Attachment 9.8

Meter Replacement Plan

Final Plan 2023/24 – 2027/28

July 2022

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Executive summary

This Meter Replacement Plan details the proposed periodic meter changes (PMCs) and other meter replacement works required over the next AA period (July 2023 to June 2028). As is customary, the vast majority of meter replacement activity over the next five years are relates to domestic and commercial PMCs.

Domestic and commercial meters are subject to periodic testing to ensure families of meters are operating withing prescribed accuracy tolerance bands (i.e. +2% to -3% of the volume of gas delivered at the site). Where meters are found to be operating outside these bands, or at end of life and not suitable for field life extension, these meters are replaced.

We are obligated to conduct PMCs under the *National Measurement Act 1960* (Commonwealth) (National Measurement Act), the Victorian Gas Distribution System Code (Victorian Code)[1] and the New South Wales *Gas Supply (Safety and Network Management) Regulation 2013* (NSW Regulation). The method used to forecast PMCs for the next AA period is the same as used and subsequently approved in the current and prior AA periods.

The unit rate for PMCs has been revised to reflect the latest market (vendor) driven estimates, and reflect the higher materials and labour costs currently being experienced across Australia in the wake of the COVID-19 pandemic. Further information on unit rates is provided in the Unit Rates Report at Attachment 9.6 of the Final Plan.

TableExecSumm 1 shows the proposed PMC replacements for the next AA period.

TableExecSumm 1: Forecast PMCs for the next AA period

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Domestic meters (≤25m³ per hour)						
Number of PMCs	22,581	31,504	34,797	31,217	31,529	**151,628**
Unit rate ($/meter)					[redacted]	[redacted]
Forecast cost ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Commercial meters (>25m³ per hour)						
Number of PMCs	246	245	347	262	257	**1,357**
Unit rate ($/meter)					[redacted]	[redacted]
Forecast cost ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total program						
Total all meters ($'000)	**5,294**	**7,183**	**8,091**	**7,157**	**7,213**	**34,939**

In addition to PMCs, we have identified two smaller programs of work that are necessary to enable us to meet our compliance obligations to provide retailers and customers with timely and accurate

[1] While the Albury Network is located in New South Wales, it is subject to the metering provisions in the Victorian Code. See Section 2.2 for more detail.

meter reads, and to test new digital metering technologies. These programs are summarised below.

Remote digital meter reading

AGN has an obligation to send timely and accurate meter data to gas retailers. To ensure customers' gas bills are accurate, we must provide actual (not estimated) meter readings at least once every 12 months. There are 4,693 meters in our network located in dangerous or inaccessible locations. Customers at these locations have not received a physical meter read for more than 12 months, and in some cases have not received an actual reading for many years.

Recent improvements in the availability and cost of metering technology means there is now a solution. Digital metering has become a viable alternative to manual reads. Digital meters can be installed at a customer's premises at relatively low cost and can be read remotely via a dedicated communications network, or via a vendor head end system. This eliminates the need for meter readers to attend the site, and enables accurate billing information to be provided to retailers as required.

During the next AA period we propose to address the issue of inaccessible meters by installing digital meters at the 4,693 sites identified as inaccessible or difficult/dangerous to access. The meters can be installed at a customer's premises at a relatively low cost, and can be read remotely. The technology we are looking at can use existing cellular 3G/4G networks, and the head end system can be integrated into AGN/APA's existing meter data system.

This solution will allow multiple remote reads to be conducted each year, and ensure we can provide actual meter data to retailers to allow accurate customer billing. It will also enable us to meet our compliance requirements and eliminate some costs associated with special meter reads.

The estimated cost of this program is $4 million. We also propose to offer customers with currently accessible meters the opportunity to 'opt-in' to having a digital meter installed. These opt-in costs will be recovered directly from customers.

Digital meters in new estates – an opportunity

To fully test the capabilities of digital metering and the associated communications solutions, we propose to install 2,500 digital meters in new housing estates. Our plan is to select a number of new estates and install a digital metering solution and comms system instead of physically-read diaphragm meters.

Digital meters are becoming a standard offering across the energy sector, and are likely to replace diaphragm meters as the PMC replacement in the future. However, before we switch to digital metering, it makes sense to fully test their technical capabilities and identify the most appropriate and cost-effective digital metering solution.

A trial in new estates will give us the opportunity to test a number of comms system configurations, as well identify the potential costs and benefits of remote vs physical reading. It will also provide opportunity to capture direct customer feedback though community consultation with the new residents, and test value-adding services such as providing regular or real time gas consumption information to customers.

Installing digital meters within a new estate is a relatively inexpensive option, as the proposed digital meters and associated comms currently only cost around $74 more per unit than the traditional diaphragm meters that would otherwise be installed.

During the next AA period, we have an excellent opportunity to trial these digital meters in Albury and Wodonga. The Albury and Wodonga section of our network is located near to the Hydrogen

Park Murray Valley (HyP Murray Valley) project. Hyp Murray Valley is a renewable hydrogen production facility, which will deliver up to 10% (by volume) hydrogen blend to the ~40,000 residential and commercial gas customers and 20 industrial customers connected to our Albury and Wodonga distribution system. We expect the Hyp Murray Valley project to be up and running in 2024.

Our growth forecasts indicate 2,511 new residential and commercial customers will connect in Albury over the next AA period, with a further 1,750 in Wodonga. It therefore makes sense to target the digital metering trial in new estates in this area.

By installing some (or all) of the proposed 2,500 digital meters in new estates in Albury and Wodonga, we will gain insight into the suitability of digital meters with hydrogen and hydrogen blends. This will be invaluable to help inform energy sector's journey towards decarbonisation.

The estimated cost of the digital metering trial is [redacted] million.

As shown in TableExecSumm 2, the digital metering roll out to inaccessible sites and the digital metering trial amount to less than 10% of the overall meter replacement program for the next AA period.

TableExecSumm 2: Victoria and Albury Network: Meter replacement capex estimate, $,000 real 2021

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
PMCs						
Domestic meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Commercial meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total PMC program	**5,294**	**7,183**	**8,091**	**7,157**	**7,213**	**34,939**
Remote digital meter reading						
Inaccessible meters	[redacted]	[redacted]				[redacted]
Opt-ins	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Digital meters in new estates						
Incremental costs to purchase and install digital meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total meter replacement program	**7,651**	**8,177**	**8,280**	**7,346**	**7,402**	**38,856**

Addressing a known compliance and customer satisfaction issue is a prudent activity, consistent with good practice and justified under clause 79 the National Gas Rules (NGR). Further, we consider the incremental costs to trial digital meters in new estates is a high value and low cost exercise, which will enable us to achieve the lowest sustainable costs of providing metering services over the long term, ultimately benefitting all network users.

1 Introduction

1.1 Purpose

Australian Gas Networks Limited (AGN) reticulates gas to approximately 746,426 customers in the Victorian and Albury natural gas distribution networks. The volume of gas delivered to a customer is measured through a meter, with meter measurements being a key input into customer bills.

Under the *National Measurement Act 1960* (Commonwealth) (National Measurement Act), the Victorian Gas Distribution System Code (Victorian Code)[2] and the New South Wales *Gas Supply (Safety and Network Management) Regulation 2013* (NSW Regulation) we have a regulatory obligation to manage the integrity of these meters and ensure they operate within a prescribed tolerance band for metering accuracy (i.e. +2% to -3% of the volume of gas delivered at the site). Periodic meter changes (PMCs) must therefore be carried out to:

- test the accuracy of meters; and
- replace meters when the accuracy of their measurements falls outside the prescribed band.

Failure to maintain the accuracy of meters to the required standards increases the likelihood of customers being charged the incorrect amount for gas usage. For meters servicing larger customers, this inaccuracy can have a significant effect on the level of unaccounted for gas. It can also result in a breach of our licence obligations, penalties and other compliance actions.

We also have an obligation to collect metering data and provide it to gas retailers in a timely manner (at least once every 12 months) to enable them to issue accurate bills to customers. It is therefore imperative that all our meters are accessible and are able to be read.

This Meter Replacement Plan provides an overview of the current stock of domestic and commercial meters in our networks, the standards for metering installations, and our obligations to test, replace and read these meters. This plan outlines the work program we will follow during the next access arrangement (AA) period (July 2023 to June 2028) to comply with our regulatory obligations and ensure our metering fleet is fit for purpose.

The proposed forecast capital expenditure (capex) program on PMCs and other meter replacements is provided in section 5 of this document.[3]

In developing this plan, we have had regard to:

- the metering standards and other regulatory obligations set out in the National Measurement Act, the Victorian Code, the NSW Regulation, and Australian Standard (AS) 4944 (Gas meters – In-Service Compliance Testing);
- our obligations to retailers and customers to provide timely and accurate meter reads, avoiding estimated reads where practicable;
- the energy transition happening in Australia and worldwide, and the asset management activities we must undertake to make sure our network is ready to transport renewable gas; and
- Rule 79 of the National Gas Rules (NGR), which requires capex to be:

[2] While the Albury Network is located in New South Wales, it is subject to the metering provisions in the Victorian Code. See Section 2.2 for more detail.

[3] Note that this Plan does not include Tariff D interval meters because the cost of these meters is recovered directly from the Tariff D customers.

- 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 providing this service; and
- justifiable on one of the grounds set out in rule 79(2), which includes being necessary to maintain the integrity of services and to comply with a regulatory obligation or requirement.

This plan has been developed and reviewed as part of our asset management planning processes and is an input into the Asset Management Plan (AMP), which is provided as Attachment 9.2 to the Final Plan.

1.2 Stakeholder engagement

We are committed to operating our networks in a manner that is consistent with the long-term interests of our customers. To facilitate this, we have implemented a stakeholder engagement program to understand and respond to the priorities of our customers and stakeholders. This plan, and the proposed meter testing and replacement, is consistent with stakeholder feedback that maintenance and improvement of network safety is of highest importance and that customers are concerned with recent price increases.

Feedback from recent customer workshops indicates customers prefer greater visibility / transparency of how their gas bill is estimated and are interested in digital technologies that may help them manage their gas usage. In summary we found:

- 36% of customers ranked price as their number one priority;
- customers have little understanding of the makeup of their gas bill and are keen for more education and transparency.
- customers told us affordability means fair and transparent prices, manageable prices and forward visibility to avoid 'bill shock'
- customers are looking for new digital ways to manage their gas usage and reduce their bills.

Our proposal to commence installing digital remote meters is consistent with this customer feedback and will help eliminate the need for estimate reads, improving billing accuracy and transparency.

Feedback from the workshops also highlights customers' support for decarbonisation and the potential for introducing renewable gas to the network. We found:

- clean energy and reducing carbon emissions is an imperative for the majority of customers;
- 87% of customers view climate change and reducing carbon emissions as important or very important;
- customers expect AGN to be on the journey towards a cleaner energy supply;
- customers are keen to better understand the cost implications for transitioning to renewable gas, including the need to potentially switch appliances in the future; and
- 89% of customers support AGN's proposed approach to preparing our networks for renewable gas.

Our proposal to get our network ready for hydrogen by installing 100% hydrogen compatible meters at strategic locations is consistent with these stakeholder expectations

Further information on our stakeholder engagement program is available in Chapter 5 of our Final Plan.

1.3 Document structure

This document is structured as follows:

- Chapter 1 – *Introduction* – outlines the purpose and context of the Meter Replacement Plan
- Chapter 2 – *Metering related regulatory obligations* – outlines AGN's metering related obligations under the National Measurement Act, the Victorian Code, the NSW Regulation and Australian Standard AS 4944;
- Chapter 3 – *Meters in the Victorian and Albury networks* – sets out the types of meters currently in operation in our networks;
- Chapter 4 – *Meter replacement policy*– outlines the meter replacement policy for the next AA period; and
- Chapter 5 – *Capital works program* – details forecast expenditure on meter replacement for the next AA period, including the methodology we have used to determine the amount we expect to spend on PMCs, which comprises the majority of our recurring capital expenditure. This section also describes meter replacements necessary to meet our meter data provision requirements and to enable the introduction of renewable gas into the network.

2 Metering related regulatory obligations

This chapter outlines AGN's role in customer metering, some basic metering concepts and the obligations we have to test and replace meters. For more information relating to other metering obligations, please refer to our AMP provided as Attachment 9.2 to our Final Plan.

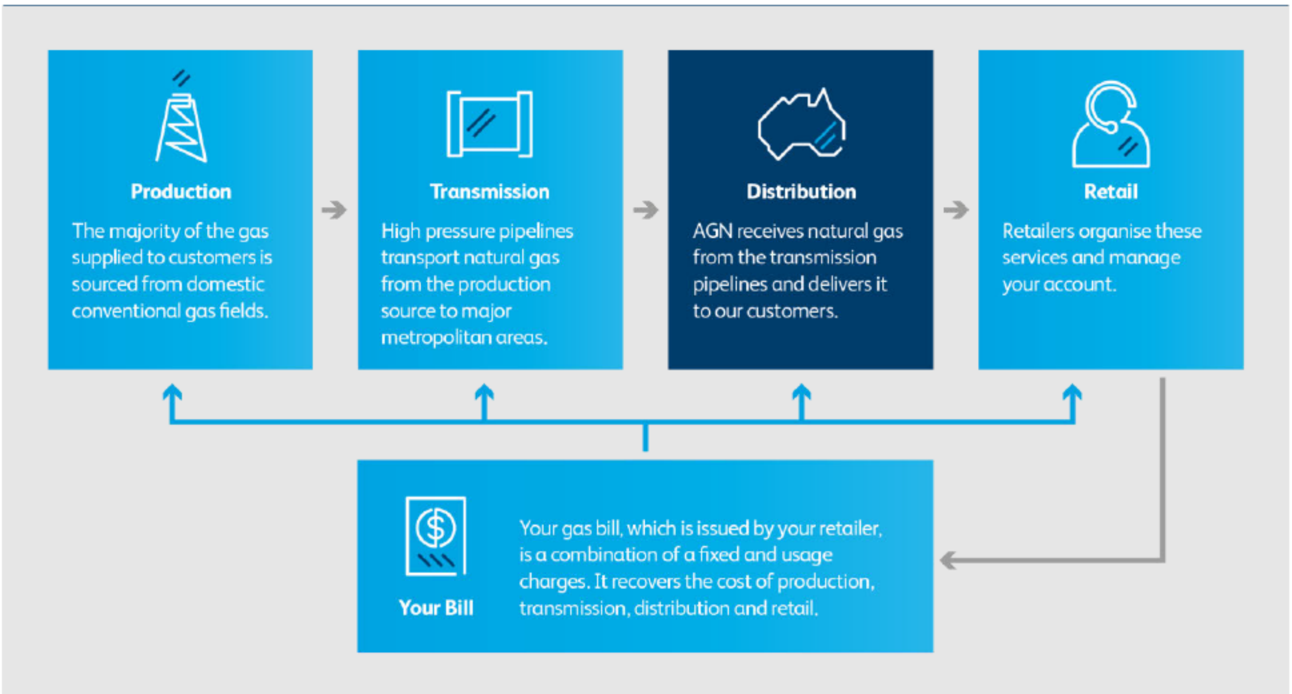
2.1 Role of AGN in customer metering

Our role in supplying natural gas to customers is illustrated in Figure 2.1. We own the distribution networks that transport gas directly to the customer. We also own, maintain and read the meters at each customer site.

The majority[4] of customers connected to our distribution networks have their gas transported to them by retailers. These retailers purchase natural gas from producers, transport the gas through the transmission and distribution networks, and then bill for all the services required to supply natural gas to the customers' site. This includes the use of our distribution networks. The metering information we collect is therefore a key input into a retailer's billing process.

The costs of using the distribution network are recovered from customers through a fixed supply charge and a volumetric (consumption) charge. The consumption charge is directly related to the volume of gas supplied to each customer site. The meters are used to measure this volume.

Figure 2.1: AGN's role in the gas supply chain



Our asset management service provider, APA Asset Management (APA), is responsible for installing meters in our networks.[5] It is also responsible for carrying out the PMCs that are required to:

4 While there are a small number of large industrial customers that enter into their own gas supply and transportation arrangements, the majority of customers rely on a retailer for that service.

5 APA is required to install the meters in a position that allows unimpeded access to any person that is required to test, adjust, maintain, repair or replace the metering installation or collect metering data. Once the meters are installed, customers are responsible for ensuring their meter remains accessible to meter retailers.

- test the accuracy of the meters; and
- replace meters when their accuracy falls outside the prescribed tolerance band.

Meter testing is currently carried out by a National Association of Testing Authorities (NATA) accredited facility, while the physical meter replacement activities are carried out by a combination of APA staff and contractors.

2.2 Meter concepts

There are three main types of meter design used in the Victorian and Albury network:

1. diaphragm meters,
2. rotary meters, and
3. turbine meters.

These meters are typically grouped according to their service category, with the groupings including:

- domestic meters – which are typically diaphragm meters with a capacity up to 25m^3 per hour that are used to supply both residential and small commercial and industrial customers;
- commercial meters – which may be either diaphragm or rotary meters with a capacity greater than 25m^3 per hour that are used to supply medium to large scale commercial facilities; and
- industrial meters – which are usually turbine meters with a capacity greater than 25m^3 per hour that are used to supply large industrial customers.

The latter group of these meters are used at Tariff D customer sites (i.e. customers consuming more than 10 TJ per annum). The cost of replacing industrial meters is recovered directly from Tariff D customers, so they are not discussed any further in this plan. Implicit in this, any reference to meters of size >25m^3 per hour is referring to commercial meters as defined above.

Meters are also usually grouped into families, with the term family used to refer to a quantity of meters that is considered uniform. Consistent with AS 4944 and with the National Measurement Institute's document NITP 14, a meter family (also known as meter population) has the following details in common:

- manufacturer;
- country of manufacture;
- type or model of the meter;
- year of manufacture (within the same 12-month period);
- year of initial verification in the country of manufacture (within the same 12-month period);
- accuracy class; and
- certificate of approval.

For example, the Email 602 meter type, which was manufactured in each year between 1987 and 1994, consists of eight meter families.

2.3 Meter testing and replacement obligations

Meters installed in our Victorian and Albury networks are subject to the following regulatory obligations:

- *National Measurement Act 1960 (Commonwealth)* – Gas measurement laws are governed through the National Measurement Institute by the Chief Metrologist, who is empowered to oversee and administer the National Measurement Act. This Act sets out the requirements that apply to utility meters used for trade, their verification and the penalties for failure to comply with certain provisions in the Act.[6]
- Victorian Network – As a condition of our Victorian Gas Distribution Licence, we are required to comply with the metering related provisions set out in the Victorian Code. In particular, the Victorian Code requires us to:[7]
  - provide metering installations and sets out our obligations in relation to the standard of those installations, meter testing and replacements, and the collection and provision of metering data to retailers;[8] and
  - comply with AS 4944 when determining the initial and ongoing life of a meter family defined in this standard and when testing these meters.[9]
- Albury Network – As a condition of our New South Wales Gas Reticular Authorisation, we are required to comply with the *NSW Gas Supply (Safety and Network Management) Regulation 2013* (NSW Regulation), which states that when operating our network we must take into account any standards, including AS 4944 (Clause 6).[10] As a 'declared distribution system' under the National Gas Law (NGL) and NGR[11] the Albury Network is also required by the NGR[12] and the Victorian Retail Market Procedures[13] to comply with the metering provisions in the Victorian Code.

It is worth noting in this context that AS 4944 (Gas meters – In-Service Compliance Testing) only applies to meter families with a capacity of 25 m^3 per hour or less.[14] A distinction can therefore be drawn between meter families with a capacity:

- *up to 25m^3 per hour* (i.e. domestic meters), which are subject to AS 4944, the Victorian Code and the National Measurement Act; and

6 Under this Act, a person may be required to pay a penalty if they supply a utility meter for trade that gives an inaccurate measurement. The maximum penalty for such an offence is 200 penalty units, with each penalty unit worth $180. The maximum penalty that could be payable if a single meter was found to give an inaccurate measurement (i.e. running fast) is therefore $36,000.

7 The Victorian Code can be accessed online here: http://www.esc.vic.gov.au/document/energy/26123-gas-distribution-system-code-2/. This Code has been developed by the Victorian Essential Services Commission (ESC) and applies to all distributors that hold a distribution licence. The Code sets out the minimum standards for the operation and use of the distribution system, which include, amongst other things, minimum standards for connections, augmentations and metering installations. As stated in the notes to section 3 of the Code, clause 4 of AGN's Gas Distribution Licence requires compliance with this Code.

8 These provisions can be found in sections 5-8 of the Victorian Code.

9 These provisions can be found in section 7 of the Victorian Code.

10 The Regulation can be accessed online here: http://www.legislation.nsw.gov.au/regulations/2013-478.pdf. Under this Regulation, a corporation can be subject to a maximum penalty of 100 penalty units if they fail to comply with the requirement to take into account any standards (including codes, Australian Standards, guidelines or other requirements) when designing, constructing, operating or extending a gas network or any part of a gas network. A penalty unit in NSW is currently worth $110. The maximum penalty that could be payable under this regulation for a breach of AS 4944 is therefore $110,000.

11 The Albury network was defined by the Victorian Government as a 'declared distribution system' through a Ministerial Order made under section 39 of the *National Gas (Victoria) Act 2008*. See Victorian Government Gazette, No. S 222, 30 June 2009.

12 See for example, rules 298 and 304 of the NGR. Rule 298 requires metering installations at a distribution delivery point to satisfy the uncertainty limits set out in a 'declared metering requirement', while rule 304 requires the responsible person to ensure that metering data can be transmitted or otherwise collected and delivered to the metering database from its metering installations within the applicable accuracy parameters set out in the 'declared metering requirement'. For the purposes the NGR, the Victorian Code has been deemed to be the 'declared metering requirement'. See Victorian Government Gazette, No. S 222, 30 June 2009.

13 The Victorian Retail Market Procedures, which the Albury Network is subject to, also require compliance with the Victorian Code. A copy of the Retail Market Procedures can be accessed online here: https://www.aemo.com.au/Gas/Retail-markets-and-metering/Market-procedures/Victoria.

14 AS 4944:2006 section 1 Scope and section 4.1.2 Maximum flow rate.

- *greater than 25m³per hour* (i.e. commercial meters), which are subject to the Victorian Code and the *National Measurement Act*.

Our meter testing and replacement obligations under AS 4944 and the Victorian Code are outlined in sections 2.3.1 and 2.3.2 respectively.

Failure to maintain the accuracy of meters to the required standards increases the likelihood of customers being charged the incorrect amount for gas usage and, on larger meters, can have a significant effect on the level of unaccounted for gas. Failure to comply with the obligations outlined above can also result in:

- a breach of our licence conditions and authorisation in Victoria and New South Wales;
- a range of enforcement actions by the Essential Services Commission (ESC) as outlined in its *Compliance Policy Statement for Victorian Energy Businesses*;[15] and
- penalties being applied under the National Measurement Act and/or the NSW Regulation.

2.3.1 Meter testing

2.3.1.1 Domestic meters

AGN is required by the Victorian Code to carry out, or cause to be carried out the following tests on meters up to 25m³ per hour:

- acceptance tests before a new meter is placed into service, before a meter that has been removed from service is placed back into service and after any repairs, maintenance or recalibration is performed on a meter;[16]
- initial in-service compliance testing, which must be carried out in accordance with the requirements set out in AS 4944;[17] and
- field life extension (FLE) testing (also referred to as ongoing in-service compliance testing), which must be carried out in accordance with the requirements set out in AS 4944. [18]

AGN is also required to carry out testing if a customer requests such a test.[19]

The pass/fail criteria for these tests are set out in Schedule 1 Part B of the Victorian Code and summarised below:

> *"…the maximum allowable variance (error Units) in quantity from the agreed true quantity for gas meters shall be:*

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15 The Compliance Policy Statement can be accessed online here: http://www.esc.vic.gov.au/document/energy/26270-compliance-policy-statement-for-victorian-energy-businesses/. The range of compliance actions that the ESC can take include:

- Serving an enforcement order on the business, which requires compliance or rectification within a defined period of time;
- Penalties for non-compliance with an enforcement order, with the maximum penalty being 5,000 penalty units (which may be increased by 500 penalty units for each day after the service of the order that contravention continues);
- Varying a licence if the business fails to comply with the enforcement order; and
- Revoking a licence, if the business does not comply with an enforcement order.

16 Victorian Code, section 7.2.1.

17 Victorian Code, section 7.2.3(a).

18 Victorian Code, section 7.2.3(a)(v).

19 Victorian Code, section 7.2.2. This section of the Code requires AGN to:

- give the customer at least five business days' notice (or agree such other mutually convenient time) of when the requested test is proposed to be performed; and
- test a metering installation within 15 business days of a request from an affected party to ascertain whether or not the installation is defective.

This section also allows AGN to seek payment from the affected party of the costs of testing the metering installation and associated costs if the installation is not defective and meets the accuracy standards set out in the Code.

> a) *Not more that* (sic) *2 percent in favour of the Distributor;*
>
> b) *Not more that* (sic) *3 percent in favour of the Customer."*
>
> *The maximum allowable error limit range for correctors shall be ±1 % in addition to the error limits outlined in (a) and (b) above.*
>
> *Except where provided for in a sampling plan approved by the Commission, the error limit range of meters and correctors shall be established under standard conditions at (1) 20% and (2) 100% of the badge capacity of the meter, by a testing agency approved by the Commission.*
>
> *The testing procedures for gas meters and correctors shall have an uncertainty limit of no more than 1%."*

Our meter testing program is therefore carried out to ensure:

- the net volume of gas delivered to each delivery point falls within the prescribed tolerance band of metering accuracy;
- metering installations do not show any systematic bias within the allowable margin of accuracy and meters are not tampered with, or calibrated with the intent of causing bias in the meter; and
- the tolerances of the individual components (meters, correcting instruments, pressure and temperature transmitters) used to measure gas supplied to a customer are such that the gas measured is within a margin of accuracy of ±1% of the net volume of gas supplied for new meters leaving the manufacturer.

The remainder of this section provides further detail on the acceptance testing, initial in-service compliance testing and FLE testing requirements.

Acceptance testing

AGN is required to carry out, or cause to be carried out, acceptance tests on new and refurbished meters, and meters to be placed back into service. The term acceptance testing is defined in the Victorian Code as *testing and setting conducted by a manufacturer or installer on a meter, corrector or metering installation to establish the initial calibration of the meter, corrector or metering installation.*

To comply with this requirement of the Victorian Code, AGN requires domestic meters to be tested prior to delivery by the manufacturer or refurbished in accordance with AS 4647-2005 to an accuracy of at least ±1%.[20]

Meters received from manufacturers with accredited testing facilities are sealed prior to delivery and accepted without further testing. These meters are inspected on delivery to ensure seals are intact and no damage has occurred during transit. If the inspection is satisfactory, these meters are accepted without further testing, prior to installation. If the inspection is not satisfactory, the meters will be subject to further testing.

Initial in-service compliance testing

Once a meter family is placed into the field then it may, depending on when it was installed, be subject to an initial in-service compliance test to determine the initial meter life. This is referred to in AS 4944 as the compliance period, which is the interval before FLE testing is required to demonstrate that the meter family is maintaining its accuracy within an acceptable range.

In keeping with AS 4944, meters that belong to meter families installed:

[20] Manufacturers are required to supply on this basis under the terms of their contracts with APA.

- *up to and including 2008* are deemed to have an initial field life of 15 years from the date of their original installation.[21] In early-2022 there were approximately 745,757 of these meters installed in the Victoria and Albury natural gas distribution networks (the networks); and
- *from 2009 onwards* are required to undergo an initial in-service compliance test after a period of three to five years of field service to determine the initial meter life.[22] In mid-2021 there was one family with approximately 669 of these meters installed in the networks. For meters installed from 2009 onwards, the initial in-service compliance testing is usually carried out in the fifth year of service and, in keeping with AS 4944 is conducted by:
  - removing a sample from the meter family from the field that is sufficiently large to enable the testing to meet the sample requirements set out in Table 1 of AS 4944;[23] and
  - testing whether the accuracy of this sample of meters falls within a ±1.5% band, a ±2% band, a ±2.5% band or a ±3% band, which is then used to determine the initial meter life (compliance period) as set out in Table 2-1.[24]

Table 2-1: Meters In-Service Compliance Period as Derived from Initial Service Test

	Accuracy From Initial Service Test			
	Within ±1.5%	Within ±2.0%	Within ±2.5%	Within ±3.0%
Compliance Period	18 years	15 years	10 years	5 years

Source: AS 4944, Table 4.

Field life extension (ongoing in-service compliance) testing

Under AS 4944, meter families with a capacity of up to 25m^3 per hour must be tested to determine whether or not a meter family's field life can be extended beyond its designated initial meter life. This is referred to as FLE testing, or ongoing in-service compliance testing.

FLE testing generally occurs in the final year of a meter family's approved initial meter life (for example, a meter family with a 15 year initial life will be tested in year 16)[25] and, in keeping with AS 4944 is conducted by:

- removing a sample of meters from the relevant meter family (population) from the field, with the size of the sample based on the requirements set out in Table 1 of AS 4944; and
- testing whether the accuracy of this sample of meters:
  - falls within a ±2% band, a ±2.5% band or a ±3% band, in which case the field life can be extended in the manner set out in Table 2-2; or
  - falls outside the +2%/-3% band, in which case the meter family will be failed and replaced.

21 AS 4944, clause 6.2.1.
22 AS 4944, clause 6.2.2.
23 Given the potential for meters to be damaged when they are removed or transported to the testing site, or for other factors to prevent testing, AGN will usually take an additional 15% of meters from the field to ensure that the sample size that is tested meets the requirements in Table 1 of AS 4944.
24 Note that there is some flexibility that meter populations can be grouped according to year of installation rather than manufacturer.
25 Testing is carried out in this year because the Victorian Code requires the ESC to be advised at least three months before the expiry date of the initially determined meter life if it is to be extended.

Table 2-2: Accuracy criteria for FLE testing

	Accuracy From FLE Testing		
	Within ±2.0%	Within ±2.5%	Within ±3.0%
Field life extension	5 years	3 years	1 year

Source: AS 4944, Table 5.

2.3.1.2 Commercial meters

Commercial meters (i.e. meter families with a capacity greater than 25m^3 per hour) are not covered by AS 4944. The testing requirements for these types of meters are instead set out in the Victorian Code.

In a similar manner to domestic meters, the metering provisions in the Victorian Code require AGN to carry out, or cause to be carried out:

- acceptance tests before a new meter is placed into service, before a meter that has been removed from service is placed back into service and after any repairs, maintenance or recalibration is performed on a meter;[26] and
- meter specific testing if a customer requests such a test.[27]

The Victorian Code does not, however, require these meter families to undergo initial in-service compliance testing. Rather they are deemed by the Victorian Code to have an initial field life of 15 years.[28] These meter families are also not required to undergo FLE testing, unless the meter families are to be left in operation beyond their initial life of 15 years, in which case they are subject to FLE testing on an annual basis.[29]

Unlike domestic meters, the lives of commercial meters are not typically extended beyond 15 years. This is because even small metering inaccuracies at these sites can have a significant effect on unaccounted for gas volumes given the large volumes of gas supplied.

The requirement to carry out annual FLE testing also acts as a barrier to extending the life of commercial meters, because the cost of carrying out the testing is quite high and, in some cases, the removal of the meter interrupts the individual customer's business. FLE testing is not therefore commonly carried out on these meter families.

The remainder of this section provides further detail on the acceptance testing that is carried out on commercial meter families.

Acceptance testing for commercial meters

Like domestic meters, new and refurbished commercial meters are generally supplied by accredited manufacturers and tested by the manufacturer or refurbisher to an accuracy of at least ±1% prior to delivery.

Meters received from these manufacturers and refurbishers are sealed prior to delivery and accepted without further testing. These meters are inspected on delivery to ensure the seals are

26 Victorian Code, section 7.2.1.

27 Victorian Code, section 7.2.2. This section of the Code requires AGN to:

- give the customer at least 5 business days' notice (or agree such other mutually convenient time) of when the requested test is proposed to be performed; and
- test a metering installation within 15 business days of a request from an affected party to ascertain whether or not the installation is defective.

This section also allows AGN to seek payment from the affected party of the costs of testing the metering installation and associated costs if the installation is not defective and meets the accuracy standards set out in the Code.

28 Victorian Code, section 7.2.3(b)(i).

29 Victorian Code, section 7.2.3.

intact and no damage has occurred during transit. If the inspection is satisfactory, the meters are accepted without further testing, prior to installation.

If meters are received from a non-accredited manufacturer, they will be tested before being placed into the field using the following criteria set out in the Victorian Code:[30]

- all diaphragm meters are tested at both 20% and 100% flow rate and must be accurate to ±1%; and
- rotary and turbine meters are tested at 20% and 100% capacity and must be accurate to ±1%.

New meters that are not within the current network experience history, will be tested initially at five % flow rates (including 20% and 100%) across the range of flow to gain confidence in their use.

2.3.2 Meter replacement

We are required by the Victorian Code to replace meters on the following basis:

- *meters sized ≤25m³ per hour* – these meter families must be replaced if the test results fall outside the accuracy range specified in the Victorian Code;[31] and
- *meters sized >25m³ per hour* – these meter families are replaced once the meter family passes 15 years of age, unless the meter family has passed an FLE test.[32]

Where feasible, we will use commercial refurbished meters when carrying out the PMCs because while these meters have a shorter average life, they are a lower cost option than new meters (see Section 4.3 for more detail). There are, however, limits on the availability of refurbished meters (i.e. because there are only a certain number of meters that are removed from the field each year that are economically viable to repair).

Figure 2.2 outlines our approach to identifying the number of meters required to be replaced.

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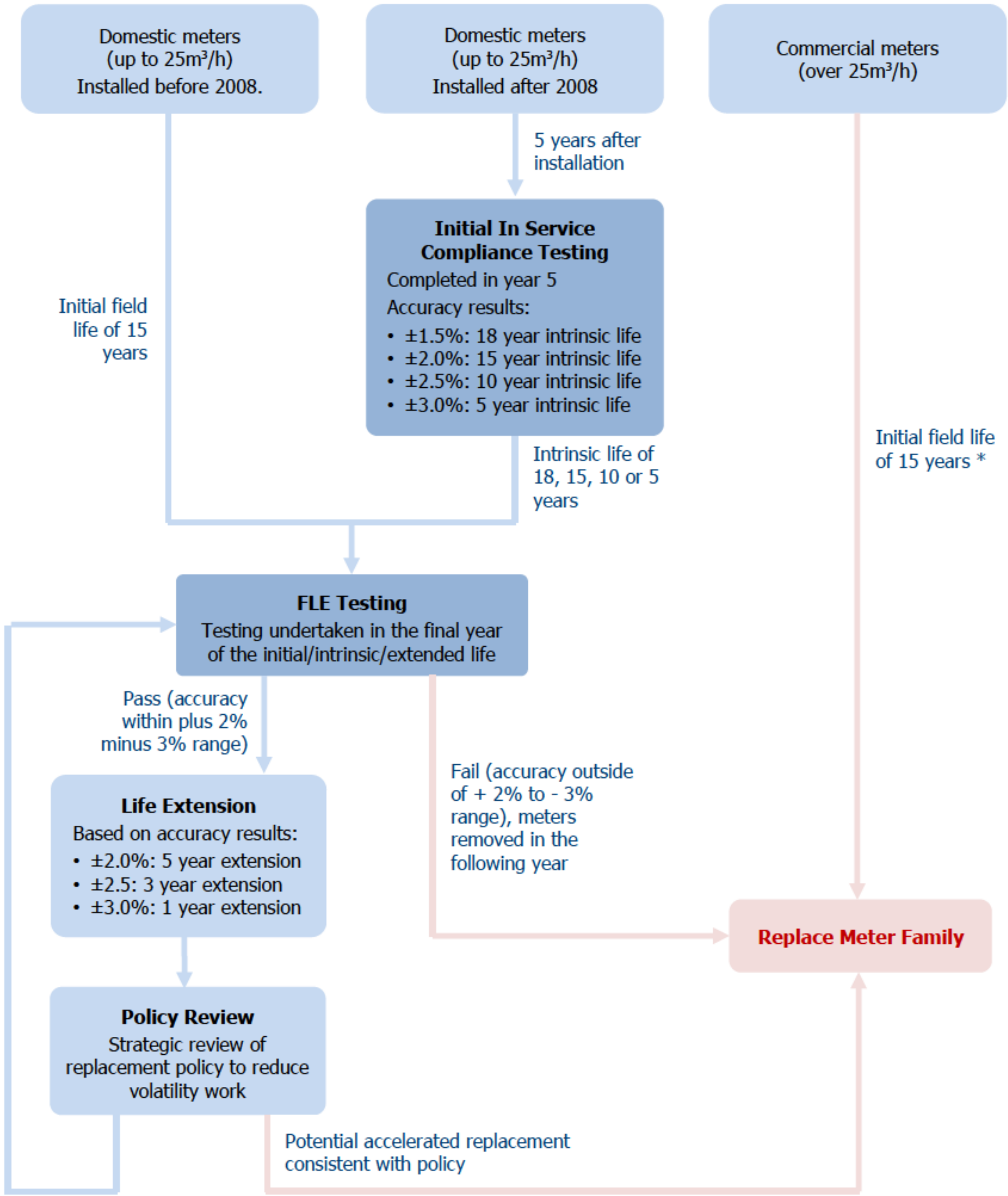
30 Victorian Code section 7.2.3(b)(iii).

31 Victorian Code, section 7.2.3a(v).

32 Victorian Code, section 7.2.3.

Figure 2.2: Meter replacement identification process



* Commercial meters are typically replaced at the end of their initial field life, but in those small number of cases where the field life is extended the meters will be subject to FLE testing on an annual basis.

As described in Figure 2.2, we may bring forward the replacement of meter populations to manage deliverability risk, minimise the cost of the replacement and ensure compliance with regulatory obligations. The process by which this occurs is outlined in Chapter 4.

Meters removed from service as part of the meter testing or replacement process may be either:

- repaired, tested and returned to service where it is economic to do so (commercial); or
- disposed of if it is uneconomic to repair the meters or parts are no longer available.

2.4 Meter reading obligations

The Victorian and Albury natural gas distribution networks deliver gas to more than 700,000 consumers. Each customer connection point has a meter, which measures how much gas the customer has used. Data from our meters is provided periodically to gas retailers, who use that data to calculate and issue gas bills to end consumers.

Under section 8.1 of the Victorian Code we are required to collect metering data and provide it to retailers '*as frequently as is required to enable the relevant Retailer to discharge its obligations and exercise its rights consistent with the Energy Retail Code and the applicable Retail Rules.*'

Section 57(2) of the Energy Retail Code of Practice requires that a '*retailer must use is best endeavours to ensure that actual readings of the meter are carried out as frequently as is required to prepare its bills consistently with the metering rules and in any event at least every 12 months.*'

Essentially, this means AGN must provide retailers actual meter readings at least once every 12 months. While estimated readings are permissible in certain circumstances, relying on estimated reads for a long period of time leads to billing inaccuracy and customers dissatisfaction. AGN must therefore ensure its meters can be read (either physically or remotely) at least once per 12-month billing cycle so that it can meet the compliance requirements under the Victorian Code and retailers can meet their obligations.

3 Meters in the Victorian and Albury Networks

This chapter sets out:

- the numbers and types of meters currently installed in the Victorian and Albury networks;
- the results of the testing that has recently been carried out in these networks; and
- the meter replacements undertaken (or are expected to be undertaken) in the current (2018 to 2022) Access Arrangement period in the networks.

3.1 Meter types

We reticulate gas to approximately 746,426 customers. Each customer has a meter installed at their premises. Table 3-1 provides a breakdown of the number and types of meter in our networks.

Table 3-1: meters installed in Victorian and Albury Networks (as of Jan 2022)

	Domestic & commercial
Number of meter types	41
Number of meters	746,426

The average age of meters is 10.3 years. as of Jan 2022.

Table 3-2 shows the age profile as of Jan 2022.

Table 3-2: Age profile of meters (as of Jan 2022)

Age	Domestic & Commercials
0-6 years	295051
6-7 years	42185
7-8 years	42014
8-9 years	38901
9-10 years	39147
10-11 years	40273
11-12 years	33290
12-13 years	25502
13-14 years	31669
14-15 years	36272
15+years	122122
Total	**746426**

As shown in the above figures, continued growth in the Albury and Victorian networks over 2018 to 2022 means the number of domestic and commercial meters installed continues to grow.

There is also a high number of domestic meters that have either been in the field 15+ years, or will reach 15 years old during the next AA period. FLE testing on these meters will also likely result in high volumes of PMCs over the coming five years.

3.2 Meter testing results

As noted previously, the Victorian Code requires meters to be sampled and tested for accuracy, with the results of those tests being used to determine the life and forecast replacement date for the wider meter family (population).

The remainder of this section provides an overview of the results of the acceptance testing, initial in-service compliance testing and the FLE testing conducted in the last five years.

3.2.1 Test results for meters ≤25m^3 per hour (domestic meters)

3.2.1.1 Acceptance testing

Manufacturers with accredited testing facilities are required to test the accuracy of new meters to a standard of ±1% prior to delivery. All new meters supplied by manufacturers over the last five years have fallen well within the ±1% accuracy range.

3.2.1.2 Initial in-service compliance testing

Within the current AA period we have had one new meter type (AC630) installed in our networks that meets the initial in-service compliance testing requirements. That family, which was installed from 2018 onwards, is due for initial life testing in 2023. Based on the size of this initial family, we intend to group three families together and test in 2025 as per AS 4944 s8.2.[33]

3.2.1.3 FLE testing

FLE testing has been conducted on 56 meter families over the last three years. Table 3-3 sets out the results of testing over this period, of which:

- 15 meter families were accorded a five year extension (the average age of the families granted this extension was 19.2 years);
- 15 meter families were accorded a three year extension (the average age of the families granted this extension was 21.2 years);
- 18 meter families were accorded a one-year extension (the average age of the families granted this extension was 23.7 years); and
- 8 meter families failed the test (the average age of the families that failed the accuracy test was 18 years).

[33] 8.2 Note: For small population years may be grouped, i.e. less than 1200 meters in a year, up to three consecutive years may be grouped.

Table 3-3: FLE meter family testing results for the current AA period

		2019	2020	2021
No. of meter families tested		**11**	**28**	**17**
Families passing:	5 year extension criteria	1	10	4
	3 year extension criteria	1	7	7
	1 year extension criteria	6	8	4
Families failing extension criteria		3	3	2

3.2.2 Test results for meters >25m^3 per hour (commercial meters)

As outlined in Section 2.3.1, the only testing commercial meters must undergo is: [34]

- acceptance testing, which must be carried out on new and refurbished meters before they are placed into service; and
- FLE testing, if the life of the meters is to be extended beyond the 15-year life set out in the Victorian Code.

Over the last five years there has been no FLE testing of commercial meters. The only testing carried out has been acceptance testing on new meters. This is because the cost of carrying out FLE testing on commercial meters is high, often more than replacing the meter with a new one, and in some cases can cause disruption to a customer's business operation.

Further, because of the large volumes of gas passing through commercial meters, any inaccuracy can have a significant impact on unaccounted for gas volumes and billing accuracy. Therefore, as a general rule, commercial meters are replaced after 15 years rather than having their field lives extended.

3.2.2.1 Acceptance testing

Manufacturers of larger meters with accredited testing facilities are required to test the accuracy of the larger meters to a standard of ±1% prior to delivery. Over the last five years, the new meters provided by manufacturers have fallen well within the ±1% accuracy range.

[34] Testing must also be carried out if requested by a customer.

4 Meter replacement policy

This chapter provides an overview of the meter replacement policy we intend to employ in the next AA period. The meter replacement forecast for the next AA period is provided in Chapter 5.

4.1 Meter replacement policy

The overarching objectives of AGN's meter replacement policy are to ensure compliance with the regulatory obligations set out in Chapter 2 and carry out the meter replacement program.

We will ensure the objective are met in the most prudent and efficient manner by:

- ensuring inter year program size within deliverability, in so doing, minimising the unit rates and program delivery risks;
- maximising the use of refurbished meters (commercial) in the meter replacement program, which is more cost effective to install than new meters; and
- using testing facilities and contractors that have been selected through a competitive tender process (for more information relating to our proposed unit rates for the next AA period, please refer to Attachment 9.6 Unit Rates Report of our Final Plan).

Further detail on the processes AGN has put in place to minimise the costs and risks associated with the meter replacement program are set out below.

4.2 Efficient delivery

The annual meter replacement works program is primarily compliance driven, with AGN having a requirement to replace/test meters as they reach a certain age. This can give rise to a 'lumpy' work profile as large families of meters reach replacement age at the same time.

Significant inter-year variability can place upward pressure on the internal[35] and external costs of carrying out the program. This is due to costs associated with mobilising and demobilising resources on a year-to-year basis and constraints on the availability of resources.

Therefore, to the extent practicable, we aim to smooth the delivery profile of PMCs, working within a sustainable upper bound of replacements per year.

To estimate the sustainable upper bound for annual meter replacement in the next AA period, we have considered the following deliverability factors:

- *Availability of refurbished meters* – AGN intends to buy and install new meters for its domestic meter replacement program. However, to minimise the cost of the commercial meter replacement program, we will use refurbished commercial meters where practicable. There is, however, a limit on the availability of refurbished commercial meters of around 300 meters per annum from the supplier.

  This means that if the number of commercial meters that needs to be replaced in a year exceeds 300, new commercial meters will need to be installed, which are approximately 35% more expensive than refurbished meters. If the number of new commercial meters to be

[35] Internal costs will increase because additional resources will need to be used to plan, schedule and co-ordinate the program.

installed in a particular year are too high, then we may also experience constraints trying to procure new meters, which could drive up the price of these meters.

- *Gas fitting services* – for large programs (e.g. those above 40,000 PMCs per year), there is a risk that the demand for skilled labour will outstrip supply (particularly in Victoria where there are three gas distribution businesses requiring services), which will negate any benefit that may be expected from economies of scale.
- *Internal labour* – internal resources are used to plan, schedule and co-ordinate the meter replacement program, so if the number of meters to be replaced in a particular year substantially exceeds the average, then additional resources will need to be dedicated to this task. Internal labour constraints may require contractors to be engaged in peak years to supplement the internal work force, giving rise to additional costs, e.g. for training and overtime (to complete the program).

Given these factors, coupled with the growing fleet of meters in our networks, we consider a sustainable upper bound for meter replacement in the next AA period is:

- up to 40,000 meter replacements per annum for domestic meters; and
- up to 350 meter replacements per annum for commercial meters.

The upper bound is based on our experience in delivering large scale programs and reflects the additional costs and risks that can be faced if programs in excess of this level are carried out.

4.2.1 Use of competitive tender processes

To ensure the testing and meter replacements are carried out in the most efficient manner, we have entered into contracts with a series of service providers through competitive tender processes. Further detail on these contracts can be found in the Unit Rates Report, provided as Attachment 9.6 to our Final Plan.

5 Capital works program

5.1 Periodic meter changes

This chapter sets out forecast expenditure on domestic and commercial PMCs in the Victorian and Albury networks over the next AA period. In developing these forecasts, we have had regard to the regulatory obligations set out in the Victorian Code, the NSW Regulation, AS 4944 and the National Measurement Act. We have also had regard to:

- Rule 79 of the NGR, which requires the capex to 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 providing this service; and
  - justifiable on one of the following grounds set out in Rule 79(2) of the NGR:
    - a the overall economic value of the expenditure is positive; or
    - b the present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure; or
    - c the capital expenditure is necessary:
      - i to maintain and improve the safety of services; or
      - ii to maintain the integrity of services; or
      - iii to comply with a regulatory obligation or requirement; or
      - iv to maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or
    - d the capital expenditure is an aggregate amount divisible into 2 parts, one referable to incremental services and the other referable to a purpose referred to in paragraph (c), and the former is justifiable under paragraph (b) and the latter under paragraph (c); and
- Rule 74 of the NGR, which states that any forecast or estimate must be arrived at on a reasonable basis and represent the best forecast or estimate possible in the circumstances.

5.1.1 Forecasting approach

To develop the forecasts for the next AA period, we have taken the following steps:

Step 1. **Forecast the number of PMCs for meters sized ≤25m^3 per hour to occur in the next AA period:** Using information on the age of the meters with a capacity of up to 25m^3 per hour that are expected to be in place as at 1 January 2023, and prior testing results, we have developed a forecast of:

- the number of initial in-service compliance tests that will be required over the next AA period;
- the number of FLE tests that will be required over the next AA period and the extensions that will flow from this testing;

- the number of meters that will fail the FLE testing and require replacement in the next AA period; and
- the number of defective[36] meters that will need to be replaced on a reactive basis in the AA period.

Step 2. **Forecast the number of PMCs for meters sized >25m³ per hour to occur in the next AA period**: Using information on the age of the meters with a capacity in excess of 25m³ per hour that are expected to be in place as at 1 January 2023, we have developed a forecast of the number of meters that will reach the age of 15 and require replacement in the next AA period:

Step 3. **Ensuring inter-year deliverability in the PMC program**: Subject to the constraints posed by our regulatory obligations, we have sought to minimise the degree of inter-year variability by smoothing the replacement profile over the next AA period.

Step 4. **Calculate the forecast cost of the PMC program in the next AA period**: Using the smoothed meter replacement profile derived in Step 3 and the unit rates set out in the Unit Rates Report (see Attachment 9.6 to our Final Plan), we have calculated the forecast cost of the PMC program in the next AA period.

Each of these steps are discussed in further detail below.

5.1.2 Step 1: Forecast PMCs for meters ≤25m³ per hour (domestic meters)

To forecast the number of PMCs that will be required in the next AA period for meters with a capacity of up to 25m³ per hour, consideration must be given to:

- the number of initial in-service compliance tests that will be required in the period;
- the number of FLE tests that will be required in the period and the field life extensions that will flow from this testing;
- the number of meters that are likely to fail the FLE testing and require replacement in the period; and
- the number of defective meters that will need to be replaced on a reactive basis in the period.

5.1.2.1 Initial in-service compliance testing

To forecast the number of initial in-service compliance tests that will be required in the next AA period, we have assumed testing is carried out in the fifth year the meter population came into service.[37] Using this assumption, as well as information on the age of the meters and the sample size requirements set out in Table 1 of AS 4944,[38] we estimate 92 domestic meters will need to be removed from the field during the next AA period and subject to initial in-service compliance testing (see

Table 5-1). Further detail on how we arrived at this estimate can be found in Appendix A.

[36] The term defective is used in this context to distinguish these meters from those that are replaced because the meter family is no longer providing an accurate measure of the volume of gas consumed.

[37] As an example, there are 669 meters from the AC 630 pattern installed during this AA period. An Initial In Service life test of 92 of these meters will be required by 2025.

[38] Given the potential for meters to be damaged when they are removed or transported to the testing site, or for other factors to prevent testing, we have assumed that an additional 15% of meters from each family will need to be removed from the field for testing.

Table 5-1: Victorian and Albury Networks: Initial in-service compliance testing for domestic meters

Volumes	2023/24	2024/25	2025/26	2026/27	*2027/28	Total
Number of domestic meters to be tested	0	0	92	0	0	92

Note: given the small populations of AC 630, we have grouped 3 consecutive years together in 2025

5.1.2.2 FLE testing

In contrast to initial in-service compliance testing, FLE testing is harder to predict because meters do not generally deteriorate (fail meter testing) in a standardised and predictable manner. Some reasonable assumptions must therefore be made about when the FLE tests will be required.

For those meters that have not previously been subject to any form of in-service testing (i.e. initial in-service compliance or FLE testing), we have assumed the following:

- the initial service life of newly manufactured meters is assumed to be 15 years and meter accuracy is assumed to deteriorate through successive FLE tests as follows:
  - the first FLE test is assumed to be conducted in year 16 and result in a five year extension;
  - the second FLE test is assumed to be conducted in year 21 and result in a three year extension;
  - the third FLE test is assumed to be conducted in year 24 and result in a one year extension; and
  - the fourth FLE test is assumed to be conducted in year 25 and result in no further extensions (i.e. it is assumed to fail the test) with the meter family removed after year 24; and
- the initial service life of refurbished meters is assumed to be 15 years and meter accuracy is assumed to deteriorate through successive FLE tests as follows:
  - the first FLE test is assumed to be conducted in year 16 and result in a three year extension;
  - the second FLE test is assumed to be conducted in year 19 and result in a one year extension; and
  - the fourth FLE test is assumed to be conducted in year 20 and result in no further extensions (i.e. it is assumed to fail the test) with the meter family removed after year 19 where the meter family has been subject to an in-service test, we also assume that metering accuracy will deteriorate through successive FLE tests, but the timing of the subsequent FLE tests for that meter family will depend on the results of the last test.

Using these assumptions, as well as information on the age of the assets that will be in stock as at 1 January 2023; the results of previous initial in-service compliance and FLE testing and the sample size requirements set out in Table 1 of AS 4944, we have estimated 16,726 domestic meters from these meter families will need to be removed from the field and subject to FLE testing in the next AA period (see Table 5-2).[39] Further detail on how we arrived at this estimate can be found in Appendix A.

[39] As an example, the meter pattern Email 602 installed in 1989 was tested in 2014 and received a FLE of three years at that time. The next test of this family is required in 2017, with 230 meters to be removed and tested.

Table 5-2: Victorian and Albury Networks: FLE testing for domestic meters

Volumes	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Number of domestic meters to be tested	3,298	3,938	3,219	3,305	2,966	16,726
Number of domestic meter families	23	28	25	26	22	124

Note: Totals may not add due to rounding.

5.1.2.3 Meters forecast to fail the FLE test in the period

The number of meters that will need to be replaced in a particular year because the meter family's accuracy no longer falls within the prescribed tolerance band will depend on the results of the previous year's FLE testing, with meters that fail this testing being removed from service in the following year. This include meter families that are either too small or uneconomical to test.

To estimate the number of meters that will fail the FLE in the next AA period, as per previous Meter Replacement Plans, we have made an assumption about the average life of these meters. For meters that have not previously been subject to any form of in-service testing, we have used our experience and assumed that:

- newly manufactured meters have a 24-year life (i.e. an initial service life of 15 years plus three FLE extensions totaling nine years);[40] and
- refurbished meters have a 19 year life (i.e. an initial service life of 15 years plus two FLE extensions totaling four years).

For meters that have previously been subject to initial in-service compliance and/or FLE testing, the life of the meters will be informed by the results of the last tests that were conducted. Using these assumptions, as well as information on the age of the assets that will be in stock as at 1 January 2023, and prior test results, we estimate 109,810 domestic meters will need to be removed from the field during the next AA period because they fail the FLE testing (see Table 5-3). Further detail on how we arrived at this estimate can be found in Appendix A.

Table 5-3: Victorian and Albury Networks: Domestic meters to be replaced due to failure of FLE testing

Volumes	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Domestic meters to be replaced	14,283	2,566	46,486	22,912	23,563	109,810

Note: Totals may not add due to rounding.

5.1.2.4 Reactive replacements of defective meters

In addition to having to replace meter families that no longer satisfy the prescribed tolerance band for metering accuracy, there are occasions where individual meters become defective and require replacement. This is referred to as 'reactive replacement'.

Historically, around 5,000 meters per annum have had to be replaced on this basis. Provision has therefore been made in the forecast for an equivalent number of reactive replacements to occur over the next AA period.

[40] It is noteworthy that as described in Section 3.2.1.3, the number of meter families failing the FLE testing has increased in the last three years and in most cases has occurred on meters that are 14 to 15 years of age, meaning these meters are being removed from service at an age of around 15 years, less than the 24 year life assumed to develop these forecasts. The basis of this meter replacement forecast can therefore be considered conservative.

Table 5-4: Victorian and Albury Networks: Reactive domestic meter replacements

Volumes	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Domestic meters to be replaced	5,000	5,000	5,000	5,000	5,000	25,000

5.1.2.5 Summary of forecast number of PMCs for domestic meters

The total number of PMCs for meters sized ≤25m^3 per hour forecast for the next AA period in the Victorian and Albury networks is summarised in Table 5-5.

Table 5-5: Victorian and Albury Networks: PMC forecast for meters sized ≤25m^3 per hour

Volumes	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Initial in-service testing	0	0	92	0	0	92
FLE testing	3,298	3,938	3,219	3,305	2,966	16,726
Domestic meters requiring replacement after failing FLE testing	14,283	2,566	46,486	22,912	23,563	109,810
Reactive replacements of defective domestic meters	5,000	5,000	5,000	5,000	5,000	25,000
Total	**22,581**	**11,504**	**54,797**	**31,217**	**31,529**	**151,628**

5.1.3 Step 2: Forecast PMCs for meters >25m^3 per hour (commercial meters).

To forecast the number of meters of size >25m^3 per hour that will need to be replaced in the next AA period, we have assumed that meters will be replaced after the end of their 15th year of service, consistent with the standard life set out in the Victorian Code (see Section 2.3.1.2 for more detail). The commercial meters that will reach this age in the next AA period are those 1,357 meters that were installed between 2007 and 2011[41] (see

Table 5-6). Further detail on how we arrived at this estimate can be found in Appendix A.

Table 5-6: Victorian and Albury Networks: PMCs for meters sized >25m^3 per hour

Volumes	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Commercial meters reaching 15 years of age	246	245	347	262	257	1,357

5.1.4 Step 3: Ensuring inter-year deliverability

The total number of domestic and commercial PMCs forecast to be required in the Victorian and Albury networks in the next AA period is summarised in Table 5-7.

[41] For example, in 2023 the number of meters that will need to be replaced is equal to the number of meters that were installed in 2007 that are still in operation (i.e. 246).

Table 5-7: Victorian and Albury Networks: Meter replacement volumes forecast (unsmoothed)

Volumes	2023/24	2024/25	2025/26	2026/27	2027/28	Total	Five Year Average
Domestic meters	22,581	11,504	54,797	31,217	31,529	151,628	30,326
Commercial meters	246	245	347	262	257	1,357	272
Total	**22,827**	**11,749**	**55,144**	**31,479**	**31,786**	**152,985**	**30,598**

The forecast exhibits a significant degree of variability, with the number of PMCs to be conducted per year of the AA period ranging from 11,504 to 54,797. Carrying out a program above our normal deliverability can be more costly to implement because of the costs associated with mobilising and demobilising resources and constraints on the availability of refurbished meters, gas fitting services and internal labour. It can also give rise to a range of program delivery risks, the most significant of which being non-compliance with the regulatory obligations set out in the Victorian Code, the NSW Regulation, AS 4944 and the National Measurement Act. We have therefore sought to minimse the degree of inter-year variability in the PMC forecasts.

Before setting out the smoothed profile that we have adopted for these meters, it is worth reiterating that given the obligations we have under the Victorian Code, the NSW Regulation, AS 4944 and the National Measurement Act, there are some constraints on the extent to which the forecast can be smoothed over the period. Smoothing can only be achieved by bringing forward the replacement of meter families before the end of their deemed useful life.

5.1.4.1 Smoothing the PMC profile for meters ≤25m^3 per hour

Due to volumes in 2025, being in excess of operational capability (40,000 meters per annum), 20,000 meters will be brought forward from 2025 to 2024. This will reduce the peak in PMCs for meters sized up to 25m3 per hour, resulting in the program being within operational capability for all years.

5.1.4.2 Smoothing the PMC profile for meters >25m^3 per hour

As the volumes forecast for this category are all within our operational capability, no smoothing is expected to be required.

5.1.4.3 Meter replacement summary

Table 5-8 provides a summary of the smoothed PMC profile we intend to deliver in the next AA period.

Table 5-8: Victorian and Albury Networks – Smoothed PMC forecast

Volumes	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Domestic meters (≤25m³ per hour)						
Sustainable upper bound of replacement	Up to 40,000 meters per annum					**Total**
Predicted number of PMCs (Unsmoothed)	22,581	11,504	54,797	31,217	31,529	**151,628**
Smoothed number of PMCs	22,581	31,504	34,797	31217	31,529	**151,628**
Commercial meters (>25m³ per hour)						
Sustainable upper bound of replacement	1,300–1,500 meters per annum					**Total**
Predicted number of PMCs (unsmoothed)	246	245	347	262	257	**1,357**
Smoothed number of PMCs	246	245	347	262	257	**1,357**
Total program						
Smoothed number of PMCs	**10,835**	**30,927**	**33,740**	**15,050**	**12,559**	**103,111**

As this table shows, employing the smoothed program will:

- reduce the peak in PMCs for meters sized up to 25m³ per hour, from 54,797 in 2025 to 34,797 and bring the program in the peak years within operational capability (i.e. up to 40,000 per annum), while also ensuring compliance with our regulatory obligations; and
- no smoothing in PMCs for meters sized above 25m³ per hour, as the volume fall within operational capability on annual basis to ensure compliance with our regulatory obligations.

Smoothing the PMC program in this manner will also, as noted above, enable us to avoid costs spikes and risks of delivering the program over the AA period. This is consistent with rule 79 of the NGR, as the AER acknowledged in 2012 when considering a similar proposal by AusNet Services. In this case, the AER found that a smoothed replacement profile was consistent with both rule 74 and rule 79 and in doing so noted the following:[42]

> *"The AER accepts there may be costs involved in mobilising and demobilising a workforce and so considers smoothing is appropriate in some circumstances. In SP AusNet's case, the "early retirement" meters are still removed when the installed lives are at the low end of what the AER considers reasonable. Accordingly the AER accepts that these meters are not being removed from service unreasonably early.*
>
> *The AER considers the volume of meters to be replaced under this program is consistent with r. 74(2) of the NGR and prudent and efficient."*

As such, we considered that our smoothed forecast meter replacement program is consistent with the NGR and with the AER's previously approved approach.

[42] AER, *Draft Decision: SP AusNet Access Arrangement 2013-17, Part 1*, September 2012, page 60.

5.1.5 Step 4: Calculate the forecast cost of the PMC program

The forecast cost of the PMC program has been calculated by multiplying the forecast number of PMCs by the unit rates set out in the Unit Rates Report, provided as Attachment 9.6 to our Final Plan. In the Unit Rates Report, separate unit rates have been calculated for:

- meters of size ≤25 m^3 per hour – the unit rate in this case is $[redacted] per meter; and
- meters of size >25m^3– the unit rate in this case is $[redacted] per meter.

The unit rates in both cases reflect the costs of:

- procuring new and refurbished meters;
- planning and scheduling the meters to be changed over, and organizing the resources (combination of direct and contractor) to carry out the meter change;
- installing the meters; and
- carrying out the testing required by AS 4944 and the Victorian Code.

Further detail on these unit rates can be found in the Unit Rates Report at Attachment 9.6 to the Final Plan.

Table 5-9 sets out the forecast cost of the PMC program in the networks.

Table 5-9: Victoria and Albury Network: Meter replacement cost estimate, $,000 real 2021

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Domestic meters (≤25m^3 per hour)						
Number of PMCs	22,581	31,504	34,797	31,217	31,529	**151,628**
Unit rate ($/meter)					[redacted]	[redacted]
Forecast cost ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Commercial meters (>25m^3 per hour)						
Number of PMCs	246	245	347	262	257	**1,357**
Unit rate ($/meter)					[redacted]	[redacted]
Forecast cost ($'000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total program						
Total all meters ($'000)	**5,294**	**7,183**	**8,091**	**7,157**	**7,213**	**34,939**

5.2 Remote digital meter reading

As discussed in section 2.4, AGN has an obligation to send timely and accurate meter data to gas retailers. To ensure customers' gas bills are accurate, we must provide actual (not estimated) meter readings at least once every 12 months.

Most meters installed in our network are diaphragm (analogue) meters that must be physically read by meter reading personnel. Unfortunately, not all meters can be accessed easily.

In some cases, accessing customer's property may pose health and safety risks to our meter readers, such as dangerous dogs and stinging/biting insects. At other properties the meter simply is not accessible, for example a gate or barrier may have been installed blocking access to the meter, or the meter is located in a heritage building and cannot be accessed and/or relocated.

Where a meter is difficult to access, it is an industry requirement to issue an estimate in the absence of a physical reading. While estimates are permissible, they may result in inaccurate measurement and in turn, inaccurate billing. Billing inaccuracy can result in significant volatility in costs, price shock, and customer dissatisfaction. Being unable to provide actual meter data at least once every 12 months may also cause gas retailers to be in breach of the Energy Retail Code of Practice, which in turn causes AGN to be in breach of the Victorian Gas Distribution Code.

Current data shows there are 4,693 customers on our network that have not had a physical meter read for more than 12 months. In some cases these customers' meters have not been physically read for many years.

Historically, the safety and health risk posed by inaccessible/dangerous meter locations has been managed by simply not requiring our staff to attend the site and place themselves in harms way. While this manages the safety risk, it does little to address the reputational and compliance risks posed by estimated reads. This reputational/compliance risk has been considered tolerable simply because there were no practicable (affordable) alternatives to estimated reads. However, developments in metering technology means there are now practicable options to allow inaccessible meters to be read accurately, while mitigating the safety risks. The reputational/compliance risk is therefore no longer ALARP.

Digital metering has become a viable alternative to manual reads. Digital meters can be installed at a customer's premises at relatively low cost and can be read remotely via a dedicated communications network, or via a vendor head end system. This eliminates the need for meter readers to attend the site, and enables accurate billing information to be provided to retailers as required.

5.2.1 Proposed solution

Inaccessible meters

During the next AA period we propose to install digital meters at the 4,693 sites identified as inaccessible or difficult/dangerous to access. The meters can be installed at a customer's premises at a relatively low cost. The technology we are looking at ([redacted] can use existing cellular 3G/4G networks, and the head end system can be integrated into AGN/APA's existing meter data system.

This solution will allow multiple remote reads to be conducted each year, and ensure we can provide actual meter data to retailers to allow accurate customer billing. It will also enable us to meet our compliance requirements and eliminate some costs associated with special meter reads.

Note this is a proactive replacement program, which means some of these 4,693 sites will be replaced ahead of their scheduled PMC. The recurring PMC program will be adjusted to reflect this new meter family going forwards.

We considered the option of only replacing these meters upon their scheduled PMC, however, adopting such a piecemeal approach would limit our ability to achieve efficiencies through delivering the works as a scheduled program and purchasing meters in bulk. More importantly, a piecemeal approach would significantly extend the timeframe for addressing this non-compliance issue, resulting in customers receiving estimated reads for several more years to come.

This proposed program will be delivered in full during the first two years of the next AA period and recovered via regulated tariffs. We consider this expenditure is justifiable under NGR 79 as it is necessary to enable us to maintain/improve the safety of services and meet our compliance obligations.

Opt-in customers

Customers have told us they are looking for new digital ways to manage their gas usage and reduce their bills. We therefore propose to also offer **all** customers the option to have a digital meter installed at their property, even if their current meter is accessible and not at end-of-life. These 'opt-in' meter replacements would be charged directly to customers, with the costs of purchasing and installing these meters recovered via customer contributions. The 'opt-in' meter replacements would be recovered directly from these customers over ten years for a small servicing fee of $36 per annum (or $3 per month), and would give the customers the option of receiving monthly read / billing information.

We consider it prudent to include an amount in the capex forecast to cover the cost of up to 2,500 customers opting into digital meters, noting that the actual cost of these 'opt-ins' will ultimately not be recovered via regulated revenue.

5.2.2 Forecast capex – inaccessible meters

Table 5-10 shows the capital cost estimate for installing 4,693 digital meters at currently inaccessible sites.

Table 5-10: Capex estimate – Digital metering at inaccessible sites, $,000 real 2021

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
No. of meters installed at inaccessible sites	2,500	2,193	-	-	-	4,693
Meter purchase and install ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Integration into CCB ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total capex ($,000)	**2,168**	**805**				**2,974**

This capex estimate is based on hardware and installation costs provided by the meter vendor. Note installation costs for inaccessible meters are assumed to be higher than those for standard (accessible) sites or new installations, due to the need for specific appointment times and the potential for multiple site visits. The inaccessible meters program includes an initial capital cost associated with integrating the vendor's head end comms system into our meter data system.

Table 5-11 shows the capital cost for opt-in customers, assuming 2,500 customers would choose to have digital meters installed over the period. While it is not possible to estimate the number and profile of actual installations with any accuracy, for capex forecasting purposes we have assumed a smooth profile of 500 opt-ins per year.

The capital cost of the opt-ins would be recovered from the individual customers via an annual charge of $36 per year, over ten years.

Table 5-11: Capex estimate – Digital meter customer opt-in, $,000 real 2021

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Assumed number of opt-in customers	500	500	500	500	500	2,500
Meter purchase and install ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total capex ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

5.3 Digital meters in new estates – an asset management opportunity

Digital metering technology is becoming the energy sector norm, and has the potential to become the new standard for meter replacement in our network. As discussed in section 5.2, digital meters offer accurate information, eliminate the need for physical meter reads, and are generally a step-up in technology from traditional diaphragm meters.

Digital meters can be configured to capture additional information on a customer's gas usage, such as time of use and peak consumption, which can be provided to customers to help them manage their costs and gas usage. Digital metering technology is also progressing in the renewable gas space, with most models compatible with 10% hydrogen blends, and research ongoing to develop digital meters that can handle 100% hydrogen without the space constraints posed by diaphragm meters.[43]

The roll out of digital meters to the 4,693 inaccessible sites (discussed in section 5.2 above) will provide useful data on the effectiveness of digital metering, and we will use insights from this project to inform our ongoing PMC program. However, the data we will get from the inaccessible meter program will be limited because:

- these meters will be installed in challenging locations and widely dispersed across the network, which means they will cost more to install than a new estate or scheduled PMC. As a result, the program won't allow for a direct comparison with standard installation costs for diaphragm meters;
- insight on the savings and health and safety benefits of remote reads for these sites will be limited, as we are not currently reading them anyway;
- the meters will be spread across the network, which means they will be limited to using cellular 3G/4G communications technology, which will incur carrier charges. A concentration of digital meters (such as in new estates) would allow us to test alternative comms technology such as RF and PLC, as well as comms solutions that may avoid/reduce carrier charges. We will not be able to gain such insights from the dispersed 4,693 sites; and
- not all of the 4,693 inaccessible sites will be located in areas of the network capable of supporting a hydrogen blend, or where hydrogen is likely to be injected in the near future. This negates the possibility of trialling compatibility of the digital meters with renewable gas.

We therefore propose to purchase an additional 2,500 digital meters for installation at new estates over the next five years.

Installation in new estates

[43] Due to the physical properties and energy density of hydrogen (1/3 of natural gas), gas volumetric based positive development meters in a 100% hydrogen environment need to be three times as large

As discussed in section 1.2, customers have told us they are looking for new digital ways to manage their gas usage and reduce their bills. A digital metering solution can offer customers more control and transparency over their bills, and we believe would be consistent with their technology expectations. However, we are conscious the solution we offer must be delivered at the lowest practicably sustainable cost and offer benefits and/or cost savings to customers. A digital metering trial will allow us to ascertain this.

Installing a significant population of digital meters in close proximity to each other will allow us to assess the benefits and technical capabilities of these new assets more effectively. A concentrated digital metering trial in a new estate avoids the limitations (outlined above) of relying solely on the 4,693 inaccessible sites, and will provide greater insight into their practical application and operational savings.

In particular, a trial in new estates will give us the opportunity to test a number of comms system configurations and identify the most appropriate and cost-effective digital metering solution. It will also provide opportunity to capture direct customer feedback though community consultation with the new residents, and test value-adding services such as providing regular or real time gas consumption data to customers.

Installing digital meters within a new estate is a relatively inexpensive option to trial digital metering technology, as the proposed digital meters and associated comms currently cost around $74 more per unit than the traditional diaphragm meters that would otherwise be installed.

Hydrogen in Albury and Wodonga

A further opportunity exists in Albury and Wodonga. The Albury and Wodonga section of our network in northern Victoria is located near to the Hydrogen Park Murray Valley (HyP Murray Valley) project. Hyp Murray Valley is a renewable hydrogen production facility. The produced renewable hydrogen will then be blended into the existing gas distribution network to deliver up to 10% (by volume) hydrogen blend to the ~40,000 residential and commercial gas customers and 20 industrial customers in Albury and Wodonga. We expect the Hyp Murray Valley project to be up and running in 2024.

Our growth forecasts indicate 2,511 new residential and commercial customers will connect in Albury over the next AA period, with a further 1,750 in Wodonga. We therefore have a perfect opportunity to target the digital metering trial in new estates in this area.

By installing some (or all) of the proposed 2,500 digital meters in new estates in Albury and Wodonga, we will gain insight into the suitability of digital meters with hydrogen and hydrogen blends. This will be invaluable in our customers journey towards decarbonisation.

One of the challenges of transitioning to renewable gas is the current diaphragm metering technology. While our existing fleet of volumetric meters are compatible with up to a 10% hydrogen blend, meter vendors have advised that they are not suitable for hydrogen blends above this. In a 100% hydrogen environment – which we are targeting to achieve by 2050 at the latest – traditional volumetric meters would need to be three times their current size. Not only is this an issue in respect to sizing, inlet/outlet retrofitting, positioning, installation, and aesthetics, it has a significant cost impact.

Digital meters with ultrasonic or thermal mass metrology sensors can solve this problem. They support larger volumes of hydrogen without a commensurate increase in size, and have been proven to be hydrogen compatible in other jurisdictions.

The digital metering technology we are currently looking at ([redacted]) is compatible with a 10% blend. Research is ongoing as to what volume of hydrogen can be supported by these types of meters, and vendors are developing digital meters that can support 100% hydrogen. It is feasible that 100% hydrogen compatible digital meters will be available and approved for use on our network within the next few years.

We therefore propose that, as minimum, the ([redacted]) digital meters be installed in Albury and Wodonga as part of the new estates trial. However, we would reserve the right to use 100% hydrogen compatible meters as a substitute if the technology becomes available. It is worth nothing that the percentage blend of hydrogen would not affect the comms solution associated with the digital meters.

Along with other elements, digital metering is essential to ensure stakeholders expectations and the Government's decarbonisation targets[44] can be met. We need to start now to ensure the metering technology is capable of deployment by 2025, as a number of technical and regulatory challenges need to be addressed. The hydrogen metering market is in its infancy and not yet mature. Metering technology options are rapidly evolving, particularly for measurement of both Hydrogen and $NG+H_2$ blends. A trial in Albury and Wodonga provides an opportunity to significantly influence the outcomes and ensure that next generations of digital meters for the Australian market are fit for purpose.

5.3.1.1 Forecast capex – digital metering in new estates

Table 5-12 shows the forecast capital costs of installing digital meters in new estates. The installation costs per unit for new estates are assumed to be lower than those for the inaccessible meter program, as the meters can be installed in one visit without a scheduled appointment. By installing new digital meters at new estates, the incremental cost increase compared to installing standard diaphragm meters is an extra $[redacted] per unit. This installation cost covers the cost of the meter and communications set up.

Table 5-12: Capex estimate – Digital metering at new estates, $,000 real 2021

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
No. of meters installed at new estates	500	500	500	500	500	2,500
Digital meter purchase and install ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Less cost of standard diaphragm meters ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Incremental costs to purchase and install digital meters ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total capex ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

5.3.2 Operating costs associated with digital meters

There are ongoing operating costs associated with the digital metering solution. These include:

- an annual hosting charge for the vendor system ($[redacted]);
- an annual hosting charge per meter ($[redacted] per meter); and
- ongoing IT and administration support (estimated [redacted] per year).

[44] As stated in the Gas Substitution Roadmap Consultation Paper, June 2021, the Victorian Government is committed to reaching net zero greenhouse gas emissions by 2050 and has set emissions reduction targets of 28% to 33% by 2025 and 45% to 50% by 2030.

However, these costs will be offset by annual savings in physical meter read costs. The service fee for 'opt-in' customers will be recovered via a direct charge to each customer, which will reduce the forecast opex requirement.[45]

Table 5-13 shows the forecast operating costs associated with the digital meters installed in our network over the next AA period, including offsets.

Table 5-13: Forecast opex - remote metering solution, $,000 real 2021

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Number of digital meters installed	3,500	3,193	1,000	1,000	1,000	9,693
Digital meter hosted service charge ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
IT & admin support ($,000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Meter read savings ($,000)*	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total opex	**100**	**191**	**203**	**207**	**211**	**911**

* Based on 6 meter reads pa per customer, and one special read pa for customers opting in.

Costs are predominantly based on quotations for the digital meters. The rates include supply of the digital meters, service charges for IT hosting and commissioning. The meters will be installed using the current capex program for the hard to access sites, incorporating the additional costs for coordinating access to these sites.

New estates incorporate the incremental cost of digital meters comparative to the current diaphragm meters, and customers opting in includes the cost of the digital meters and commissioning, noting the customer contribution will operate to recover these costs on a ten year payback.

Table 5-14 shows the forecast customer contributions from opt-in customers for the five-year AA period.

Table 5-14: Forecast opex - remote metering solution, $,000 real 2021

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Customer contribution ($,000)	(9)	(27)	(45)	(63)	(81)	(225)

45 The opex adjustment will be commensurate with the capital cost to purchase the 'opt-in' meters and will result in tariff customers being cost neutral. This will ensure 'user pays' cost recovery for customers who choose to have digital meters installed before end of life.

5.4 Capex program summary

Table 5-15 sets out the forecast capital cost of the PMC and digital meter programs.

Table 5-15: Victoria and Albury Network: Meter replacement capex estimate, $,000 real 2021

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
PMCs						
Domestic meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Commercial meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total PMC program	**5,294**	**7,183**	**8,091**	**7,157**	**7,213**	**34,939**
Remote digital meter reading						
Inaccessible meters	[redacted]	[redacted]				[redacted]
Opt-ins	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Digital meters in new estates						
Incremental costs to purchase and install digital meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total meter replacement program	**7,651**	**8,177**	**8,280**	**7,346**	**7,402**	**38,846**

5.5 Consistency of forecast with the National Gas Rules

Consistent with the requirements of rule 79(1)(a) of the NGR, AGN considers the forecast capex for this project to be:

- *Prudent* – The expenditure is necessary to maintain the accuracy of meters and the integrity of metering services, and is of a nature that a prudent service provider that is subject to the regulatory obligations set out in the Victorian Code, the NSW Regulation, the National Measurement Act and AS 4944, would incur. The decision to smooth the replacement program over the AA period also represents a prudent decision, given the additional costs and risks that would be faced if additional resources had to be mobilised and de-mobilised on a yearly basis.
- *Efficient* – The manner in which we intend to carry out the replacement program can also be considered efficient, because it will be carried out:
  - by meter testers, manufacturers and gas fitters that have all been selected through competitive tender processes; and
  - on a steady basis over the AA period, which will enable us to:
    - minimise the internal and external costs associated with delivering the program (e.g. because it will avoid the internal and external costs that may be incurred when rapidly mobilising and demobilising resources and will also allow the optimal number of refurbished meters to be used);
    - reduce the field risks to as low as reasonably practicable, because it will allow retention of, and investment in, trained contractors; and
    - minimse the non-compliance risks.

- *Consistent with accepted good industry practice* – Complying with the regulatory obligations set out in the Victorian Code, the NSW Regulation, the National Measurement Act and AS 4944 is consistent with accepted good industry practice.
- *Achieves the lowest sustainable cost of delivering pipeline services* – Carrying out the replacement program in a smoothed manner represents the most cost effective option and will contribute to the attainment of the lowest sustainable cost of delivering pipeline services over the next AA period.
- *Is consistent with feedback received from customers and stakeholders* – Customers consider the safe operation of our networks to be of highest importance.

The capex can therefore be viewed as being consistent with rule 79(1)(a) of the NGR.

The proposed capex is also consistent with rule 79(1)(b), because it is necessary to:

- *maintain the integrity of services (rule 79(2)(c)(ii))* – carrying out the testing and meter replacements proposed in this Plan will enable us to maintain the integrity of the metering services, which is, as noted above, critical to:
  - ensuring the accuracy of the measurement of our customers' gas usage falls within the prescribed tolerance band of +2% to -3%;
  - minimising the volume of unaccounted for gas at larger consuming sites; and
  - ensure customer bills accurately reflect their usage.
- *comply with a regulatory obligation (rule 79(2)(c)(iii))* – carrying out the testing and meter replacements proposed in this Plan will ensure that we comply with the regulatory obligations prescribed in:
  - the National Measurement Act 1960;
  - the Victorian Code;
  - the NSW Regulation; and
  - AS 4944.

As noted above, if we fail to comply with the obligations set out in these instruments it can constitute a breach of our license and authorisation, result in penalties and a range of other compliance related actions.

Appendix A – Domestic PMC Forecast

The tables below provides more detail on how the forecasts for Initial In-Service Compliance testing, FLE testing and meter replacements have been developed.

Table A.1: Domestic PMC forecast

TEMC 2023

Family	Type	Year	Total	Reason
AH	U6	2007	80	Too Small
FW	RF 1	2007	87	Too Small
4B	602R	2007	2	Too Small
88	602I/M	2007	4	Too Small
FS	610R	2007	650	Too Small
95	U10	2007	1166	Too Small
FX	Gallus MC	2006	2673	Fail FLE 2022
4B	602R	2002	2232	Fail FLE 2022
4B	602R	1995	2363	Fail FLE 2022
OA	602	1989	4975	Fail FLE 2022
5E	RK 1000	2007	1	Too Small
9A	RK 1000	2007	49	Too Small
2A	AL 1000	2007	1	Too Small
			14283	

FLE 2023

Family	Type	Year	FLE Sample req	Total	Next test
FX	Gallus MC	2007	144	1611	Remove 2024
4B	602R	2007	362	15695	2025
GA	U8	2007	230	6794	2027
3H	RK MR8	2007	144	1851	2025
3H	RK MR8	2005	230	4642	2024
4B	602R	2005	230	7758	2024
4B	602R	1996	144	1577	2026
OA	602	1993	230	6763	2024
OA	602	1992	362	13887	2024
OA	602	1988	230	7849	2024
OA	602	1987	230	6269	2024
86	AL 1000	2000	37	143	Remove 2024
86	AL 1000	2007	58	282	2027
OF	AL 425	2007	92	503	2027
AR	SCH 1000	2007	37	265	2027
4F	RK MR12	2007	37	187	2024
4F	RK MR 12	2005	37	182	2024
9A	RK 1000	2005	23	110	2024

TEMC 2023

Family	Type	Year	Total	Reason

FLE 2023

Family	Type	Year	FLE Sample req	Total	Next test
86	AL 1000	2005	37	161	2024
OF	AL 425	2000	15	87	2024
86	AL 1000	1998	15	52	2024
FY	Ampy 750	2007	230	5432	2027
TD	1010	2007	144	1568	2027
			3298	83668	

TEMC 2024

Family	Type	Year	Total	Reason
OD	DS 5	2008	248	Too Small
17	Gallus	2008	89	Too Small
4B	602R	2008	1	Too Small
FX	Gallus MC	2008	403	Too Small
AH	U6	2008	181	Too Small
FR	Gallus R	2008	1	Too Small
OA	602	2008	1	Too Small
3H	RK MR8	2008	1	Too Small
2A	AL 1000	2008	6	Too Small
5E	RK 1000	2008	2	Too Small
OF	AL 425	2003	23	Too Small
FX	Gallus MC	2007	1467	Failed FLE 2023
86	AL 1000	2000	106	Failed FLE 2023
86	AL 1000	1998	37	Too Small
			2566	

Familiy	Type	Year	FLE sample req	Total	Next test
4B	602R	2008	362	12584	2026
3H	RK MR8	2008	144	3051	2026
GA	U8	2008	230	6907	2028
3H	RK MR8	2004	144	2235	2027
4B	602R	1997	144	2789	2025
3H	RK MR8	2005	230	4412	Remove 2025
4B	602R	2005	230	7528	Remove 2025
OA	602	1993	230	6533	Remove 2025
OA	602	1992	362	13525	Remove 2025
OA	602	1988	230	7619	Remove 2025
OA	602	1987	230	6039	Remove 2025
TD	1010	2008	144	2207	2028
9A	RK 1000	2008	15	50	2028
AR	SCH 1000	2008	58	350	2028
86	AL 1000	2008	58	367	2028
4F	RK MR12	2008	37	168	2028
OF	AL 425	2008	58	324	2028
86	AL 1000	2004	37	177	2027
OF	AL 425	2004	37	220	2027
AR	Sch 1000	2004	37	166	2027
86	AL 1000	1999	23	123	2027

TEMC 2024

Family	Type	Year	Total	Reason

Familiy	Type	Year	FLE sample req	Total	Next test
4F	RK MR12	2005	23	144	Remove 2025
9A	RK 1000	2005	15	87	Remove 2025
86	AL 1000	2005	23	124	Remove 2025
OF	AL 425	2000	15	72	Remove 2025
FY	Ampy 750	2008	230	4652	2028
4B	602R	2006	362	13109	2025
3H	RK MR8	2006	230	2795	2025
			3938	98357	

TEMC 2025

Family	Type	Year	Total	Reason
10	Gallus H	2009	1	Too small
AH	U6	2009	809	Too small
FX	Gallus MC	2009	22	Too small
17	Gallus	2009	413	Too small
FS	610R	2009	668	Too small
FW	RF1	2009	38	Too small
30	AL 425	2009	1	Too small
2A	AL 1000	2009	1	Too small
5E	RK 1000	2009	1	Too small
4F	RK MR12	2003	37	Too small
3H	RK MR8	2005	4182	Failed FLE 2024
4B	602R	2005	7298	Failed FLE 2024
OA	602	1993	6303	Failed FLE 2024
OA	602	1992	13163	Failed FLE 2024
OA	602	1988	7389	Failed FLE 2024
OA	602	1987	5809	Failed FLE 2024
4F	RK MR12	2005	121	Failed FLE 2024
9A	RK 1000	2005	72	Failed FLE 2024
86	AL 1000	2005	101	Failed FLE 2024
OF	AL 425	2000	57	Failed FLE 2024
			46486	

Family	Type	year	FLE sample req	Total	Next test
4B	602R	2009	362	11039	2027
3H	RK MR8	2009	144	2809	2027
GA	U8	2009	144	1952	2029
TD	1010	2009	144	1918	2029
OA	602	1991	362	11465	2028
OA	602	1990	230	5821	2028
86	AL 1000	2009	15	90	2029
OF	AL 425	2009	37	188	2029
4F	RK MR12	2009	37	191	2029
AR	SCH 1000	2009	23	143	2029
9A	RK 1000	2009	23	100	2029
AR	SCH 1000	2005	37	196	2028
OF	AL 425	2005	37	230	2028
86	AL 1000	2001	23	111	2028
OF	AL 425	2001	37	168	2028
OF	AL 425	1999	15	64	2028
4B	602R	1997	144	2645	Remove 2026
AR	SCH 1000	2003	15	89	2026
OF	AL 425	1998	23	145	2026
95	U10	2009	144	1802	2029
FY	Ampy 750	2009	230	3306	2029
4B	602R	2007	362	15333	2026
3H	RK MR8	2007	144	1707	2026
4B	602R	2006	362	12747	Remove 2026
3H	RK MR8	2006	125	2670	Remove 2026
			3219	76929	

TEMC 2026

Family	Type	Year	Total	Reason
OC	P&C	2010	1	Too Small
10	Gallus H	2010	1	Too Small
FR	Gallus R	2010	1	Too Small
FX	Gallus MC	2010	52	Too Small
4B	602R	2010	1	Too Small
FS	610R	2010	1142	Too Small
3E	RK MR8	2010	1	Too Small
OD	DS 5	2010	268	Too Small
17	Gallus	2010	336	Too Small
AH	U6	2010	1756	Decision to remove
AH	U6	2010	1	Too Small
GA	U8	2010	1	Too Small
4B	602R	1997	2501	Failed FLE 2025
4B	602R	1996	1433	Too Small
4B	602R	2006	12747	Failed FLE 2025
3H	RK MR8	2006	2670	Failed FLE 2025
			22912	

Familiy	Type	year	FLE sample req	Total	Next test
3H	RK MR8	2010	230	6151	2028
95	U10	2010	144	2262	2030
FY	750	2010	230	4730	2030
4B	602R	2010	230	8339	2028
GA	U8	2010	230	5760	2030
TD	1010	2010	144	1680	2030
4B	602R	2007	362	15333	Remove 2027
3H	RK MR8	2007	144	1707	Remove 2027
FY	750	2006	144	2321	2029
OF	AL 425	2010	23	130	2030
86	AL 1000	2010	23	130	2030
9A	RK 1000	2010	23	99	2030
4F	RK MR12	2010	58	281	2030
AR	SCH 1000	2010	37	154	2030
OF	AL 425	2002	15	83	2029
AR	SCH 1000	2002	15	83	2029
4F	RK MR12	2006	37	239	2029
OF	AL 425	2006	92	647	2029
86	AL 1000	2006	37	258	2029
AR	SCH 1000	2006	37	262	2029
AR	SCH 1000	2003	15	74	Remove 2027
OF	AL 425	1998	23	122	Remove 2027
4B	602R	2008	362	12222	2027
3H	RK MR8	2008	144	2907	2027
4B	602R	2007	362	15333	Remove 2027
3H	RK MR8	2007	144	1707	Remove 2027

2799	65974

TEMC 2027

Family	Type	Year	Total	Reason
3H	RK MR8	2011	194	Too Small
FS	610R	2011	819	Too Small
AH	U6	2011	1	Too Small
AH	U6	2011	2714	Decision to remove
5E	RK 1000	2011	1	Too Small
86	AL 1000	2011	40	Too Small
4B	602R	1996	1145	Too Small
AR	SCH 1000	2003	59	Failed FLE 2026
OF	AL 425	1998	99	Failed FLE 2026
TD	1010	2007	1424	Too small
TD	1010	2011	533	Too Small
4B	602R	2007	14971	Failed FLE 2026
3H	RK MR8	2007	1563	Failed FLE 2026
			23563	

Familiy	Type	year	FLE sample req	Total	Next test
FY	750	2011	362	12886	2031
GA	U8	2011	230	9271	2031
95	U10	2011	144	2748	2031
4B	602R	2011	230	9977	2029
4F	RK MR12	2011	58	476	2031
9A	RK 1000	2011	15	61	2031
OF	AL 425	2011	15	86	2031
AR	SCh 1000	2011	58	353	2031
GA	U8	2007	230	6564	2030
3H	RK MR8	2004	144	2091	2028
86	AL 1000	2007	37	224	2030
OF	AL 425	2007	58	411	2030
AR	SCH 1000	2007	37	209	2030
86	AL 1000	2004	23	140	2028
OF	AL 425	2004	37	183	2028
AR	Sch 1000	2004	23	129	2028
86	AL 1000	1999	23	100	2028
FY	Ampy 750	2007	230	5432	2030
4B	602R	2009	362	11039	2028
3H	RK MR8	2009	144	2809	2028
4B	602R	2008	362	11860	Remove 2028
3H	RK MR8	2008	144	2763	Remove 2028
			2966	79812	