 5.9 per cent until the middle of 2028. A slowing economy will then force the unemployment rate above 6.0 per cent which will remain the case until the end of the projection period.

The total employment growth outcomes consistent with the unemployment rate profiles are as follows (Figure 3.6). After growing at between 3.0 and 4.0 per cent per annum over the 2022 and 2023 fiscal years, total employment is expected to fall marginally for the 2023-24 year and increase marginally, 0.4 per cent for the 2024-25 year. That is, total employment is expected to be stable for two years at around 13.2 million.

With the imposition of a satisfactory inflationary environment by 2025-26, employment growth is expected to be in excess of 2.0 per cent, followed by four years where the average employment growth is 1.5 per cent per annum. Due to weaker overall growth for the final three years of the projection period, the average employment growth falls.

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Figure 3.5: Productivity growth and the Unemployment rate (%)

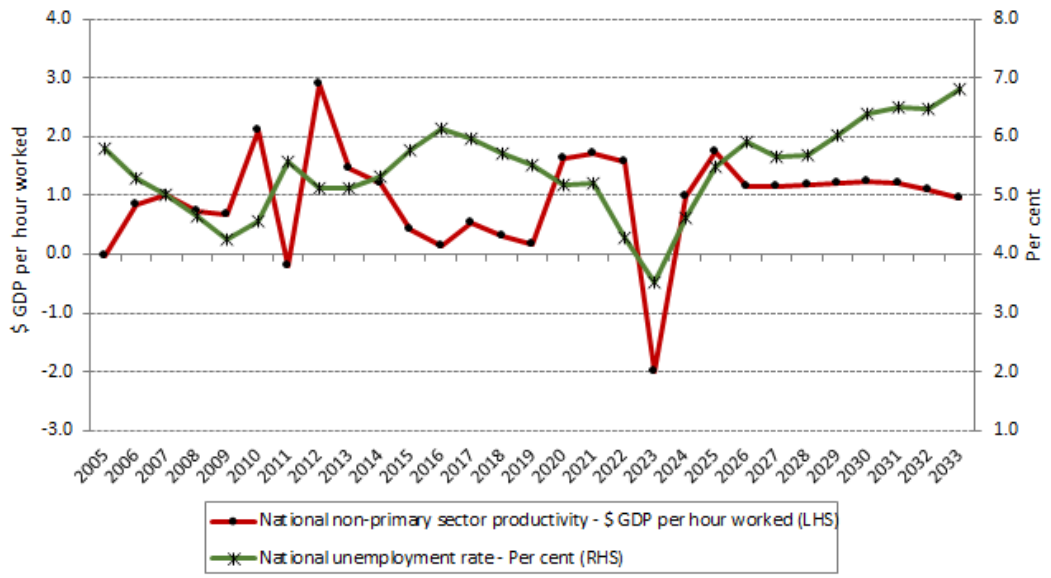
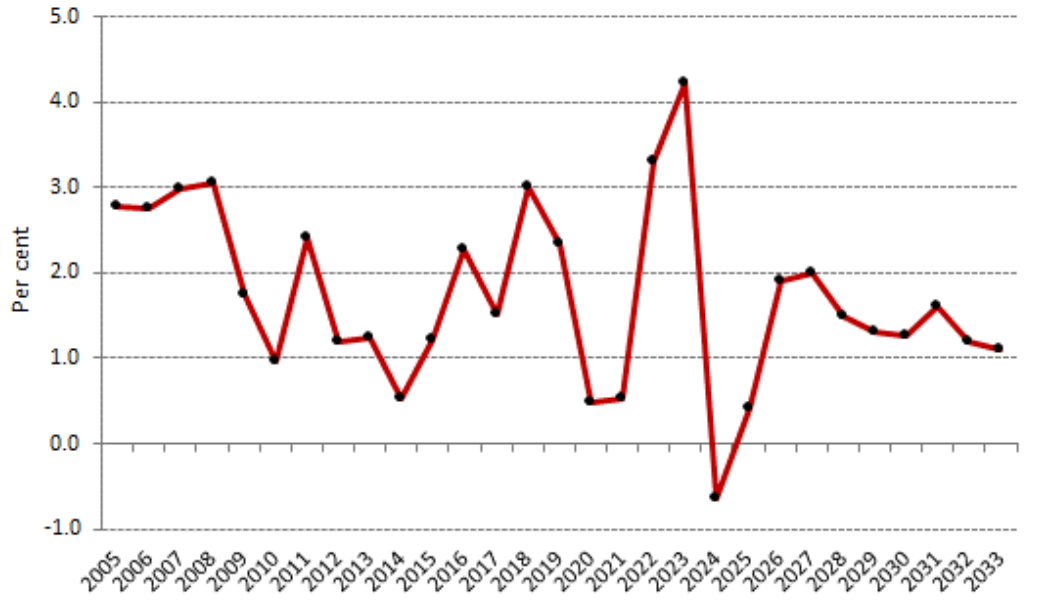


Figure 3.6: Total employment growth rates – Australia (%)



3.3.4 National population

An important driver of the above outcomes is the population growth profile. In 2022-23, the level of net foreign immigration is expected to be just under 400,000, followed by a level of 325,000 in 2023-24. This partly reflects the current shortages of labour. However, as shortages ease and the unemployment rate increases, the international net immigration is expected to fall to 220,000 and remain around 200,000 for the remainder of the projection period, Figure 3.7.

Given the expected trends in productivity and mortality, the total population growth rate will be 1.75 per cent over 2022-23 and 2023-24 before falling to an average of 1.4 per cent for 2024-25, and falling to between 1.14 and 1.19 per cent per annum for the remainder of the projection period.

Figure 3.7: National population and immigration (%)

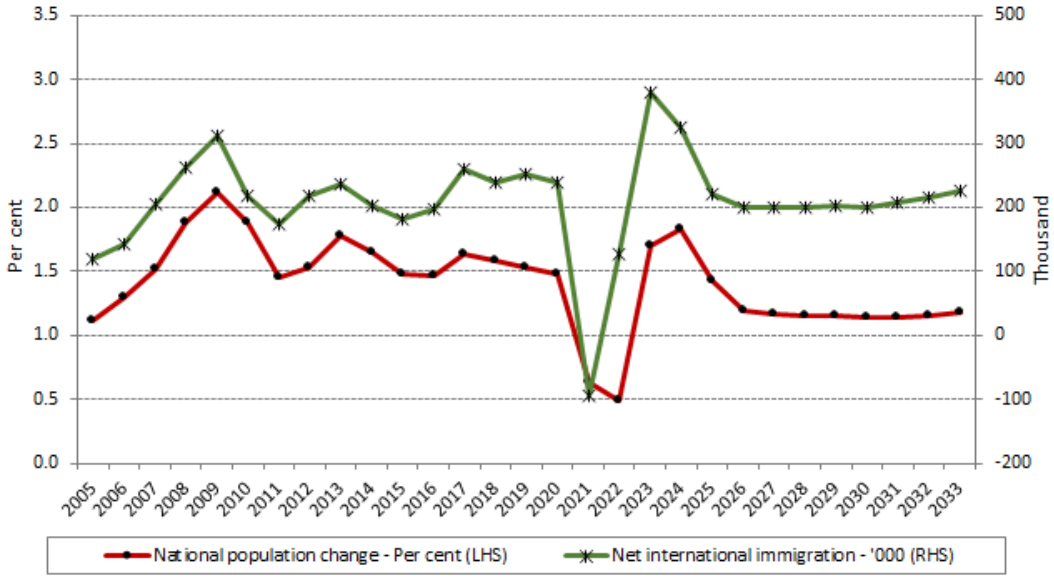


Table 3.1 Formation of Australian GDP (per cent)															
	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33
Demand															
GDP	2.2	-0.1	2.2	3.7	3.3	1.0	0.8	2.7	3.0	2.7	3.2	2.9	2.3	2.0	2.0
Farm GDP ($m)	-11.4	-11.2	28.7	27.1	-5.8	-11.1	-7.0	8.1	-0.2	2.1	2.0	2.0	1.9	1.9	1.8
Non-farm GDP ($m)	2.5	0.2	1.8	3.2	3.5	1.3	1.0	2.6	3.1	2.7	3.2	2.9	2.3	2.0	2.0
Labour market															
Employment	2.3	0.5	0.5	3.3	4.2	-0.6	0.4	1.9	2.0	1.5	1.3	1.3	1.6	1.2	1.1
Unemployment rate (%)	5.1	5.6	6.2	4.3	3.5	4.6	5.4	6.2	5.7	5.8	6.1	6.5	6.3	6.5	6.9
Finance															
90 day bank bill (%)	1.8	0.7	0.0	0.3	3.2	4.5	4.8	4.1	3.7	3.9	3.8	3.8	3.8	3.9	3.9
10 year bond rate (%)	2.2	1.0	1.2	2.1	3.6	4.2	4.8	4.8	4.5	4.6	4.6	4.6	4.6	4.6	4.6
$US/$A	70.0	65.7	77.0	71.5	66.8	67.4	68.7	71.2	71.3	71.6	71.3	71.3	71.2	71.1	71.0
Wages and prices															
Average weekly earnings	2.6	3.6	3.1	1.9	3.3	4.5	3.8	5.5	5.5	2.1	4.4	4.0	3.3	2.7	3.2
CPI	1.6	1.3	1.6	4.4	7.0	6.4	4.4	2.0	3.1	3.4	2.8	2.7	2.8	2.6	2.4
Population growth	1.5	1.4	0.4	0.8	1.9	1.7	1.4	1.2	1.2	1.2	1.3	1.1	1.1	1.2	1.2

Source: ABS, Australian Treasury, NIEIR.

4. The economic outlook for Western Australia to 2032-33

4.1 Introduction

This section outlines the economic outlook for Western Australia to 2032-33, focusing on the short-term to 2027-28.

4.2 Summary of outlook

Figure 4.1 shows the outlook for Australian and Western Australian Gross State Product (GSP) growth over the period to 2032-33. Between 2021-22 and 2032-33 Western Australian GSP growth is projected to average 2.7 per cent per annum under the Base scenario.

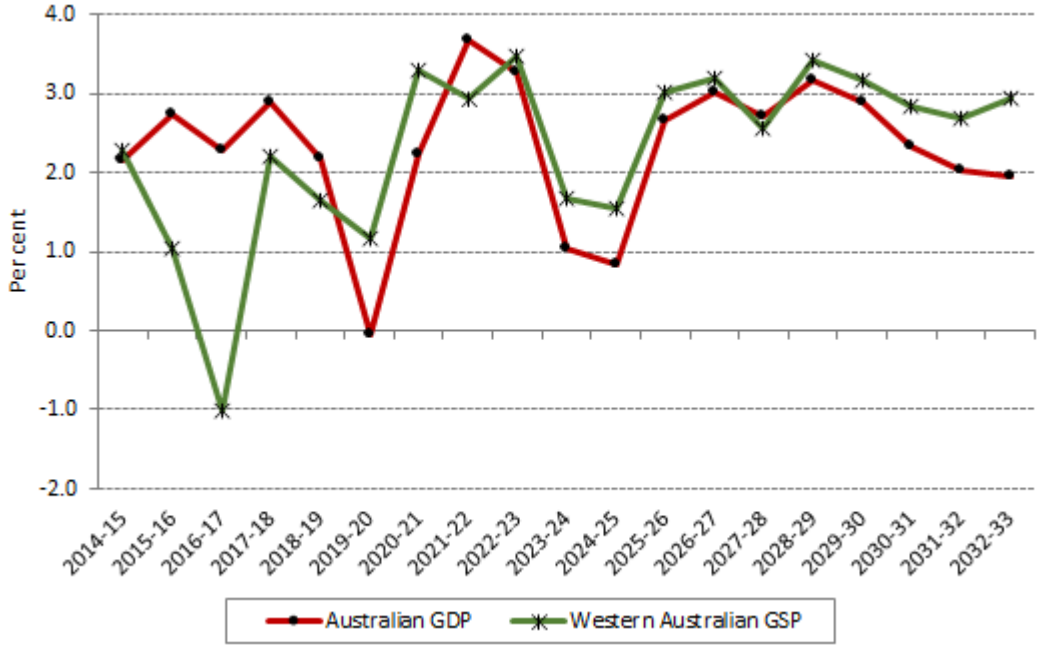
Table 4.1 shows the projected annual economic growth rates projected for Australia and Western Australia by scenario for the period 2014-15 to 2032-33. Table 4.1 also shows the percentage difference between actual and projected Western Australian GSP and Australian GDP. Western Australia's share of national GDP is also provided.

Finally, the Western Australian Government's forecasts are also shown in Table 4.1. The Western Australian Treasury forecasts are broadly consistent with NIEIR's forecasts, with growth slowing over 2023-24 and 2024-25. The resumption of stronger economic growth is forecast by NIEIR in 2025-26 and 2026-27. However, this is not reflected in the Western Australian Treasury forecasts. Average forecast GSP growth by Western Australian Treasury is only 1.8 per cent in 2025-26 and 2026-27, compared to 3.1 per cent for NIEIR's forecast over the same period. This may reflect different assumptions regarding key drivers, such as interest rates, inflation and net overseas migration.

4.3 The Base scenario outlook for Western Australia to 2028-29

Table 4.2 presents selected economic indicators for Western Australia to 2028-29 under the Base scenario.

Figure 4.1: Australian GDP and Western Australian GSP growth – Base scenario – 2014-15 to 2032-33



Note: Actuals = 2014-15 to 2022-23; Estimate = 2023-24; Forecasts = 2024-25 to 2032-33.

Table 4.1 Actual and projected Australian GDP and Western Australian GSP – Base scenario to 2032-33					
	Australian GDP	Western Australian GSP	Difference – Western Australia less Australia	Western Australia's share of national GDP	Western Australian Budget Papers 2023-24
Per cent change					
2014-15	2.2	2.3	0.1	18.2	
2015-16	2.7	1.0	-1.7	17.9	
2016-17	2.3	-1.0	-3.3	17.3	
2017-18	2.9	2.2	-0.7	17.2	
2018-19	2.2	1.7	-0.5	17.1	
2019-20	-0.1	1.2	1.2	17.4	
2020-21	2.2	3.3	1.0	17.6	
2021-22	3.7	2.9	-0.8	17.3	3.1
2022-23	3.3	3.5	0.2	17.4	4.3
2023-24	1.0	1.7	0.6	17.5	2.3
2024-25	0.8	1.5	0.7	17.7	1.8
2025-26	2.7	3.0	0.3	17.7	2.0
2026-27	3.0	3.2	0.2	17.7	1.5
2027-28	2.7	2.6	-0.2	17.7	
2028-29	3.2	3.4	0.3	17.8	
2029-30	2.9	3.2	0.3	17.8	
2030-31	2.3	2.8	0.5	17.9	
2031-32	2.0	2.7	0.7	18.0	
2032-33	2.0	3.0	1.0	18.2	
2022-23 to 2028-29	2.2	2.6	0.4	17.7	
2028-29 to 2032-33	2.3	2.9	0.6	18.0	
2022-23 to 2032-33	2.3	2.7	0.4	17.8	

Notes: Financial year basis. Actuals = 2014-15 to 2022-23; Estimate = 2023-24; Forecasts = 2024-25 to 2032-33.
Sources: Australian Bureau of Statistics (ABS), NIEIR and Budget Paper No. 3, Economic and fiscal outlook, 2023-24.

Table 4.2 Macroeconomic aggregates and selected indicators – Western Australia (per cent change)										
	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	Compound average annual change 2022-23 to 2028-29
Private consumption	2.8	6.1	3.5	1.5	1.4	3.8	4.7	2.4	2.6	2.8
Private dwelling expenditure	3.0	1.6	-2.5	3.3	10.8	6.0	11.6	-6.2	-10.6	2.5
Business investment	7.0	4.8	4.3	5.7	1.2	-2.8	-3.3	-3.6	5.1	0.4
Government consumption	6.6	5.4	4.8	0.9	1.3	3.1	1.8	1.8	2.9	2.0
Government investment	2.5	15.1	10.7	7.1	1.2	-1.7	-4.2	6.5	4.1	2.2
State final demand	5.0	6.1	3.8	2.6	1.7	2.2	2.4	1.0	2.6	2.1
Gross State Product	3.3	2.9	3.5	1.7	1.5	3.0	3.2	2.6	3.4	2.6
Population	1.4	1.4	2.7	2.2	1.5	1.3	1.2	1.4	1.4	1.5
Employment	2.4	5.8	2.4	-0.4	0.3	1.9	1.8	1.2	1.5	1.0

Notes: Percentage change unless otherwise specified.
Actuals = 2020-21 to 2022-23; Estimate = 2023-24; Forecasts = 2024-25 to 2032-33.
Source: NIEIR.

4.3.1 Gross State Product

Western Australia has, over the last three years (2020-21 to 2022-23), experienced relatively strong GSP growth averaging 3.2 per cent. Economic growth in Western Australia over the 2015-16 to 2019-20 period was relatively weak, averaging only 1.0 per cent per annum.

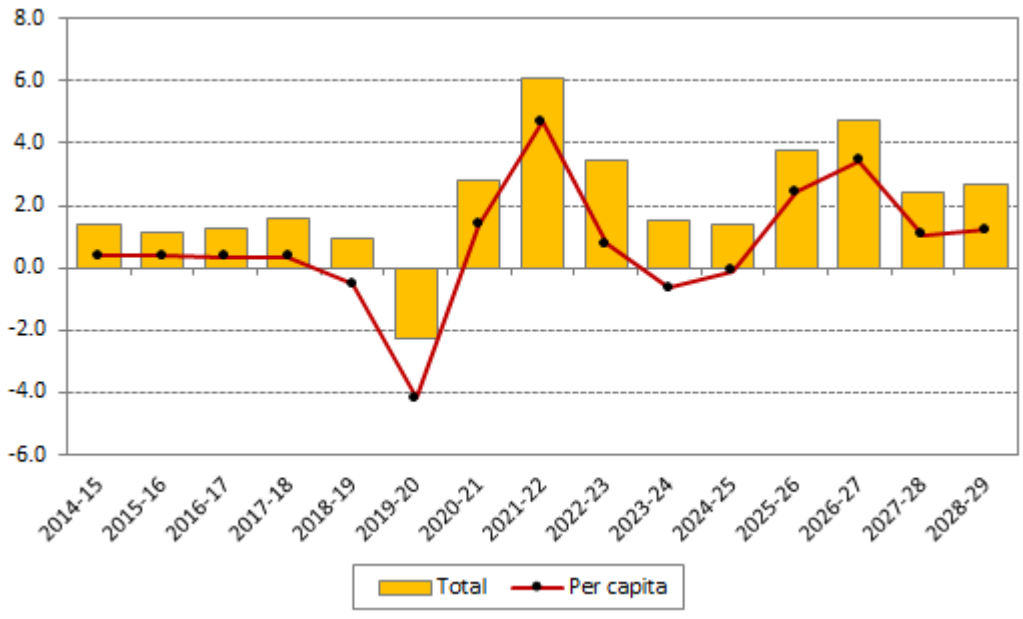
The recovery in Western Australian GSP growth over recent years reflects a number of factors. These include a recovery in private household expenditures, solid growth in private business investment, and stronger public sector outlays, both in current and capital expenditures. The recovery in private sector expenditures also in part reflects a rebound from the impact of the COVID-19 pandemic.

The acceleration in inflationary pressures in Australia over 2023 and 2024, and the subsequent rise in official interest rates, will constrain growth in Western Australia over 2023-24 and 2024-25. Western Australian GSP growth is 1.7 per cent in 2023-24 and 1.5 per cent in 2024-25. A sharp fall in private consumption expenditure growth in 2023-24 and 2024-25 is the principal driver of weaker GSP growth.

Stronger growth in Western Australian GSP resumes in 2025-26, supported by higher levels of household expenditure as well as a recovery in new dwelling construction. Private business investment falls slightly between 2025-26 and 2027-28, although it remains at a high level of between A$48 and A$50 billion.

Overall, Western Australian GSP growth averages 3.1 per cent between 2025-26 and 2029-30. It exceeds the projected national GDP growth rate by 0.2 percentage points. As a share of national GDP, Western Australia's share rises from 17.7 per cent in 2024-25 to 18.2 per cent by 2032-33.

Figure 4.2: Private consumption expenditure growth – Western Australia – Base scenario



Note: Actuals = 2014-15 to 2022-23; Estimate = 2023-24; Forecasts = 2024-25 to 2028-29.

4.3.2 Population and employment

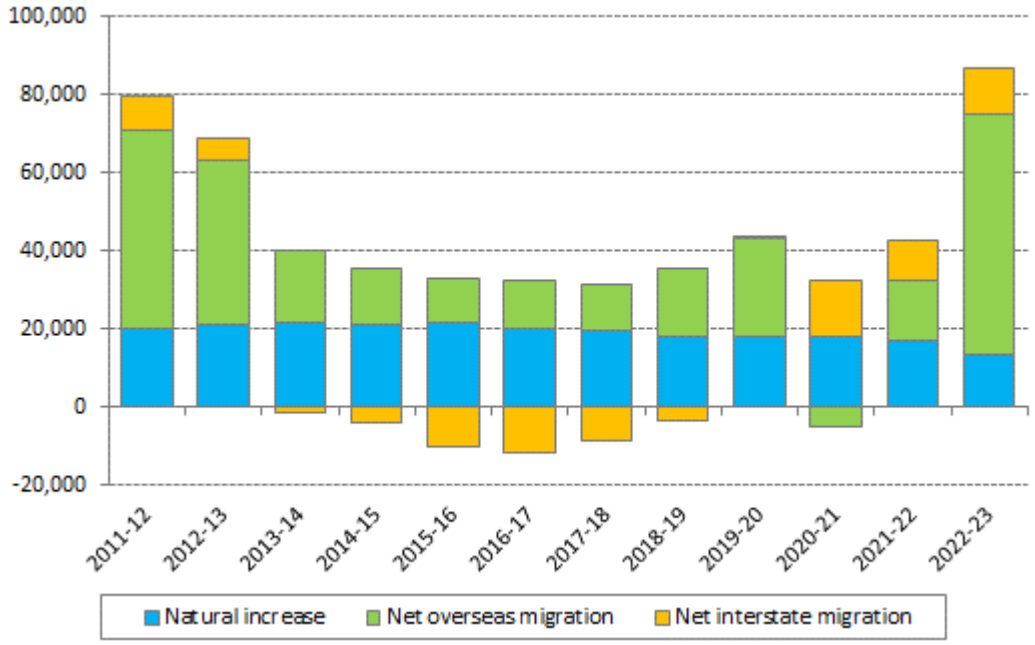
Population growth in Western Australia accelerated to 2.7 per cent in 2022-23, mainly reflecting a surge in net overseas migration gains. Average population growth over the previous five years was 1.5 per cent per annum.

The turnaround in Western Australian population growth reflects stronger employment and economic growth, despite the COVID-19 pandemic. Net interstate migration gains have been strong over the last three years, averaging nearly 12,000 persons per annum. The rate of natural increase has fallen, partly due to declining fertility rates.

Western Australian population growth is expected to slow by 2024-25 to 2026-27. This mainly reflects weaker labour market outcomes, which leads to cuts in international migration into Australia.

Western Australian employment growth is negligible over 2023-24 and 2024-25. Growth resumes in 2025-26 and 2026-27.

Figure 4.3: Components of population growth – Western Australia



Source: Australian Demographic Statistics, ABS.

5. Regional economic outlook

5.1 Introduction

This section summarises the outlook for Western Australian regions. For the purposes of the ATCO gas forecast, outlooks are required for:

(i) the ATCO distribution area (sometimes known as the Coastal region); and

(ii) the rest of Western Australia.

The rest of Western Australia is dominated by agricultural and mining activity, including oil, gas and LNG production, iron ore production and gold and other minerals production (e.g. lithium).

5.2 Regional mapping

Appendix A provides a concordance between Western Australian Local Government Areas (LGAs) and the ATCO distribution region. NIEIR's regional database covering a wide range of economic and sociodemographic data can be assessed by LGA.

NIEIR has mapped regional ATCO gas consumption and customer numbers into Local Government Areas. The purpose behind this mapping is to define the network boundaries and to align gas consumption and customer numbers across time to NIEIR's regional economic indicators.

The mapping relies on two sets of data:

(i) total customer numbers and gas consumption by tariff (A1, A2, B1, B2 and B3) for each postcode (provided by ATCO) from 2008 to 2022; and

(ii) population statistics cross tabulated by LGA and postcode for Western Australia (ABS Census of Population and Housing, 2011, 2016 and 2021).

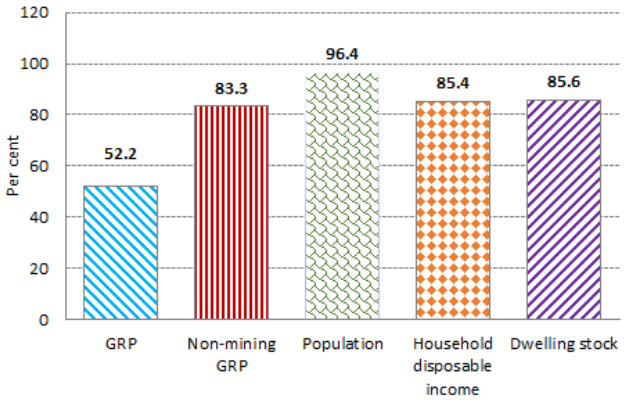
ABS Census population statistics were converted to weights to convert postcode areas to LGAs. This was based on 2011, 2016 and 2021 census years. The weights in the years between census years were interpolated. This allows for a dynamic weighting across time that reflects urban growth and demographic change.

The population weights were applied to total customer numbers and gas consumption by tariff to estimate the LGA time series. Appendix A contains a table of indicators (0 and 1) for the ATCO service area by Western Australian LGA.

5.3 The regional economic industry composition

Figure 5.1 shows the ATCO's share of total Western Australia in terms of selected indicators, including real gross regional product (both total and non-mining GSP), population, real household income and the dwelling stock for 2021-22.

Figure 5.1: ATCO distribution area share of Western Australia – selected key indicators – 2021-22



As indicated in Figure 5.1, the ATCO area represents around 86 per cent of population, dwellings and income, but only 52.2 per cent of total Western Australian GRP. This mainly reflects the dominance of mining in Western Australian GSP and its dominance in areas not serviced by the ATCO gas network. In terms of non-mining GSP, the ATCO area represents 83.3 per cent of the Western Australian total.

Table 5.1 shows the industry composition of GSP by region for 2021-22. With the exception of three industries, most are concentrated in the ATCO distribution area, with shares ranging from 85 to 96 per cent. The exceptions are:

- agriculture, forestry, fishing and hunting;
- mining; and
- construction.

Nearly 85 per cent of mining GSP is located outside the ATCO region, 66 per cent of agriculture, forestry, fishing and hunting, and over 40 per cent of total construction.

Table 5.1 Gross product at market prices by industry – 2021-22						
		ATCO area		Western Australia		
Industry	A1 industry code	% million	Per cent share (%)	$ million	Per cent share (%)	ATCO share of Western Australia (%)
Agriculture	A	2992	1.6	9076	2.5	32.97
Mining	B	27229	14.8	171860	47.8	15.84
Manufacturing	C	17145	9.3	20498	5.7	83.64
Electricity, gas and water	D	4848	2.6	5801	1.6	83.57
Construction	E	11955	6.5	20425	5.7	58.53
Wholesale trade	F	7832	4.3	8750	2.4	89.51
Retail trade	G	9445	5.1	10366	2.9	91.12
Accommodation	H	4580	2.5	5342	1.5	85.73
Transport and storage	I	9770	5.3	11537	3.2	84.68
Information media	J	3208	1.7	3477	1.0	92.28
Financial and insurance services	K	12608	6.9	13135	3.7	95.99
Rental, hiring and real estate services	L	7568	4.1	8935	2.5	84.71
Professional, scientific and technical services	M	16017	8.7	16715	4.6	95.83
Administrative and building services	N	7187	3.9	8161	2.3	88.07
Public administration	O	9706	5.3	10894	3.0	89.09
Education	P	9202	5.0	10215	2.8	90.09
Health and social services	Q	16079	8.8	17405	4.8	92.38
Arts and recreation	R	1689	0.9	1872	0.5	90.21
Personal and other services	S	4565	2.5	5202	1.4	87.75
Total GSP		**183627**	**100.0**	**359665**	**100.0**	**51.05**
Non-mining GSP		**156397**	**85.2**	**187805**	**52.2**	**83.28**

Source: NIEIR Regional Data (2023).

5.4 The economic outlook for Western Australian regions

This section summarises the economic outlook for Western Australian regions. For this study, these are designated as follows:

The ATCO gas distribution region; and

The rest of Western Australia.

Forecasts in this section are presented on a fiscal year basis, consistent with Chapters 3 and 4 of this report. For modelling purposes, actual historical calendar year drivers were computed and these were then indexed forward in time.

For the ATCO gas distribution region, the key drivers of economic growth are the conventional drivers of economic activity. These include:

- household sentiment and producer expectations;
- household consumption and private business investment;
- public sector expenditures, revenues and debt;
- the supply demand balance in some markets (e.g. dwelling construction);
- the cost of finance (domestic interest rates); and
- domestic production, exports and imports.

For the rest of Western Australia, the key drivers of growth are fundamentally different. Dominated by mining production the key drivers include:

- international commodity prices;
- export demands from Asian markets and China in particular;
- competition from other mining developed countries;
- developments in new and emerging technologies such as battery storage; and
- movements in stocks of key commodities and expectations.

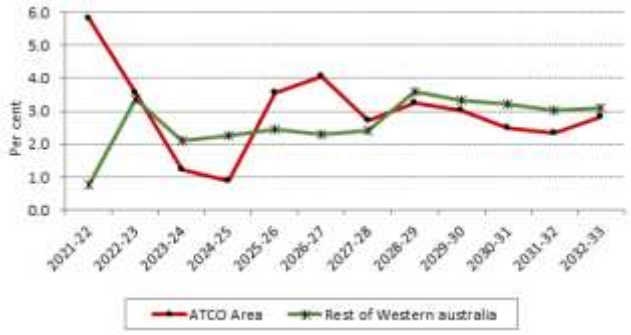
Table 5.2 shows the outlook for the ATCO distribution region, the rest of Western Australia, and total Western Australia in terms of gross state (and regional) product. Figure 5.2 shows the outlook to 2032-33 for the ATCO and rest of Australia in terms of GRP.

ATCO region's GRP is weaker over 2023-24 and 2024-25, as expected, however, it strengthens over the 2025-26 period as the domestic economy recovers. Average growth in the ATCO region's GRP is 0.2 percentage points above the Western Australian growth rate.

Table 5.2 Real GRP growth rates – ATCO area, rest of Western Australia, and Western Australia (per cent)

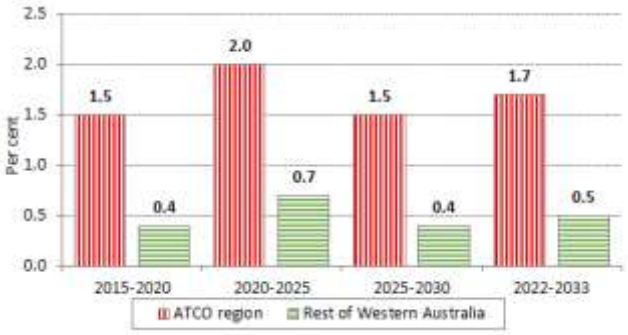
	ATCO area	Rest of Western Australia	Western Australia
2021-22	5.8	0.8	2.9
2022-23	3.5	3.4	3.5
2023-24	1.2	2.1	1.7
2024-25	0.9	2.2	1.5
2025-26	3.6	2.4	3.0
2026-27	4.1	2.3	3.2
2027-28	2.7	2.4	2.6
2028-29	3.3	3.6	3.4
2029-30	3.0	3.3	3.2
2030-31	2.5	3.2	2.8
2031-32	2.3	3.0	2.7
2032-33	2.8	3.1	3.0
2021-22 to 2032-33	3.0	2.7	2.8
2024-25 to 2029-30	3.3	2.8	3.1

Figure 5.2: Real GRP growth rates – ATCO area and rest of Western Australia (per cent)



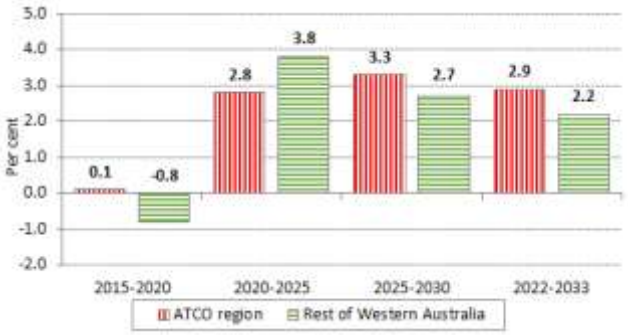
Figures 5.3 to 5.5 show projected growth rates for population, household disposable income and dwelling stock for the ATCO region and the rest of Western Australia.

Figure 5.3: Population growth – ATCO and rest of Western Australia – selected growth spans (average)



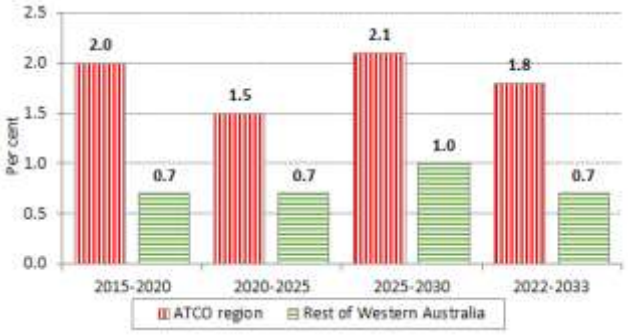
Source: NIEIR.

Figure 5.4: Household disposable income growth – ATCO and rest of Western Australia – selected growth spans (average)



Source: NIEIR.

Figure 5.5: Dwelling stock growth – ATCO and rest of Western Australia – selected growth spans (average)



Source: NIEIR.

6. Methodological approach – ATCO gas forecasts

This section outlines the key elements of NIEIR's methodological approach to forecasting customer numbers and gas consumption for the ATCO network. The forecasts cover the Mid-West and South-West Gas Distribution Systems (MWSWGDS).

6.1 Overall modelling methodology

The NIEIR forecasts for ATCO were developed within an econometric model of the Western Australian gas sector. NIEIR's previous work included direct experience in modelling the ATCO network tariff groups (previously known as WA Gas Networks).

This section provides an overview of the overall modelling approach. NIEIR also investigated estimating equations using ATCO data. These regression results are reported in Section 6.8.

6.1.1 Information provided by ATCO

NIEIR's initial information request from ATCO covered all data provided to CORE Energy for their report issued on 14 July 2023. This covered data from January 2008 to December 2022.

The data provided by ATCO included:

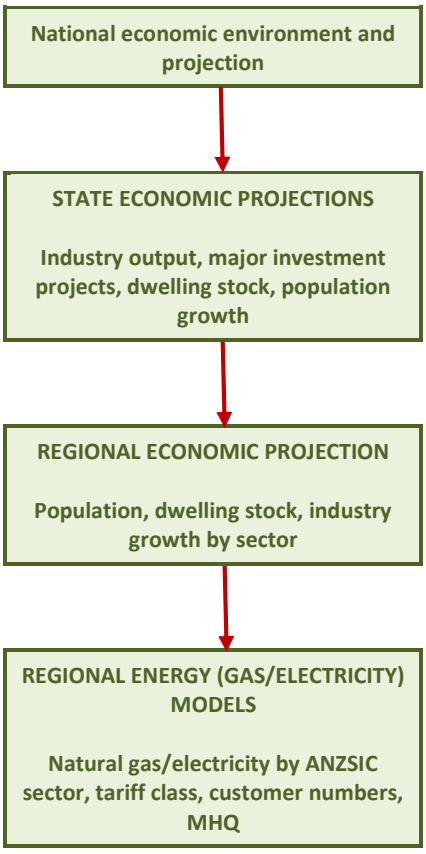
- historical gate flow data on a daily basis;
- total billed consumption, customer and MHQ (where applicable to A1) on a monthly basis;
- a complete listing of Tariffs A1 and A2 customers and their gas usage and MHQ;
- a sample of Tariff B1 customers (approximately 500) for industry coding;
- consumption records for individual Tariff B3 customers to allow usage trends over time to be identified;
- Ancillary services data;
- EDD Index Model; and
- survey information for Tariffs A1 and A2.

Some of these data were also updated to 2023 where possible by ATCO. A listing of the files provided to NIEIR is provided in Appendix B of this report.

6.1.2 Modelling approach

A tops down modelling approach is generally taken with respect to forming regional gas demand projections for ATCO. National economic projections are mapped to the state level and then down to the LGA level, or an aggregation of LGAs, as is the case with ATCO distribution (refer to Chapter 5). Figure 6.1 shows the broad linkages between NIEIR's national economic models and the regional gas projection models.

Figure 6.1: NIEIR's regional energy (gas/electricity) models



The key drivers at the regional level are gross regional product by industry, real household disposable income, population, the dwelling stock, and real gas prices.

Industry gas sales

Forecasts of regional gas sales for Tariffs A1, A2 and B1 were developed on an industry basis and the region covered is consistent with the relevant gas distribution area. NIEIR industry coded the individual Tariffs A1, A2 and B1 customers for the ATCO distribution area for the period 2017 to 2022.

The structure of this model, in terms of industry coverage, is shown in Table 6.1.

Table 6.1 Reconciliation of major customer class categories with ANZSIC industries

Customer class category	ANZSIC
Residential	
Commercial	■ Electricity, gas and water. ■ Construction. ■ Wholesale and retail trade. ■ Transport, storage and communication. ■ Finance, property, business services. ■ Public administration, defence, and community services. ■ Recreation, personal and other services.
Industrial	■ Agriculture, forestry, fishing and hunting. ■ Mining. ■ Food, beverages, tobacco manufacturing. ■ Textiles, clothing and footwear manufacturing. ■ Wood, wood products manufacturing. ■ Chemicals, petroleum, coal manufacturing. ■ Paper, paper products manufacturing. ■ Non-metallic minerals manufacturing. ■ Basic metal products manufacturing. ■ Fabricated metal products manufacturing. ■ Transport equipment manufacturing. ■ Other machinery and equipment manufacturing. ■ Miscellaneous manufacturing

Note: ANZSIC = Australia and New Zealand Standard Industrial Classification.

The industry regression models specifically relate gas consumption to:

- the change in output for that industry within the gas distribution area; and
- the change in real gas prices for that industry (incorporating lags in real prices to proxy the long-run response or long-run price elasticity).

The output and price elasticities at the regional level were adjusted to reflect differences in the gas intensity between industries and regions.

The projections by ANZSIC category for Tariffs A1, A2 and B1 for the distribution area were, therefore, determined by:

- the outlook for ANZSIC industry growth in the distribution area; and
- the outlook for real gas prices, incorporating a five year distributed lag structure.

Forecasts for Tariff B2 were linked to a general equation for gas sales, where sales were related to real gas prices and total commercial output for the ATCO distribution area.

Table 6.2 summarises the implicit output and long-run price elasticities used for modelling.

These elasticities were:

- estimated from previous modelling work by NIEIR (e.g. NIEIR's state gas forecasting models);
- used in previous regulatory work in Victoria, New South Wales and South Australia; and
- inferred from a literature review of gas price elasticities of Australian and overseas empirical studies.

Table 6.2 Summary of output and long-run price elasticities used for ATCO modelling by sector

	Residential	Commercial	Industrial
Output elasticity	0.21	0.30	0.55
Long-run price elasticity	-0.23	-0.15	-0.28

Source: NIEIR.

Residential gas sales

Residential gas sales forecasts (nearly all of tariff B3) were determined from a regression model based on average gas sales. Average gas sales per customer were determined from a regression model incorporating real household disposable income per capita and real residential gas prices.

For Tariff B3, new customer usage data was directly used in the forecast model. Average new customer usage trends are outlined in Section 6.5 of this report.

Residential customer number forecasts are simply linked to NIEIR's forecasts of the dwelling stock for the ATCO distribution area.

6.2 Industry gas usage – Tariffs A1, A2 and B1

ATCO provided NIEIR with the following information for industry coding of ATCO's main tariff groups:

- a complete list of names, addresses and annual gas consumption (and MHQ for Tariff A2) for Tariff A1 and A2; and
- a sample of over 500 B1 customer names, addresses and annual gas consumption.

Consumption records were provided from 2017 to 2022 by customer on a calendar year basis.

NIEIR mapped these Tariff A1, A2 and B1 customers and their consumption into industries for modelling purposes. The sample of 500 customers from Tariff B1 is more than sufficient to enable statistical inferences to be made from.

Tables 6.3 to 6.5 show customers and actual gas consumption by industry for calendar 2022 for Tariffs A1, A2 and B1.

Table 6.3 Tariff A1 customers and actual energy by industry – 2022

Industry	Customer numbers	Consumption (TJ)	Average consumption (TJ)	Percentage share consumption (%)
Agriculture	0	0.0	0.0	0.0
Mining	0	0.0	0.0	0.0
Food, beverages, tobacco manufacturing	10	1365.5	130.9	11.5
Textiles, clothing and footwear manufacturing	2	153.5	73.6	1.3
Wood and paper, wood products	2	614.6	294.7	5.2
Paper product manufacturing	0	0.0	0.0	0.0
Chemicals, petroleum, coal manufacturing	14	2052.3	151.4	17.3
Non-metallic minerals manufacturing	17	6056.2	363.0	51.2
Basic metal products manufacturing	2	77.9	37.4	0.7
Fabricated metal products manufacturing	1	25.0	24.0	0.2
Transport equipment manufacturing	0	0.0	0.0	0.0
Other machinery equipment manufacturing	1	25.5	24.5	0.2
Miscellaneous manufacturing	1	131.5	126.1	1.1
Electricity, gas and water (excluding GPG)	0	0.0	0.0	0.0
Construction	0	0.0	0.0	0.0
Wholesale trade and retail trade	0	0.0	0.0	0.0
Transport and storage and communication services	8	609.0	73.0	5.1
Finance insurance property and business services	0	0.0	0.0	0.0
Government administration, defence, education, health and community services	11	624.4	54.4	5.3
Accommodation, cafes, restaurants, cultural and recreational services, personal and other services	3	94.8	30.3	0.8
Total	**73**	**11830.3**	**162.1**	**100.0**

Note: Gas consumption in this table is based on the unnormalised energy.
Source: ATCO and NIEIR.

Table 6.4 Tariff A2 customers and actual energy by industry – 2022				
Industry	Customer numbers	Consumption (TJ)	Average consumption (TJ)	Percentage share consumption (%)
Agriculture	2	43.6	21.6	2.3
Mining	0	0.0	0.0	0.0
Food, beverages, tobacco manufacturing	21	461.8	21.8	24.1
Textiles, clothing and footwear manufacturing	1	27.3	27.1	1.4
Wood and paper, wood products	0	0.0	0.0	0.0
Paper product manufacturing	5	109.3	21.7	5.7
Chemicals, petroleum, coal manufacturing	9	163.5	18.0	8.5
Non-metallic minerals manufacturing	7	160.1	22.7	8.3
Basic metal products manufacturing	0	0.0	0.0	0.0
Fabricated metal products manufacturing	6	107.1	17.7	5.6
Transport equipment manufacturing	0	0.0	0.0	0.0
Other machinery equipment manufacturing	2	51.7	25.6	2.7
Miscellaneous manufacturing	0	0.0	0.0	0.0
Electricity, gas and water (excluding GPG)	0	0.0	0.0	0.0
Construction	0	0.0	0.0	0.0
Wholesale trade and retail trade	2	28.6	14.1	1.5
Transport and storage and communication services	3	77.3	25.5	4.0
Finance insurance property and business services	6	121.3	20.0	6.3
Government administration, defence, education, health and community services	21	375.7	17.7	19.6
Accommodation, cafes, restaurants, cultural and recreational services, personal and other services	17	190.9	11.1	10.0
Total	**103**	**1918.3**	**18.6**	**100.0**

Note: Gas consumption in this table is based on the unnormalised energy.
Source: ATCO and NIEIR.

Table 6.5 Tariff B1 customers and actual energy by industry – 2022				
Industry	Customer numbers	Consumption (TJ)	Average consumption (TJ)	Percentage share consumption (%)
Agriculture	0	0.0	0.0	0.0
Mining	0	0.0	0.0	0.0
Food, beverages, tobacco manufacturing	76	144.4	1.9	6.8
Textiles, clothing and footwear manufacturing	4	8.1	2.0	0.4
Wood and paper, wood products	4	2.5	0.6	0.1
Paper product manufacturing	0	0.0	0.0	0.0
Chemicals, petroleum, coal manufacturing	12	24.0	2.0	1.1
Non-metallic minerals manufacturing	8	37.7	4.7	1.8
Basic metal products manufacturing	0	0.0	0.0	0.0
Fabricated metal products manufacturing	44	108.8	2.5	5.1
Transport equipment manufacturing	12	11.8	1.0	0.6
Other machinery equipment manufacturing	4	0.4	0.1	0.0
Miscellaneous manufacturing	8	4.2	0.5	0.2
Electricity, gas and water (excluding GPG)	12	19.5	1.6	0.9
Construction	12	5.9	0.5	0.3
Wholesale trade and retail trade	295	361.6	1.2	17.0
Transport and storage and communication services	20	19.4	1.0	0.9
Finance insurance property and business services	586	436.3	0.7	20.5
Government administration, defence, education, health and community services	402	379.8	0.9	17.8
Accommodation, cafes, restaurants, cultural and recreational services, personal and other services	470	566.4	1.2	26.6
Total	**1968**	**2130.6**	**1.1**	**100.0**

Note: Gas consumption in this table is based on the unnormalised energy.
Source: ATCO and NIEIR.

Tariff A1 industry use presented in Table 6.3 shows:

- the dominance of manufacturing industry gas use with only 11.2 per cent used in the tertiary sector (transport (buses) and health);
- manufacturing A1 usage is primarily in non-metallic minerals production, such as brick and cement production (51.2 per cent); and
- other major manufacturing gas consumers under A1 are food, beverages and tobacco (11.5 per cent); and chemicals petroleum and coal (17.3 per cent).

Across the Tariff A2 group industry usage of gas is spread more evenly across different sectors:

- the largest industry sector is food, beverages and tobacco manufacturing (24.1 per cent);
- the next largest sector of Tariff A2 gas use is government administration, defence, education, health and community services (19.6 per cent). These represent councils, health (hospitals) and universities; and
- accommodation, cafes, restaurants and other services accounts for 10 per cent of Tariff A1 gas usage.

Tariff B1 industry gas usage is dominated by building complexes in the tertiary sector. Tertiary sector gas usage accounted for 84 per cent of total Tariff B1 gas use. Major industries included:

- wholesale and retail trade (17 per cent), including shopping centres, supermarkets, etc.;
- finance, property business services (20.5 per cent), mainly representing apartment complexes and some offices;
- government administration, defence, education, health and community services (17.8 per cent), including aged care facilities, council buildings, police and gaols, and educational (schools); and
- accommodation, cafes, restaurants, cultural and recreational and personal services (26.6 per cent). Examples include restaurants and bars, swimming complexes, cinemas and sports stadiums.

6.3 Weather normalisation of ATCO gas data

6.3.1 Introduction

Gas demand is highly sensitive to seasonal weather conditions. Particularly in the residential segment of the gas market where gas is used for space and water heating, variations in weather patterns between years can lead to significant fluctuations in levels of annual gas demand.

Because of the highly unpredictable nature of future weather conditions, it is conventional to prepare forecasts of gas demand assuming that typical or "normal" weather conditions will prevail in future years; that is, weather conditions will be neither seasonally colder nor warmer than normal.

To develop forecasts on this basis, historical annual (monthly) demand readings need to be first adjusted for "abnormal" weather conditions – a process often called weather normalisation.

The weather normalisation of historical gas demand is typically undertaken in three steps.

1. Identifying normal – year weather conditions.
2. Establishing a relationship between gas demand and weather conditions.
3. Combining information derived in (1) and (2) and computing weather normalised estimates.

Effective Degree Days

Victorian weather standards for gas forecasting have traditionally used the Effective Degree Day (EDD) index, which was originally developed by VENCorp (now AEMO). This approach may be applied to other States gas networks.

The EDD index comprises the following elements:

- temperature (measured three hourly);
- wind speed;
- sunshine hours; and
- seasonality.

In states outside of Victoria, a simpler Heating Degree Day (HDD) index is often used for gas demand forecasting (including by AEMO). Compared to the EDD, the HDD index only includes a temperature component.

6.3.2 Weather and gas demand

NIEIR have independently obtained temperature, wind and sunshine hours for Western Australia from the Bureau of Meteorology (BOM) to November 2023. Temperature and wind data are available for multiple weather stations across Western Australia, while daily sunshine hours are only currently measured at Perth Airport. The weather data independently obtained by NIEIR is consistent with the data provided to NIEIR from the ERA.

6.3.3 Temperature

As temperatures get colder, gas use is expected to increase as one of the main end uses of gas is for heating. When temperatures increase beyond a certain point, gas use for heating is expected to be minimal. This is represented by a 'threshold value' in a Degree Day Index.

Figure 6.2 shows daily gas demand per connection against average daily temperatures as measured by the average of temperatures every three hours from 3:00am to 12:00am ($Temperature_{312}$) for total B1, B2 and B3 tariffs. Gas demand has clear relationship with temperature. As temperatures get colder below the threshold temperature, gas demand increases. Similarly, there is a consistent decrease in gas demand as temperatures increase. However, the relationship is not as strong as it is for cold temperatures.

Figure 6.3 shows daily gas demand per connection for A1 and A2 customers against $Temperature_{312}$. While the relationship is not as strong as B1, B2 and B3 customers, gas demand appears to increase for A1 and A2 customers as temperatures get colder. Note that A1 and A2 tariff groups also show seasonality with higher demand during colder months and lower demand during hotter months, which is further evidence that these customers are temperature sensitive.

Figure 6.2: Daily gas demand per connection and Average temperatures, 2019 B1, B2 and B3

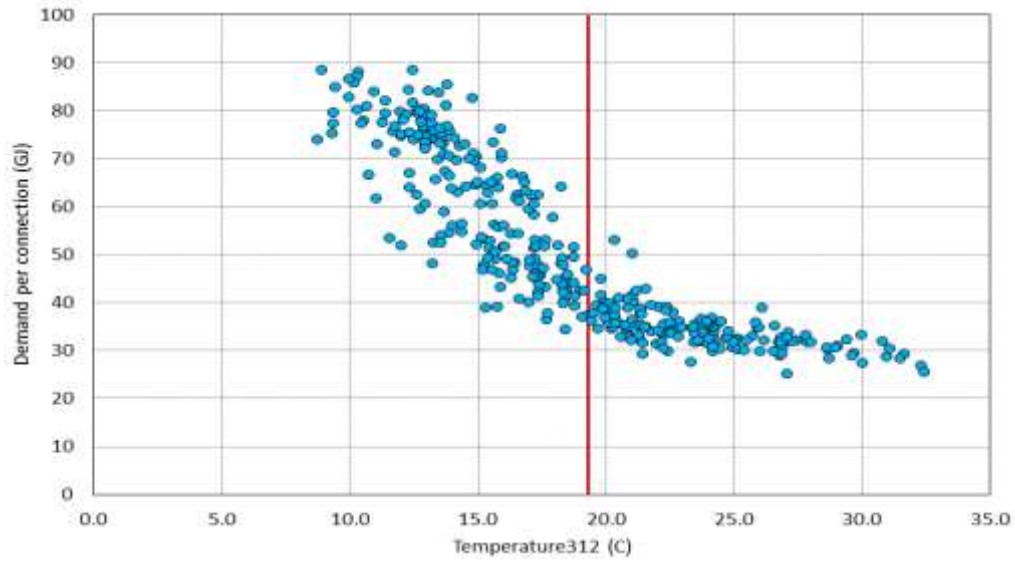
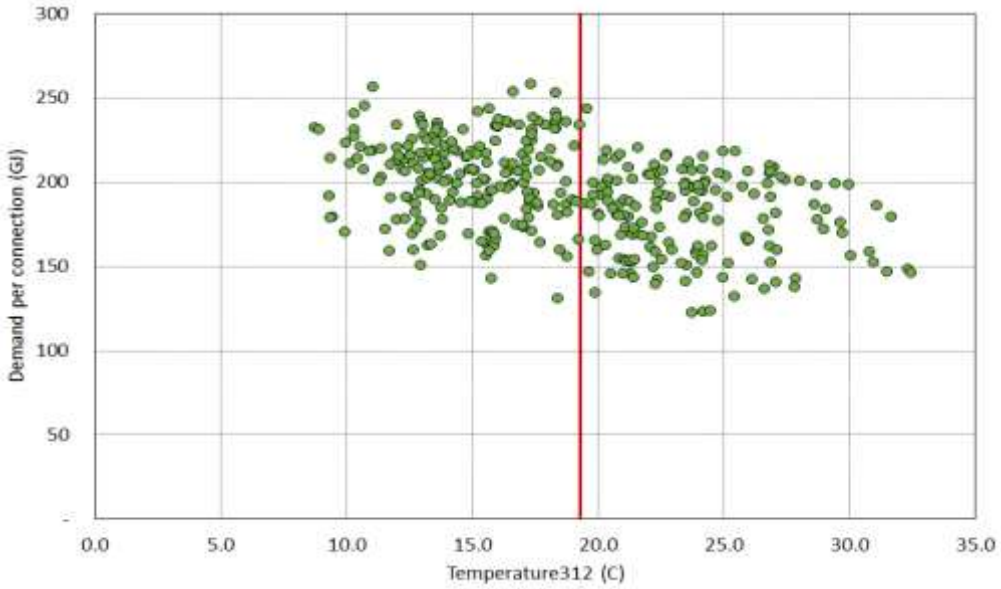


Figure 6.3: Daily gas demand per connection and Average temperatures, 2019 A1 and A2



6.3.4 Wind

Figure 6.4 shows daily gas demand per connection for total B1, B2 and B3 customers compared to wind speed (not formulated as wind chill). The relationship is much less significant than for temperature.

6.3.5 Sunshine hours

Figure 6.5 shows daily gas demand per connection for total B1, B2 and B3 customers compared to sunshine hours. Gas demand appears to fall quite sharply for days that have 10 hours of sunshine or higher. Below 10 hours of sunshine per day, the relationship is much weaker. As there are shorter days during winter when gas demand is high, no significant relationship with sunshine hours is plausible, which is consistent with CORE Energy.

Figure 6.4: Daily gas demand per connection and Wind Speed, 2019 B1, B2 and B3

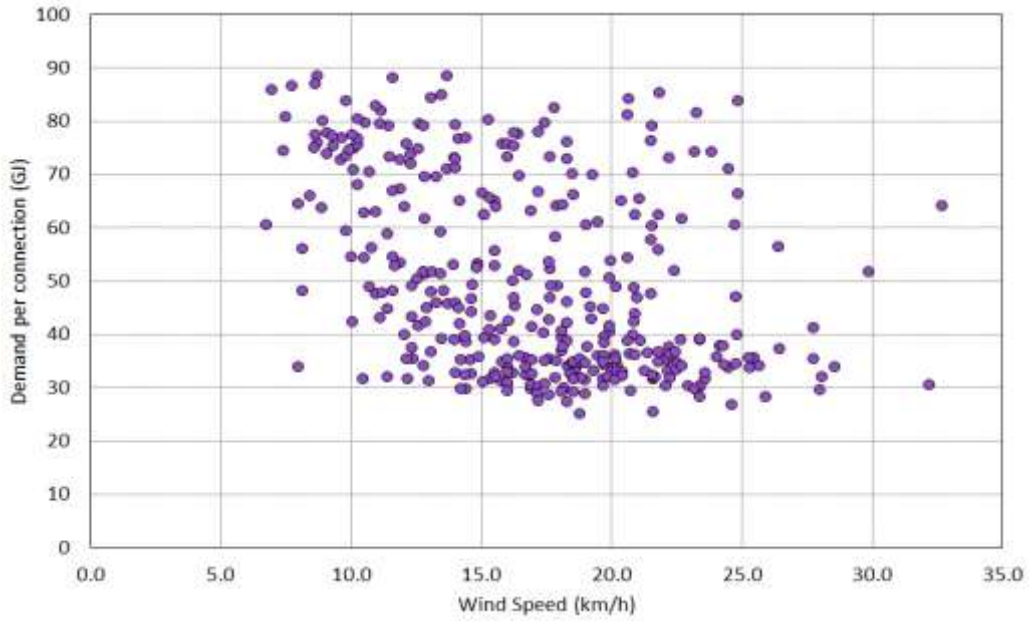
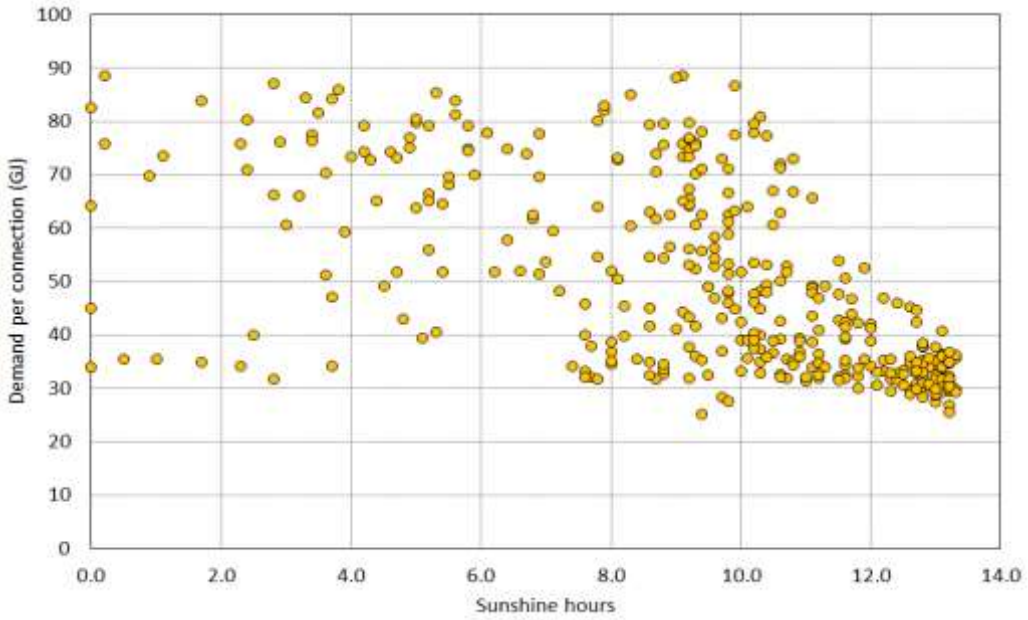


Figure 6.5: Daily gas demand per connection and Sunshine hours, 2019
B1, B2 and B3



6.3.6 Effective Degree Day index

Effective Degree Days are estimated using the following equation:

Effective Degree Days ("EDD") =

	Temperature (DD)	MAX(Threshold – Temperature, 0)
plus	Wind Chill	Wind Chill Coefficient * MAX(Threshold – Temperature, 0) * Wind
plus	Insolation	Insolation Coefficient * Sunshine Hours
plus	Seasonality	MAX(Seasonality Coefficient * 2 * Cosine(2π(Day – Seasonality Factor)/365)

Where Temperature and Wind are the average of observations every three hours from 3:00am to 12:00am.

The coefficients of the Effective Degree Day index are determined by repeatedly trialling coefficients using Excel's inbuilt Solver program. The objective is to find the mix of coefficients that will minimise the error between demand and fitted demand according to the equation above (the sum of squared residuals). The model also includes other measures of goodness of fit such as the R^2, which can also be used to compare models.

The objective demand function contains the intercept (a), Effective Degree Days (EDD), and day of week dummy variables (0 or 1).

> Demand per connection (GJ) = a + b1 * EDD + b2 * Friday + b3 * Saturday + b4 * Sunday

The EDD model is trained on data from 1/01/2008 to 31/12/2019 and does not use data for 2020, 2021 or 2022 years on the basis that these years are COVID-19 affected.

The EDD model is also only trained on B1, B2, and B3 demand and does not consider A1 or A2 demand. NIEIR have trialled alternative specifications for the EDD index using CORE Energy's model, and the EDD index could be improved by including more recent observations, however NIEIR have elected to keep the same coefficients as CORE Energy to allow for more comparability in long term trends. NIEIR notes that the model fit (R^2) goes down to from 0.910 to 0.844 when wind child, insolation and seasonality are excluded. NIEIR found that an EDD index with the given coefficients provides significant explanatory power for gas demand per customer for A1 and A2 customers. Although the overall gas demand model fit is weaker than the B1, B2 and B3 model, weather is still significant, albeit smaller component of demand.

6.3.7 Cooling Degree Day index

NIEIR have included the Cooling Degree Day (CDD) index in the weather normalisation analysis to account to decreased gas demand on hotter days. The index only includes a temperature component.

The CDD index is defined as:

> Cooling Degree Days ("CDD") =
> MAX(Temperature – Threshold, 0)

6.3.8 Weather standards

NIEIR has re-estimated weather standards to be used for forecasting purposes in the ATCO network. This includes re-estimated EDD weather standards and estimated CDD weather standards.

CORE Energy weather standards are determined on a daily basis ("Linearised EDD") for the EDD Index by using a long-term trend across each day of the year from 01/01/1993 to 31/12/2015. The long-term trend does not include any data from 01/01/2016 to 31/12/2022 and this period is effectively treated as an out-of-sample forecast.

The daily trend EDD Index is aggregated into monthly standards. These are then used for weather normalisation.

NIEIR performed a sensitivity analysis on the inclusion of out-of-sample period. Overall, the trend in the EDD Index remains weakly positive since 1993. The inclusion of the most recent observations strengthens that trend slightly. This means that for the most recent two years, for example, the difference between the annual Linearised EDD and Actual EDD is slightly smaller than current CORE Energy estimations.

NIEIR notes that long term trends can differ between seasons, for example, winter EDD could be changing at a different rate to summer EDD across time. CORE Energy effectively ignores trends in between seasons by taking a long-term daily trend. However, the focus of the gas demand forecasts is on an annual basis. This means CORE Energy are relying on the seasonal errors between the trend and the actual EDD balancing out when the daily trends are aggregated into annual figures. This may reconcile, but it could potentially introduce bias if warming trends differ between seasons.

To account for seasonal differences in trends, NIEIR aggregated the EDD and CDD into months before applying the trend. Each month is trended separately, so there is a separate EDD and CDD standard time series for January, February, March, …, and December.

Note, changing the trend to a monthly basis means that on an annual basis, the trend in EDD's is slightly negative, which is typically expected under warming trends due to climate change.

Tables 6.6 and 6.7 contain NIEIR's monthly and weather standards for Effective Degree Days and Cooling Degree Days.

Table 6.6 Effective Degree Day monthly actual and standard

Year	Month												Annual
	1	2	3	4	5	6	7	8	9	10	11	12	
Actual													
2008	0	0	8	100	266	469	596	562	365	150	51	9	**2576**
2009	0	4	10	41	236	482	588	502	427	150	51	2	**2493**
2010	0	0	0	58	325	502	626	550	370	164	26	18	**2640**
2011	0	0	0	36	234	430	558	486	368	111	44	0	**2268**
2012	0	0	7	53	271	443	601	492	363	115	67	9	**2420**
2013	0	1	26	28	290	468	583	453	359	151	5	3	**2367**
2014	0	0	5	59	267	487	557	420	301	124	44	7	**2271**
2015	0	0	4	51	331	424	539	501	327	76	13	15	**2280**
2016	6	11	1	56	331	493	601	577	459	223	54	12	**2824**
2017	4	13	28	48	262	437	555	519	357	183	9	11	**2427**
2018	0	1	5	61	242	462	524	553	382	124	72	10	**2436**
2019	10	0	2	84	321	461	531	498	310	137	37	0	**2390**
2020	5	0	12	61	313	383	523	515	321	106	81	12	**2331**
2021	0	2	6	38	254	518	533	496	354	227	52	7	**2487**
2022	0	0	2	63	285	460	536	545	349	223	81	3	**2546**
2023	0	0	2	115	275	539	550	483	292	102	48	8	**2415**

Table 6.6 Effective Degree Day monthly actual and standard (continued)													
	Month												
Year	1	2	3	4	5	6	7	8	9	10	11	12	Annual
Standard													
2008	2	2	10	62	271	465	559	514	361	163	46	11	**2467**
2009	2	2	10	62	273	465	559	514	361	162	46	11	**2466**
2010	2	2	10	62	274	466	559	514	360	161	46	11	**2466**
2011	2	2	10	63	275	466	559	514	359	160	46	10	**2465**
2012	2	2	9	63	276	466	559	513	359	158	46	10	**2464**
2013	2	2	9	63	278	467	559	513	358	157	47	10	**2464**
2014	2	2	9	64	279	467	558	513	357	156	47	10	**2463**
2015	2	2	9	64	280	467	558	512	357	155	47	10	**2462**
2016	2	2	8	64	281	468	558	512	356	153	47	9	**2462**
2017	2	2	8	65	283	468	558	512	356	152	47	9	**2461**
2018	2	2	8	65	284	468	558	511	355	151	47	9	**2461**
2019	2	2	8	65	285	469	557	511	354	150	48	9	**2460**
2020	2	2	7	66	286	469	557	511	354	148	48	9	**2459**
2021	2	2	7	66	288	469	557	510	353	147	48	8	**2459**
2022	2	2	7	66	289	470	557	510	352	146	48	8	**2458**
2023	2	2	7	67	290	470	557	510	352	145	48	8	**2457**
Abnormal													
2008	2	2	2	-38	5	-4	-36	-47	-4	13	-6	2	**-109**
2009	2	-3	0	21	36	-17	-28	12	-66	12	-5	9	**-27**
2010	2	2	10	5	-51	-37	-67	-37	-10	-3	20	-8	**-174**
2011	2	2	10	27	41	35	1	27	-8	49	2	10	**197**
2012	2	2	3	10	6	23	-43	21	-4	44	-20	1	**44**
2013	2	1	-17	36	-12	-2	-25	60	-1	6	41	7	**97**
2014	2	2	4	5	12	-20	1	92	57	32	2	3	**192**
2015	2	2	5	13	-51	44	20	12	30	79	34	-6	**182**
2016	-4	-9	8	8	-50	-25	-43	-66	-103	-70	-6	-3	**-363**
2017	-2	-11	-20	17	20	31	3	-7	-2	-31	38	-2	**34**
2018	2	1	2	4	42	6	34	-41	-27	27	-24	-1	**24**
2019	-8	2	6	-18	-36	7	27	13	44	13	11	9	**69**
2020	-3	2	-4	5	-26	87	34	-5	32	42	-33	-3	**128**
2021	2	0	1	28	34	-49	24	15	-1	-80	-4	2	**-28**
2022	2	2	5	3	4	10	21	-35	3	-77	-32	5	**-88**
2023	2	2	5	-48	15	-68	7	26	59	43	0	0	**42**

Notes: 1. Actual weather data up until 31 October 2023. November and December 2023 actual values were assumed to equal the monthly standard.
2. All data in the NIEIR ATCO model are expressed as real numbers, not integers. This may produce small rounding errors in per cent changes and absolute changes.

Source: Bureau of Meteorology, NIEIR.

Table 6.7 Cooling Degree Day monthly actual and standard													
	Month												
Year	1	2	3	4	5	6	7	8	9	10	11	12	Annual
Actual													
2008	200	181	112	11	0	0	0	0	0	28	4	71	**608**
2009	195	153	85	53	0	0	0	0	0	19	46	134	**684**
2010	217	161	133	19	0	0	0	0	4	10	101	107	**753**
2011	194	222	180	61	2	0	0	1	0	13	44	138	**855**
2012	215	139	126	39	4	0	0	0	3	20	36	148	**730**
2013	177	191	76	80	0	0	0	0	0	17	82	122	**745**
2014	183	176	134	45	0	0	0	0	3	21	26	94	**682**
2015	184	163	103	21	3	0	0	0	4	33	77	116	**705**
2016	181	163	124	29	0	0	0	0	0	3	63	82	**644**
2017	150	119	83	26	2	0	0	0	0	12	89	119	**601**
2018	148	118	128	33	8	0	0	0	0	9	26	106	**576**
2019	128	137	128	32	0	0	0	1	3	13	91	198	**731**
2020	144	193	127	47	2	1	0	0	3	25	23	162	**726**
2021	194	120	124	37	2	0	0	0	0	5	42	162	**686**
2022	213	196	138	40	0	0	0	0	4	0	34	115	**740**
2023	185	155	113	6	3	0	0	0	8	40	56	133	**699**
Standard													
2008	164	153	116	36	4	0	0	0	1	13	50	115	**651**
2009	165	153	117	35	3	0	0	0	1	13	51	116	**655**
2010	167	154	117	35	3	0	0	0	1	13	51	117	**659**
2011	168	154	118	35	3	0	0	0	2	14	51	119	**663**
2012	169	155	118	35	3	0	0	0	2	14	52	120	**667**
2013	170	155	119	35	3	0	0	0	2	14	52	121	**671**
2014	171	156	120	35	3	0	0	0	2	15	53	122	**675**
2015	172	156	120	34	2	0	0	0	2	15	53	123	**679**
2016	173	157	121	34	2	0	0	0	2	16	53	125	**683**
2017	174	158	121	34	2	0	0	0	2	16	54	126	**687**
2018	175	158	122	34	2	0	0	0	2	16	54	127	**691**
2019	177	159	123	34	2	0	0	0	2	17	54	128	**695**
2020	178	159	123	34	2	0	0	0	2	17	55	129	**699**
2021	179	160	124	33	2	0	0	0	3	17	55	131	**703**
2022	180	160	124	33	1	0	0	0	3	18	55	132	**707**
2023	181	161	125	33	1	0	0	0	3	18	56	133	**711**
Abnormal													
2008	-35	-29	4	25	4	0	0	0	1	-16	46	44	**44**
2009	-29	1	32	-18	3	0	0	0	1	-6	5	-18	**-29**
2010	-50	-7	-16	16	3	0	0	0	-3	4	-50	10	**-93**
2011	-27	-68	-62	-26	1	0	0	-1	2	1	7	-19	**-192**
2012	-46	16	-8	-4	-1	0	0	0	-2	-6	16	-29	**-63**
2013	-7	-35	43	-45	3	0	0	0	2	-3	-29	-1	**-73**
2014	-12	-20	-15	-11	3	0	0	0	-1	-6	27	28	**-6**
2015	-12	-7	17	14	0	0	0	0	-2	-18	-24	7	**-25**
2016	-8	-6	-3	6	2	0	0	0	2	13	-10	42	**40**
2017	24	39	38	8	0	0	0	0	2	4	-35	7	**87**
2018	28	40	-6	1	-6	0	0	0	2	7	28	21	**115**
2019	49	22	-6	2	2	0	0	-1	-1	3	-37	-70	**-36**
2020	34	-33	-4	-13	-1	-1	0	0	-1	-8	32	-32	**-27**
2021	-15	39	0	-3	-1	0	0	0	2	13	13	-31	**17**
2022	-33	-35	-13	-7	1	0	0	0	-1	17	21	17	**-33**
2023	-4	6	12	27	-1	0	0	0	-5	-22	0	0	**12**

Notes: 1. Actual weather data up until 31 October 2023. November and December 2023 actual values were assumed to equal the monthly standard.
2. All data in the NIEIR ATCO model are expressed as real numbers, not integers. This may produce small rounding errors in per cent changes and absolute changes.

Source: Bureau of Meteorology, NIEIR.

6.3.9 Estimating the relationship between weather and gas demand

In the first stage of equations, NIEIR have estimated gas demand-weather relationship regression equations using daily gate inflow data for combined B1, B2 and B3 tariffs, and A1 and A2 tariffs separately. A separate equation is estimated from each year from 2008 to 2023 so that there are a total of 16 equations for each of the tariff groups.

The equations include EDD, CDD, and timing variables. The general form of the equation used to weather normalise each tariff group is:

Daily gas demand = a + b1EDD + b2CDD
+ b3Monday + b4Friday + b5Saturday + b6Sunday

The results for B1, B2, and B3 tariffs imply that the temperature sensitivity of the network has been declining over time. This means that in recent years, on average, colder temperatures lead to less increase in gas demand than earlier years.

The second stage of equations is performed on the accruals data, which is only a monthly frequency. The equations are specified in a similar manner to the stage 1 equations, but the accruals database has all tariffs B1, B2, B3, A1, and A2 separated. These annual equations are less reliable than using the daily gate inflow data, but the new estimated coefficient on weather by tariff allows a reasonable method to allocate temperature impacts between B1, B2, and B3 tariffs.

6.4 Normalised tariff groups and implied average usage trends – NIEIR

Table 6.8 presents actual, normalised and abnormal energy by ATCO tariff group computed in December 2023. The data extends from calendar 2008 to calendar 2022 by tariff groups A1, A2, B1, B2 and B3.

All tariff groups are normalised as they are all correlated with underlying weather conditions.

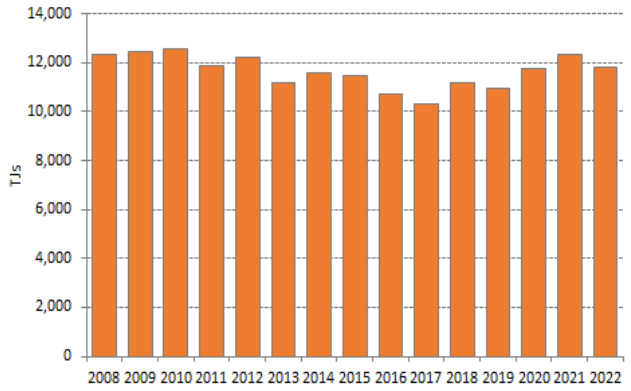
Figures 6.6(a) and 6.6(b) show total normalised usage and average consumption per customer from 2008 to 2022 for Tariff A1. Figures 6.6(c) to 6.6(j) show the corresponding normalised usage and average usage for the remaining tariff groups.

Table 6.8 Actual, normalised and abnormal energy by ATCO tariff group – NIEIR estimates						
Year	**A1**	**A2**	**B1**	**B2**	**B3**	**Total**
Actual energy (TJ)						
2008	12346.2	1952.5	1606.9	1161.7	10455.4	**27522.7**
2009	12468.6	1895.7	1607.7	1168.1	10539.6	**27679.8**
2010	12565.3	1924.4	1644.2	1183.6	10295.4	**27613.0**
2011	11844.8	2011.6	1532.4	1162.5	9410.1	**25961.4**
2012	12180.8	2110.1	1607.9	1219.3	9837.1	**26955.2**
2013	11142.0	1965.2	1628.2	1236.8	9852.6	**25824.7**
2014	11561.7	1880.7	1639.9	1259.0	9580.0	**25921.3**
2015	11398.2	1854.0	1715.5	1289.5	9761.8	**26019.1**
2016	10778.0	1819.9	1929.1	1370.6	10890.5	**26788.1**
2017	10338.2	1814.5	1867.6	1339.4	9938.3	**25298.0**
2018	11225.1	1788.2	2000.5	1348.7	10083.6	**26446.1**
2019	10913.2	1842.3	1937.5	1327.4	9873.3	**25893.8**
2020	11753.9	1711.4	1835.7	1230.7	10115.4	**26647.1**
2021	12346.5	1829.9	2070.7	1323.0	10481.4	**28051.6**
2022	11830.3	1918.3	2130.6	1309.8	10327.2	**27516.2**
2023 YTD	10571.5	1607.0	1870.5	1128.8	8929.2	**24107.0**
Normalised energy (TJ)						
2008	12356.4	1945.2	1592.6	1153.5	10260.3	**27308.0**
2009	12477.4	1897.8	1604.8	1166.8	10500.1	**27646.9**
2010	12593.8	1927.0	1622.1	1172.7	10036.4	**27352.0**
2011	11863.6	2044.3	1568.7	1181.1	9771.9	**26429.7**
2012	12224.7	2121.4	1617.7	1224.5	9926.4	**27114.8**
2013	11157.2	1976.1	1644.8	1245.5	10021.3	**26045.0**
2014	11601.2	1894.4	1668.1	1272.1	9847.6	**26283.4**
2015	11444.8	1868.0	1746.0	1303.1	10016.5	**26378.4**
2016	10715.4	1790.7	1858.3	1341.3	10333.1	**26038.9**
2017	10322.4	1806.3	1869.4	1339.9	9953.4	**25291.3**
2018	11188.1	1781.3	1996.1	1347.3	10067.4	**26380.2**
2019	10930.8	1848.9	1951.3	1333.2	9977.8	**26042.1**
2020	11763.7	1717.6	1861.8	1240.4	10293.9	**26877.3**
2021	12343.6	1826.3	2063.8	1320.2	10432.8	**27986.6**
2022	11820.1	1914.9	2119.9	1305.4	10227.0	**27387.2**
2023 YTD	10563.6	1609.3	1877.6	1131.5	8987.5	**24169.5**
Abnormal energy (TJ)						
2008	10.2	-7.3	-14.3	-8.2	-195.1	**-214.7**
2009	8.8	2.1	-2.9	-1.3	-39.5	**-32.9**
2010	28.5	2.6	-22.1	-10.9	-259.0	**-261.0**
2011	18.8	32.7	36.3	18.6	361.8	**468.3**
2012	43.9	11.3	9.8	5.2	89.3	**159.6**
2013	15.2	10.9	16.6	8.7	168.7	**220.3**
2014	39.5	13.7	28.2	13.1	267.6	**362.1**
2015	46.6	14.0	30.5	13.6	254.7	**359.3**
2016	-62.6	-29.2	-70.8	-29.3	-557.4	**-749.2**
2017	-15.8	-8.2	1.8	0.5	15.1	**-6.7**
2018	-37.0	-6.9	-4.4	-1.4	-16.2	**-65.9**
2019	17.6	6.6	13.8	5.8	104.5	**148.3**
2020	9.8	6.2	26.1	9.7	178.5	**230.2**
2021	-2.9	-3.6	-6.9	-2.8	-48.6	**-65.0**
2022	-10.2	-3.4	-10.7	-4.4	-100.2	**-129.0**
2023 YTD	-7.9	2.3	7.1	2.7	58.3	**62.5**

Notes: *1.* 2023 is the year to date (YTD) from 1 January to 31 October 2023.
2. All data in the NIEIR ATCO model are expressed as real numbers, not integers. This may produce small rounding errors in per cent changes and absolute changes.

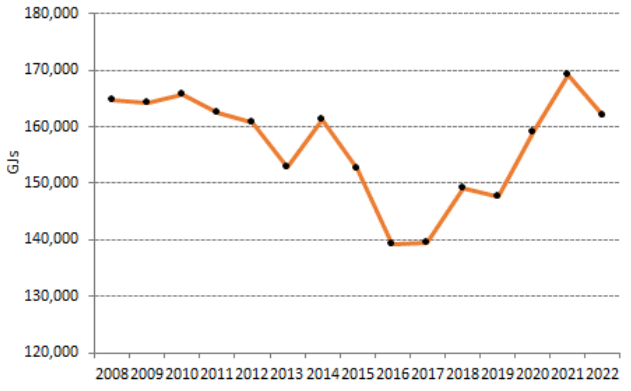
Source: Actual from Volumes and Connection History 13112023.xlsx, weather normalised from NIEIR.

Figure 6.6(a): Tariff A1 – Total annual gas usage – Normalised



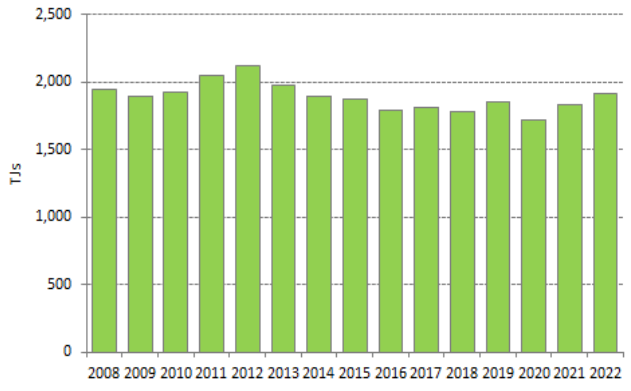
Source: ATCO and NIEIR.

Figure 6.6(b): Tariff A1 – Total average annual gas use per customer – Normalised



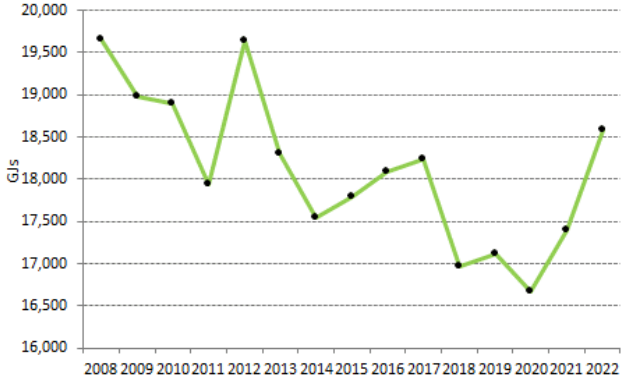
Source: ATCO and NIEIR.

Figure 6.6(c): Tariff A2 – Total annual gas usage – Normalised



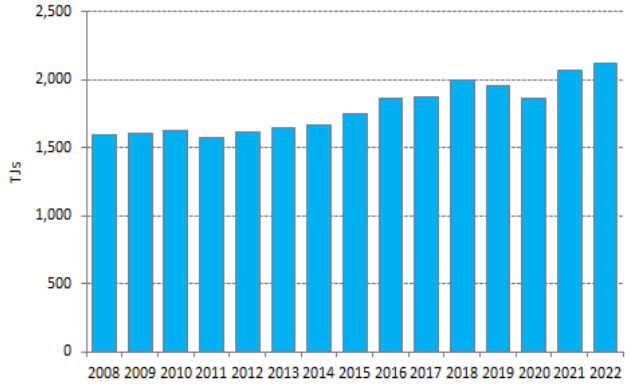
Source: ATCO and NIEIR.

Figure 6.6(d): Tariff A2 – Total average annual gas use per customer – Normalised



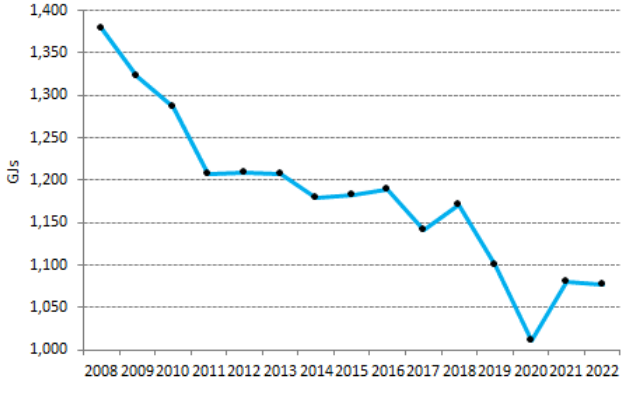
Source: ATCO and NIEIR.

Figure 6.6(e): Tariff B1 – Total annual gas usage – Normalised



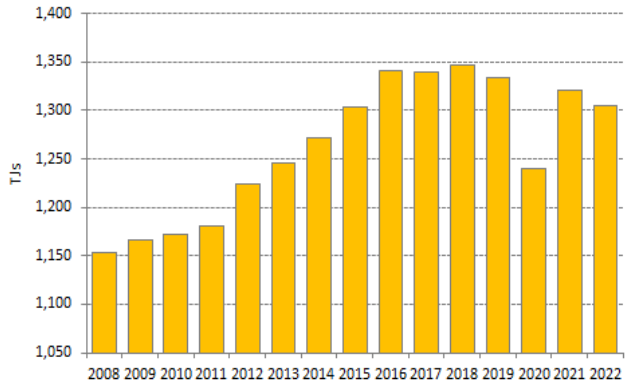
Source: ATCO and NIEIR.

Figure 6.6(f): Tariff B1 – Total average annual gas use per customer – Normalised



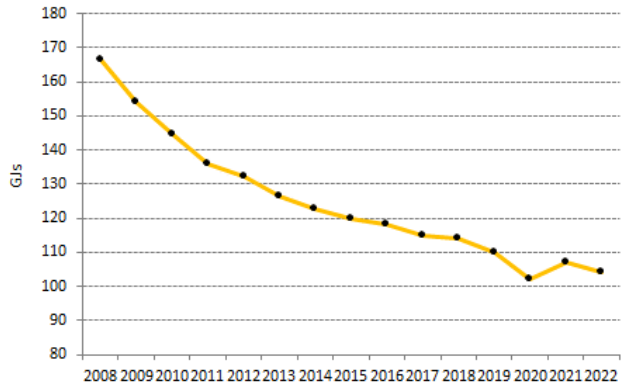
Source: ATCO and NIEIR.

Figure 6.6(g): Tariff B2 – Total annual gas usage – Normalised



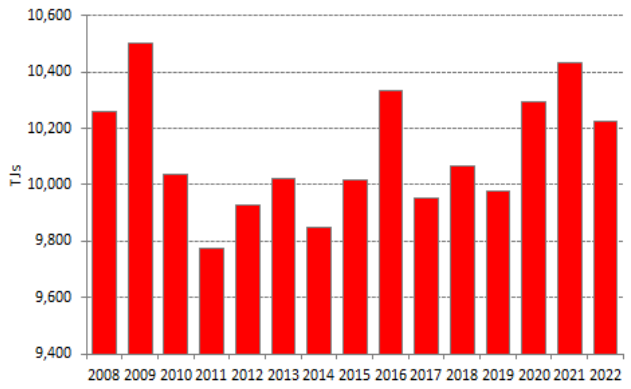
Source: ATCO and NIEIR.

Figure 6.6(h): Tariff B2 – Total average annual gas use per customer – Normalised



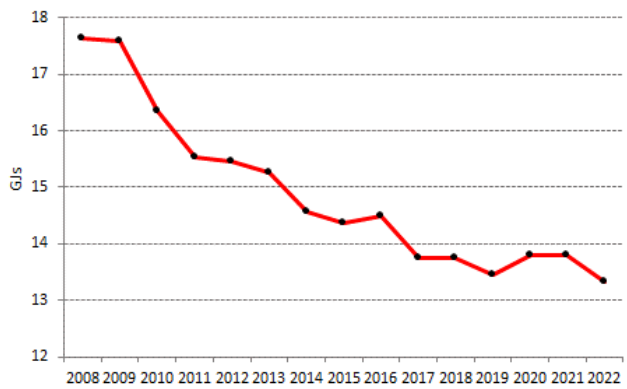
Source: ATCO and NIEIR.

Figure 6.6(i): Tariff B3 – Total annual gas usage – Normalised



Source: ATCO and NIEIR.

Figure 6.6(j): Tariff B3 – Total average annual gas use per customer – Normalised



Source: ATCO and NIEIR.

6.5 An assessment of new customer usage trends

ATCO provided NIEIR with individual MIRN reads for individual customers by tariff group and vintage (year of connection). Usage records for each MIRN were recoded from year of activation to 2022 on a calendar year basis. The records commenced in calendar 2007.

New customer usage trends over time help reveal how changes in dwelling structures, price, building standards and government energy policies are impacting on average consumption of natural gas. While ATCO provided this data by tariff group (A1, A2, B1, B2 and B3), the primary interest was the residential class, represented by Tariff B3.

Table 6.9 Total new MIRNs by tariff group – 2007 to 2021 (number)

	Tariff A1	Tariff A2	Tariff B1	Tariff B2	Tariff B3
Number of MIRNs by tariff group	21	31	831	6,718	248,853

Source: New Customer Usage by Year 20211231.xlxs (ATCO).

For the Tariff A1 and A2 groups, the number of new customers is relatively small and differences in average use per customer mainly reflects the nature of gas use by specific customers.

For Tariff B new customers, a number of points/observations can be made in respect to the data. These are:

(i) the initial two to three years of usage by customers and groups of customers can be artificially low as the MIRN is under construction, unoccupied or operating at less than full capacity. The latest new customer use for 2020, 2021 and 2022 is impacted by this factor;

(ii) the impact of weather on annual new customer use could be estimated. However, this step can be avoided by comparing average usage across the same time spans (i.e. the same weather years); and

(iii) the ATCO new customer data is impacted by customers who have zero consumption for single and multiple years. This could lead to an understatement of average use. A large number of very high gas users could also similarly impact the averages. This issue can be corrected by calculating trim means for average usage by tariff class. A trim mean of 5 per cent removes the top and bottom 5 per cent of customers.

Table 6.10 presents average overall new customer use for Tariff B3 customers from 2015 and consumption through to calendar 2022. The number of MIRNs for each year is also presented in the first column of the table. This table illustrates some of the points noted above.

Table 6.10 Average unnormalised consumption per Tariff B3 customer by vintage of customer – 2015-2022

New MIRN Count	Vintage	Average usage (GJ)							
		2015	2016	2017	2018	2019	2020	2021	2022
24414	2015	1.8	9.2	10.2	10.6	10.7	11.0	11.1	11.1
19496	2016	0.0	2.3	8.8	10.2	10.4	10.8	11.0	11.0
13511	2017	0.0	0.0	2.2	8.6	9.6	10.2	10.3	10.4
12697	2018	0.0	0.0	0.0	2.2	8.7	10.1	10.4	10.5
11412	2019	0.0	0.0	0.0	0.0	2.4	8.2	9.7	10.0
10691	2020	0.0	0.0	0.0	0.0	0.0	2.1	8.7	9.7
11498	2021	0.0	0.0	0.0	0.0	0.0	0.0	2.2	8.5

Source:

Table 6.11 presents average unnormalised consumption per customer for Tariffs B1 to B2 for the 2022 consumption year.

For Tariff B1, the average new customer use was generally below the overall average of 1,085.5 GJ in 2022. This could, in part, reflect large Tariff B1 customers shifting to Tariff A2. New customers in 2011 and 2012 consumed more than the average for Tariff B1.

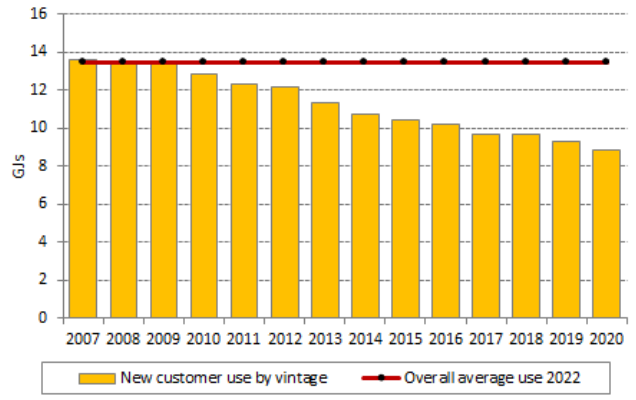
For Tariff B2 new customers, average usage is well below the average overall Tariff B2 usage of 104.5 GJ per annum in 2022. It suggests that pre-2007 Tariff B2 customers consumed nearly double the average overall Tariff B2 usage. As indicated in Table 6.11, average new customer Tariff B2 usage has been increasing over time.

For Tariff B3, there is an unambiguous fall in average Tariff B3 usage by new Tariff B3 customers. Whilst a large proportion of the fall between 2009 and 2012 is probably due to real price shocks in 2009 and 2010. Nevertheless, average Tariff B3 customer use has trended further downwards since 2013. Figure 6.7 shows the actual tariff B3 average usage for 2022 by vintage, while Figure 6.8 shows the three year rolling average for Tariff B3.

Table 6.11 Average unnormalised consumption per customer, Tariffs B1, B2 and B3

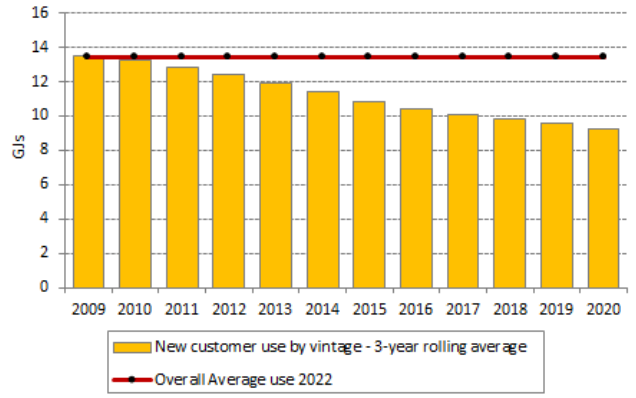
	2022 Consumption year GJ		
	Tariff B1	Tariff B2	Tariff B3
Overall average 2022	1,085.5	104.5	13.5
New Customers by Vintage (trim mean 5%)			
2007	678.7	43.5	13.6
2008	853.1	37.5	13.5
2009	657.1	37.3	13.4
2010	772.5	45.9	12.9
2011	1,229.6	35.6	12.3
2012	1,148.8	37.5	12.2
2013	1,004.3	42.7	11.3
2014	862.5	53.6	10.7
2015	622.5	55.3	10.4
2016	765.6	56.4	10.2
2017	707.9	63.7	9.7
2018	827.8	62.5	9.7
2019	888.5	68.9	9.3
2020	959.2	59.2	8.9

Figure 6.7: Tariff B3 unnormalised average usage – Consumption year 2022



Source: Table 6.11.

Figure 6.8: Tariff B3 unnormalised average usage – 3-year rolling average (consumption year 2022)



Source: Table 6.11.

6.6 Federal and State Government energy policy

Commonwealth and Western Australia state governments all have active energy policies that create incentives to change the way residential, commercial and industrial customers consume energy. Most active government policies are guided by emissions reductions targets, in particular for Net Zero greenhouse gas emissions by 2050. Both State and Federal governments have Net Zero 2050 targets. The Federal government is currently consulting on an interim 2035 emissions reduction target.

In order to reduce emissions, Australia's energy consumption is required to shift away from emissions-intensive fossil fuel-based energy and toward renewable energy. This means decarbonising the electricity grid by reducing reliance on coal and natural gas-powered generation and increasing solar and wind generation (and others).

At the end-use level, customers will face increased incentives to install electric appliances over gas appliances, whether this is for new installations or gas to electric substitutions. This incentive will increase through several factors.

- The continued decarbonisation of the electricity grid means electricity consumption emission intensity is decreasing relative to natural gas emission intensity.
- Energy efficiency improvement in electric appliances has increased much more rapidly than gas appliances over the past 20 years. Minimum energy performance standards and heat pump technology have lead improvements. Heat pumps have seen strong increases in appliance efficiency for electric space heating and water heating.
- Electric cooktop appliances have improved, including induction cooktops.
- Prevalence of solar panel systems and solar hot water installations can make electricity consumption relatively cheap compared to network gas.

Table 6.12 provides a summary of Federal and State energy policies that have impacted gas demand recently and may impact forecast gas demand. In the short term, more stringent 7-star building standards for new buildings will be introduced in October 2025 in Western Australia which may reduce space heating and cooling requirements by 24 per cent for new buildings compared to a 6-star standard.

Minimum Energy Performance Standards and Gas Labels have been in place for over 10 years and are now factored into business-as-usual conditions without any expected future changes.

Government incentives to substitute to from electricity to gas has disappeared or are being phased out. Gas to electricity end use substitution is going to become more prevalent. Federal and State governments may introduce further direct financial incentives to encourage the shift away from gas toward electricity consumption. Currently, there are limited direct subsidies to encourage the switch from electric to gas in Western Australia. Subsidies for renewable solar panel, solar hot water, and heat pump systems are still available at the Federal level through the Small-scale renewable energy scheme.

In the long term, fossil fuel use, including natural gas consumption needs to continue to decline to meet climate targets. In Victoria, the state government has banned gas connections to new dwellings from 1 January 2024 to meet emissions reductions targets. At this stage, Western Australia has not planned to introduce a similar ban and the forecasts assume that new gas connections will continue.

Table 6.12 Summary of Federal and State energy policies				
			Timing	
Policy	Measures	Impact on gas demand	Start	End
Federal				
Small-Scale Renewable Energy Scheme	Incentives to install solar panel systems, solar water heaters and air source heat pumps.	Reduces gas use for hot water.		2030
Net Zero 2050	Target for net zero greenhouse emissions.	Disincentive for new gas uptake and continued use.		2050
2035 Emissions Reduction Target	Interim target for emissions reduction by 2035.	Disincentive for new gas uptake and continued use.		2035
Minimum Energy Performance Standards (MEPS) – Gas water heaters	Regulates electricity and gas appliances. Only gas water heaters covered for gas. 4-Star and above gas heaters only.	Historical reductions as old gas water heaters replaced with more efficient.	2013	
Gas Energy Rating Label	Required for gas heaters and gas water heaters for gas product certification.	Encourages installation of more efficient systems. Reduces gas demand.		
Western Australia				
6-Star Building Standards	Minimum requirements for thermal efficiency in buildings.	Increase thermal performance of buildings, and reduce space heating requirements.	May 2012	Septembe r 2025
7-Star Building Standards	Minimum requirements for thermal efficiency in buildings.	Increase thermal performance of buildings, and reduce space heating requirements.	Oct 2025	
Net Zero 2050	Target for net zero greenhouse emissions.	Reduce long-term gas use.		2050
Household Energy Efficiency Scheme	Aims to improve energy efficiency for 10,000 households experiencing hardship. Implemented mostly through coaching households on best practice household energy efficiency. Limited direct financial support for appliance switching.	Improve energy efficiency. Small potential gas demand reduction.	2021	2025
Energy Transformation Strategy (including Powering WA)	Powering WA is a State Government organisation that supports transmission infrastructure, renewable generation and battery storage.	Decarbonise electricity grid. Displace natural gas powered generation.	2019	–
Distributed Energy Buyback Scheme (DEBS)	Eligible customers receive payments for electricity exports to grid (solar, battery, EV).	Encourages electric uptake.		

6.7 Natural gas price outlooks

Natural gas prices in Western Australia are regulated for customers on the main distribution systems. Customers must consume less than 1 terajoule per annum. This applies to residential, business and government customers.

The Energy Coordination (Gas Tariffs) Regulations 2000 provides a regulated maximum price for retailers. Retailers can offer lower prices than the regulated price cap through market contracts.

Natural gas prices comprise a number of components. These include:

(i) cost of production (e.g. well-head price);

(ii) transmission costs;

(iii) distribution network charges; and

(iv) the retail cost.

ATCO distribution prices are regulated by the ERA. ATCO submits its proposed expenditures and prices for consideration and approval by the ERA.

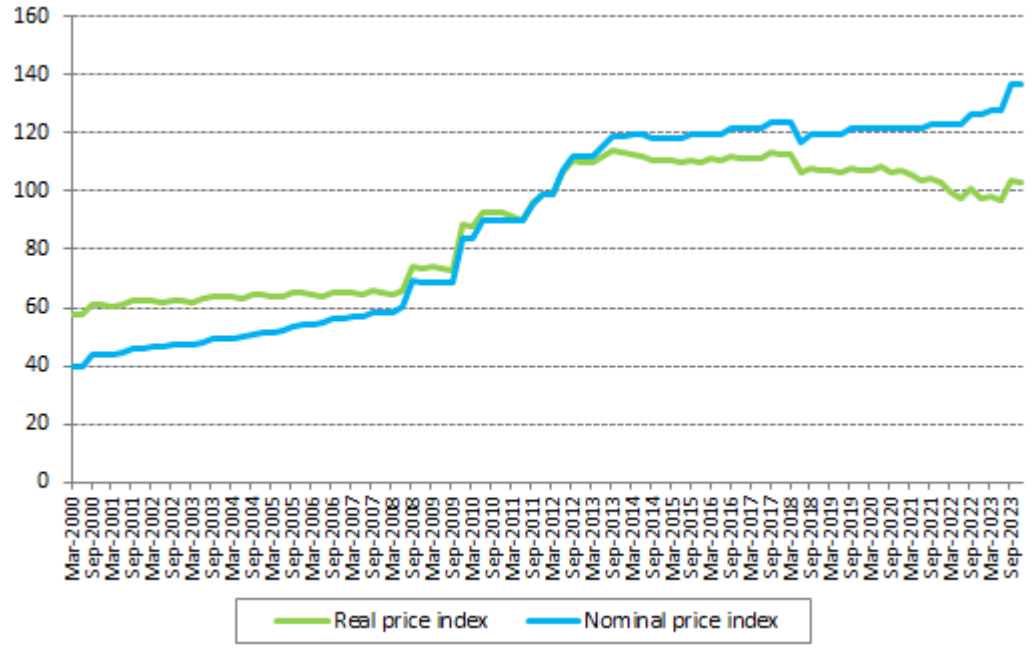
Under the 2020-24 (final ERA decision), residential gas prices were to be increased by 5.8 per cent in 2020 and around 0.5 per cent per year in 2021, 2022, 2023 and 2024. ATCO initially proposed to increase haulage tariffs by 31.2 per cent in real terms over the AA5 2020-24 period.

The ABS indirectly measures gas prices in its quarterly Consumer Price Index (CPI) publication. Index numbers are provided for gas and other household fuels. Other fuels are oil, wood and bottled gas, although the weight for reticulated natural gas is dominant. Prices are collated by capital city.

As indicated in Figure 6.9, real gas and other fuel prices rose strongly between 2009 and 2013, rising by over 50 per cent in real terms. As indicated in ATCO's data, the increase in gas prices led to significant reductions in average gas use (particularly the Tariff B3 group). Real prices post-2013 remained flat and declined slightly into 2021 and 2022. In 2023 prices rose slightly.

AEMO's 2023 Western Australian Gas Statement of Opportunities (GSOO) identified a tight gas demand and supply over the next 10 years. The gas market in Western Australia was projected to be in deficit between 2024 and 2029. AEMO stated that gas supply facilities were running close to, or at, capacity.

Figure 6.9: Gas and other household fuels – Perth – 2000 to 2023 (nominal and real index numbers)



Source: ABS Consumer Price Index, data downloads.

The AEMO gas demand projection includes in 2028 the Perdaman Karratha Urea project, a significant new gas customer. It would not include Alcoa's recent announcement in January 2024 of the closure of the Kwinana Alumina Refinery by around September 2024. The transition to net zero emissions will also involve coal generation retirements, possibly increasing the gas generating requirement, as total renewables and storage capacity increases.

Since mid-2021, there has been some significant upward pressure on nominal Western Australian gas spot prices as shown in Figure 6.10. Spot gas prices in June 2023 were over $10 per GJ compared to $4.85 per GJ in June 2021.

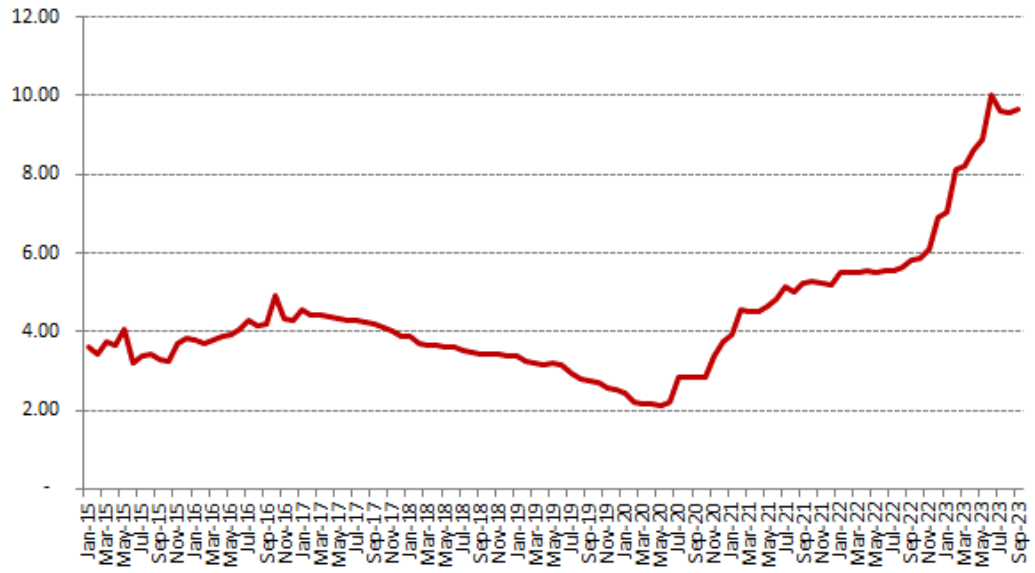
Weighted average domestic gas contract prices have also risen over the last few years. This data is compiled by the Department of Energy Mines, Industry, Regulation and Safety, Western Australia.

Domestic gas contract prices reached $7.35 per GJ in the March quarter 2023, compared to prices of $2.87 to $3.56 in 2020. Table 6.13 shows quarterly gas spot and contract prices from March quarter 2018.

The outlook for retail natural gas prices remains uncertain. The recent increase in spot prices will provide some upward pressure on real prices in the short-term. A continued demand supply deficit could generate a period of sustained price rises. The ATCO Access Arrangement outcome remains uncertain.

On balance, in NIEIR's assessment real retail gas prices are projected to rise by 10.4 per cent between 2023 and 2029. Table 6.14 shows the outlook for natural gas prices for residential and small business customers.

Figure 6.10: Western Australian nominal gas spot market prices



Source: AEMO Western Australia.

Table 6.13	Western Australian nominal gas spot market prices and domestic gas contract prices	
	WA spot gas prices	Domestic gas contract prices
Mar-18	3.75	4.10
Jun-18	3.63	4.11
Sep-18	3.48	4.20
Dec-18	3.41	3.48
Mar-19	3.29	3.46
Jun-19	3.75	4.10
Sep-19	2.83	3.62
Dec-19	2.60	3.52
Mar-20	2.27	3.62
Jun-20	2.17	3.56
Sep-20	2.83	2.87
Dec-20	3.33	4.36
Mar-21	4.34	4.72
Jun-21	4.67	4.98
Sep-21	5.13	5.44
Dec-21	5.22	5.35
Mar-22	5.50	5.45
Jun-22	5.54	5.25
Sep-22	5.66	5.08
Dec-22	6.29	6.07
Mar-23	7.79	7.35
Jun-23	9.18	6.65
Sep-23	9.61	6.65

Sources: AEMO and Western Australia and Department of Mines, Industry, Regulation and Safety, Western Australia.

Table 6.14	Actual and projected Western Australian real gas prices	
	Index values	Annual per cent change
2008	69.4	6.7
2009	77.2	11.2
2010	91.4	18.4
2011	94.2	3.0
2012	106.4	13.0
2013	112.3	5.6
2014	111.4	-0.8
2015	110.2	-1.1
2016	111.1	0.8
2017	112.1	0.9
2018	108.4	-3.3
2019	107.2	-1.1
2020	107.2	0.0
2021	104.2	-2.8
2022	99.1	-4.9
2023	100.4	1.3
2024	103.4	3.0
2025	106.5	3.0
2026	107.6	1.0
2027	108.7	1.0
2028	109.7	1.0
2029	110.8	1.0
2030	110.3	-0.5
2031	110.7	0.4
2032	111.3	0.5
2033	111.1	-0.2

Source: ABS, Consumer Price Index and NIEIR.

6.8 Gas demand equations – ATCO

6.8.1 Introduction

This section investigates the estimation of structural gas demand equations for the ATCO distribution area.

Gas is an important input into household and business economic activity. Like electricity, natural gas is a key factor input into domestic production of a wide range of goods and services.

Energy use in Australia has traditionally increased with economic growth. From a structural perspective, the key drivers of gas demand are economic growth, weather conditions and gas prices. The following analysis, although preliminary, demonstrates that economic growth, real gas prices and weather conditions remain key drivers of gas consumption in the ATCO distribution area.

6.8.2 ATCO gas usage – industry and residential

NIEIR aggregated ATCO's industry usage of gas across its Tariffs A1, A2, B1 and B2 groups. This aggregation, as close as possible, represents total industry gas usage. Residential gas usage is represented by Tariff B3.

Figure 6.11 shows quarterly normalised gas sales from the March quarter 2008 to September 2023 for industry. Both actual quarterly use and the four-quarter moving average is shown for ATCO industry gas usage. Total industry usage falls between 2008 and 2013 and then recovers in 2014 and 2015 before slowing again around 2017. There is a recovery post-2021.

Figure 6.12 shows quarterly normalised Tariff B3 gas use from the December quarter 2008 to September 2023. Both actual quarterly use and the four-quarter moving average are shown. Tariff B3 sales are relatively flat, although there is a decline over the 2008 to 2013 period.

Both industry and residential normalised quarterly gas consumption show a strong seasonal pattern with higher seasonal usage in the June and September quarters.

Figure 6.13 shows quarterly normalised Tariff B3 per connection from December 2008 to December 2022. Again, actual and moving averages are shown in this figure. The figure highlights the significant fall in average Tariff B3 use, particularly between 2008 and 2014.

Figure 6.11: ATCO quarterly industry gas sales – actual and four quarter moving average

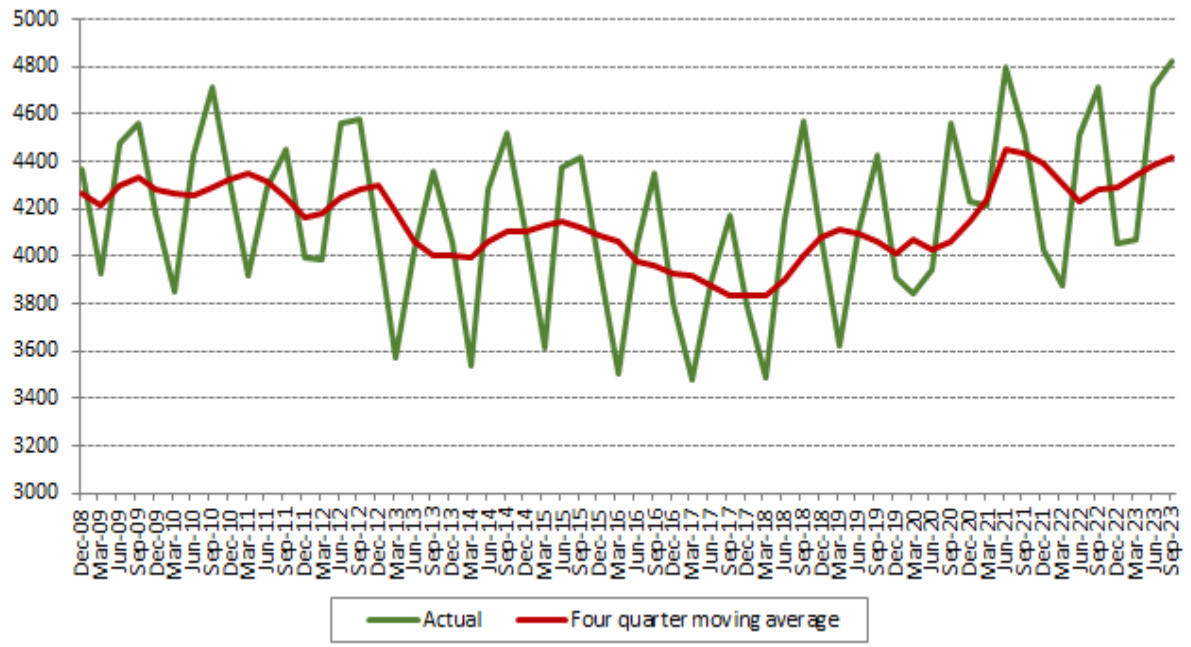


Figure 6.12: ATCO quarterly residential (Tariff B3) gas sales – actual and four quarter moving average

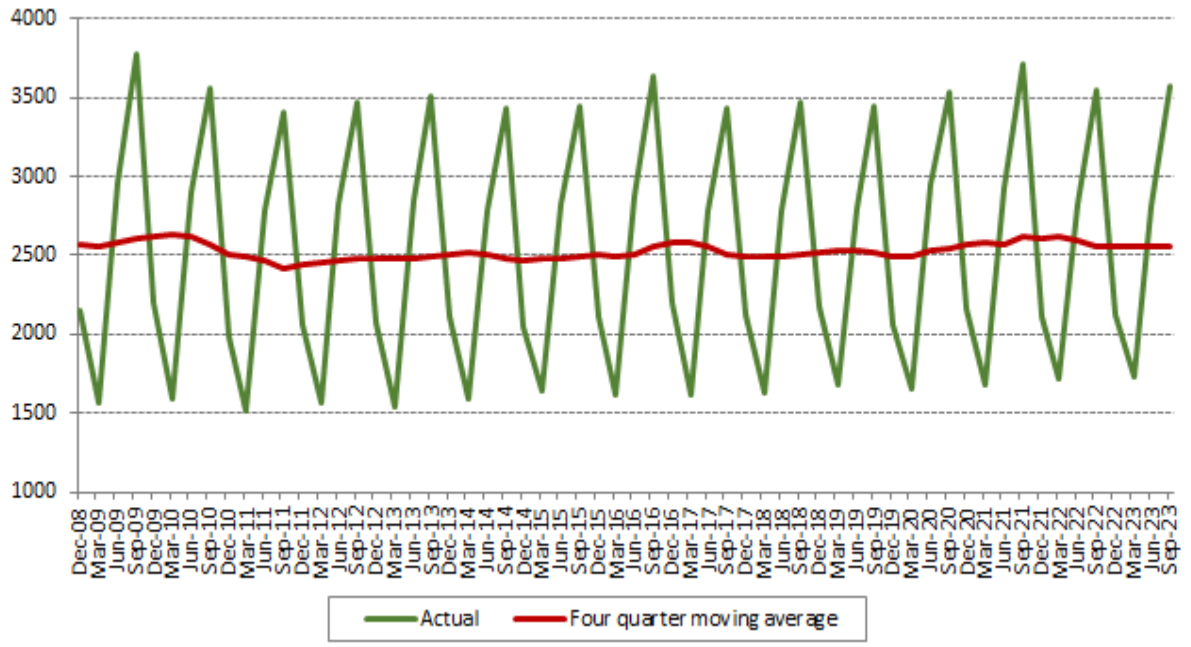
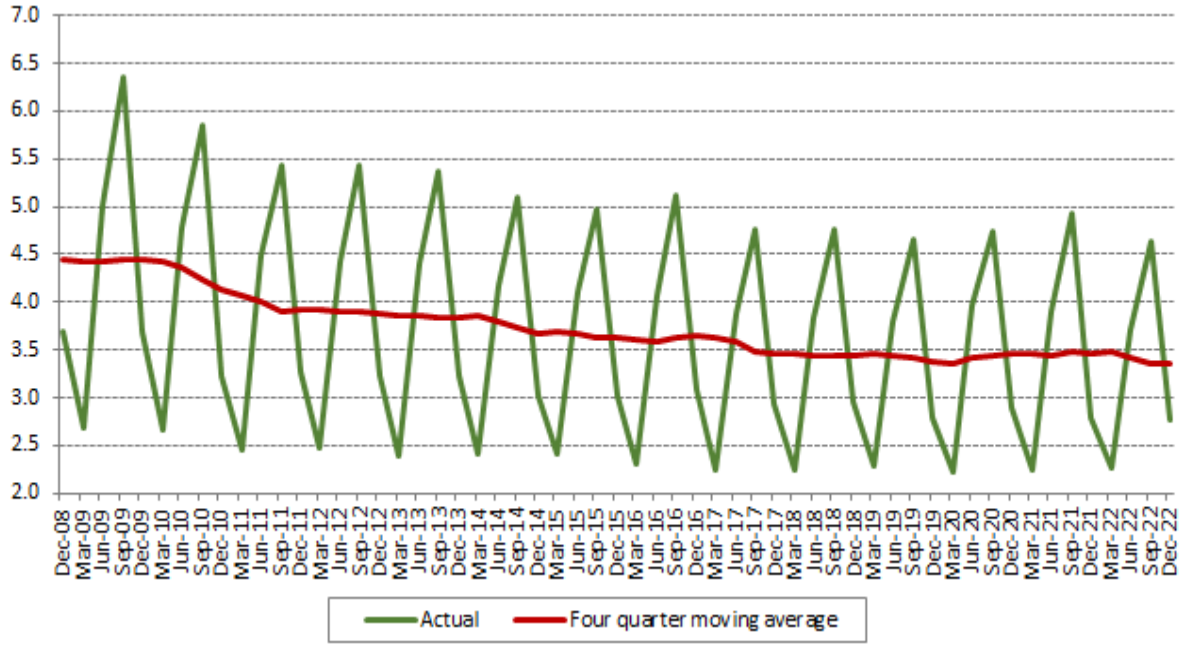


Figure 6.13: ATCO quarterly residential (Tariff B3) gas sales per connection – actual and four quarter moving average



6.8.3 Model specification and data sources

Two aggregate gas consumption equations were specified, one for industry gas use and one for residential average usage, in the ATCO distribution area.

The industry gas equation specification was:

$$ln\ GASI = a1 * C + a2 * ln\ GRP + a3 * lnRGP + a4 * DUMM + a5 * DUMD + a6 * DUMS$$

Where:

ln is the natural logarithm;

GASI is quarterly ATCO gas use by industry (A1, A2, B1, B2);

GRP is quarterly ATCO real gross regional product;

RGP is a 3-year lagged average real gas price for Perth;

C is a constant;

DUMM, *DUMD* and *DUMS* are seasonal dummy variables for the March, December and September quarters; and

a1, *a2*, *a3*, *a4*, *a5* and *a6* are parameters to be estimated.

The *GASI* data is the quarterly normalised data derived by NIEIR from ATCO's supplied data. Quarterly ATCO gross regional product is measured at market prices and calculated annually by NIEIR's regional data and modelling team. The price variable is based on the ABS's gas and other household fuels index and the total index for Perth. The price variable is effectively a proxy variable for the industry gas price.

The residential gas equation specification was:

$$ln\ B3C = b1 * C + b2 * ln\ INC + b3 * lnRGP + b4 * DUMM + b5 * DUMD + b6 * DUMS$$

Where:

ln is the natural logarithm;

B3C is quarterly ATCO normalised Tariff B3 use per connection;

INC is quarterly real household disposable income per capita;

RGP is a 3-year lagged average real gas price for Perth;

C is a constant;

DUMM, *DUMD* and *DUMS* are seasonal dummy variables for the March, December and September quarters; and

b1, *b2*, *b3*, *b4*, *b5* and *b6* are parameters to be estimated.

The quarterly ATCO household disposable income and population data were obtained from NIEIR's regional data and modelling team.

6.8.4 Estimation techniques and hypothesis testing

Two alternative estimators were used in this section. These include single equation least squares and Full Information Maximum Likelihood (FIML).

Single equation ordinary least squares (OLS) is the standard estimator for linear models. It minimises the sum of squared residuals.

OLS computes the regression coefficients and associated statistics such as the standard error of the residuals, the Durbin -Watson statistic, and the mean and standard deviation of the dependant variable. The R-Squared and adjusted R-Squared, and F-Statistic are also provided. The R-Squared statistics are a measure for "goodness of fit". The R-Squared statistic is the squared correlation coefficient between the dependent and independent variables.

The Durbin-Watson statistic is a test statistic for autocorrelation. That is, the residuals are correlated amongst themselves.

FIML is a systems estimator and is asymptotically efficient for both linear and non-linear models. The electricity consumption equations for each state are estimated jointly and as an efficient estimator, the standard errors on individual coefficients should be lower under FIML estimation than OLS. Electricity demand equations were estimated jointly using the FIML estimator for New South Wales, Victoria, Queensland, and South Australia.

6.8.5 Estimation results

Table 6.15 provides ordinary least squares (OLS) parameter estimates and R-Squared for total ATCO industry gas use, ATCO Tariffs A1 and A2, and ATCO Tariffs B1 and B2.

For total industry sales and Tariffs A1 and A2 equations, the overall model fit is satisfactory and both the output and price elasticity coefficients assume the correct or expected sign. The Tariffs B1 and B2 equation has a high fit, however, the price variable assumes an incorrect sign.

Table 6.16 provides regression results for total industry, Tariffs A1 and A2, and Tariffs B1 and B2. Strictly speaking, only the total industry equation is valid as the different tariffs only segment gas usage by the volume of customer use. They are provided for comparative purposes only.

The output elasticity in Tariffs B1 and B2 is lower, as would be expected by these types of commercial gas loads. Overall, the industry sales equations for ATCO are satisfactory, with the exception that the price elasticity is quite high.

The OLS estimator for Tariff B3 per connection also performs relatively well over the sample period, with an income elasticity of 0.47 and a price elasticity of -0.61. Again, the price elasticity is quite high, reflecting the sharp increase in gas prices between 2009 and 2013 and the significant demand response by customers over this period.

Table 6.16 shows the full information maximum likelihood equations. Both the own price elasticities for industry gas use fall compared to the initial OLS estimates.

The Durbin Watson statistics indicate the estimated equations are impacted by first order auto-correlation. Corrected regression equations are presented in Table 6.17. Most parameter estimates are similar under the AR1 corrected regression results. The price elasticity for the Tariff B1 and B2 equation assumes the correct sign but is statistically insignificant.

6.8.6 Conclusion

As noted above, the estimation results reported validate the approach, but both the output and price elasticities are quite high. In NIEIR's view, lower elasticities should be utilised in this time series forecasting exercise. Table 6.2 shows the output and long-run price elasticities utilised by NIEIR.

Table 6.15 Ordinary least squares regression results – ATCO industry and residential gas sales									
Industry sales		**Sample**	**R2 adjusted**	**Durbin Watson statistic**	**Output coefficient**	**Price coefficient**	**Dummy variable March**	**Dummy variable December**	**Dummy variable September**
Total industry sales	Parameter	2008:1 to 2022:2	0.78	1.17	0.51	-0.43	-0.13	-0.04	0.05
	t-statistic				4.84	-6.41	-9.04	-3.09	3.63
Tariffs A1 and A2	Parameter	2008:1 to 2022:2	0.67	1.1	0.59	-0.59	-0.09	-0.28	0.027
	t-statistic				4.71	-7.35	-5.68	-1.63	1.62
Tariffs B1 and B2	Parameter	2008:1 to 2022:2	0.91	0.28	0.2	0.26	-0.28	-0.19	0.15
	t-statistic				1.31	2.67	-14.14	-5.85	7.76
Residential gas sales									
Tariff B3 per customer	Parameter	2008:1 to 2022:2	0.99	0.78	0.47	-0.61	-0.57	-0.3	0.22
	t-statistic				3.32	-13.84	-41.17	-21.35	15.65

Notes: The output variable for industry gas sales is real gross regional product. The output variable for residential gas sales is real household disposable income per capita.
The dependent variable and all explanatory variables are in logarithmic form. The residential dependent variable is energy per customer.

Table 6.16 Full information maximum likelihood regression results – ATCO industry and residential gas sales									
		Sample	**R2 adjusted**	**Durbin Watson statistic**	**Output coefficient**	**Price coefficient**	**Dummy variable March**	**Dummy variable December**	**Dummy variable September**
Total industry sales	Parameter	2008:1 to 2022:2	0.8	1.18	0.44	-0.39	-0.13	-0.04	0.05
	t-statistic				2.58	-3.96	10.21	-2.66	3.31
Residential gas sales									
Tariff B3 per customers	Parameter	2008:1 to 2022:2	0.99	0.47	0.46	-0.61	-0.57	-0.3	0.22
	t-statistic				2.75	-11.76	-34.12	-20.58	15.14

Table 6.17 First order auto-regressive disturbances (AR1) regression results – ATCO industry and residential gas sales										
Industry sales		**Sample**	**R2 adjusted**	**Durbin Watson statistic**	**Output coefficient**	**Price coefficient**	**Dummy variable March**	**Dummy variable December**	**Dummy variable September**	**RHO**
Total industry sales	Parameter	2008:1 to 2022:2	0.81	1.79	0.55	-0.46	-0.13	-0.43	0.05	0.41
	t-statistic				4.46	-5.51	-12.7	-3.75	5.11	3.4
Tariffs A1 and A2	Parameter	2008:1 to 2022:2	0.72	1.77	0.61	-0.6	-0.09	-0.27	0.027	0.44
	t-statistic				4.21	-6.1	-8.25	-2.04	2.31	3.76
Tariffs B1 and B2	Parameter	2008:1 to 2022:2	0.98	2.27	0.51	-0.03	-0.28	-0.11	0.16	0.89
	t-statistic				4.95	-0.18	-48.52	-16.67	26.28	15.72
Residential gas sales										
Tariff B3 per customer	Parameter	2008:1 to 2022:2	0.99	1.87	0.44	-0.61	-0.57	-0.3	0.21	0.62
	t-statistic				2.11	-7.98	-72.26	-32.67	26.7	5.56

7. NIEIR forecasts for the ATCO gas distribution region

7.1 Introduction

This section presents NIEIR's forecasts for ATCO volumes, customers and MHQ by major tariff group, Tariffs A1, A2, B1, B2 and B3. The forecasts extend out to calendar 2033, even though the current Access Arrangement is for 2025 to 2029 calendar years.

The methodology, the drivers of gas demand and customer growth, was outlined in Chapters 5 and 6 of this report. Forecasts for the national economy and the Western Australian economy were outlined in Chapters 3 and 4 of this report.

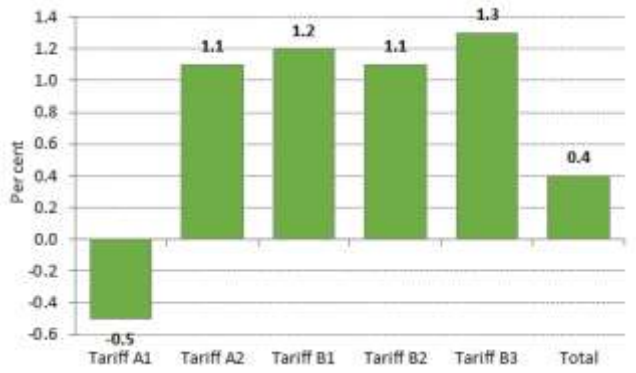
A comparison of the NIEIR (2024) and CORE Energy (2023) forecasts is presented in Chapter 8 of this report.

7.2 Volumes, customers and average usage by tariff group

Tables 7.1, 7.3 and 7.4 show forecast total volumes, customers and average usage by major tariff group, Tariffs A1, A2, B1, B2 and B3. The forecasts are on a calendar year basis. Table 7.2 shows gas volumes by industry, covering tariff groups A1, A2 and B1. There are 20 industry groups identified in Table 7.2, including 11 manufacturing industry groups.

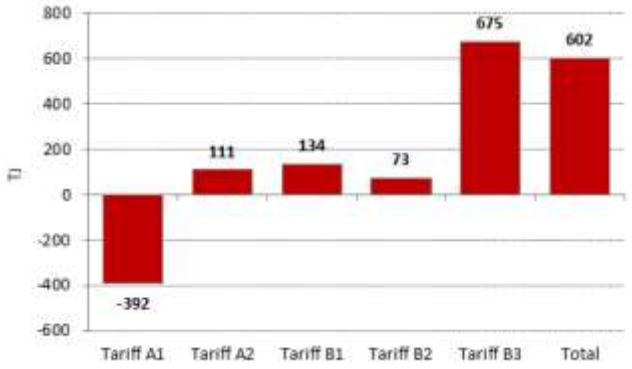
Figures 7.1 to 7.5 summarise the outlook for volumes, customers and average usage between 2024 and 2029. Estimated volumes by tariff group for 2023 use actual year to date volumes to October 2023.

Figure 7.1: Gas volumes by tariff group – ATCO – 2024 to 2029
Compound average growth rate (%)



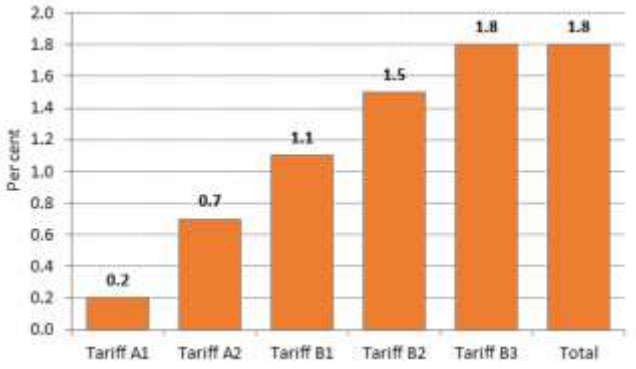
Source: NIEIR forecasts.

Figure 7.2: Gas volumes by tariff group – ATCO – 2024 to 2029
Volume growth (TJ)



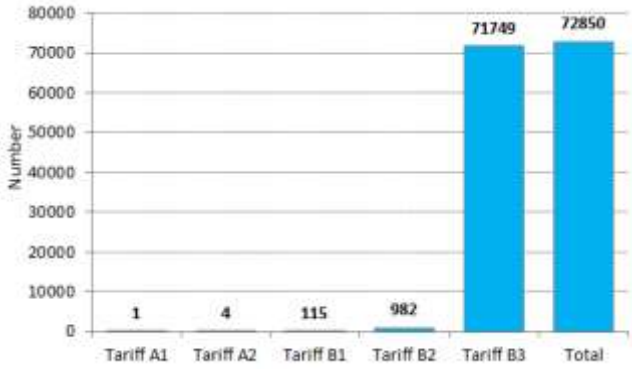
Source: NIEIR forecasts.

Figure 7.3: Customers by tariff group – ATCO – 2024 to 2029
Compound average growth rate (%)



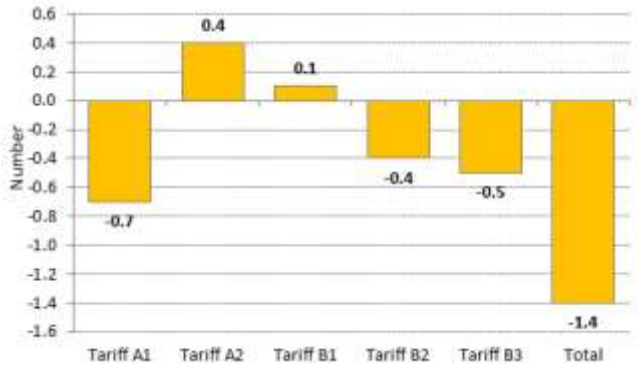
Source: NIEIR forecasts.

Figure 7.4: Customers by tariff group – ATCO – 2024 to 2029
Customer growth (no.)



Source: NIEIR forecasts.

Figure 7.5: Average usage by tariff group – ATCO – 2024 to 2029
Compound average growth rate (%)



Source: NIEIR forecasts.

7.2.1 Tariff A1

Tariff A1 is the largest tariff group by volume and consisted of 73 large usage customers in 2022. ATCO conducted a survey at the end of 2022 on individual customer intentions and planned gas usage to 2029.

Whilst NIEIR was provided access to the survey results, some of the larger user customers contained ambiguous responses. In the CORE Energy forecast of 2023, ATCO made significant adjustments to the Tariff A1 volume forecasts.

NIEIR is also concerned that the survey is outdated from late 2022, particularly given the changed economic conditions including domestic interest rates.

The NIEIR Tariff A1 takes account of the ATCO and CORE Energy increased volumes by 2024 (in the absence of any better advice), but then allows for NIEIR's forecasts to impact Tariff A1 through the 2025 to 2029 period.

Total volume change in Tariff A1 between 2024 and 2029 is a fall of 392 terajoules, or 0.5 per cent per annum.

7.2.2 Tariff A2

Tariff A2 was originally set up to accommodate the larger B1 customers. There were 103 Tariff A2 customers with a total volume of 1,922 terajoules in 2022. Tariff A2 has a mix of commercial and industrial customers, the dominant being food, beverages and tobacco, and government administration, defence, health, education, and community services.

Tariff A2 increases by 111 terajoules between 2024 and 2029, or 1.1 per cent per annum. Customer growth over the period is 4 customers.

7.2.3 Tariff B1

Tariff B1 had 1,968 customers and a total volume of 2,141 terajoules in 2022. Tariff B1 is dominated by commercial customers. Commercial use represents around 84 per cent of total Tariff B1 gas usage. Usage is dominated by offices, other buildings, apartments, hotels, cafes, restaurants and aquatic centres.

Tariff B1 volumes are forecast to increase by 134 terajoules between 2024 and 2029, or 1.2 per cent per annum.

7.2.4 Tariff B2

Tariff B2 has a larger number of smaller customers. Total Tariff B2 volumes were 1,314 terajoules in 2022 with some 12,540 customers. Overall, volume growth between 2024 and 2029 is 73 terajoules and average annual growth is 1.1 per cent per annum. Customer growth is 1.5 per cent per annum, or 982 customers over the same period.

7.2.5 Tariff B3

Tariff B3 represents mostly residential customers, with a total volume of 10,227 terajoules and 767,161 customers. Total Tariff B3 volumes are projected to rise by 675 terajoules between 2024 and 2029, or by 1.3 per cent per annum.

Tariff B3 customer growth between 2024 and 2029 is 71,749 customers, or an average 1.8 per cent growth per annum. Average usage per customer falls from 13.4 gigajoules in 2024 to 13.0 gigajoules in 2029, a fall of 0.4 gigajoules, or 0.5 per cent per annum over the period.

7.3 Ancillary services

NIEIR forecasts of various Ancillary services to 2029 are presented in Table 7.6.

The Ancillary services forecasts were based on applying an average historical rate to total Tariff B3 connections. The average was calculated for 2019, 2020 and 2023. The COVID-19 impacted years of 2021 and 2022 were excluded. The per cent factors applied by service are provided below.

Ancillary services forecast

Meter lock applications	0.739
Meter lock removals	0.614
Deregistrations	0.290
Regulator removals	0.243
Regulator reinstallations	0.236
Special reads	13.171

Table 7.1 Gas volumes terajoules weather normalised (TJ)

	Total sales billed	Tariff A1	Tariff A2	Tariff B1	Tariff B2	Tariff B3
Gas volumes (TJ)						
2018	26,380	11,188	1,781	1,996	1,347	10,067
2019	26,042	10,931	1,849	1,951	1,333	9,978
2020	26,877	11,764	1,718	1,862	1,240	10,294
2021	27,987	12,344	1,826	2,064	1,320	10,433
2022	27,387	11,820	1,915	2,120	1,305	10,227
2023	28,351	12,612	1,894	2,158	1,320	10,367
2024	30,975	15,041	1,962	2,177	1,327	10,467
2025	31,290	15,197	1,981	2,199	1,336	10,578
2026	31,746	15,422	2,013	2,231	1,353	10,727
2027	32,114	15,575	2,038	2,259	1,370	10,874
2028	31,652	14,915	2,054	2,284	1,385	11,014
2029	31,577	14,649	2,073	2,312	1,400	11,142
2030	31,695	14,603	2,089	2,337	1,415	11,251
2031	32,026	14,761	2,107	2,362	1,429	11,367
2032	32,429	14,958	2,132	2,390	1,444	11,505
2033	32,965	15,274	2,166	2,423	1,463	11,641
Average per cent growth (%)						
2018-2022	0.9	1.4	1.8	1.5	-0.8	0.4
2022-2029	2.1	3.1	1.1	1.2	1.0	1.2
2025-2029	0.2	-0.9	1.1	1.3	1.2	1.3
2023-2033	1.5	1.9	1.3	1.2	1.0	1.2
Absolute volume change (TJ)						
2018-2022	1,007	632	134	124	-42	160
2022-2029	4,189	2,829	158	192	95	915
2025-2029	287	-547	92	113	65	564
2023-2033	4,615	2,662	272	265	143	1,273

Note: All data in the NIEIR ATCO model are expressed as real number, not integers. This may produce small rounding errors in per cent changes and absolute changes.

Source: ATCO and NIEIR.

Table 7.2 Industry sales (Tariffs A1, A2 and B1) – terajoules											
	Business sales	Commercial Sales	Electricity, gas & water (excluding GPG)	Construction	Wholesale trade and retail trade	Transport & storage & communication services	Finance insurance property & business services	Government administration, defence, education, health & community services	Accommodation, cafes, restaurants, cultural & recreational services, personal & other services	Industrial sales	Agriculture
2018	14,965	4,029	13	4	356	935	508	1,451	764	10,937	48
2019	14,731	4,006	17	4	377	924	512	1,369	802	10,725	47
2020	15,343	3,715	19	4	356	828	487	1,301	720	11,628	41
2021	16,234	3,910	14	4	377	782	537	1,328	869	12,324	49
2022	15,855	3,887	20	6	390	706	553	1,368	844	11,968	44
2023	16,663	3,959	20	6	395	719	562	1,383	875	12,704	45
2024	19,181	4,000	20	6	398	724	566	1,390	897	15,181	45
2025	19,376	4,041	20	6	401	731	572	1,394	917	15,336	46
2026	19,666	4,098	20	6	408	741	584	1,402	937	15,568	47
2027	19,871	4,151	21	6	414	750	596	1,410	954	15,720	47
2028	19,253	4,200	21	6	420	759	606	1,418	970	15,053	48
2029	19,034	4,252	21	6	426	768	617	1,426	987	14,783	49
2030	19,029	4,300	21	6	432	777	627	1,434	1,003	14,729	50
2031	19,230	4,347	21	6	437	785	637	1,441	1,019	14,882	50
2032	19,479	4,398	22	6	443	794	647	1,450	1,035	15,081	51
2033	19,862	4,458	22	6	450	804	660	1,460	1,055	15,405	52
Average per cent growth (%)											
2018-2022	1.5	-0.9	11.8	12.7	2.3	-6.8	2.1	-1.4	2.5	2.3	-2.2
2022-2029	2.6	1.3	1.0	1.0	1.3	1.2	1.6	0.6	2.3	3.1	1.6
2025-2029	-0.4	1.3	1.1	0.8	1.5	1.3	1.9	0.6	1.9	-0.9	1.6
2023-2033	1.8	1.2	0.9	0.9	1.3	1.1	1.6	0.5	1.9	1.9	1.6
Absolute volume change (TJ)											
2018-2022	889	-142	7	2	34	-229	45	-82	81	1,032	-4
2022-2029	3,179	365	1	0	36	62	64	57	143	2,814	5
2025-2029	-342	211	1	0	25	37	45	32	71	-553	3
2023-2033	3,199	499	2	1	55	86	98	77	180	2,700	8

Table 7.2 Industry sales (Tariffs A1, A2 and B1) – terajoules (continued)												
	Mining	Food, beverages, tobacco manufact-uring	Textiles, clothing and footwear manufact-uring	Wood and paper, wood products	Paper product manufact-uring	Chemicals, petroleum, coal manufact-uring	Non-metallic minerals manufact-uring	Basic metal products manufact-uring	Fabricated metal products manufact-uring	Transport equipment manufact-uring	Other machinery equipment manufact-uring	Miscellaneous manufact-uring
2018	-	1,952	162	358	116	2,798	4,929	78	254	10	83	149
2019	-	1,901	162	612	116	2,643	4,713	71	230	11	77	141
2020	-	1,797	158	664	101	2,407	5,972	53	220	10	96	110
2021	-	1,846	175	635	103	2,656	6,361	59	228	12	73	126
2022	-	1,972	189	617	109	2,240	6,254	78	241	12	78	136
2023	-	1,967	186	623	112	2,266	6,960	75	244	12	79	137
2024	-	2,008	181	623	113	2,284	9,383	71	245	12	80	136
2025	-	2,019	177	622	114	2,299	9,518	67	246	12	81	136
2026	-	2,040	173	621	116	2,323	9,707	64	248	12	82	136
2027	-	2,054	169	619	117	2,341	9,831	61	249	12	84	135
2028	-	2,070	165	618	118	2,361	9,131	59	250	12	85	135
2029	-	2,092	162	618	120	2,387	8,812	56	252	12	87	135
2030	-	2,110	159	618	122	2,409	8,719	54	254	12	88	135
2031	-	2,127	155	618	124	2,430	8,835	51	256	12	90	135
2032	-	2,147	152	619	125	2,454	8,987	49	258	12	91	135
2033	-	2,175	149	620	128	2,487	9,245	47	260	12	94	136
Average per cent growth (%)												
2018-2022	0.0	0.3	3.8	14.6	-1.4	-5.4	6.1	-0.2	-1.3	4.5	-1.8	-2.2
2022-2029	0.0	0.8	-2.2	0.0	1.4	0.9	5.0	-4.6	0.7	0.4	1.6	0.0
2025-2029	0.0	0.9	-2.1	-0.2	1.4	0.9	-1.9	-4.5	0.6	0.3	1.9	-0.1
2023-2033	0.0	1.0	-2.2	0.0	1.4	0.9	2.9	-4.6	0.6	0.3	1.7	-0.1
Absolute volume change (TJ)												
2018-2022	-	20	26	259	-6	-558	1,325	-1	-13	2	-6	-13
2022-2029	-	120	-27	1	11	147	2,557	-22	11	0	9	-0
2025-2029	-	73	-15	-4	6	88	-706	-11	6	0	6	-0
2023-2033	-	208	-37	-3	16	222	2,285	-28	16	0	14	-1

Note: Business sales represent total ATCO industry sales for these tariff groups. Industrial and commercial sales are aggregations of groups as presented in Table 6.1 of this report.

Table 7.3 Gas customers (number)						
	Total number	Tariff A1	Tariff A2	Tariff B1	Tariff B2	Tariff B3
Gas customers (no.)						
2018	746,339	75	105	1,704	11,828	732,627
2019	755,513	74	108	1,774	12,120	741,437
2020	760,796	74	103	1,841	12,139	746,639
2021	770,562	73	105	1,912	12,318	756,154
2022	781,845	73	103	1,968	12,540	767,161
2023	789,612	74	103	1,999	12,730	774,706
2024	798,843	77	105	2,015	12,826	783,820
2025	810,885	77	106	2,033	12,943	795,727
2026	826,106	77	106	2,060	13,175	810,688
2027	841,311	78	107	2,084	13,394	825,648
2028	856,496	77	108	2,106	13,596	840,609
2029	871,693	77	109	2,130	13,807	855,570
2030	886,875	77	109	2,152	14,006	870,531
2031	902,049	78	110	2,173	14,197	885,491
2032	917,243	78	111	2,196	14,406	900,452
2033	932,481	79	112	2,223	14,655	915,413
Average per cent growth (%)						
2018-2022	1.2	-0.7	-0.5	3.7	1.5	1.2
2022-2029	1.6	0.8	0.8	1.1	1.4	1.6
2025-2029	1.8	0.1	0.7	1.2	1.6	1.8
2023-2033	1.7	0.6	0.8	1.1	1.4	1.7
Absolute volume change (no.)						
2018-2022	35,506	-2	-2	264	712	34,534
2022-2029	89,848	4	6	162	1,267	88,409
2025-2029	60,808	0	3	97	864	59,843
2023-2033	142,869	4	9	225	1,925	140,706

Note: All data in the NIEIR ATCO model are expressed as real number, not integers. This may produce small rounding errors in per cent changes and absolute changes.

Source: ATCO and NIEIR.

Table 7.4 Gas average consumption (gigajoules)						
	Total number	Tariff A1	Tariff A2	Tariff B1	Tariff B2	Tariff B3
Average gas consumption (GJ)						
2018	35.3	149,175.0	16,964.7	1,171.4	113.9	13.7
2019	34.5	147,713.5	17,119.2	1,100.0	110.0	13.5
2020	35.3	158,969.1	16,675.2	1,011.3	102.2	13.8
2021	36.3	169,090.5	17,393.3	1,079.4	107.2	13.8
2022	35.0	161,919.2	18,590.8	1,077.2	104.1	13.3
2023	35.9	169,964.9	18,462.8	1,079.6	103.7	13.4
2024	38.8	196,412.2	18,718.1	1,080.5	103.5	13.4
2025	38.6	197,775.8	18,774.5	1,081.5	103.2	13.3
2026	38.4	199,608.6	18,908.5	1,082.9	102.7	13.2
2027	38.2	200,790.2	19,000.6	1,083.9	102.3	13.2
2028	37.0	193,235.0	19,041.1	1,084.6	101.8	13.1
2029	36.2	189,810.8	19,093.8	1,085.5	101.4	13.0
2030	35.7	188,839.3	19,132.7	1,086.2	101.0	12.9
2031	35.5	190,079.9	19,186.0	1,087.0	100.7	12.8
2032	35.4	191,648.4	19,278.5	1,088.1	100.3	12.8
2033	35.4	194,294.2	19,407.3	1,089.7	99.8	12.7
Average per cent growth (%)						
2018-2022	-0.2	2.1	2.3	-2.1	-2.2	-0.8
2022-2029	0.5	2.3	0.4	0.1	-0.4	-0.3
2025-2029	-1.6	-1.0	0.4	0.1	-0.4	-0.5
2023-2033	-0.2	1.3	0.5	0.1	-0.4	-0.5
Absolute volume change (GJ)						
2018-2022	-0.3	12,744.2	1,626.1	-94.2	-9.8	-0.4
2022-2029	1.2	27,891.6	503.0	8.3	-2.7	-0.3
2025-2029	-2.4	-7,965.1	319.4	4.0	-1.8	-0.3
2023-2033	-0.6	24,329.4	944.5	10.1	-3.9	-0.7

Note: All data in the NIEIR ATCO model are expressed as real number, not integers. This may produce small rounding errors in per cent changes and absolute changes.

Source: ATCO and NIEIR.

Table 7.5 Total MHQ billed	
	Tariff 1
Total MHQ billed	
2018	5,866
2019	5,866
2020	5,866
2021	5,866
2022	5,830
2023	5,970
2024	6,325
2025	6,351
2026	6,389
2027	6,415
2028	6,335
2029	6,307
2030	6,307
2031	6,336
2032	6,370
2033	6,370
Average per cent growth (%)	
2018-2022	-0.2
2022-2029	1.1
2025-2029	-0.2
2023-2033	0.7
Absolute volume change	
2018-2022	-36
2022-2029	478
2025-2029	-43
2023-2033	400

Note: The Tariff A1 MHQ data supplied by ATCO does not reconcile with the data published by CORE Energy.

Table 7.6 Ancillary services forecast (number)						
	Meter lock applications	Meter lock removals	Deregistrations	Regulator removals	Regulator reinstallations	Special reads
Ancillary services (no.)						
2018	9,109	7,613	4,704	3,267	2,870	123,645
2019	9,906	8,158	2,222	3,695	3,255	151,050
2020	3,305	3,263	2,802	911	1,357	104,837
2021	1,367	872	2,048	163	182	105,295
2022	813	720	1,570	219	357	108,797
2023	3,502	2,465	1,538	890	718	95,544
2024	5,789	4,810	2,273	1,904	1,846	103,239
2025	5,877	4,883	2,308	1,933	1,874	104,808
2026	5,988	4,975	2,351	1,969	1,909	106,778
2027	6,098	5,067	2,395	2,006	1,945	108,749
2028	6,209	5,158	2,438	2,042	1,980	110,719
2029	6,319	5,250	2,481	2,078	2,015	112,690
2030	6,430	5,342	2,525	2,115	2,050	114,660
2031	6,540	5,434	2,568	2,151	2,086	116,631
2032	6,651	5,526	2,611	2,187	2,121	118,601
2033	6,761	5,618	2,655	2,224	2,156	120,572
Note: **2023 is ATCO forecast numbers supplied.**						
Average per cent growth (%)						
2018-2022	-45.3	-44.5	-24.0	-49.1	-40.6	-3.1
2022-2029	34.0	32.8	6.8	37.9	28.0	0.5
2025-2029	1.8	1.8	1.8	1.8	1.8	1.8
2023-2033	6.8	8.6	5.6	9.6	11.6	2.4
Absolute volume change (no.)						
2018-2022	-8,296	-6,893	-3,134	-3,048	-2,513	-14,848
2022-2029	5,506	4,530	911	1,859	1,658	3,893
2025-2029	442	367	174	145	141	7,882
2023-2033	3,260	3,153	1,116	1,333	1,438	25,028

Notes: Based on CORE Energy reported actuals. ATCO did not supply historical data.
All data in the NIEIR ATCO model are expressed as real numbers, not integers. This may produce small rounding errors in per cent changes and absolute changes.

8. Comparison of NIEIR ATCO forecasts with CORE Energy forecasts to calendar 2029

8.1 Introduction

This section compares NIEIR's 2024 ATCO projections with the CORE Energy forecasts prepared on 14 July 2023, commissioned by ATCO.

Table 8.1 compares the NIEIR and CORE Energy forecasts by tariff over the 2018 to 2029 period. The table shows the NIEIR forecast, the CORE Energy forecast, and the difference, for each year between 2018 and 2029 on a calendar year basis. Since NIEIR has forecast closing customer numbers, Table 8.1 uses CORE Energy closing customer numbers.

The metrics for comparison for each tariff group (A1, A2, B1, B2 and B3) are:

- Total normalised energy;
- Total customers;
- Average energy per customer; and
- MHQ (for Tariff A1 only).

Ancillary services forecasts are also compared on a similar basis in Table 8.2

Table 8.1 Comparison of NIEIR and CORE Energy forecasts – volumes, customers and average usage													
	Unit	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
TARIFF A1													
Gas volumes terajoules weather normalised													
NIEIR	TJ	11,188	10,931	11,764	12,344	11,820	12,612	15,041	15,197	15,422	15,575	14,915	14,649
CORE Energy	TJ	11,178	10,889	11,718	12,322	11,854	12,737	15,048	15,221	14,973	14,950	14,884	14,841
Difference	TJ	10	42	46	22	-34	-126	-7	-24	449	625	30	-192
Gas customers													
NIEIR	Number	75	74	74	73	73	74	77	77	77	78	77	77
CORE Energy	Number	75	74	74	73	73	76	76	76	76	76	76	76
Difference	Number	0	0	0	0	0	-2	1	1	1	2	1	1
Average consumption													
NIEIR	GJ	149,175	147,714	158,969	169,090	161,919	169,965	196,412	197,776	199,609	200,790	193,235	189,811
CORE Energy	GJ	149,041	147,151	158,349	168,793	162,380	167,594	197,998	200,274	197,009	196,705	195,848	195,275
Difference	GJ	134	562	620	298	-461	2,371	-1,585	-2,498	2,600	4,085	-2,613	-5,464
MHQ maximum hourly quantity													
NIEIR		5,866	5,866	5,866	5,866	5,725	5,863	6,212	6,237	6,275	6,301	6,222	6,194
CORE Energy		5,292	5,292	5,292	5,292	5,663	6,085	7,189	7,272	7,153	7,142	7,111	7,090
Difference		574	574	574	574	61	-223	-977	-1,035	-879	-841	-889	-896

Table 8.1 Comparison of NIEIR and CORE Energy forecasts – volumes, customers and average usage (continued)													
	Unit	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
TARIFF A2													
Gas volumes terajoules weather normalised													
NIEIR	TJ	1,781	1,849	1,718	1,826	1,915	1,894	1,962	1,981	2,013	2,038	2,054	2,073
CORE Energy	TJ	1,835	1,849	1,736	1,842	1,879	1,868	1,912	1,933	1,920	1,916	1,911	1,906
Difference	TJ	-53	0	-18	-15	36	26	50	47	93	122	143	167
Gas customers													
NIEIR	number	105	108	103	105	103	103	105	106	106	107	108	109
CORE Energy	number	105	108	103	105	103	104	105	105	105	105	105	105
Difference	number	0	0	0	0	0	-1	0	1	1	2	3	4
Average consumption													
NIEIR	GJ	16,965	17,119	16,675	17,393	18,591	18,463	18,718	18,774	18,908	19,001	19,041	19,094
CORE Energy	GJ	17,472	17,118	16,854	17,539	18,243	17,966	18,210	18,413	18,286	18,246	18,199	18,153
Difference	GJ	-507	1	-179	-145	347	497	509	361	623	755	842	941

Table 8.1 Comparison of NIEIR and CORE Energy forecasts – volumes, customers and average usage (continued)													
	Unit	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
TARIFF B1													
Gas volumes terajoules weather normalised													
NIEIR	TJ	1996	1951	1862	2064	2120	2158	2177	2199	2231	2259	2284	2312
CORE Energy	TJ	1998	1935	1847	2077	2141	2090	2070	2050	2030	2010	1991	1971
Difference	TJ	-2	16	14	-13	-21	68	108	149	201	249	294	341
Gas customers													
NIEIR	Number	1704	1774	1841	1912	1968	1999	2015	2033	2060	2084	2106	2130
CORE Energy	Number	1704	1774	1841	1912	1968	2025	2084	2144	2206	2270	2336	2404
Difference	Number	0	0	0	0	0	-26	-69	-111	-147	-186	-230	-274
Average consumption													
NIEIR	GJ	1171	1100	1011	1079	1077	1080	1081	1081	1083	1084	1085	1085
CORE Energy	GJ	1173	1091	1003	1086	1088	1032	993	956	920	885	852	820
Difference	GJ	-1	9	8	-7	-11	47	87	126	163	198	232	265

Table 8.1 Comparison of NIEIR and CORE Energy forecasts – volumes, customers and average usage (continued)													
	Unit	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
TARIFF B2													
Gas volumes terajoules weather normalised													
NIEIR	TJ	1,347	1,333	1,240	1,320	1,305	1,320	1,327	1,336	1,353	1,370	1,385	1,400
CORE Energy	TJ	1,344	1,329	1,251	1,318	1,297	1,281	1,277	1,273	1,269	1,265	1,262	1,258
Difference	TJ	4	4	-11	2	8	39	50	63	84	104	123	143
Gas customers													
NIEIR	number	11,828	12,120	12,139	12,318	12,540	12,730	12,826	12,943	13,175	13,394	13,596	13,807
CORE Energy	number	11,828	12,120	12,139	12,318	12,540	12,778	13,021	13,268	13,521	13,777	14,039	14,306
Difference	number	0	0	0	0	0	-48	-195	-325	-345	-383	-443	-498
Average consumption													
NIEIR	GJ	114	110	102	107	104	104	103	103	103	102	102	101
CORE Energy	GJ	114	110	103	107	103	100	98	96	94	92	90	88
Difference	GJ	0	0	-1	0	1	3	5	7	9	10	12	14

Table 8.1 Comparison of NIEIR and CORE Energy forecasts – volumes, customers and average usage (continued)													
	Unit	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
TARIFF B3													
Gas volumes terajoules weather normalised													
NIEIR	TJ	10,067	9,978	10,294	10,433	10,227	10,367	10,467	10,578	10,727	10,874	11,014	11,142
CORE Energy	TJ	10,159	10,027	10,426	10,521	10,255	9,940	9,767	9,575	9,389	9,220	9,070	8,937
Difference	TJ	-92	-50	-133	-88	-28	427	700	1,003	1,338	1,654	1,944	2,205
Gas customers													
NIEIR	number	732,627	741,437	746,639	756,154	767,161	774,706	783,820	795,727	810,688	825,648	840,609	855,570
CORE Energy	number	732,627	741,437	746,639	756,154	767,161	776,126	782,880	790,060	798,526	807,905	817,732	827,739
Difference	number	0	0	0	0	0	-1,419	941	5,667	12,162	17,744	22,877	27,831
Average consumption													
NIEIR	GJ	13.7	13.5	13.8	13.8	13.3	13.4	13.4	13.3	13.2	13.2	13.1	13.0
CORE Energy	GJ	13.9	13.5	14.0	13.9	13.4	12.8	12.5	12.1	11.8	11.4	11.1	10.8
Difference	GJ	-0.1	-0.1	-0.2	-0.1	-0.0	0.6	0.9	1.2	1.5	1.8	2.0	2.2

Note: NIEIR has used closing customer numbers for each tariff group in Table 8.1 to be consistent with the NIEIR customer number forecast. This will produce different average usage estimates by tariff when average customer numbers are used instead.

Table 8.2 Comparison NIEIR and CORE Energy – Ancillary services												
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
NIEIR												
Meter lock applications	9,109	9,906	3,305	1,367	813	3,502	5,789	5,877	5,988	6,098	6,209	6,319
Meter lock removals	7,613	8,158	3,263	872	720	2,465	4,810	4,883	4,975	5,067	5,158	5,250
Deregistrations	4,704	2,222	2,802	2,048	1,570	1,538	2,273	2,308	2,351	2,395	2,438	2,481
Regulator removals	3,267	3,695	911	163	219	890	1,904	1,933	1,969	2,006	2,042	2,078
Regulator reinstallations	2,870	3,255	1,357	182	357	718	1,846	1,874	1,909	1,945	1,980	2,015
Special reads	123,645	151,050	104,837	105,295	108,797	95,544	103,239	104,808	106,778	108,749	110,719	112,690
CORE Energy												
Meter lock applications	9,109	9,906	3,305	1,367	813	3,510	6,024	8,651	8,737	8,835	8,941	9,050
Meter lock removals	7,613	8,158	3,263	872	720	2,520	5,457	8,454	8,544	8,645	8,750	8,857
Deregistrations	4,704	2,222	2,802	2,048	1,570	1,575	3,477	3,508	3,543	3,582	3,625	3,669
Regulator removals	3,267	3,695	911	163	219	910	2,423	3,696	3,733	3,775	3,820	3,867
Regulator reinstallations	2,870	3,255	1,357	182	357	730	1,678	3,067	3,098	3,133	3,170	3,209
Special reads	123,645	151,050	104,837	105,295	108,797	95,544	101,335	102,241	103,258	104,418	105,666	106,956
Difference												
Meter lock applications						-8	-235	-2,774	-2,750	-2,737	-2,732	-2,731
Meter lock removals						-55	-647	-3,571	-3,569	-3,578	-3,591	-3,607
Deregistrations						-37	-1,203	-1,200	-1,191	-1,188	-1,187	-1,188
Regulator removals						-20	-519	-1,764	-1,764	-1,770	-1,778	-1,789
Regulator reinstallations						-12	168	-1,193	-1,188	-1,188	-1,190	-1,194
Special reads						0	1,904	2,567	3,520	4,331	5,053	5,734

Note: NIEIR has used closing customer numbers for each tariff group in Table 8.1 to be consistent with the NIEIR customer number forecast. This will produce different average usage estimates by tariff when average customer numbers are used instead.

Appendix A: ATCO service area concordance with Local Government Areas (LGAs)

LGA Code	LGA Name	ATCO Service Area
50080	Albany (C)	0
50210	Armadale (C)	1
50250	Ashburton (S)	0
50280	Augusta-Margaret River (S)	0
50350	Bassendean (T)	1
50420	Bayswater (C)	1
50490	Belmont (C)	1
50560	Beverley (S)	0
50630	Boddington (S)	0
50770	Boyup Brook (S)	0
50840	Bridgetown-Greenbushes (S)	0
50910	Brookton (S)	0
50980	Broome (S)	0
51080	Broomehill-Tambellup (S)	0
51120	Bruce Rock (S)	0
51190	Bunbury (C)	1
51260	Busselton (C)	1
51310	Cambridge (T)	1
51330	Canning (C)	1
51400	Capel (S)	1
51470	Carnamah (S)	0
51540	Carnarvon (S)	0
51610	Chapman Valley (S)	1
51680	Chittering (S)	1
51750	Claremont (T)	1
51820	Cockburn (C)	1
51890	Collie (S)	0
51960	Coolgardie (S)	0
52030	Coorow (S)	0
52100	Corrigin (S)	0
52170	Cottesloe (T)	1
52240	Cranbrook (S)	0
52310	Cuballing (S)	0
52380	Cue (S)	0
52450	Cunderdin (S)	0
52520	Dalwallinu (S)	0
52590	Dandaragan (S)	0
52660	Dardanup (S)	1
52730	Denmark (S)	0
52800	Derby-West Kimberley (S)	0
52870	Donnybrook-Balingup (S)	0
52940	Dowerin (S)	0
53010	Dumbleyung (S)	0
53080	Dundas (S)	0

LGA Code	LGA Name	ATCO Service Area
53150	East Fremantle (T)	1
53220	East Pilbara (S)	0
53290	Esperance (S)	0
53360	Exmouth (S)	0
53430	Fremantle (C)	1
53570	Gingin (S)	0
53640	Gnowangerup (S)	0
53710	Goomalling (S)	0
53780	Gosnells (C)	1
53800	Greater Geraldton (C)	1
53920	Halls Creek (S)	0
53990	Harvey (S)	1
54060	Irwin (S)	0
54130	Jerramungup (S)	0
54170	Joondalup (C)	1
54200	Kalamunda (C)	1
54280	Kalgoorlie/Boulder (C)	0
54310	Karratha (C)	0
54340	Katanning (S)	0
54410	Kellerberrin (S)	0
54480	Kent (S)	0
54550	Kojonup (S)	0
54620	Kondinin (S)	0
54690	Koorda (S)	0
54760	Kulin (S)	0
54830	Kwinana (C)	1
54900	Lake Grace (S)	0
54970	Laverton (S)	0
55040	Leonora (S)	0
55110	Mandurah (C)	1
55180	Manjimup (S)	0
55250	Meekatharra (S)	0
55320	Melville (C)	1
55390	Menzies (S)	0
55460	Merredin (S)	0
55530	Mingenew (S)	0
55600	Moora (S)	0
55670	Morawa (S)	0
55740	Mosman Park (T)	1
55810	Mount Magnet (S)	0
55880	Mount Marshall (S)	0
55950	Mukinbudin (S)	0
56090	Mundaring (S)	1
56160	Murchison (S)	0

LGA Code	LGA Name	ATCO Service Area
56230	Murray (S)	1
56300	Nannup (S)	0
56370	Narembeen (S)	0
56460	Narrogin (S)	0
56580	Nedlands (C)	1
56620	Ngaanyatjarraku (S)	0
56730	Northam (S)	0
56790	Northampton (S)	1
56860	Nungarin (S)	0
56930	Peppermint Grove (S)	1
57000	Perenjori (S)	0
57080	Perth (C)	1
57140	Pingelly (S)	0
57210	Plantagenet (S)	0
57280	Port Hedland (T)	0
57350	Quairading (S)	0
57420	Ravensthorpe (S)	0
57490	Rockingham (C)	1
57630	Sandstone (S)	0
57700	Serpentine-Jarrahdale (S)	1
57770	Shark Bay (S)	1
57840	South Perth (C)	1
57910	Stirling (C)	1
57980	Subiaco (C)	1
58050	Swan (C)	1

LGA Code	LGA Name	ATCO Service Area
58190	Tammin (S)	0
58260	Three Springs (S)	0
58330	Toodyay (S)	0
58400	Trayning (S)	0
58470	Upper Gascoyne (S)	0
58510	Victoria Park (T)	1
58540	Victoria Plains (S)	0
58570	Vincent (C)	1
58610	Wagin (S)	0
58680	Wandering (S)	0
58760	Wanneroo (C)	1
58820	Waroona (S)	0
58890	West Arthur (S)	0
59030	Westonia (S)	0
59100	Wickepin (S)	0
59170	Williams (S)	0
59250	Wiluna (S)	0
59310	Wongan-Ballidu (S)	0
59320	Woodanilling (S)	0
59330	Wyalkatchem (S)	0
59340	Wyndham-East Kimberley (S)	0
59350	Yalgoo (S)	0
59360	Yilgarn (S)	0
59370	York (S)	0

Appendix B: List of files provided by ATCO

07.002 - Core AA6 Supporting Information workbook.xlsx
07.003 - EDD Index Model B123.xlsm
07.004 - MWSWGDS Weather Normalised Model B1 B2 B3.xlsx
07.005 - MWSWGDS Demand Forecast Model_DDR.xlsx
A1 & A2 Survey Information.docx
CONFIDENTIAL - ATCO Forecast Survey 2022_FINAL_N88 .xlsx
2023 Ancillary Services Revenue Forecast Jan - Dec 22 Dec 22 EIM.xlsx
A1 and A2 Daily Data 2022.xlsx
A1 and A2 Daily Data.xlsx
AGA B3 consumption banded 2011-2022 v2.xlsx
Ancillary Services YTD2023.xlsx
Bureau of Meteorology Climate Data 20223112.xlsx
Copy of 33207_ATCO Forecast Survey 2022_FINAL_N=88.xlsx
Daily Closing Customer Base extended to 31 Dec 2022.xlsx
Daily New Connection B1-B3 up to 31 Dec 2022.xlsx
Demolition Data Set - 2015-YTD2023.xlsx
Gate Inflows 2008 to 30082022 v2 (20221231).xlsx
New Customer Usage by Year 20211231.xlsx
Volumes and Connection History 13022023.xlsx
ZCM.xlsx
2023 Ancillary Services Revenue Forecast Actualised only Jan - Oct 23.xlsx
500 B1 Customers.xlsx
A1 A2 Daily Data Oct 23 YTD.xlsx
A1_A2 Customer List.xlsx
AGA B3 consumption banded 2011- Oct 2023.xlsx
Bureau of Meteorology Climate Data 20231031.xlsx
Daily Closing Customer Base extended to Oct 2023.xlsx
Daily New Connection B1-B3 up to Oct 2023.xlsx
Demolition Data Set - 2015 - OCT 23 YTD.xlsx
Gate Inflows 2008 to 31102023 v2_.xlsx
New Customer Usage by Year - 2023.xlsx
Volumes and Connection History 13112023.xlsx

Glossary

AA	Access Arrangement
AA5	Fifth Access Arrangement
AA6	Sixth Access Arrangement
ABS	Australian Bureau of Statistics
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AGA	ATCO Gas Australia
ARI	First order serial correlation correction estimator
BOM	Bureau of Meteorology
CORE Energy	CORE Energy and Resources
EDD	Effective Degree Day
ERA	Economic Regulation Authority – Western Australia
FIML	Full Information Maximum Likelihood Estimation
GDS	Gas Distribution Systems
GJ	Gigajoule
GSP	Gross State Product
GRP	Gross Regional Product
HDD	Heating Degree Day
MHQ	Maximum Hourly Quantity
MWSWGDS	Mid-West and South-West Gas Distribution Systems
NGR	National Gas Rules
NIEIR	National Institute of Economic and Industry Research
OLS	Ordinary Least Squares
PJ	Petajoule
TJ	Terajoule
WA	Western Australia
WN	Weather Normalisation