evoenergy

Appendix 4.3: Unaccounted for Gas

Access Arrangement Information

ACT and Queanbeyan-Palerang gas network 2026–31

Submission to the Australian Energy Regulator

June 2025

Evoenergy

Unaccounted for gas

Evoenergy 2026-31 Access Arrangement Proposal

TABLE OF CONTENTS

Abbreviations

AA	Access Arrangement
AER	Australian Energy Regulator
CTM	Custody Transfer Meter
CTS	Custody Transfer Station
DAMS	Distribution Asset Management agreement
I&C	Industrial and Commercial
JAM	Jemena Asset Management
kPa	Kilopascals
NGR	National Gas Rules
Opex	Operating expenditure
SUG	System Use Gas
TJ	Terajoule
UAG	Unaccounted for Gas

Overview

As part of its Access Arrangement (AA) proposal, Evoenergy is required to provide a forecast of its operating expenditure (opex). One of the elements of Evoenergy's opex, is the cost of Unaccounted for Gas (UAG). This document provides a summary of Evoenergy's UAG performance and provides an overview of how we report and manage UAG across the network. It also sets out Evoenergy's UAG proposal for the 2026-31 period.

UAG is the difference between the quantity of gas that is measured entering the network at custody transfer stations (receipts) and the quantity of gas that is measured leaving the network (deliveries). This difference is effectively "lost" or "unaccounted for". UAG is generally expressed as a percentage of receipts into the network and allows UAG levels to be viewed in terms of efficiency and appropriately benchmarked between various networks. Evoenergy is required to replace UAG under the terms of its Access Arrangement – effectively replacing gas that belonged to the Users of the network that has not been delivered to their customers.

Jemena Asset Management (JAM) manages the UAG as part of the services provided to Evoenergy under the Distribution Asset Management (DAMS) agreement. The underlying causes for UAG arise from gas measurement, calculation errors and physical losses. However, an important consideration when seeking to understand and manage UAG is the significant uncertainty around the estimates of the factors contributing to UAG as they cannot be directly measured and inferences about any particular source of UAG are difficult to make, despite best efforts to do so. This significant uncertainty is accepted in the gas industry.

Evoenergy's UAG level has increased from the prior Access Arrangement period from around 2.49 per cent to a four year average of 2.58 per cent. Analysis of UAG data demonstrates that Evoenergy's UAG is largely attributable to measurement related issues, rather than leakages on the network. This is supported by the effect of the balance of supply into the network between its two receipt points on the level of UAG.

The use of a four year historical period to forecast the UAG allowance is consistent with two previous Access Arrangements where the period 2016 to 2019 was used to forecast the UAG allowance for the 2021-2026 Access Arrangement and the 2010-2014 period was used to forecast the UAG allowance for the 2016-2021 Access Arrangement.

Accordingly, the four year historical average of 2.58 per cent of gas receipts has been applied as the forecast for UAG for the 2026-2031 Access Arrangement Period. This approach is consistent with the requirement of Rule 91 of the National Gas Rules (NGR) that states, *"Operating expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of delivering pipeline services".*

1. Introduction

As part of its Access Arrangement proposal, Evoenergy is required to provide a forecast of its operating expenditure (opex). One of the elements of Evoenergy's opex, is the cost of Unaccounted for Gas (UAG).

UAG is the difference between the quantity of gas that is measured entering the network at custody transfer stations (receipts) and the quantity of gas that is measured leaving the network (deliveries). This difference is effectively "lost" or "unaccounted for". UAG is generally expressed as a percentage of receipts into the network and allows UAG levels to be viewed in terms of efficiency and appropriately benchmarked between various networks.

Evoenergy is required to replace UAG under the terms of its Access Arrangement – effectively replacing gas that belonged to the Users of the network that has not been delivered to their customers.

Rule 91 of the NGR requires that, *"Operating Expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of delivering pipeline services".* In the case of UAG, Evoenergy may only include the cost of UAG that is prudent and efficient and will deliver the lowest sustainable cost.

JAM manages UAG as part of the services provided to Evoenergy under the Distribution Asset Management (DAMS) agreement.

2. Background of UAG

2.1 Sources of UAG

The efficiency of Evoenergy's UAG is best understood by considering what contributes to UAG. The causes for UAG can be grouped into gas measurement and calculation errors and physical losses:

- Measurement and calculation errors:
  - metering uncertainty[1] in receipt meters
  - metering uncertainty in delivery meters - both high and low capacity meters
  - degradation of meter accuracy
  - measurement uncertainty, due to heating value allocation
  - measurement uncertainty, in the calculation of the fixed factor(s) used for billing, including errors incurred due to atmospheric pressure and temperature changes
  - measurement period errors
  - billing estimation.
- Physical losses:
  - leakage, due to:
    - integrity of materials
    - network damage
  - theft
  - unmeasured gas used for operational purposes.

Further explanation of each error or loss is provided below.

2.1.1 Measurement error

Receipt meter uncertainty

- Receipt meters or Custody Transfer Meters (CTM) are installed at points where Evoenergy accepts gas into the network. The size and complexity of these meters varies subject to the volume of gas being receipted into the network (or network section). Typically, these meters operate in the range of +/- 0.5% (volumetric error) and are subject to validation checks on an annual basis.

Delivery meter uncertainty

- Low capacity meters – These are the meters that supply our volume market customers, which include residential, commercial and small industrial customers. These meters typically have an accuracy range of +/-1.5% to +/-2% (volumetric error)[2].

[1] Metering uncertainty is often called metering error because it is the difference between the amount measured and the true measurement which cannot be known.

[2] Under the ACT General Gas Metering Code a meter is considered accurate if it is reading between -3% and +2%.

- High capacity meters – These meters are used at large (demand market) customers. As these meters record larger volumes of gas, meters of a higher specifications are utilised providing more accuracy than the low capacity meters. Subject to their size and type, these meters generally operate in the range of +/- 0.5% to +/- 1% (volumetric error).

Degradation of meter accuracy

- The typical life of a customer meter ranges from 5 to 35 years.
  - High capacity meters, such as turbine and rotary meters are used for large demand market customers, and are typically replaced after 5 (turbine meters) to 10 (rotary meters) years. These meters tend to read 'slow'[3] as they age.
  - Diaphragm meters are used for volume market customers and are replaced after 15 to 35 years. As they degrade they may either read 'fast' or 'slow', although they have an inherent bias to read slow.
- The ongoing life extensions for the residential metering families are likely to result in an increase in the UAG percentage due to the tendency for meters to under-register (read slow) as they degrade. Although the general population of meters are within the accuracy tolerance, as the population continues to age (due to the ongoing life extension of the residential meters), the levels of UAG should be expected to continue to rise.While they generally remain within the accuracy requirements set by the Gas Metering Code[4], aging does cause meter degradation. The Gas Metering Code allows for more error on under-reading than it does for over-reading.

Measurement uncertainty (metrology errors)

- Heating value allocation uncertainty. The heating value is one of the key factors (alongside pressure and temperature) used to convert volumetric quantities into energy quantities[5].
  - There are two different sources of gas entering the network[6] and they have differing heating values. While the application of a single heating value to delivery meters is a practical approach to characterising the heating value of delivered gas, it has an inherent impact on the accuracy of measurement of gas deliveries, subject to the operational and seasonal requirements at each source.
- High capacity meters – high capacity meters incorporate temperature and pressure measurement equipment. The combination of the errors in each of the contributing measurements allows a high capacity meter to be accurate to within +/- 0.5% of the true quantity being measured.
- Low capacity meters – to convert the volume measured to an energy quantity for low capacity meters, a fixed factor is used to adjust for temperature and pressure (both the pressure delivered to the customer gas system and the effect of barometric pressure).
  - The element of the fixed factor relating to the delivery pressure is based upon the pressure set by the regulator device on the meter.
  - The element of the fixed factor relating to temperature and barometric pressure is based on published long-term averages from the Bureau of Meteorology.

  While these corrections are essential for maximising the accuracy of gas measurement, they are imperfect representations of the conditions at each customer's meter, because actual monthly temperatures will vary from the historical average and the temperatures at a single location will be an imperfect proxy for the actual temperatures of gas passing through a customer's meter. The same is true of barometric pressure. As a result there is an inherent additional uncertainty in the measurement of gas being delivered from the network.

3 A meter reading slow will under-rad or under-register the true flow.

4 ACT Gas Metering Code (a technical code made under Part 3 of the Utilities (Technical Regulation) Act 2014 is the code governing metering. Under the ACT General Gas Metering Code a meter is considered accurate if it is reading between -3% and +2%.

5 Gas is measured on a volumetric basis (that is, m^3) but is converted to energy (that is, GJ) for billing purposes.

6 Gas in the ACT network is supplied via the Moomba Sydney Pipeline (sourcing gas from Moomba or Southeastern Queensland) and the Eastern Gas Pipeline (sourcing gas from Victoria).

Measurement period errors

- Meters in the network are read at different intervals. For example, large network customers are read daily, whereas small domestic customers are read on a three monthly cycle. In order to calculate UAG, these periods need to be aligned and, in the case of the domestic customers, the readings need to be interpolated into smaller periods (i.e. months). This process includes a degree of estimation which introduces errors into the calculation.

Billing estimation

- Where meters are unable to be read, or are known to be faulty, the flow through the meter may be estimated and the bill created accordingly. Any estimation of gas consumption introduces errors into the UAG calculation.
- The failure of meters can lead to them not registering flow. These are referred to as “non-registering meters”. A significant proportion of non-registering meters are identified and replaced after one or more billing cycles, although some may not be identified for some time.[7] Where a non-registering meter is identified, an estimate is applied to the gas consumption.

Unread consumption

- In a small number of instances, meters may be installed but not correctly recorded and hence not be part of the reading/billing cycle.

2.1.2 Physical losses

Leakage[8]

- Integrity of materials – the Evoenergy network commenced operation in 1982 and is constructed with modern steel and plastic technology and so has relatively low levels of leakage. The majority of leakage from modern plastic networks is from small above ground leaks related to the deterioration of meter fittings, which are relatively easily detected and rectified. However, as the network continues to age, there will be deterioration in the plastic and steel mains and services and the levels of leakage can be expected to increase.
- Network damage - while Evoenergy’s network is designed to limit third party damage through participation in the ‘Before you dig’ service and patrols of its high pressure networks, third party impact can occur and contributes to UAG.
- Leakage from the high pressure pipelines is considered to be zero for practical purposes with the exception of some gas escape during maintenance. Small amounts of leakage may occur from above ground flanges and fittings, however, these are easily detected and rectified.

Theft

- Theft is considered to be uncommon, due to the inherent hazards of unskilled work with gas. This element is particularly hard to both detect and estimate. Theft is typically the bypassing or partial bypassing of a gas meter.

Operational usage

- Meter regulator venting. Meter regulators incorporated in both network pressure control equipment and customer pressure control equipment can vent during some operational circumstances (such as pressure surges or temperature effects). The gas released from such venting is generally only small in quantity and is unmeasured.

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7 For example, some customers only use gas for heating, so it is not unusual to have no consumption for these meters over the warmer months. This means that it may take longer to identify a non-registering meter.

8 Many of the items of leakage identified here are very small volumes and are generally not considered a safety risk. The use of odorant provides for most leaks to be detected well before a safety issue arises.

- Operational usage, such as venting. A small amount of gas is lost from the systems during maintenance and operational activities.
- System Use Gas (SUG) is gas used for operational purposes ie for water bath heaters within gas facility compounds. This is measured separately and is excluded from UAG.

2.2 UAG Calculation Uncertainty

An important consideration when seeking to understand and manage UAG is the significant uncertainty inherent in the calculation of UAG (as identified above). This is accepted in the gas industry.

With respect to the measurement related causes, these uncertainties are unavoidable because of limitations associated with any measurement process. Even the most accurate metering systems cannot provide an accuracy of better than +/- 0.5%. Typically the cost of improving the accuracy of any of these elements is far greater than any benefit. Industry practice has determined the efficient levels of accuracy for each of these elements over many years of gas industry operation.

Similarly, estimating gas losses from the network from leakage, operational use and theft inherently has high levels of uncertainty. While there is some scope to estimate gas lost from leakage, purging and filling mains and when there is a third party hit, estimates will be only ever be order of magnitude level estimates. The cost of improving the estimates would significantly outweigh any benefit, which can be expected to be small.

3. UAG Performance

3.1 Management of UAG

JAM actively monitors and manages Evoenergy's UAG to ensure that it maintained at an economic level. The management of UAG is multi-faceted and targeted at each of its sources. Management of UAG is overseen by a senior cross-functional management committee.

UAG Management Oversight

JAM has a senior management committee whose scope is to review ongoing quantity and cost of UAG. The key objectives of the committee are to ensure that:

- the quantity of unaccounted for gas is minimised, consistent with minimising total cost
- controls are in place to accurately capture, monitor and report UAG

The committee meets at least nine times per year and its membership is comprised of senior managers from across the business.

Monitoring and reporting of UAG is undertaken on a monthly basis, with investigations conducted as required to ensure UAG performance is maintained within acceptable thresholds.

3.1.1 Activities to manage measurement errors

JAM undertakes a range of activities and programs to manage measurement error.

Metering uncertainty (volumetric errors) and degradation of metering accuracy

- Meter testing to confirm accuracy – Jemena undertakes meter type and batch testing of meters and meter repairs to ensure compliance with applicable accuracy standards. Jemena applies meter sizing charts to ensure that the meter size is appropriately matched to customer loads in the network. All turbine and rotary meters are calibrated typically at 5 and 10 years respectively to confirm accuracy after refurbishment.
- Validation programs – JAM undertakes validation program of Custody Transfer Station (CTS) meters by obtaining calibration results and witness testing third party CTS meter calibrations.
- Aged and planned meter replacement program:
  - Statistical meter testing program – samples of meters are removed for testing and results are analysed and are applied to populations by age, meter type and manufacturer.
  - Meters are replaced once they reach an age when there is insufficient confidence of meter accuracy. This may be up to 35 years where statistical analysis demonstrates that meters remain accurate.
  - Resizing of industrial and commercial (I&C) meter sets when the flow rates through the meters are either greater or less than the accurate range.
  - Replacement of I&C rotary and turbine meters is more frequent than for smaller meters due to the larger volumes measured by these meters. .
- Defective review and response – Defective meters are examined under the field failure program to identify any trends which would result in loss of accuracy or failure. Defective program performance is assessed periodically to identify any failure or inaccuracy issues resulting from type failure.

Measurement uncertainty (metrology errors)

- Pressure and temperature corrections are applied to large consumers. JAM undertakes reconciliations of pressure correction factors recorded in the asset management system and metering/billing system to ensure there have been no administrative errors in billing consumption details.
- JAM undertakes planned maintenance on meter sets operating at 15kPa and above, including, where fitted, calibration of temperature and pressure transducers.
- Gas heating value for the network is measured at the two receipt points and a volume weighted value is applied across the networks as one heating value zone.
- Fixed factor billing is reviewed against Bureau of Meteorology data on a periodic basis.

Billing estimation and profiling

- Meters that under-record consumption are detected in the billing system. In the first instance an estimate of consumption is applied and the meter is flagged for replacement.
- Ongoing review of large consumers - meter data is analysed on an individual meter basis to identify changes in consumption patterns that could result in UAG.
- Daily metered customer data is monitored to detect any indications of faulty metering equipment.
- Contractors carrying out calibration and maintenance of daily metered sites are subject to audit, to ensure that they perform in accordance with required standards.
- Incorrect or missing data is substituted with estimated or recovered actual data, to ensure that the measurement of total UAG is as accurate as possible.

3.1.2 Activities to minimise losses

Key activities to minimises losses of natural gas from the network include:

- Prompt responses to all gas escapes and undertake repairs immediately where gas leaks are found
- Replacement of customer meter regulators with leaks
- Regular leakage survey which is used to inform mains repair
- Quality construction (joining of steel and plastic) to ensure joints are leak tight
- Tracking of meters purchased to ensure all installed meters are read and billed.

3.2 Historical pattern of UAG levels

Evoenergy’s UAG performance reflects that it is a modern network with no cast iron or unprotected steel mains. Mains are constructed of cathodically protected welded steel mains for high pressures (ie: 1,050kPa and above) and glued / fused plastic pipe operating at medium pressure (210kPa and below). The result is that leakage is a much smaller component of UAG than older networks that have cast iron and unprotected steel mains.

Figure 3–22 shows Evoenergy’s historical pattern of UAG levels.

Up until December 2015, UAG was close to 1.96 per cent which was allowed by the AER for the previous 2016-2021 Access Arrangement period. However, due to the impacts of an enterprise reporting system change and a calculation configuration within that system, there has increasing volatility in the rate of UAG since that time.

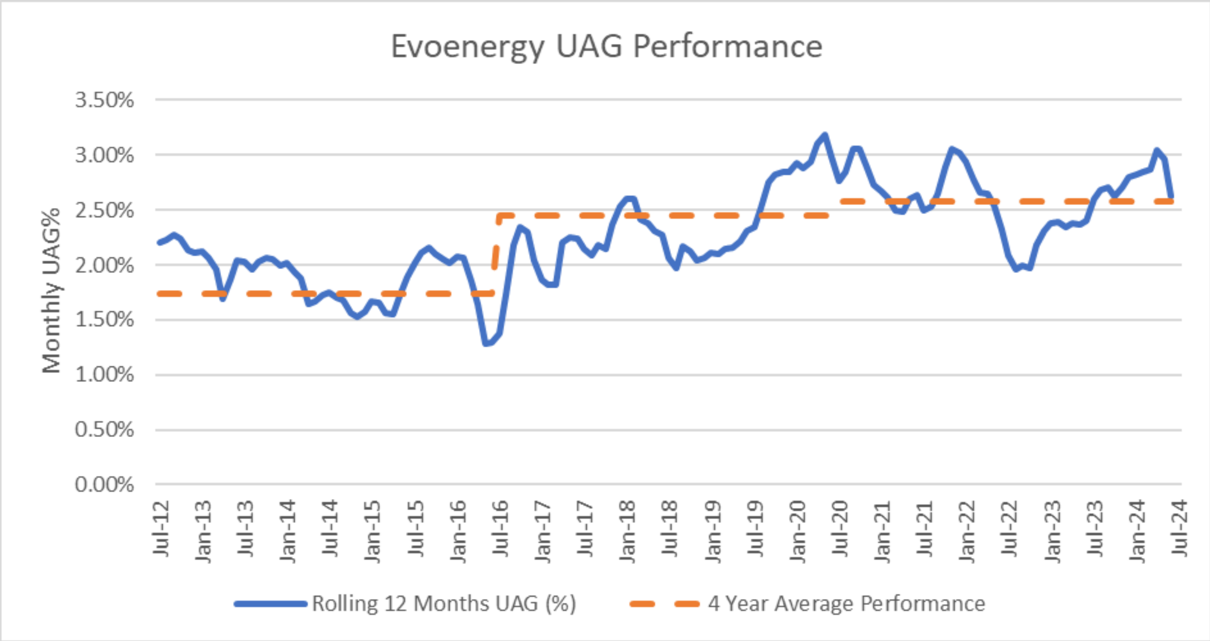

Figure 3–2 : Evoenergy's UAG Performance

Commencing in July 2015, Jemena transitioned from its GASS+ enterprise reporting system to a new SAP system. UAG reporting transferred from GASS+ to SAP at that time with the calculations for JGN and Evoenergy transferring. Cutover between the two systems took place in two stages, the second being in May 2016, after which GASS+ was decommissioned. Inaccuracies in UAG reporting within SAP were identified in mid-2016, and investigations to identify and correct reporting errors were carried out. Due to the complex nature of the UAG calculation methodology, multiple fixes to correct the errors in SAP were only finalised in late 2018.Once the SAP fixes were effected, there was a step change in reported UAG.

Since that time UAG has remained largely steady with a small increase in UAG as shown through an increase in the four year average UAG versus the four year average UAG used for the current AA period. This increase can be partly attributed to the extending the life of the meter families which results in the under reading of consumption.

We also updated Evoenergy's approach to calculating the UAG allowance to include the most recent available data up to June 2024 presenting the information in regulatory years not calendar years.

3.3 Evoenergy's UAG is largely measurement driven

UAG as a result of leakage, operational use or theft is largely unrelated to the level of network throughput. Therefore, any correlation between throughput and UAG is generally a product of uncertainty in measurement. The following Figure 3-3 Evoenergy's Monthly UAG vs Monthly Total Receipts, shows the relationship between UAG quantities (i.e.: in TJ's, not as a percentage of receipts) and total network receipts. Clearly, there is a very strong relationship between the quantity of UAG and network throughput with the quantity of UAG closely following the quantity of gas receipts.

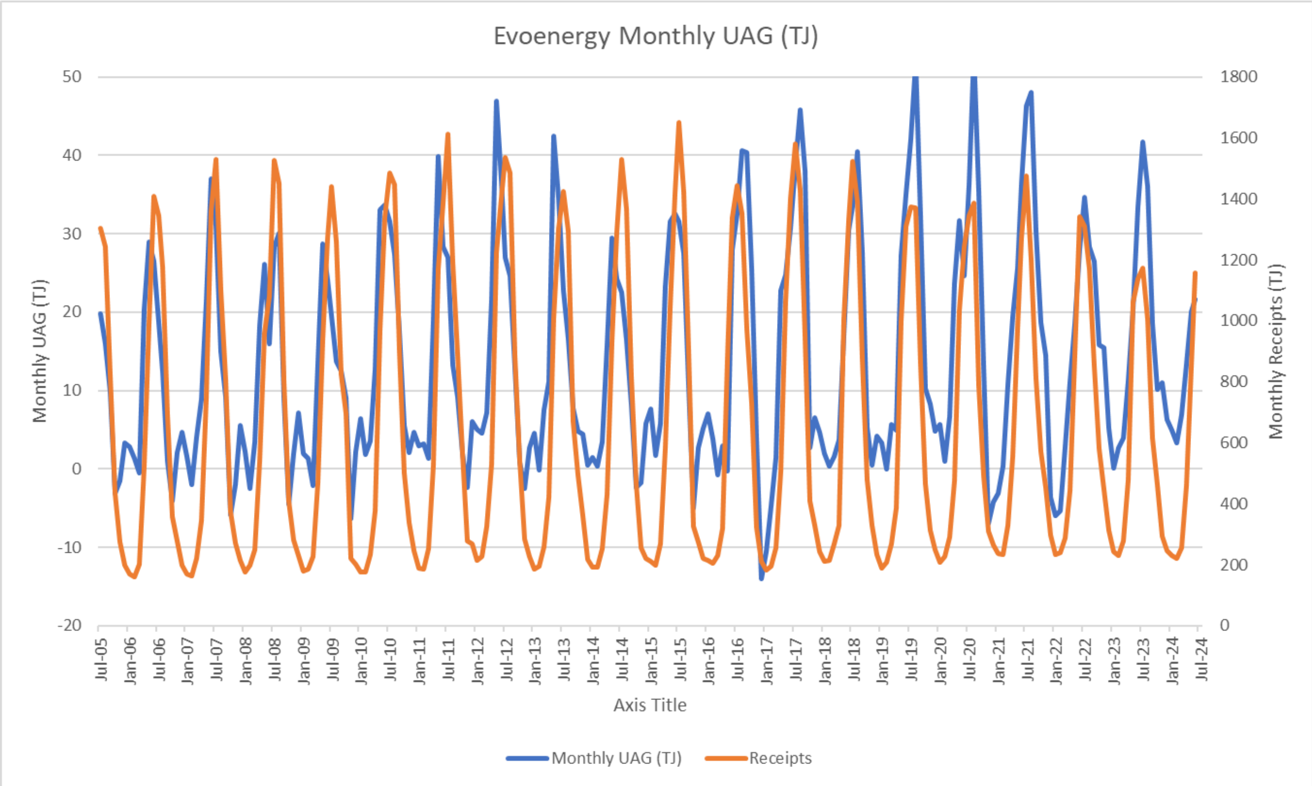

Figure 3-3 : Evoenergy's Monthly UAG vs Monthly Total Receipts

4. Proposed UAG Level for the 2026-31 Period

An important consideration when seeking to understand and manage UAG is the significant uncertainty around the estimates of the factors contributing to UAG as they cannot be directly measured and inferences about any particular source of UAG are difficult to make, despite best efforts to do so.

Evoenergy's historical UAG level has increased from the prior Access Arrangement period from around 2.49 per cent to a four year average of 2.58 per cent. Analysis of UAG data demonstrates that Evoenergy's UAG is largely attributable to measurement related issues, rather than leakages on the network. This is supported by the effect of the balance of supply into the network between its two receipt points on the level of UAG.

JAM, on behalf of Evoenergy, propose that the four year historical average of 2.58 per cent of gas receipts be applied as the forecast for UAG for the 2026-2031 Access Arrangement Period. This is consistent with two previous Access Arrangements where the UAG allowance has been forecast using the rates over a four year period - 2016 to 2019 for the 2021-2026 Access Arrangement and 2010-2014 for the 2016-2021 Access Arrangement.