Attachment 7

Demand forecasts

Access arrangement information

ACT and Queanbeyan-Palerang gas network 2021–26

Submission to the Australian Energy Regulator

June 2020

evoenergy

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7 Demand forecasts

Key points

- Gas demand and customer number forecasts are used to determine Evoenergy's operating and capital expenditure requirements, as well as the prices we charge for using the gas network.
- We commissioned the Centre for International Economics to develop forecasts for our two market segments – volume customers (residential and small business), and demand customers (large businesses).
- The forecasts take into account a range of factors including population growth, weather effects, gas prices, and the historically declining trend in average gas usage per customer.
- The forecasts also account for the impacts of the ACT Government's Climate Change Strategy, which outlines a commitment to explore alternatives to natural gas. This policy is predicted to result in fewer new gas connections, higher rates of disconnection, and lower overall usage per customer.
- We forecast the number of connections to grow by 4,700 (3.1 per cent) over the 2021-26 period. Usage per customer has consistently decreased during the 2016–21 AA period, and we forecast this to continue in 2021–26, with an average annual decrease of 2.9 per cent over the period. Overall, total gas usage is expected to fall from 7.5 PJ in 2021-22 to 6.9 PJ in 2025-26.
- We listened to customer groups in developing our forecasts. Stakeholders were generally supportive of our demand forecasting approach and recognised the importance of accounting for the ACT government's campaign to transition away from natural gas. While some feedback suggested Evoenergy should assume greater reductions in gas demand in response to ACT policy, most submissions recognised the uncertainty around the precise impacts of climate policy during the 2021-26 period.

7.1 Introduction

Gas demand forecasts are a critical input into our access arrangement proposal. The forecasts are used to determine Evoenergy's operating and capital expenditure requirements, as well as our reference tariffs for the 2021-26 period.

Under the Rules, as part of its Access Arrangement Information, Evoenergy is required to provide an explanation of its forecasts. Specifically, Rule 74 requires that:

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

In addition, Rule 75 requires that information in the nature of an extrapolation or inference must be supported by the primary information on which the extrapolation or inference is based.

This attachment provides an overview of Evoenergy's forecasts of customer numbers and gas demand over the 2021-26 AA period. The attachment explains the basis on which the forecasts were developed, the relevant supporting information, and why the forecasts represent the best possible forecast in the circumstances. The attachment should be read in conjunction with the detailed demand forecasting report (Appendix 7.1), which provides an in-depth explanation of the assumptions and methodology employed in the forecasts.

The development of the forecasts has been strongly influenced by the policy environment in the ACT, including the ACT Government's target of net zero greenhouse gas emissions by 2045. We have sought feedback on our forecasts from a range of stakeholders and have worked closely with our expert consultant to develop a forecast that is as accurate as possible.

This attachment is structured as follows:

- Section 7.2 describes the approach to forecasting gas demand including customer numbers and consumption per connection in each of our two key customer markets
- Section 7.3 provides an overview of our gas demand forecast results
- Section 7.4 summarises the engagement we have undertaken in developing the demand forecasts, and the feedback we have heard
- Section 7.5 reviews the forecasts of gas demand for the 2016-21 period, including customer numbers and consumption per connection, and describes some of the updates made in the 2021-26 forecasts to ensure we have the best possible forecast for the upcoming AA period

7.1.1 Supporting appendices

A detailed technical description of the demand forecasting methodology and calculations is provided in the following attachments, prepared by our consultant the Centre of International Economics (CIE):

- **Appendix 7.1:** Demand forecasting report
- **Appendix 7.2:** Demand forecasting model (Excel spreadsheet), which includes additional post-model adjustments applied by Evoenergy.

7.2 Approach to forecasting

Evoenergy commissioned the Centre for International Economics (CIE), as expert consultants to develop an independent and detailed forecast of demand and customer numbers for Evoenergy's gas distribution network. CIE is recognised for its experience in providing rigorous and trusted forecasts for energy markets, having previously undertaken forecasting work for the AEMC, and other electricity and gas distribution businesses in Australia and overseas.

CIE's approach involves developing forecasts for our two tariff classes:

- Volume customers, which include around 150,000 residential and small business customers who use less than 10 terajoules (TJ) of gas a year and are charged based on the volume of gas they consume; and

- Demand customers, which include around 40 of our largest commercial and industrial customers who use more than 10 TJ of gas a year and are mainly charged on how much capacity in the supply pipeline they require.

For each class, CIE forecast total gas usage by combining two components: a forecast of customer numbers and a forecast of usage per customer. For demand customers, CIE forecast usage for each individual customer. The specific forecasting approach for volume and demand customers is outlined in Sections 7.2.1 and 7.2.2 below.

The forecasts were then adjusted to account for the expected effects of the ACT Government's Climate Change Strategy. While some of the initial policy impacts are reflected in the historical trends used in CIE's econometric model, Evoenergy recognises that the policy environment has continued to evolve since the time of CIE's modelling. Accordingly, the full effects of the ACT Government's policy in the 2021-26 AA period are not accounted for in historical trends. Evoenergy has therefore developed a series of post-model adjustments that reflect a conservative expectation of reduced gas usage and connection numbers in 2021-26 as customers continue to respond to new incentives offered by the ACT Government. The CIE's approach to modelling these impacts, and Evoenergy's post-model adjustments, are described in Section 7.2.3

7.2.1 Volume customers

Volume customers make up the majority of Evoenergy's gas network customers and comprise smaller customers who use less than 10 terajoules (TJ) of gas a year.

In developing the forecasts, CIE segmented the volume market by residential and small commercial customers to reflect different drivers of demand between the two groups. Residential customers were further segmented by detached dwellings and medium density/high rise dwellings in ACT and NSW. The connection numbers were forecast by CIE at the postcode level, to account for the differing trends in growth across new and established suburbs.

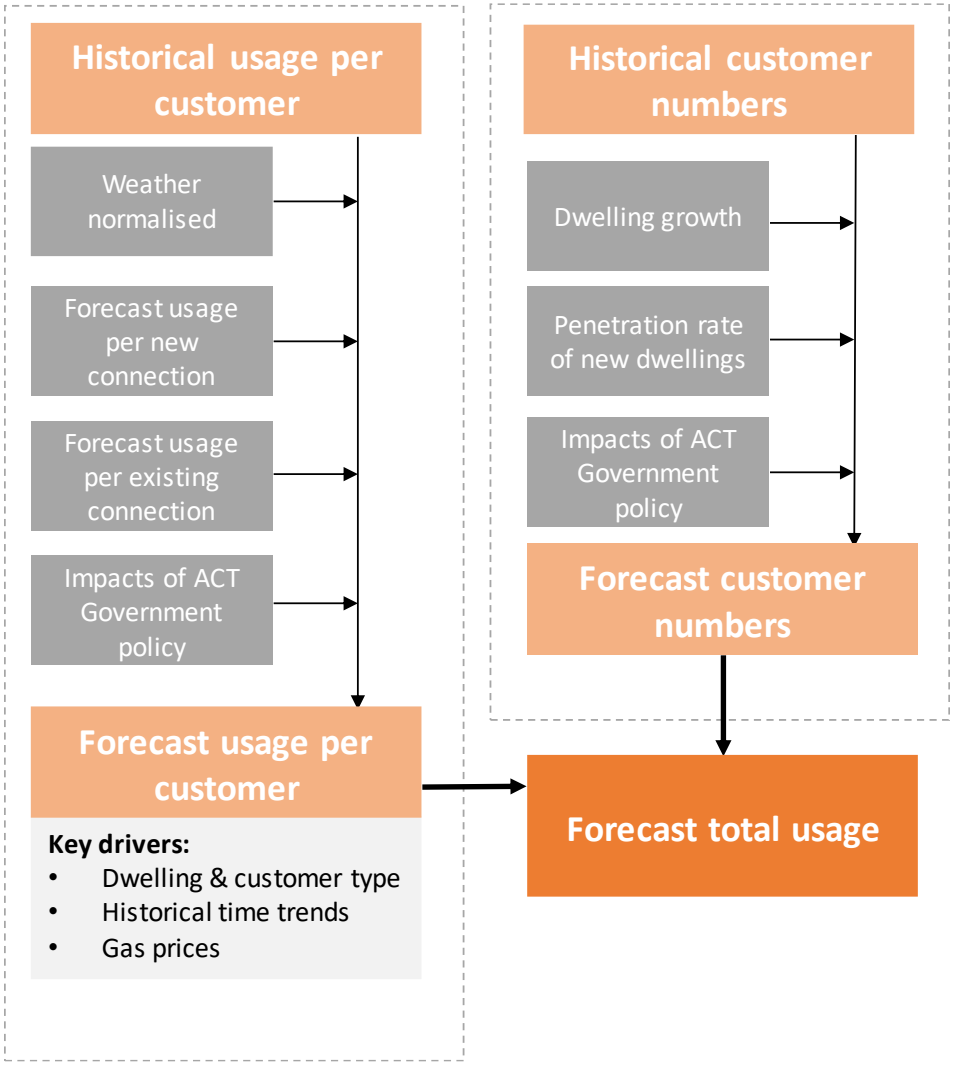
Figure 7.1 summarises CIE's approach to forecasting demand for the volume market. The key steps include:

- Forecasting net new customers:
  - For residential customers, this involves projecting new dwelling approvals based on ACT Government population growth forecasts,[1] then applying a marginal penetration rate based on the observed ratio of new customers to dwelling approvals
  - For small commercial customers, the number of connections has been forecast based on historical trends and was then allocated across postcodes based on each postcode's contribution to overall growth over the last three years.
- Decomposing net new customers into connections at new builds, electricity-to-gas conversions and abolishments (permanent disconnections)

[1] For NSW segments, dwelling approvals are projected based on NSW Government dwelling projections.

- Forecasting usage per customer using a fixed-effects econometric model for each connection type, accounting for the effects of weather,[2] gas prices and historical time trends
- Applying adjustments to reflect the impacts of the ACT Government's climate change strategy (see section 7.2.2 below)
- Combining the forecasts for customer numbers and usage per customer to derive a forecast of total gas usage for each customer and dwelling type.

Figure 7.1 Volume customer forecast methodology



A further adjustment was made to account for suspended connections (where the meter and supply infrastructure remain in place, but the physical flow of gas is prevented). In the past, retailers of customers with a suspended connection were still billed fixed charges. However, from October 2019, these retailers have not been charged fixed

[2] The weather effect is captured through the Effective Degree Day metric which measures the difference between average temperature throughout each day and a base comfort level temperature, with additional impacts of wind chill, solar insolation, and seasonal factors.

charges for customers following disconnection. This creates a strong incentive for retailers with customers who are not using their gas supply to suspend their connection. It is therefore assumed that customers who have recorded zero consumption for the last 12 months or longer will be suspended and will no longer pay the fixed charge. There are currently approximately 7,000 connections in this category.

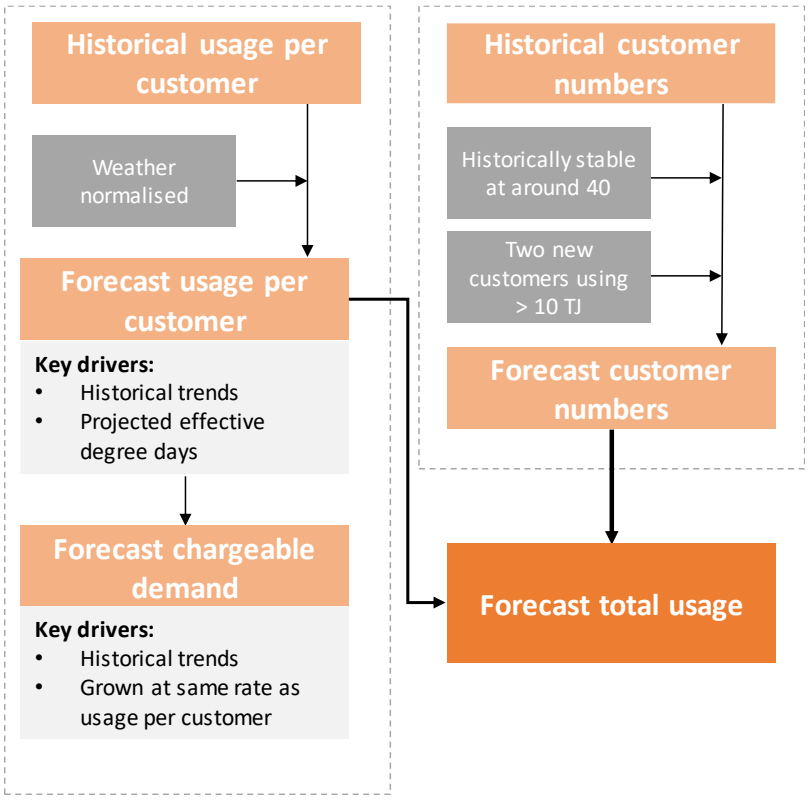
7.2.2 Demand customers

Demand customers are industrial or large government customers who use more than 10 TJ per year and are charged based on their chargeable demand or throughput. While demand customers make up less than 0.03 per cent of Evoenergy's gas customers, they contribute to around 16 per cent of total gas demand.

Figure 7.2 summarises CIE's approach to forecasting gas usage and customer numbers for the demand market. The key steps include:

- Forecasting customer numbers to remain stable at the current level of 41 customers, with an increase of two customers projected in 2019/20 to account for two volume customers who have recently used more than 10 TJ over 12 months.
- Forecasting annual usage for each customer based on historical weather-normalised usage and a projection of effective degree days.
- Forecasting chargeable demand for each customer based on the ninth-highest usage day for each customer during 2018/19, grown at the same rate as the annual usage forecast.
- Combining the forecasts for customer numbers and usage per customer to derive a forecast of total gas usage for each customer and dwelling type

Figure 7.2 Demand customer forecast methodology



7.2.3 Impacts from the ACT Government climate change strategy

The ACT Government's legislated target of net zero greenhouse gas emissions by 2045 is a significant source of uncertainty for the demand forecasts. With the recently achieved milestone of net zero emissions from electricity in the ACT, natural gas and transport remain the major sources of emissions in the ACT.

The ACT Government's Climate Change Strategy 2019–25 outlines the government's commitment to explore alternatives to natural gas to meet emissions targets, and to campaign for a transition from gas to electric options. As one possible outcome, the strategy contemplates mass disconnection of customers from the gas network by 2025.[3]

The goals set out in the strategy are likely to impact the gas demand forecast in several critical ways. These include reducing the rate of gas connections for new dwellings, increasing disconnections by existing dwellings, and reducing overall usage per customer.

To date, the ACT Government has already commenced several actions under the strategy to reduce emissions from gas, including:[4]

- Amending planning regulations to remove the mandating of reticulated gas in new suburbs (*Action 4.3*)
- Conducting a campaign to support the transition from gas by highlighting electric options (*Action 4.4*)
- Providing incentives under the Energy Efficiency Improvement Scheme (EEIS) for households to install a heat pump hot water system or reverse cycle air conditioner to replace gas appliances.

The CIE's approach to modelling these impacts is outlined below, with further detail provided in CIE's report at Appendix 7.1.

7.2.3.1 REMOVAL OF MANDATED GAS RETICULATION IN NEW SUBURBS

CIE notes that the removal of mandated gas reticulation in new ACT suburbs is a readily available option for the ACT Government to reduce gas connections over the 2021–26 period.[5] Connections in greenfield development areas are likely to be the first to cease under the ACT Government's climate change strategy. To give effect to this strategy, in early 2020, the ACT Government published a variation to the Territory Plan to remove the mandatory requirement for gas connection to bocks in new suburbs from the Estate Development Code.[6]

The removal of mandated reticulation is further reinforced by the ACT Government's campaign to transition from gas to electric options. For example, this includes the recently announced Home Energy Rebate Program, which offers residential home buyers in Whitlam rebates of up to $10,000 if, among other things, they do not connect

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3 ACT Climate Change Strategy 2019-25, p. 39.
4 ACT climate change strategy 2019-25, p.10.
5 Centre for International Economics, Forecast demand for natural gas ACT and Queanbeyan-Palerang 2021-26, p.31.
6 ACT Government, Planning and Development (Draft Variation No 373) Consultation notice 2020. Notifiable instrument NI2020-26 (ACT)

their house to the gas network.[7] Similarly, under the ACT Government's EEIS, households are eligible to receive rebates of up to $5,000 to replace gas heating, and discounts are also available to upgrade gas hot water to electric heat pump systems

As a result, CIE have forecast zero gross new connections from 2021–22 in four postcodes with significant forecast greenfield development:[8]

- 2611, which includes Denman Prospect and Whitlam;
- 2615, which includes Strathnairn and Macnamara;
- 2618, which includes Gooromon; and
- 2914, which includes Taylor

For these postcodes, only gross new connections have been forecast as zero, and net new customers are calculated as the residual after accounting for abolishments and electricity-to-gas (E2G) connections.

7.2.3.2 ACT GOVERNMENT CAMPAIGN AND INCENTIVES TO TRANSITION FROM GAS TO ELECTRIC OPTIONS

In developing its forecast, CIE has modelled the incremental impact of new rebates for switching from gas to electric appliances under the ACT Energy Efficiency Improvement Scheme (EEIS). In July 2019 new rebates were introduced offering up to $5,000 for upgrading a ducted gas heater to reverse cycle air conditioning, and up to $2,500 for upgrading a room heater. Based on initial data from the EEIS over the period August 2019 to January 2020, CIE has forecast that the current rebate will result in existing ACT residential customers using 2.8 per cent less gas by 2025-26.

Similarly, the demand forecast assumes that electricity-to-gas connections will continue to decline over the 2021-26 AA period given the ACT Government Climate Change Strategy. E2G connections have shown consistent declines between 2016/17 and 2018/19 (falling by around 34 per cent each year), and this trend is expected to continue over the 2021-26 AA period.

However, it is noted that this analysis is based on early data from the EEIS following the introduction of the new rebates (covering a 6 month period from August 2019 to January 2020). Rates of take-up residential customers are likely to increase as the ACT government continues to campaign for the transition from gas to electric options, and there is greater awareness of available rebates in the community. CIE also notes that it is possible the ACT Government may introduce additional incentives for electrification during the forecast period, which would further reduce gas usage.[9]

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7 ACT Government Suburban Land Agency, Home Energy Rebate Program – Whitlam, March 2020.

8 Evoenergy has assumed there will be a 50 per cent reduction in greenfield connections in 2020–21, ramping up to 100 per cent in 2021–22

9 Centre for International Economics, Forecast demand for natural gas ACT and Queanbeyan-Palerang 2021-26, p67.

7.2.3.3 ADJUSTMENTS FOR IMPACTS OF ACT POLICY DURING 2021-26

While the ACT Government has commenced work on implementing some aspects of the strategy, many of the strategy's impacts will not yet be reflected in current trends in gas usage and connection numbers. In particular, the effects of the ACT Government's broader campaign to transition from gas to electric options are likely to manifest during the 2021-26 AA period as the ACT Government ramps-up initiatives to implement the strategy. An example of one such initiative is the recently announced rebate of up to $10,000 for residential home buyers in Whitlam who commit to energy efficiency measures, including an undertaking to not connect to the gas network.[10]

Another factor that will affect future gas demand is Evoenergy's ongoing market campaign for customers to install newer, more energy efficient gas appliances. For example, customers can receive a $500 rebate for installing a 5 or 6 star energy efficient whole-of-home ducted gas system, or $300 for a new gas hot water system. As the penetration of new, energy efficient gas appliances grows, gas usage per customer is expected to fall in the ACT.

These future impacts will necessarily not be captured in the econometric framework used for the demand forecasts, which relies heavily on observed historical data to project future demand. Evoenergy considers that not accounting for these impacts in the demand forecast would be an unrealistic response to the goals set out in the ACT Government's climate change strategy. This concern was also shared by customer groups with whom we engaged on our forecasts (see Section 7.4). Therefore, Evoenergy has developed a series of post-model adjustments that reflect a conservative expectation of decreasing gas usage and a higher number of disconnections over the 2021-26 period. The adjustments include:

- 10 per cent reduction in gas usage by existing ACT customers by 2025/26; and
- Tripling of the rate of abolishments by 2025/26 (an increase from approximately 350 per year to 1000 per year).

The adjustments have been assumed to follow a linear ramp-up beginning in 2020/21 and reaching their full value by 2025/26. These adjustments are shown in the demand forecasting model contained in Appendix 7.2. Note, since these adjustments are additional to the early policy impacts modelled by CIE, the results shown in the demand forecasting model may not match those described in CIE's written report contained in Appendix 7.1.

The effects are inclusive of both the impacts of government policy to date (as captured in CIE's demand model), as well as the additional impacts expected during the 2021-26 AA period. The adjustments have only been applied to customers on the Volume Residential Individual (VRI) tariff since the ACT Government's campaign to date has been largely focussed on residential and small business customers.

We note that these assumptions are conservative and do not account for the full breadth of options contemplated by the ACT government, such as the possibility of disconnecting around 60,000 existing customers by 2025.[11] As discussed in Section 7.4, some consumer groups provided feedback that Evoenergy's demand forecasts should include more significant reductions in usage and customer numbers based on the ACT Government's policy. However, Evoenergy considers that, given the uncertainty surrounding the precise size of the expected impacts, a more measured approach is

[10] ACT Government Suburban Land Agency, *Home Energy Rebate Program – Whitlam*, March 2020.
[11] ACT Climate change strategy 2019–25, p.39.

appropriate for the 2021-26 AA period. Evoenergy will continue to monitor the impacts on gas demand as the ACT Government's policy develops, and whether any additional adjustments may be necessary to the demand forecast in the 2026-31 AA period.

7.3 Overview of 2021-26 demand forecast

This section provides an overview of our proposed gas demand and customer number forecast for the 2021-25. The detailed forecast results and supporting calculations are contained in Appendix 7.2.

7.3.1 Volume tariff customers

Table 7.1 sets out our forecast of connection numbers (number of fixed charges), usage per connection, and total usage for volume customers for the 2021-26 period. This captures all customers on the Volume Residential Individual (VRI) and Volume Residential Boundary (VRB) tariffs.

Table 7.1 Volume market forecast 2021-26

	2021/22	2022/23	2023/24	2024/25	2025/26
Number of connections (fixed charges)	152,027	153,367	154,581	155,678	156,730
Usage per connection (GJ/a)	41.15	39.72	38.40	37.24	35.90
Total usage (GJ/a)	**6,255,863**	**6,091,617**	**5,935,843**	**5,796,847**	**5,625,937**

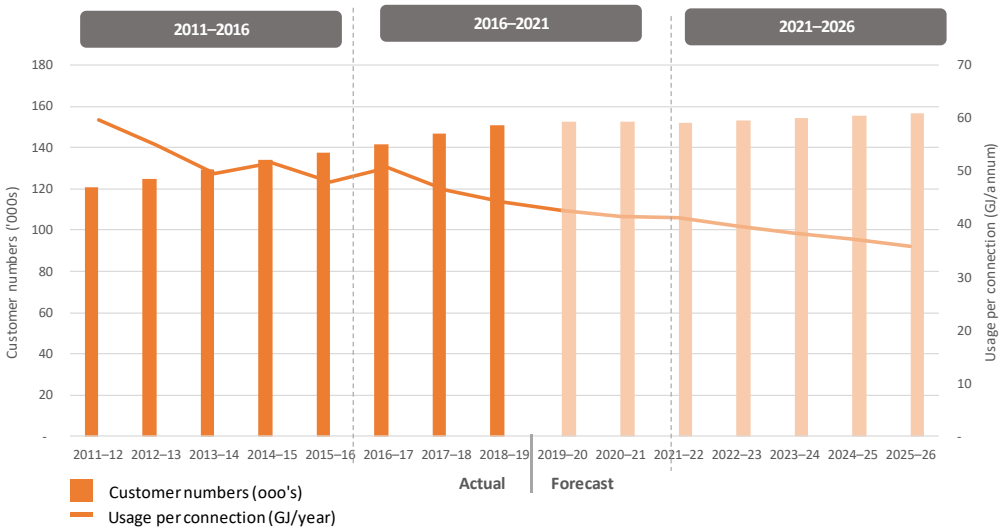
Note: number of connections is expressed as an average over the year

Figure 7.3 shows the forecast and historical usage per customer and number of connections. Connections are expected to continue growing over the 2021-26 period, increasing by 3.1%. However, the rate of growth is slower than historically due to the impacts of the ACT Government's Climate Change Strategy.

Usage per connection is forecast to continue its historical declines, reflecting greater energy efficiency in homes, uptake of incentives under the EEIS, and the ACT Government's campaign to transition from gas to electric appliances. Between 2021/22 and 2025/26, usage per connection is forecast to decline by an average of 3.4% per year.

Overall, total gas usage in the volume market is expected to decline by 10% between 2021/22 and 2025/26. This is slightly above the 8% decrease seen in the 2011-16 period, but below the 11% decrease expected for 2016-21.

Figure 7.3 Volume market historical and forecast connection numbers and usage



7.3.2 Demand tariff customers

Table 7.2 sets out the forecast number of connections, usage and chargeable demand for Evoenergy's demand tariff.

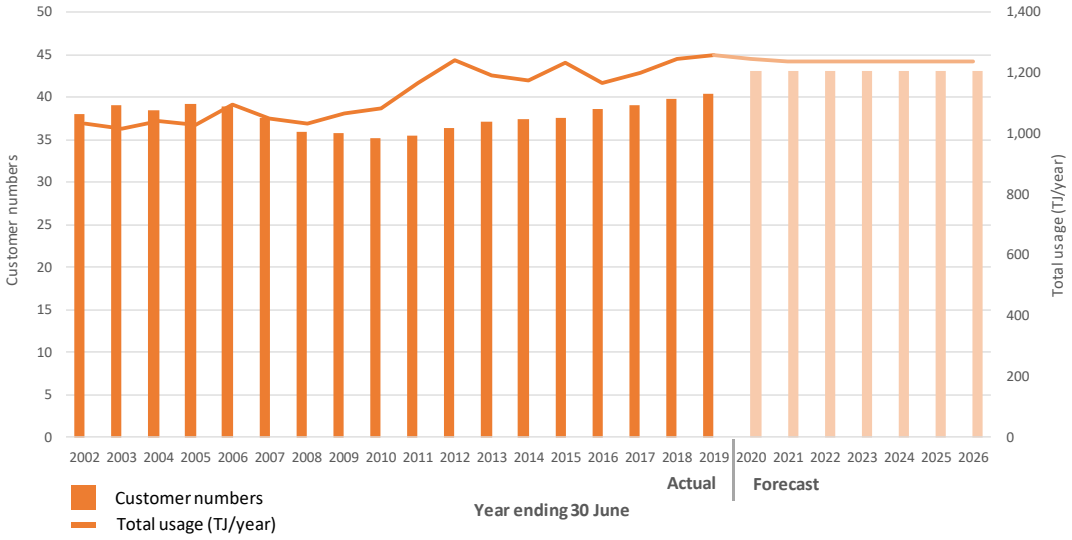
Table 7.2 Demand market forecast 2021-26

	2021/22	2022/23	2023/24	2024/25	2025/26
Number of connections (fixed charges)	43	43	43	43	43
Usage per connection (TJ/a)	28.80	28.79	28.78	28.77	28.76
Total usage (TJ/a)	**1,238**	**1,238**	**1,237**	**1,237**	**1,237**
Total chargeable demand (GJ/day)	**7,200**	**7,197**	**7,194**	**7,191**	**7,187**

Note: number of connections is expressed as an average over the year

Figure 7.4 shows the forecast and historical usage per customer and number of connections for Evoenergy's demand customers.

Figure 7.4 Demand market historical and forecast connection numbers and usage



The number of demand customers has been relatively stable at around 40 customers for the past 18 years, and this trend is forecast to continue for the 2021-26 AA period. An increase of two customers is forecast in 2019/20 to account for two volume customers who have recently used more than 10 TJ over 12 months, with no further growth in customers forecast thereafter. Overall, demand customers are forecast to use around 1.2 PJ each year, similar to levels observed over the past 8 to 9 years.

7.4 What we heard from stakeholders

Evoenergy received feedback on its forecast of connection numbers and gas usage through a number of channels, including submissions to the 2021-26 Draft Plan and the citizens' jury process.

The focus of stakeholder feedback on the demand forecast was the impact of the ACT Government's Climate Change Strategy. Stakeholders were generally supportive of Evoenergy's demand forecasting approach and recognised the importance of taking account of recent government policy developments in the ACT. However, some stakeholders commented that Evoenergy's forecast of gas usage and connection numbers was too high in light of the ACT Climate Change Strategy. Most stakeholders, however, recognised the degree of uncertainty surrounding the precise effects expected during the 2021-26 AA period.

In relation to the demand forecast, our 2021-26 Draft Plan asked stakeholders, "*Does our approach seem reasonable in light of the ACT Government's Climate Change Strategy and commitment to explore alternatives to natural gas?*"

Most submissions agreed that the overall demand forecasting approach is reasonable and methodologically sound. Stakeholders also acknowledged the importance of modelling the ACT's policy to transition from natural gas to electric options.

The ACTCOSS submission generally agreed with Evoenergy's assumption of zero gross new connections in major greenfield areas. ACTCOSS also agreed with the assumption of reduced gas usage per customer and increased gas disconnections in 2021-26. However, ACTCOSS suggested that Evoenergy's assumptions of falling demand may not go far enough with respect to addressing some of the options contemplated in the

ACT Climate Change Strategy, such as the disconnection of around 60,000 existing households by 2025. The CCP24 submission to the draft plan arrived at a similar conclusion and recommended a scenario-based analysis to examine the options proposed in the ACT Climate Change Strategy. CCP24 also recommended that Evoenergy take into account commitments made by specific customers such as ACT Health, the Australian National University, and ACT Public Housing to move towards electric and renewable options.

Some consumer submissions to the draft plan provided feedback that Evoenergy's demand forecast should include the cessation of all new gas connections in response to the ACT Government's Climate Change Strategy. This included a submission from the Conservation Council which supported a rapid phase-out of natural gas over the next ten years to meet emissions targets. Other submissions, such as from advocacy group Better Renting, considered that Evoenergy's demand forecast should reflect a shrinking gas network due to policy incentives for greater electrification. A similar recommendation was arrived at by Evoenergy's Citizen's Jury, which proposed 'that Evoenergy suspend expending the gas network into new developments until low emissions sources of gas become available'.[12]

In contrast, there were also a small number of submissions to the Draft Plan that considered that Evoenergy should continue to expand the gas network into major greenfield areas to meet customers' preferences for natural gas heating and cooking appliances.

On balance, Evoenergy considers that the 2021-26 demand forecast represents a measured and conservative response to the ACT Government's climate policy. As discussed in Section 7.2.3, we have taken account of stakeholder feedback by adopting a series of top-down post-model adjustments relating to fewer new gas connections, higher rates of disconnections, and lower usage per customer during 2021-26. Given the uncertainty that remains over the precise impacts, we consider this approach is preferable to a bottom-up method that attempts to quantify specific policy outcomes and customers' behavioural responses.

The precise nature and magnitude of the policy impacts are likely to become apparent only during the 2021-26 AA period, as the ACT's climate change policy further develops, and consumers continue to respond to incentives to transition to greater electrification. Our demand forecast allows us to continue to preserve value in the gas network for current and future customers, while also recognising the ACT Government's campaign. Evoenergy will continue to monitor gas demand during the 2021-26 AA period to evaluate any further adjustments to the demand forecasting approach that may be required in the 2026-31 AA period.

7.5 Review of current period demand and forecasts

This section summarises Evoenergy's gas demand and customer numbers in the 2016-21 AA period, as required under the Rules, and how we performed against our demand forecast for the period.

[12] Evoenergy, *Report from the Evoenergy Citizens' Jury*, Supplementary Recommendation 2, 3 November 2019.

7.5.1 Gas demand and customer numbers in 2016-21

Rule 72(1)a(iii) of the Rules requires that Evoenergy show for the 2016-21 AA period the minimum, maximum and average demand for our network. This information is presented in Table 7.3 for the years we have actual data.

Table 7.3 Minimum, maximum and average daily load

Terajoules	2016/17	2017/18	2018/19
Minimum load	4.29	5.36	4.69
Maximum load	64.68	61.25	64.47
Average load	23.64	22.73	22.45

The Rules also require Evoenergy to provide customer numbers, in total and by tariff class. This information is provided in Table 7.4.

Table 7.4 Minimum, maximum and average daily load

Terajoules	2016/17	2017/18	2018/19	2019/20 (*forecast*)	2020/21 (*forecast*)
Volume tariff class	141,807	146,967	151,102	152,667	152,917
Demand tariff class	39	40	40	43	43
Total	**141,846**	**147,007**	**151,142**	**152,710**	**152,960**

Numbers are expressed as an average over each financial year.

Rule 72(1)(d) provides that an Access Arrangement Information must include to the extent practicable a forecast of pipeline capacity and utilisation over the next AA period and the basis upon which the forecast has been derived. Capacity and utilisation information for a distribution network is not available or relevantly meaningful, and there are a number of practical considerations governing why it is not possible to calculate capacity and utilisation for Evoenergy's gas distribution network.

7.5.2 Review of gas forecast for 2016-21 period

Our forecast for the current 2016-21 AA period was prepared by Core Energy in 2015. The forecasts also included 2014/15 and 2015/16 (the last two years prior to the current AA period). The AER revised the forecasts in its draft decision. Evoenergy also proposed revisions to the connections forecast for medium density/high rise customers, which were accepted in the AER's final decision.

In developing our forecast for the 2021-26 AA period, our consultants CIE reviewed the gas forecasts for the earlier AA period and identified some improvements that were implemented in the current forecasting methodology. A detailed review of the forecasts for 2016-21 is presented in Section 2 of the CIE's report, contained in Appendix 7.1.

The key findings include:

- **Total connections grew at a faster rate than forecast by Core Energy and AER**, driven primarily by the residential customer segment, which grew by 2.9 per cent per year, on average, over the past four years. The under-forecast was likely caused by potential data imperfections which led to a lower assumed penetration rate. CIE's forecast for 2021-26 takes a different approach and projects the penetration rate based on the historical ratio of connections to dwelling growth, which provides a more accurate forecast.

- **Total gas consumption has been higher in 2015-19 compared to the Core Energy and AER forecasts, with the greatest difference seen among business customers.** This is partly explained by the higher connection numbers noted above, and colder weather compared to the forecasts. The higher than forecast demand was also influenced by a temporary pause in the decline of usage per customer observed between 2014/15 and 2016/17, which did not reflect the historical trends used to derive the forecasts. While it is not completely clear what caused this pause, CIE's forecast for the 2021-26 AA period accounts for the time-trend in consumption up to 2018/19 (the latest year of actual data), and therefore more accurately reflects recently observed patterns of gas usage.

Shortened forms

Term	Meaning
AA	Access Arrangement
ACT	Australian Capital Territory
ACT climate change strategy	ACT Government's Climate Change Strategy 2019-25
ACTCOSS	ACT Council of Social Service
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ANU	Australian National University
ARENA	Australian Renewable Energy Agency
BISOE	BIS Oxford Economics
CABS	A Jemena Ltd proprietary system providing retailer billing, demand customer management, network balancing and retailer nomination services.
CALD	culturally and linguistically diverse (community)
capex	capital expenditure
CCP, CCP24	the AER's Consumer Challenge Panel (number 24)
CEG	Competition Economists Group
CEPA	Centre for Efficiency and Productivity Analysis (University of Queensland)
CESS	Capital Expenditure Sharing Scheme
CIE	Centre of International Economics
CIT	Canberra Institute of Technology
CPI	consumer price index
DAE	Deloitte Access Economics
DAMS	Distribution asset management services (agreement)
DC	Demand Capacity Tariff
DT	Demand Throughput Tariff
E2G	Electricity-to-gas
EEIS	Energy Efficiency Improvement Scheme
ECM	Efficiency Carryover Mechanism
ECRC	Energy Consumer Reference Council
EGWWS	electricity, gas, water and waste services (sector)
EI	Economic Insights
EIL	Energy Industry Levy
ETC	Estimated cost of corporate income tax
EPSDD	ACT Environment, Planning and Sustainable Development Directorate

Term	Meaning
GDBs	gas distribution businesses
GN21	Evoenergy gas network access arrangement 2021–26
GJ	gigajoule = 10^9 joules
GWh	gigawatt hour
I&C	Industrial and commercial
ITAUF	Information Technology Asset Utilisation Fee
km	kilometre
LPG	liquid petroleum gas
MDLs	Meter Data Loggers
NGL	National Gas Law
NGO	National Gas Objective
NSW	New South Wales
opex	operating expenditure
PFP	Partial Factor Productivity
PJ	petajoule = 10^{15} joules
PLS	Pressure Limiting Station
PPA	power purchase agreement
PTRM	post-tax revenue model
QPRC	Queanbeyan–Palerang Regional Council (local government authority)
RAB	regulatory asset base
RFM	roll-forward model
RIN	Regulatory Information Notice
Rules	National Gas Rules
SDRS	Secondary District Regulator Sets
TAB	tax asset base
TJ	terajoule = 10^{12} joules
UAG	unaccounted for gas
UNFT	Utilities Network Facilities Tax
VB	Volume Boundary (tariff class)
VI	Volume Individual (tariff class)