Attachment 9.2

Asset Management Plan

Final Plan 2023/24 – 2027/28

July 2022

AGN_VIC_NSW_FY24-FY28_Asset Management Plan

PROJECT / SPECIFICATION TITLE	AGN_VIC_NSW_FY24-FY28_Asset Management Plan
PROJECT / SPECIFICATION ID NUMBER	

SPECIFICATION REVIEW & APPROVAL	Prepared By	Checked By	Approved By
	Kathleen Murphy	Martijn Vlugt	Mark Beech

Document control & approval information

Summary of Changes

Below is a summary of the changes made to the document since the previous issued version.

Revision	Description	Date	Author

Printed Working Copy

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Responsibility

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Document Reviewed By

Name	Position	Date

Executive Summary

As part of the Australian Gas Infrastructure Group (AGIG), Australian Gas Networks (AGN) distributes gas to over 1.3 million residential, commercial, and industrial customers across South Australian, Victoria and Queensland (mostly Brisbane), as well as smaller towns in New South Wales (Albury, Wagga Wagga) and the Northern Territory (Alice Springs). The combined networks include over 1,300 km of transmission pipelines and 24,000 km of distribution mains.

In Victoria, our Network supplies gas to approximately 750,000 end users through a network of approximately 12,000 km of distribution mains, and 312 km of transmission pressure pipelines, of which 252km are regulated. Our Victorian operations team also manages our smaller non-regulated networks in the Southern New South Wales.

Our vision is to be the leading gas infrastructure business in Australia. By doing so, we aim to always deliver for the customer, be a good employer and be sustainably cost efficient.

This Asset Management Plan (AMP) provides a consolidated view of the strategies adopted by us (and our network operator – APA Group) to manage the assets contained in our Victorian and Albury (NSW) networks in a safe and sustainable manner. The AMP is derived from a number of key operational and technical plans and is a key input into the development of business plans and capital expenditure forecasts.

Our approach to Asset Management is consistent with our Vision and is outlined in Section 3 of this document. A summary of our network performances is contained in Section 4, Finally, Sections 5 (regulated networks) provides an overview of our capital requirements for the next Access Arrangement (AA) period (1 July 2023 to 30 June 2028).

In total, we are forecasting to incur $489 million of capital expenditure in our regulated VIC network during the next AA period. This is summarised by asset type in Table 1 below.

Table 1 Network Expenditure Summary ($'000)

Expenditure Category	2024	2025	2026	2027	2028	Total
Mains Replacement	$5,769	$5,884	$5,884	$5,312	$5,312	$28,161
Meter Replacement	$6,703	$4,240	$12,823	$7,649	$7,698	$39,114
Augmentation	$28,608	$20,632	$13,910	$7,749	$2,461	$73,359
Telemetry	$1,015	$821	$802	$807	$762	$4,207
Information Technology	$13,898	$10,614	$10,599	$17,108	$18,535	$70,754
Growth Assets	$5,769	$5,884	$5,884	$5,312	$5,312	$28,161
Other Assets	$47,481	$43,288	$42,035	$42,263	$42,350	$217,417
Total Direct CAPEX ($k)	$112,022	$92,567	$100,313	$88,458	$81,471	$474,831
OPEX Projects	$2,358	$3,478	$2,358	$3,478	$2,358	$14,028
Total Expenditure ($k)	**$114,379**	**$96,045**	**$102,670**	**$91,936**	**$83,829**	**$488,859**

Contents

1 Document Overview

1.1 Purpose

This AMP provides a consolidated view of strategies for and asset lifecycle issues of Australian Gas Networks (AGN) assets in Victoria and Albury in New South Wales that are managed by the Victorian networks business of APT O&M Services Pty Ltd (APA). The AMP is derived from a number of key operational and technical plans and is a key input into the development of business cases and capital expenditure requirements.

It has the following key objectives:

- It provides a high-level summary of projects and programs defined within AGN's suite of asset & network strategies / plans;
- It outlines AGN's planned network Capex profile for the forecast period (FY24 – FY28);
- It provides a summary of AGN's planned network Opex expenditure profile for the forecast period;
- It provides an overview of network performance; and
- It defines the linkage between the overarching Asset Management Strategy (AMS) and the underpinning asset specific plans and/or business cases.

The document is intended for use by:

- AGN Network staff (and its contractors); and
- Regulators – Technical, Safety and Economic.

1.2 Scope

The AMP covers the regulated Australian Gas Networks' (AGN) assets in Victoria and New South Wales (NSW) managed by the Victorian networks business of APT O&M Services Pty Ltd (APA Group or APA). Specifically, the assets covered are Victoria metropolitan and regional networks (excluding Mildura which is managed by the South Australian networks business) and Albury Gas Company. An overview of the networks covered in Victoria and NSW are in Table 2.

Table 2 – Regulatory Coverage of Networks

Regulatory Coverage	Network Entity
Regulated Assets	Victoria Networks (excluding Albury and Mildura)
Regulated Assets	Albury Gas Company Networks, NSW

It includes:

- Transmission pipelines, distribution mains, distribution services and associated easements and access tracks,
- Consumer regulators and supply regulating stations, valves, heaters, filters, vents, syphons and auxiliary assets used in the operation of the distribution and transmission networks,
- Corrosion protection, control, metering, enclosures and communications equipment, and

- Asset management processes and systems such as Supervisory Control and Data Acquisition (SCADA).

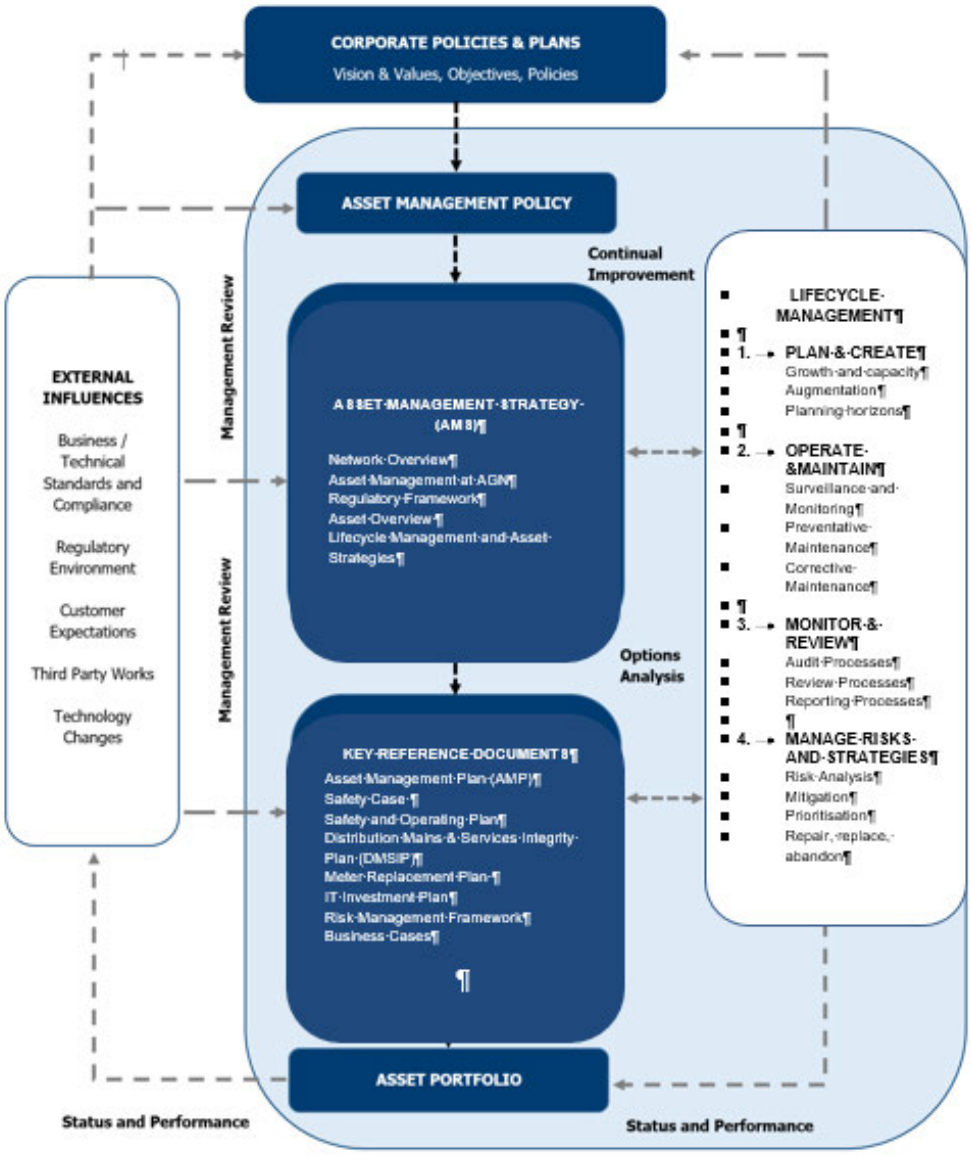
The AMP should be read in conjunction with AGN's IT Strategy (which provides capital expenditure forecasts for IT related program) to gain a network wide appreciation of capital expenditure at AGN.

The AMP is written to align with the reporting categories for the FY24 – FY28 Access Arrangement (AA) capital expenditure categories.

1.3 Relationship with other Key Asset Management Documents

The AMP is one of a number of key asset management documents developed and published by AGN in relation to its gas network. As indicated in Figure 11, detailed asset strategies inform both the AMS and AMP of the required capital and operational programs needed to achieve the long-term objectives of the Gas Distribution network.

Figure 11: Asset Management Framework



1.4 Phasing and Financial Disclosure

All financial figures quoted within this document - unless otherwise specifically stated - have the following characteristics: Real Expenditure / Cost (reference year = 2021);

- Direct Expenditure only (i.e. excludes overheads and finance costs);
- Program totals are in units of $1,000 (i.e. '000);
- All years are denoted in Financial Year format (July to June); and
- Total values shown in tables and referred to in the text of this document may not reconcile due to rounding.

Conversion factors used in the escalation of historic expenditure to real 2021 equivalent expenditure are provided in Table 3Table 3: CPI .

Table 3: CPI Index – nominal to June 2021

	2017	2018	2019	2020	2021
CPI Index – nominal to June 2021	0.949	0.968	0.988	1.004	1.000

1.5 Data Sources

The AMP draws on the capital forecasts outlined in AGN's detailed business cases and asset plans. Table 4 provides a summarised alignment of the AMP against business cases and asset plans.

Table 4: Alignment between AMP and Business Cases/Asset Strategies

Document #	Strategy/ Business Case	Mains Replacement	Meter Replacement	Augmentation	Telemetry	Information Technology	Growth Assets	Other Assets
V.01.CD	Heater Upgrades	-	-	Y	-	-	-	-
V.02.CD	City Gate Upgrades	-	-	Y	-	-	-	-
V.03.CD	HP Augmentation Projects	-	-	Y	-	-	-	-
V.04.CD	Sale City Gate	-	-	Y	-	-	-	-
V.05.CD	DCP	-	-	Y	-	-	-	-
V.06.OP	SCADA End of life replacement	-	-	-	Y	-	-	-
V.07.OP	SCADA Regional Towns and Fringe Points	-	-	-	Y	-	-	-
V.08.OP	Refurbishment of Sleeved Railway Casing Pipes	-	-	-	-	-	-	Y
V.09.OP	I&C Meter Set Refurbishment	-	-	-	-	-	-	Y
V.10.CD	Pipeline modification for ILI	-	-	-	-	-	-	Y
V.11.OP	DCVG Survey & Coating Repairs	-	-	-	-	-	-	Y
V.12.OP	Replacement of Grove Regulators	-	-	-	-	-	-	Y
V.13.CD	Transmission Valve Replacement	-	-	-	-	-	-	Y
V.14.OP	Thomastown Depot	-	-	-	-	-	-	Y
V.15.OP	CP Remote Monitoring	-	-	-	Y	-	-	
V.16.OP	CP Asset Replacement	-	-	-	-	-	-	Y
V.17.OP	Plant & Equipment Renewal	-	-	-	-	-	-	Y
V.18.OP	City Gate Compound Refurb	-	-	-	-	-	-	Y
V.19.OP	City Gate Asset Refurb	-	-	-	-	-	-	Y

Document #	Strategy/ Business Case	Mains Replacement	Meter Replacement	Augmentation	Telemetry	Information Technology	Growth Assets	Other Assets
V.20.OP	Water bath heater replacement	-	-	-	-	-	-	Y
V.22.IT	Application Renewals	-	-	-	-	Y	-	-
V.23.IT	Infrastructure Renewals	-	-	-	-	Y	-	-
V.24.IT	AGIG One IT	-	-	-	-	Y	-	-
V.21.CS	Digital Customer Experience	-	-	-	-	Y	-	-
AGIG-SP-0001	Network Adaptation Strategy	-	-	-	-	-	-	Y
Attachment 9.3	Capex Forecast Model	Y	Y	Y	Y	Y	Y	Y
Attachment 9.7	DMSIP	Y	-	-	-	-	-	-
Attachment 9.8	Meter Replacement Plan	-	Y	-	-	-	-	-
Attachment 9.9	IT Investment Plan	-	-	-	-	Y	-	-
Attachment 13.1	Demand Forecasting Report	-	-	-	-		-Y	-

Refer to the individual business cases and plans highlighted in Table 4 for data sources drawn on in the development of each business case / plan and ultimately this Asset Management Plan.

1.6 Document Review

The AMP is reviewed and approved at a minimum every five years or when changes are required.

An approved copy of the current version of this Asset Management Plan document is retained in the National Networks Document Library. Communication to relevant internal and external stakeholders, service providers and other relevant parties who require knowledge of this document is via the Intranet publication and standard company briefing processes.

1.7 References

- Gas Safety Case
- Gas Distribution System Code Ver.15
- Retail Market Procedures (Victoria)
- National Gas Rules: Part 19 - Declared Wholesale Gas Market Rules
- AS/NZS 4944:2006 In-service Compliance testing of Diaphragm Meters
- National Gas Law
- Gas Safety Act 1997
- Distribution License
- Gas Pipelines Act 2005
- Asset / Network Business Cases (Various)

2 Network Overview

2.1 Australian Gas Infrastructure Group

Australian Gas Infrastructure Group (AGIG) is one of Australia's largest gas infrastructure businesses which includes assets in each mainland state in Australia, in addition to the Northern Territory.

Collectively, AGIG delivers for customers across the gas supply chain – with over 35,000km of distribution networks, more than 4,400km of transmission pipelines and 60 petajoules of storage capacity.

AGIG is made up of three separate companies.

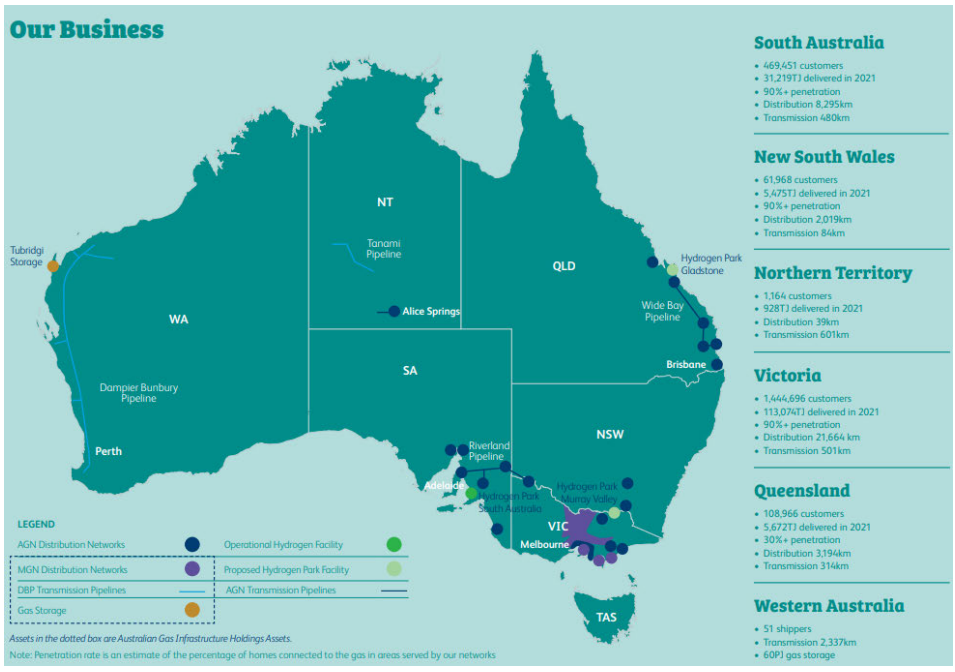
Multinet Gas Networks (MGN) distributes natural gas to over 700,000 customers throughout Melbourne's inner and outer east, the Yarra ranges and South Gippsland. The network transports gas to residential, commercial and industrial customers

Australian Gas Networks (AGN) distribute natural gas to 1.3 million residential, commercial and industrial customers across Victoria, South Australia, Queensland, New South Wales and the Northern Territory

The Dampier Bunbury Pipeline (DBP) is WA's key gas transmission pipeline. Stretching almost 1600kms, it transports gas to mining, industrial, commercial and residential customers across Western Australia

Australian Gas Infrastructure Group is owned by various consortia of private sector entities listed on the Hong Kong Stock Exchange. This includes CK Asset Holdings Ltd (CKA), CK Infrastructure Holdings Ltd (CKI), Power Assets Holdings Ltd (PAH) and CK Hutchison Holdings Ltd (CKH), all part of the CK Group.

Figure 1: Overview of AGIG Operations



2.2 About AGN

AGN is a gas distributor who supplies gas to over 1.3 million residential, commercial, and industrial customers across South Australia, Victoria, Queensland (mostly Brisbane) as well as smaller towns in New South Wales (including Albury Gas Company and Southern NSW Networks) and the Northern Territory (Alice Springs). The network includes over 1,300 km of transmission pipelines and 25,000 km of distribution mains.

AGN forms part of Australian Gas Infrastructure Group (AGIG) which is one of the largest gas infrastructure businesses in Australia.

AGN is the holder of the gas transmission and distribution licenses for the natural gas assets. APT Operation & Maintenance Services (referred to in this document as "APA") has been contracted by AGN to install, operate and maintain their gas infrastructure assets. In doing so APA must comply with all applicable laws and authorisations. APA is responsible for all aspects of the operation and management of AGN's networks in accordance with prudent and accepted industry standards.

In Victoria and Southern NSW (including Albury Gas Company, but excluding Mildura, Victoria) , the regulated AGN network supplies gas to approximately 750,000 end users through a network of more than 12,000 km of distribution mains, and 252 km of transmission pipelines.

The footprint of AGN Victoria includes two areas earmarked by the Victorian Government as growth corridors including the Northern Growth Corridor and the South East Growth Corridor. These regions underpin the driver for the extensive augmentation requirements due to stable demand growth as these areas infill.

3 Asset Management Drivers

3.1 Network Vision

AGIG's company vision is shared with the wider group of gas businesses owned by CKI in Australia, known as the Australian Gas Networks (AGIG); namely Australian Gas Networks (AGN), Dampier to Bunbury Pipeline (DBP), and Multinet Gas Networks (MGN).

This vision is further articulated through a set of Corporate Objectives as shown in Figure 2.

Figure 2 AGIG Corporate Objectives

3.1.1 Delivering for customers

As AGN's network is situated in both densely populated and regional areas, AGN strives to maintain public safety through both construction activities and day-to-day operation of the network.

AGN aims to continuously reduce the duration and frequency of interruptions to customers and minimise inconveniences from any new connections, meter replacements and any construction activities. This is in line with AGNs objectives of improving reliability and enhancing customer service.

3.1.2 A good employer

AGN strives to be a leader in health and safety (H&S) by ensuring employees and contractors are mindful of the factors affecting their physical and mental health. This is done through strict H&S procedures, incentive programs and regular workshops and health screenings.

AGN strives for high employee engagement through a range of activities including frequent and consistent communication.

Skills development is also a priority for AGN ensuring that both contractors and employees have the relevant up to date skills and requirements for fulfilling their roles.

3.1.3 Sustainably cost efficient

AGN strives to be sustainably cost efficient in working within AA benchmarks. AGN strives to ensure natural gas remains a competitive, value-for-money fuel option in line with customer interests and expectations.

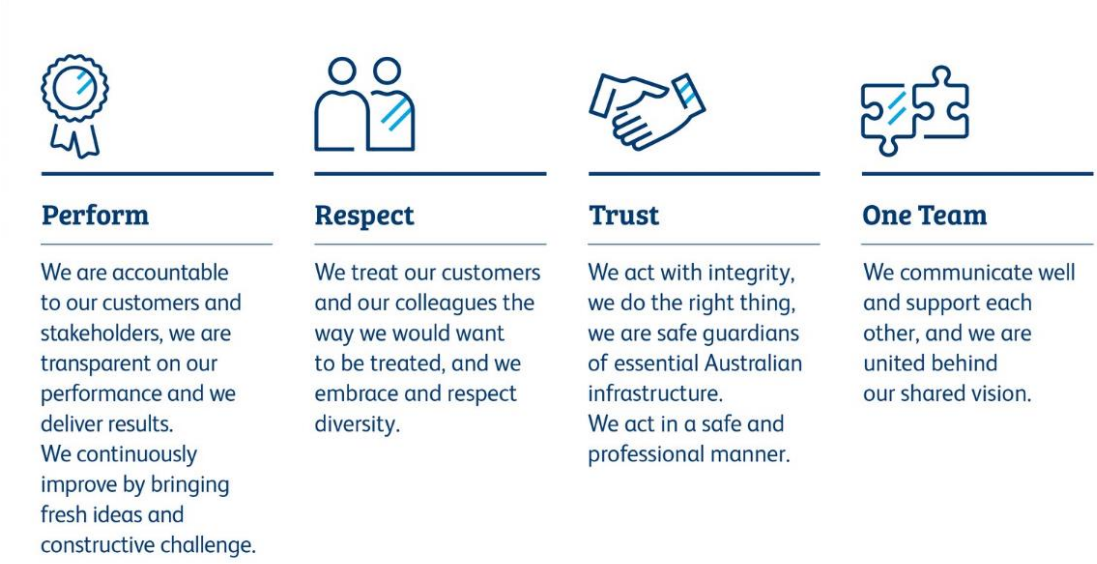
AGN aims to encourage growth of the network via in-fill development and through the introduction of gas into regional areas.

AGN endeavours to be compliant with legislative and regulatory obligations which underpin network operations and work practices in order to be an organisation both environmentally and socially responsible.

3.2 Values

Our corporate values drive the culture at AGIG (including AGN) by determining how employees should behave and make decisions. Our corporate values of "Respect," "Trust," "Perform" and "One Team" are highlighted in Figure 3.

Figure 3: AGIG Corporate Values



4 Network Performance

AGN measures network performance through a range of Key Performance Indicators (KPI's) and strategic reports. This section provides an overview of measures included under the following categories:

- Customer Expenditure Sharing Scheme (Section 4.1)
- Other Performance Measures (Section 4.2)

4.1 Capital Expenditure Sharing Scheme

The Capital Expenditure Share Scheme (CESS) is an incentive mechanism introduced for the 2018-22 AA period to encourage efficient capital expenditure over the period. In summary, AGN and customers share the benefit (30/70) of any efficient reduction of capex (below benchmark) for the period.

The rules that govern the CESS are that it:

- Calculates the Net Present Value (NPV) of the under/over spend incurred over the period
- Allows us to keep 30% of gains/losses (the other 70% goes to customers)
- Takes account of financing benefits or losses already incurred during the regulatory period
- Is contingent on maintaining network health
- Is asymmetric – reduced rewards if performance drops, no increase if performance increases (incentive to maintain, not increase, performance).

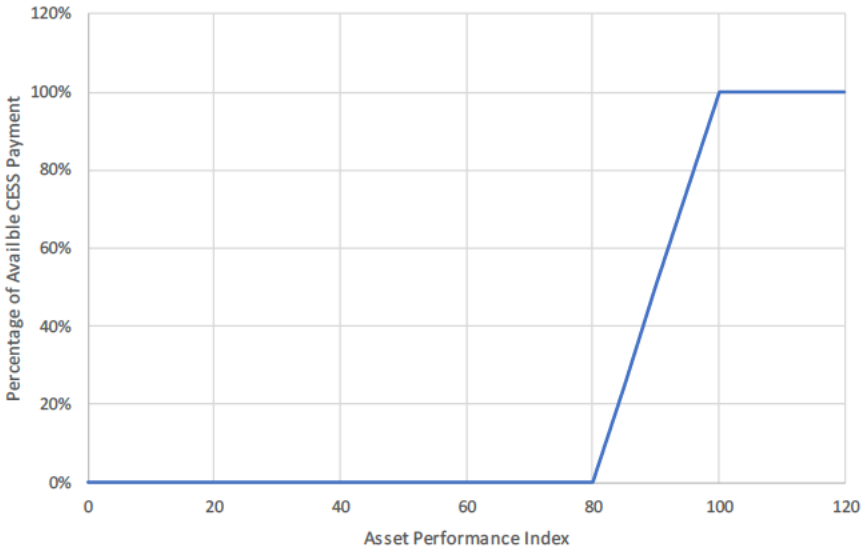
As highlighted, the CESS is contingent on AGN maintaining the "health" of the networks. This is determined through the application of an Asset Performance Index (API), measured out of 100, for the period. The measure included in the API are summarised in Table 5.

Table 5: API Measures

API Measure	Weight	Target
Unplanned SAIDI (Per 1000 customers)	25.0%	3,389
Unplanned SAIFI (Per 1000 customers)	25.0%	27.8
Mains Leaks (Per km)	29.9%	0.04
Service Leaks (Per 1000 customers	14.9%	3.0
Meter Leaks (Per 1000 customers)	5.2%	19.0
Total weighting	**100%**	

A one (1) point reduction in API results in a 5% reduction in potential CESS payment to AGN. This relationship is shown in Figure 4. Note: There is not additional CESS benefit for API scores >100.

Figure 4: Relationship between API and potential CESS incentive



As the CESS is a newly introduced measure for the 2018 – 2022 AA period, AGN's performance against the API metrics is shown in Table 6 below. AGN is currently tacking at an API of 123.5 (capped at 100) which would result in the full CESS benefit if capex allowances were to be outperformed.

Table 6: AGN Asset Performance Index

	Network Performance					API Calculation			
Measures	2018	2019	2020	2021	Average	Target	Index	Contribution	
Unplanned SAIDI	3,991	3,384	2,897	1,920	3,048	3,389	110.1	25%	27.5
Unplanned SAIFI	25.8	24.3	23.7	18.9	23.2	27.8	116.6	25%	29.2
Mains leaks	0.02	0.02	0.02	0.02	0.02	0.04	144.0	30%	43.1
Services leaks	2.3	2.3	2.4	2.1	2.3	3.0	124.9	15%	18.6
Meter leaks	20.7	20.2	19.6	15.6	19.0	19.0	99.6	5%	5.2
					Asset Performance Index				**123.5**

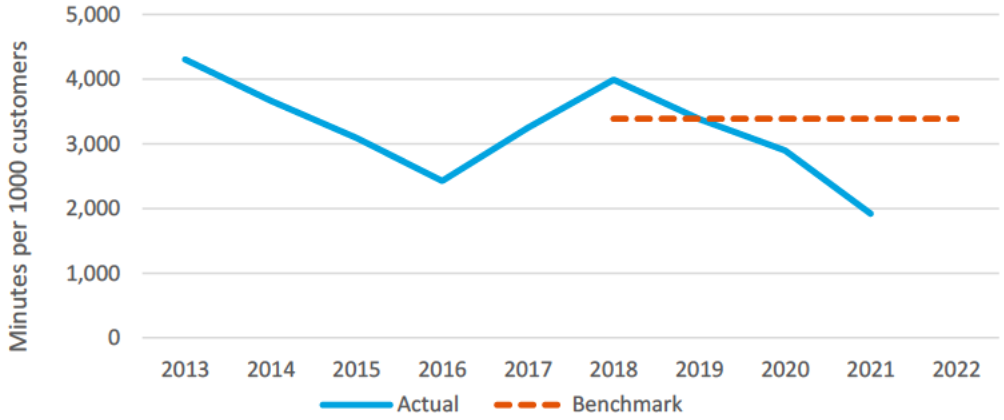
AGN's performance against each API measure is provided below.

4.1.1 Unplanned System Average Interruption Duration Index

The Unplanned System Average Interruption Duration Index (USAIDI) is defined as the average unplanned outage duration for every customer served per 1000 customers. This is a reliability measure where AGN has seen increasing USAIDI from 2016 to 2018 followed by decreasing USAIDI (below benchmarks) from 2019. The average USAIDI during the AA period was 3,048 minutes compared to a CESS benchmark of 3,389 minutes.

Current performance for this measure is contained in Figure 5.

Figure 5: CESS - USAIDI Performance

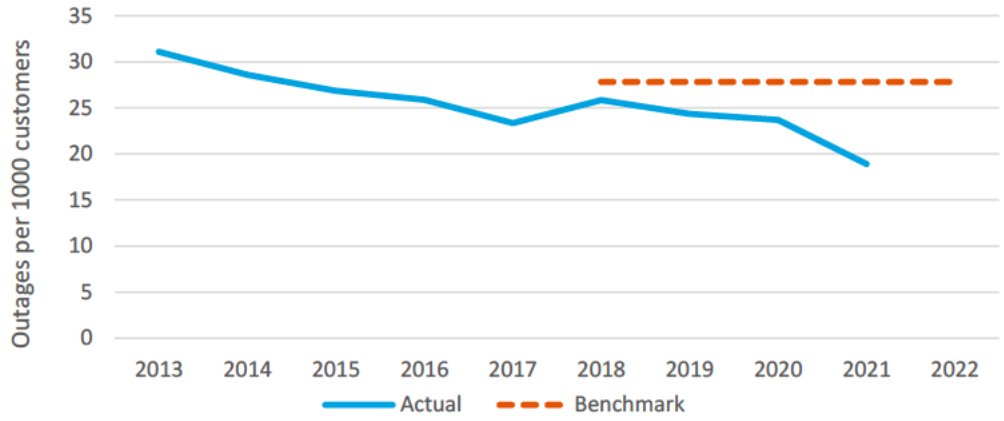


4.1.2 Unplanned System Average Interruption Frequency Index

The Unplanned System Average Interruption Frequency Index (USAFI) is defined as the average number of interruptions that a customer would experience on the network per 1000 customers. Current performance for this measure is contained in Figure 6.

AGN has outperformed this measure for each year of the AA period. The average USAFI for the period was 23.2 compared to a CESS benchmark of 27.8.

Figure 6: CESS - USAIFI performance

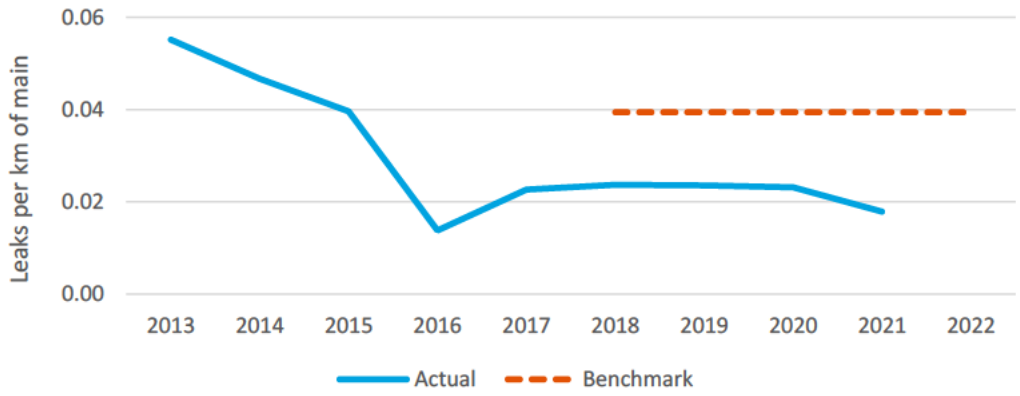


4.1.3 Leaks – Mains

Defined as the number of leaks on mains per km of distribution network. Mains leaks have been below CESS benchmarks for each year of the AA period. AGN has achieved an average mains leak rate of 0.02 leaks/km against a CESS target of 0.04 leaks/km.

Current performance for this measure is contained in Figure 7.

Figure 7: CESS - Mains leaks historical performance

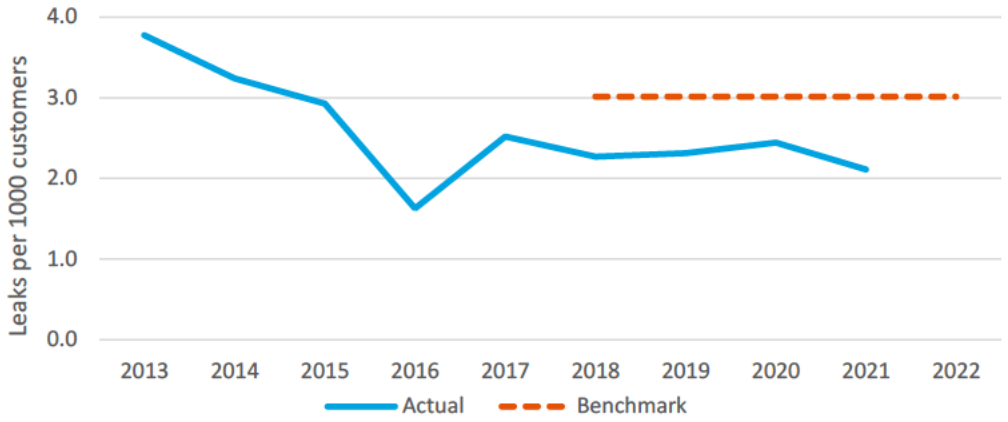


4.1.4 Leaks – Services

Defined as the number of leaks on services per 1000 customers. Service leaks have been below CESS benchmarks for each year of the AA period. AGN has achieved an average service leak rate of 2.3 leaks/1000 customers against a CESS target of 3.0 leaks/1000 customers.

Current performance for this measure is contained in Figure 8.

Figure 8: CESS - Services leaks historical performance

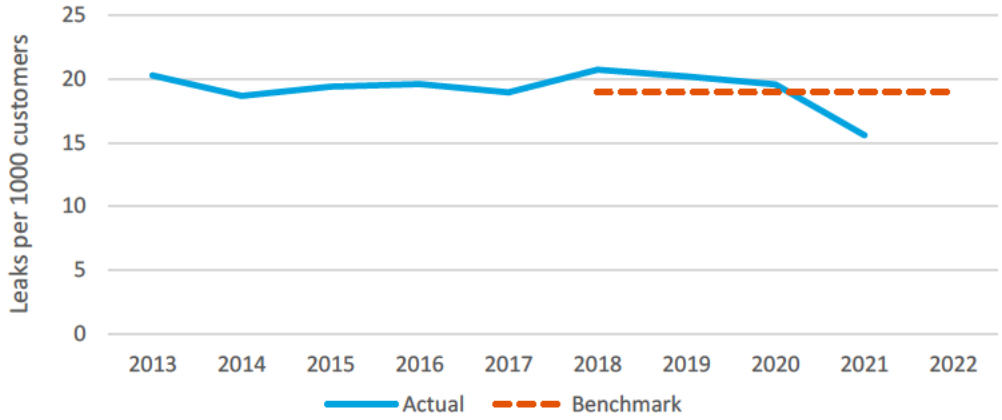


4.1.5 Leaks – Meters

Defined as the number of leaks on meters per 1000 customers. AGN's meter leak performance has improved over the period but remains slightly above (on average) the CESS benchmark of 19 leaks/1000 customers.

Current performance for this measure is contained in Figure 9.

Figure 9: CESS - Meters leaks historical performance



4.2 Other Key Asset Management Performance Measures

4.2.1 Emergency Response Times

AGN is required to respond efficiently and effectively in the event of an emergency on its distribution network. In particular, AGN is required to meet or exceed minimum response time benchmarks set by Energy Safe Victoria (ESV), which require:

- Field responses within 1 hour for 'Priority 1' (major leaks / emergencies) emergencies; and
- Field responses within 4 hours for 'Priority 2' (minor) gas escape repairs.

Regulatory benchmarks are set at 95% for the metropolitan region during business hours (BH), and 90% for metropolitan regions afterhours (AH) and all regional areas.

AGN's emergency response time performance is shown in Figure 10 (metro BH) and Figure 11 (metro AH and regional areas). Ongoing strong performance against benchmarks is seen over the period, particularly over the past 3 years.

Figure 10: Network Performance - P1 Emergency Response Times Performance – Metro Business Hours

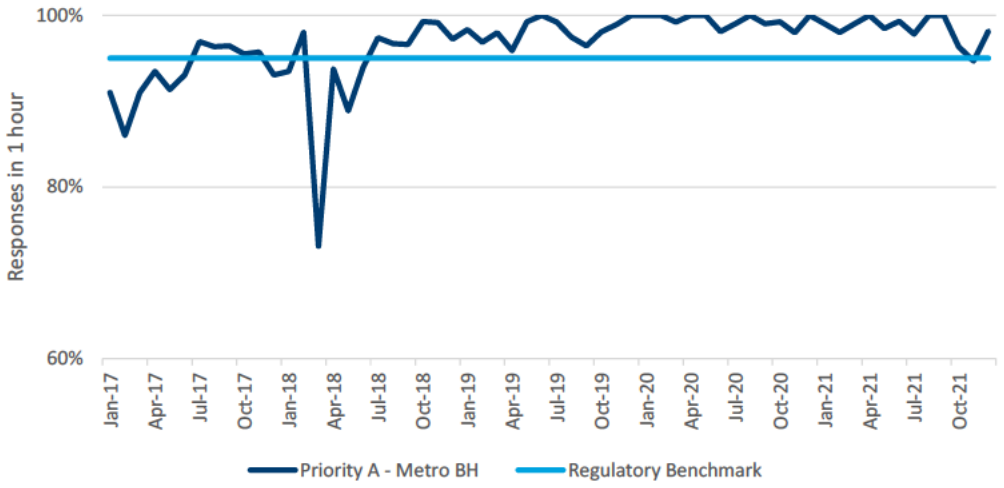
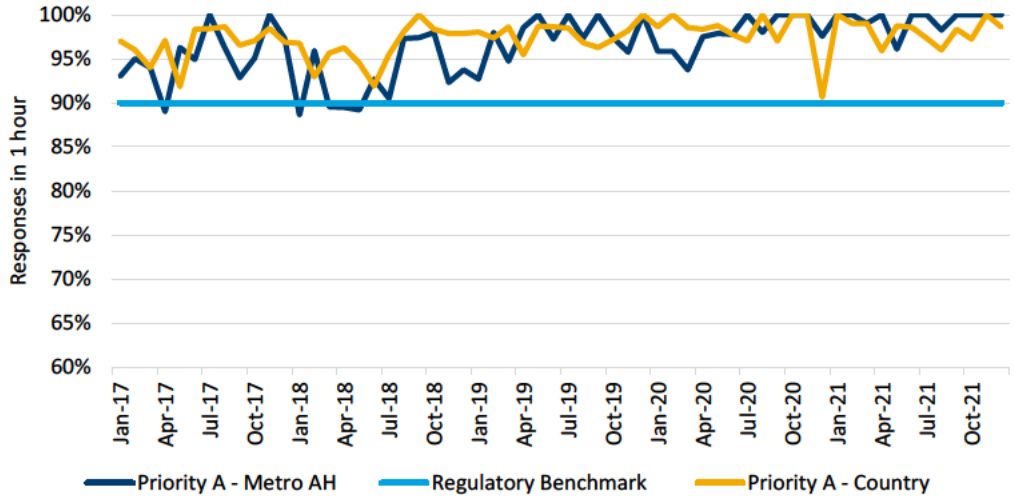


Figure 11: Network Performance - P1 Emergency Response Time Performance – Country and Metro afterhours

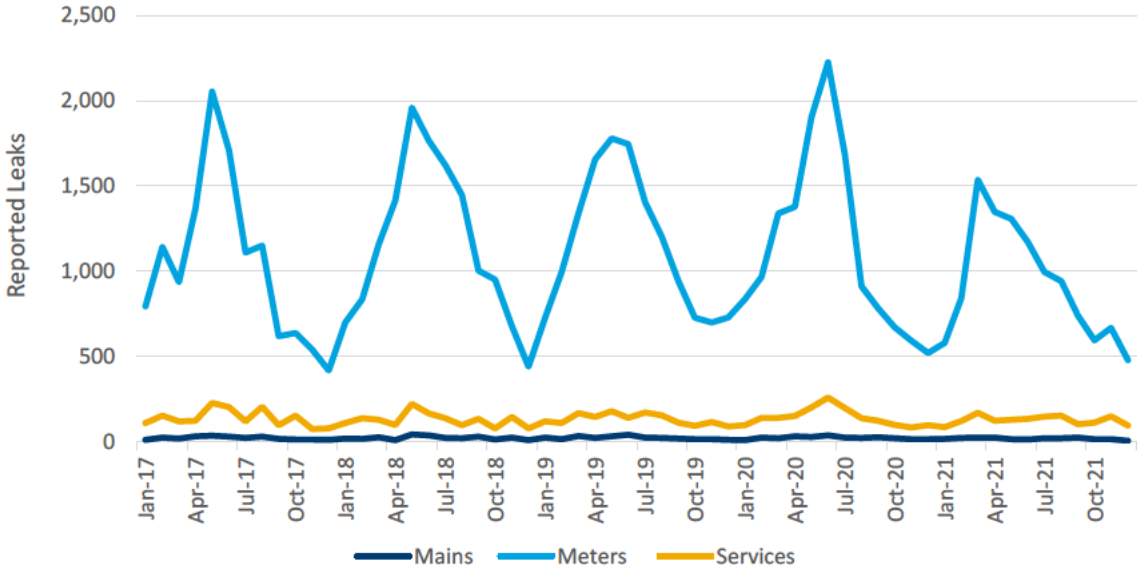


4.2.2 Publicly Reported leaks

Each leak on the gas distribution network has the potential (under the right circumstances) to cause harm to the public and damage to property. Gas is odourised so it can be easily detected by the public and then report to AGN for repair.

Figure 12 summarises the volume of publicly report leaks per month reported to AGN over the last 5 years. The cyclical nature of meter leaks aligns to network demand / throughput. In total, meter leaks contribute approximately 88% of all publicly reported leaks, followed by service leaks (10%) and then mains leaks (2%). Mains and service leaks do not exhibit the same seasonal behaviour.

Figure 12: Network Performance- Public Reported Leaks by asset type

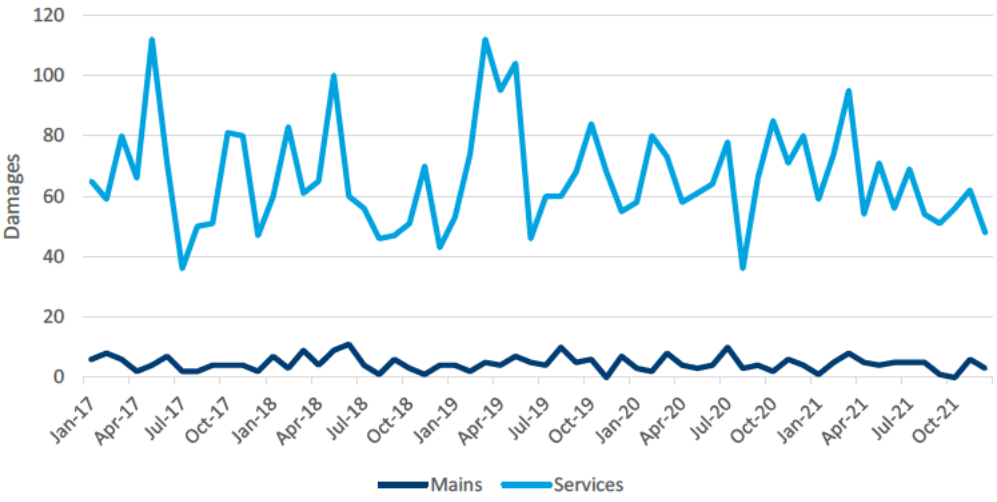


4.2.3 Third Party Damages

The majority, approximately 95%, of 3rd party damages to AGN network occur on services located in private property. Services are not shown on DBYD plans however the obligation is on the property owner (as described in the DBYD response) to contact the asset owner to have the service located.

Figure 13 outlines the monthly volumes for third party damages on mains and services on the AGN network since 2017.

Figure 13: Network Performance – Third Party Damage

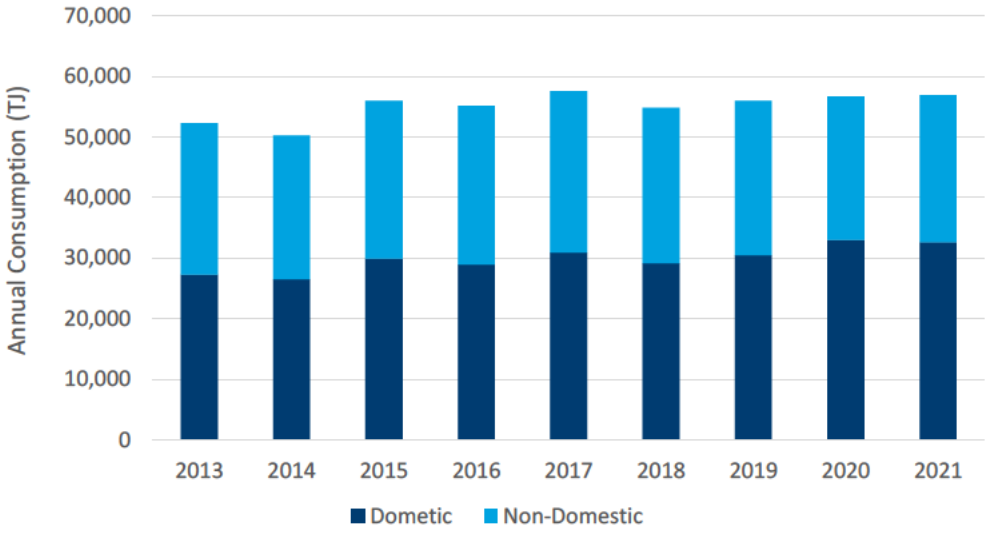


4.2.4 Annual Gas Consumption

The annual throughput of AGN's network, since 2013, is shown in Figure 14.

Domestic gas consumption, which continues to see steady levels of growth, accounted for approximately 70% of network throughput in 2021. Non-domestic consumption (30% of throughput) is considered stable with modest levels of decline over the past 5 years

Figure 14: Network Performance – Annual Gas Consumption



4.2.5 Unaccounted for Gas

Unaccounted for Gas (UAFG) refers to the difference between the measured quantities of gas entering the network (measured by Custody Transfer Meters) and the gas delivered to customers (measured by individual consumer meters).

The Gas Distribution System Code (GDSC) requires AGN to use reasonable endeavours to ensure that UAFG is less than its benchmark. The Australian Energy Market Operator (AEMO) performs an annual reconciliation between gas distributors and retailers based on whether actual UAFG is over or under the benchmark1.

The GDSC outlines UAFG benchmarks, expressed as a percentage of the aggregate quantities of gas injected into the distribution system2.

In Victoria, retailers purchase sufficient gas to cover customer consumption and actual UAFG. If actual UAFG is greater than the benchmark, the gas distributor is required to compensate the retailers for the UAFG above benchmark. Where actual UAFG is lower than the benchmark, the retailers make reconciliation payments to the distributor.

UAFG benchmarks apply to Class A and Class B customers supplied from both the Declared Transmission System (DTS) and non-DTS3 networks.

- **Class A** customers use more than 250 Terajoules per annum and are typically serviced by the high pressure and transmission networks.
- **Class B** customers use less than 250 Terajoules per annum and are typically serviced by high, medium and low-pressure networks.

Current (2018 to 2022) UAFG benchmarks are summarised in Table 7: Unaccounted for Gas benchmarks – 2018-22.

[1] Clause 2.4 of the Gas Distribution System Code, Version 15.

[2] Schedule 1, Part C of the Gas Distribution System Code. Version 15.

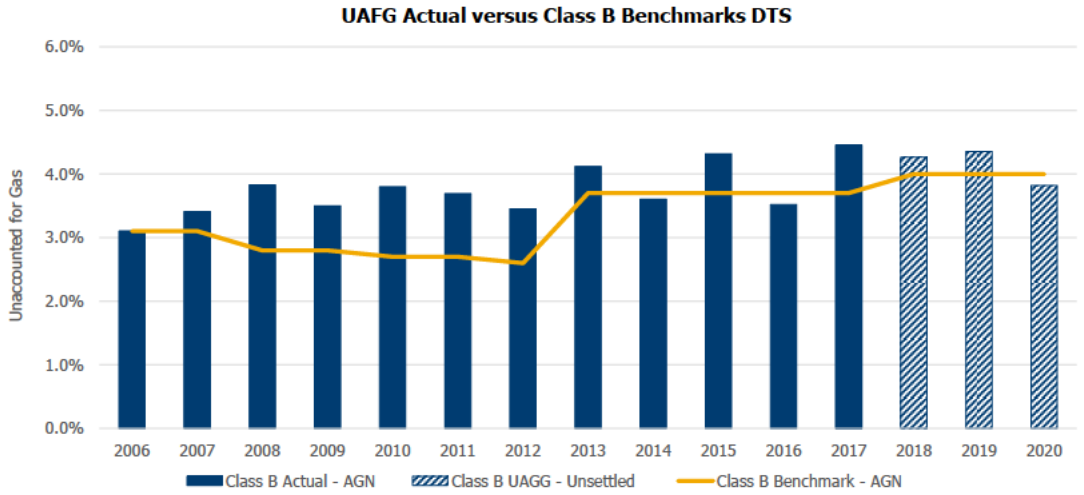
[3] For non-PTS networks, the Gas Distribution System Code sets out a single benchmark value applicable to both Class A and B customers.

Table 7: Unaccounted for Gas benchmarks – 2018-22

	DTS Class A	DTS Class B	Non-DTS (Class A &B)
AGN (Vic)	0.3%	4%	-
AGN (Albury)	0.1%	5.3%	2%

AGN's historical performance against UAFG benchmarks is shown in Figure 15.

Figure 15: Class B UAFG Performance



Settlement payments between retailers and networks only occur once all parties agree on the AEMO reconciliation of UAFG outcomes, hence the time lag between settled and unsettled UAFG in Figure 15.

5 Network Expenditure

This section provides an overview of our network investment (i.e., capital expenditure) and operation activities (I.e. operational projects) forecast for the next AA period (1 July 2023 to 30 June 2028).

For regulated assets (i.e., our AGN VIC and Albury networks excl. Mildura), our investment forecast is grouped in the following categories, as defined by the AER:

- **Mains Replacement** - Capital expenditure incurred for the replacement of existing mains and services in the network due to the condition of those mains and services;
- **Meter Replacement** - Capital expenditure incurred for the replacement of installed meters with new or refurbished meters;
- **Augmentation** - Capital expenditure incurred to change the capacity requirements of mains and services in the gas distribution network to meet the demands of existing and future customers;
- **Telemetry** - Capital expenditure incurred in the replacement of SCADA operating in the network due to the condition of the assets;
- **Growth** (Connections) - Capital expenditure incurred when connecting new customers to the gas distribution network;
- **ICT** (Information Communication and Technology) - Capital expenditure associated with ICT assets but excluding all costs associated with SCADA expenditure that exist beyond gateway devices (routers, bridges etc.) at corporate offices;
- **Other** – Capital expenditure which is not captured by other capital expenditure categories (as defined above). Other expenditure is split between capital incurred on asset directly relating to the distribution network (Other – Distribution System) and assets not directly related to the network (e.g., vehicles and non-operational buildings).

Our forecast excludes capitalised network or corporate overheads, i.e. Direct costs only.

An overview of our capital program is contained in Table 8 and summarised in Figure 16. In total, we are forecasting to spend $489 million (gross) over the five-year AA period (inclusive of $14 million of activities treated as regulatory opex).

During the forecast period, network capital expenditure is expected to average $98 million per annum, with an expected max of $114 million in 2023/24, minimum of $83.8 million in 2027/28. Annual variations are driven by program phasing for augmentation and IT projects and forecast economic activity influencing customer connections.

Figure 16: Gross Capital Expenditure Summary by asset type (Regulated Networks)

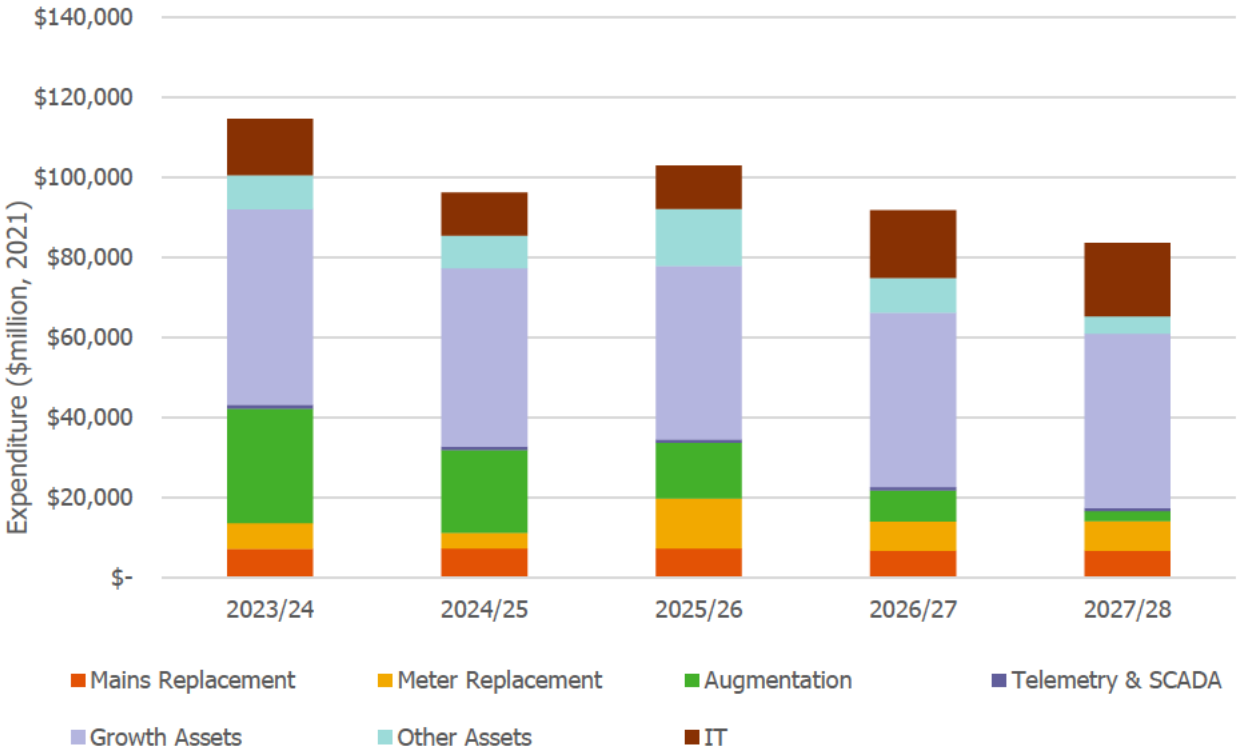
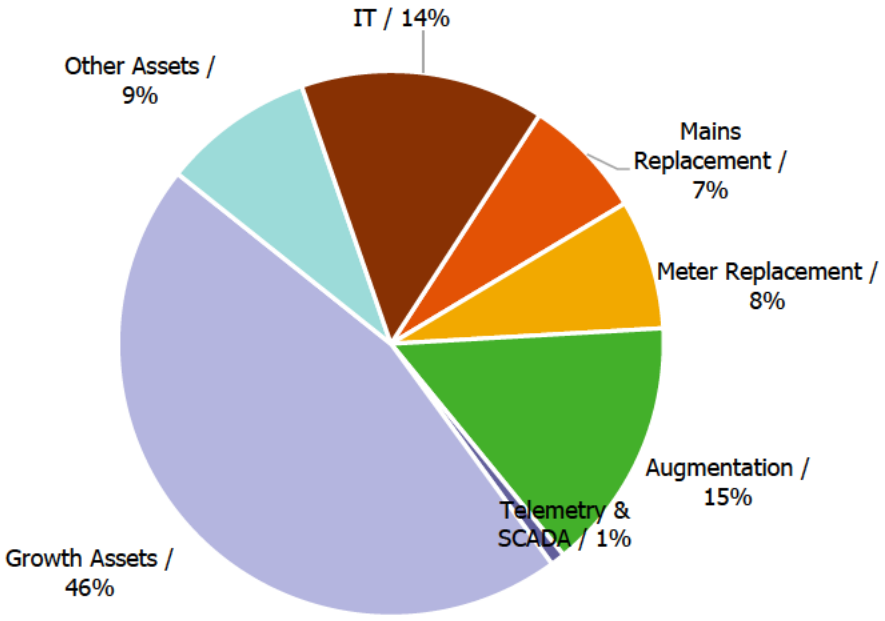


Table 8: Capital Expenditure Summary (Regulated Networks)

Ref	Capex Category	2023/24	2024/25	2025/26	2026/27	2027/28	Total
5.1	Mains Replacement	7.2	7.3	7.3	6.7	6.7	**35.3**
5.2	Meter Replacement	6.4	3.9	12.5	7.3	7.4	**37.6**
5.3	Augmentation	28.6	20.6	13.9	7.7	2.5	**73.4**
5.4	Telemetry	1.0	0.8	0.8	0.8	0.8	**4.2**
5.5	ICT	14.1	10.8	10.8	16.9	18.3	**70.8**
5.6	Growth Assets	48.7	44.5	43.3	43.5	43.6	**223.7**
5.7	Other Assets	8.5	8.2	14.2	8.7	4.3	**43.9**
Total Expenditure ($million, 2021)		**114.4**	**96.0**	**102.7**	**91.9**	**83.8**	**488.9**

Cumulatively, 46% of our forecast capital expenditure for the next AA period is related to our Growth programs; as shown in Figure 7.2. This is followed by Augmentation projects at 15% which are a consequence of the steady growth in key areas resulting in a requirement to reinforce the network.

Figure 17: Capital Expenditure Summary – Breakdown by Capex Category



Each expenditure category is further explained in the following sections.

5.1 Mains Replacement

There were 12,154 kilometres of distribution mains in the Victorian AGN network as of July 2021. These mains consist of different material types, with diameters ranging from 10 mm up to 900 mm, operating at different pressures. Pressures vary from 1.4 kPa to over 140kPa across our low, medium and high pressure networks. These material and pressure differences are the primary drivers of variability in condition and corresponding management activities over time. One of the key characteristics that helps inform and determine likely asset condition and performance is age. Typically, the longer a pipe has been in service, the more likely it is at risk of failure. Operating pressure, pipeline material, location, soil conditions, exposure to movement/impact are all risk factors that impact mains performance. The next AA period comprises four programs of work. We will invest $35 million to undertake the following:

Protected steel mains replacement and testing:

- Proactively replace 11.7 km of protected steel mains located in high density and key risk areas;
- Take steel samples at 50 locations to monitor condition and performance; and
- Reactively replace approximately 2.5 km of protected steel mains (based on historical failure rates).

HDPE mains inspection, reinforcement and testing:

- Conduct 16.4 kilometres of in line camera inspections and reinforcement of HDPE 575 mains in Albury and Wodonga; and
- Take 100 samples of vintage HDPE mains for laboratory testing.

Services replacement:

- Replace 170 services multi user service (MUS) sites;
- Budget for 13,350 reactive service replacements[1].

Decommission redundant high pressure regulator sets:

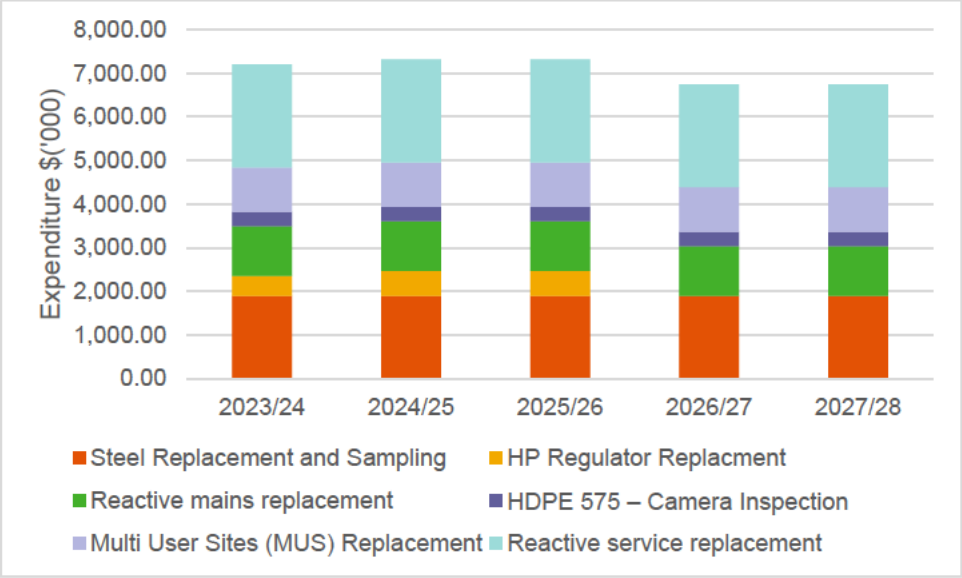
- decommission and remove 28 redundant high pressure to low pressure (HP - LP) regulators.

Please see document Attachment 9.7 DMSIP- V.23.CD further details on these programs.

Table 9: Capex Summary Mains Replacement

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Steel Replacement and Sampling	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
HP Regulator Replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Reactive mains replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
HDPE 575 – Camera Inspection	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Multi User Sites (MUS) Replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Reactive service replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Expenditure	**7,207**	**7,321**	**7,321**	**6,750**	**6,750**	**35,349**

Figure 18: Capex Spend Profile Mains Replacement



5.1.1 Mains Replacement Program Steel

On the Victorian AGN network there is more than 3,000 km of protected and unprotected steel mains within the network. These steel mains are typically PE coated and are predominantly used for the high-pressure system. The overall risk of this asset class is escalating with time due to their age and increasing leak rates. The original protected steel mains are now 55 to 70 years old and are showing an increased leak rate trend. Following a risk-based assessment of age, condition, and location factors, we have identified 11.7 km of the oldest and highest risk protected steel mains that should be replaced during the next AA period. Of the 880 km of unprotected steel mains with the highest reported leak rates, this 11.7 km accounts for 40% of the leaks (or 30% of

leaks across the entire asset population). In addition to this 11.7km, 50 samples of steel will be selected from the broader networks and sampled to form a condition register and provide critical data to longer term integrity-based programs, see Table 10 for detail.

Table 10: Steel replacement and sampling program

Program		2023/24	2024/25	2025/26	2026/27	2027/28	Total
Steel Block Replacement	Length (m)	2,340	2,340	2,340	2,340	2,340	11,700
	Unit Rate ($/m)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	subtotal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Steel Sampling Program*	Sites (ea.)	10	10	10	10	10	50
	Unit Rate ($/ea.)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	subtotal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Direct Expenditure		**1,895**	**1,895**	**1,895**	**1,895**	**1,895**	**9,474**

*this project is capex to opex and further discussed in section 5.9

5.1.2 HDPE (high density polyethylene) Inline Camera Inspections

As part of our response to a network incident that occurred in 2014, we introduced live camera inspection technology for the inspection of our early generation HDPE (high density polyethylene) mains. The camera system is a useful element to mitigate PE risks, specifically the risk associated with SCG (Slow Crack Growth) induced by mains squeeze-offs on early generation PE mains.

The inline camera is used to inspect the inside of the pipe and identify squeeze off points, i.e., points on the main susceptible to sudden failure. Once identified, the pipe is clamped and reinforced with a stainless-steel clip. This provides protection to the weakened parts of the pipe wall caused by squeeze off and reduces/removes the event of squeeze off failures that would release gas. By reducing the likelihood of squeeze off as a source of failure, the overall risk of these pipes is significantly reduced. This inspection and reinforcement option is only available for mains with a diameter of at least 50mm, as that is the size required to allow the camera access.

Inline camera inspection and reinforcement is a practical alternative to replacement for these mains and is now adopted as our primary management policy for mains where there is no history of squeeze off failure, and the technology can be effectively employed.

In the next AA period, we are forecasting to inspect the HDPE 575 mains in the CBDs of Albury and Wodonga and conduct a sampling program in conjunction with Deakin University and other Victorian distribution companies to test 100 samples of HDPE across the broader Victorian distribution system. The total cost of this program is $[redacted] million which is significantly less than an alternate replacement program, refer to Table 11 for detail.

Table 11: Capex Summary HDPE assessment

Program		2023/24	2024/25	2025/26	2026/27	2027/28	Total
Inline Camera Inspections - HDPE Albury	Length (m)	3,280	3,280	3,280	3,280	3,280	16,400
	Unit Rate ($/m)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	subtotal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
HDPE assessment*	ea.	20	20	20	20	20	
	Unit Rate ($/ea.)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	subtotal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Direct Expenditure		**334.1**	**334.1**	**334.1**	**334.1**	**334.1**	**1,670.4**

*this project is capex to opex and further discussed in section 5.9

5.2 Service Replacement Program

5.2.1 Multi User Sites Replacement

Multiuser services (MUS) are services running through unit developments and commercial premises that supply gas to multiple users. There are approximately 3,000 MUS located across our network. Services can be steel, HDPE or PE depending on when they were installed.

During the current AA period we undertook a desktop review and site survey of all MUS and selected a sample to be replaced to inform the prioritisation of a future MUS replacement program. This revealed that replacing MUS by suburb would result in the unnecessary replacement of assets that may be new, compliant, or not at the end of their useful life.

Our plan for the next AA period is to proactively replace all priority 1 MUS and increase monitoring/inspection of the priority 2 MUS with a view to informing the proactive replacement of the priority 2 MUS in future AA periods. This program is forecast to cost $[redacted] millon dollars.

Table 12: Capex Summary MUS renewal

Program		2023/24	2024/25	2025/26	2026/27	2027/28	Total
Service Renewal - MUS	Services	34	34	34	34	34	170
	Unit Rate ($/service)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Expenditure		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

5.2.2 Reactive Service Replacement

Reactive services replacement provides for an allocation of capital expenditure to allow for the piecemeal renewal of services outside the planned mains replacement program. The need for such service replacements arise when leaks or damage occur on the service and inspection reveals that

the service is heavily corroded or in such poor condition that repairs are not viable, or that the service is at a non-compliant depth.

A service is a dedicated network asset comprising of a service pipe, fittings, and metallic upstand with ball valve, which can be used to isolate customer supply in the event of an emergency. There are 716,437 inlet services connecting mains (typically located in the street) to customer meters located at each network user.

Services are typically of the same vintage of the gas main to which they are connected, as they generally were laid together as one project. We assume the same level of reactive replacement for the next AA as was observed in the current AA.

Table 13: Capex Summary Service Renewal

Program		2021/22	2022/23	2023/24	2024/25	2025/26	Total
Service Renewal - Albury	Services	86	86	86	86	86	430
	Unit Rate ($/service)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Service Renewal -	Services	2,584	2,584	2,584	2,584	2,584	
	Unit Rate ($/service)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Expenditure		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

5.2.3 High pressure regulator set removal

The allocation of capital within mains replacement program has been prioritised during the current AA period to remove the highest risk CI (Cast Iron) and UPS (unprotected steel) mains. Once these mains in an area have been replaced with HDPE, the network pressure is upgraded to a higher pressure, and high-pressure regulator sets (HPRs) within the rationalisation area become redundant.

Although HPRs are less risky than the CI (Cast Iron) and UPS (unprotected steel) mains, redundant HPRs cannot remain indefinitely and must be fully decommissioned and removed. The inherent risk of the infrastructure also increases over time.

Prudent asset management practice is to remove redundant assets rather than leave them in the ground, as this eliminates any risk of corrosion, leakage or third-party damage. It also avoids ongoing maintenance costs.

When the low-pressure mains replacement program is completed (in 2022/23), there will be 28 redundant HPRs. The most cost-effective approach is to leverage the economies of scale and complete all 28 removals as a single project, using a dedicated team with an efficient blend of specialist contractors and internal workforce. This program will cost 1.6 million, refer to Table 14.

Table 14: Capex Summary HP regulator removal

Program		2023/24	2024/25	2025/26	2026/27	2027/28	Total
HP regulator replacement	Number (ea.)	8	10	10	0	0	28
	Unit Rate ($/ea.)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Expenditure		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

5.3 Meter Replacement

Australian Gas Networks Limited (AGN) reticulates gas to approximately 750,000 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.

AGN has a regulatory obligation to manage the integrity of these meters and ensure they operate within a prescribed tolerance band for metering accuracy. 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.

We also have an obligation to collect metering data and provide it to gas retailers in a timely manner for billing purposes.

AGN groups meter types into the following categories:

- Domestic meters – which are typically diaphragm meters with a capacity up to 25 m3/h 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 25 m3 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 25 m3 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.

Domestic and commercial meters are subject to periodic testing to ensure families of meters are operating within 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.

Procurement of gas meters is required for:

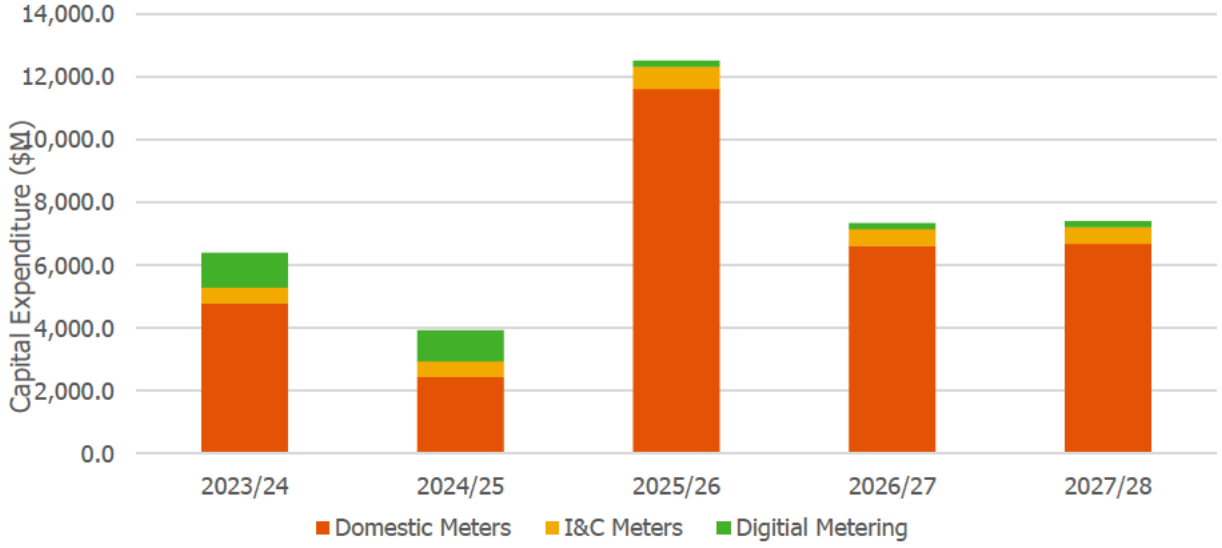
- New connections;
- Time expired meter replacement;
- Field life extension; and
- Defective meter replacement.

AGN meter replacement programs are summarised in the sections below. Additional details can be found in Attachment 9.8 Meter Replacement Plan

Table 15: Capex Summary Meter Replacement Plan

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Domestic Meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
I&C Meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Digital Metering	1,106	994	189	189	189	2,666
Total Expenditure ($'000)	**6,400**	**3,937**	**12,520**	**7,346**	**7,402**	**37,606**

Figure 19: Capex Summary Meter Replacement Plan



5.3.1 Meter Testing

AGN is required by the Victorian Gas Distribution System Code (GSDC) to carry out, or cause to be carried out the following tests on meters up to 25 m3/h:

- 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,
- Initial in-service compliance testing, which must be carried out in accordance with the requirements set out in AS 4944;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.

5.3.2 Test Results for Domestic Meters

Acceptance Testing: To comply with the 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%.

All new meters supplied by manufacturers over the last five years have fallen well within the ±1% accuracy range.

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.

FLE Testing: FLE testing has been conducted on 56 meter families over the last three years. Table 16: FLE meter family testing results for the current AA periodsets out the results of testing over this period, of which:

Table 16: 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

5.3.3 Test Results for Commercial Meters

In a similar manner to domestic meters, the commercial metering provisions (more than 25 m3/h) 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; and
- Meter specific testing if a customer requests such a test

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. 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.

Acceptance testing: Over the last five years, the new meters provided by manufacturers have fallen well within the ±1% accuracy range.

FLE testing: 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.

Therefore, as a general rule, commercial meters are replaced after 15 years rather than having their field lives extended.

Meter Replacement

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

Meters sized ≤25 m3 per hour – these meter families must be replaced if the test results fall outside the accuracy range specified in the Victorian Code 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

Currently 746,426 meters installed in Victorian and Albury Networks. The continued growth in the Albury and Victorian networks over 2018 to 2022 results in 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.

5.3.4 Forecast PMCs for Domestic Meters

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.

The estimated number of domestic meters that need to be removed from the field during the next AA period and subject to initial in-service compliance testing are shown in Table 17:

Table 17: Victorian and Albury Networks: Initial in-service compliance testing for domestic meters

Volumes	2023	2024	2025	2026	*2027	Total
Number of domestic meters to be tested	0	0	92	0	0	92

FLE Testing

Using some information on the age of the assets that will be in stock as at 1 January 2023; as well as some assumptions based on the extension period for the newly manufactured meters and refurbished meters, the results of previous initial in-service compliance and FLE testing and the sample size requirements as 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.

Table 18: Victorian and Albury Networks: FLE testing for domestic meters

Volumes	2023	2024	2025	2026	2027	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

Failure of FLE Testing

The estimated number for the replacement of meter families that no longer satisfy the prescribed tolerance band for metering in the next AA period is tabulated in Table xx. The number is based 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 totalling nine years);and

- Refurbished meters have a 19 year life (i.e. an initial service life of 15 years plus two FLE extensions totalling four years).

Table 19Victorian and Albury Networks: Domestic meters to be replaced due to failure of FLE testing

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

5.3.5 Reactive Replacements of Defective Meters

Historically, around 5,000 meters per annum become defective and require replacement.

Provision has therefore been made in the forecast for an equivalent number of reactive replacements to occur over the next AA period.

Table 20: Victorian and Albury Networks: Reactive domestic meter replacements

Volumes	2023	2024	2025	2026	2027	Total
Domestic meters to be replaced	5,000	5,000	5,000	5,000	5,000	25,000

5.3.6 Summary of Forecast Number of PMCs for Domestic Meters

The total number of PMCs for meters sized ≤25m3 per hour forecast for the next AA period in the Victorian and Albury networks is summarised in Table 21

Table 21Total Forecast Number of PMCs for Domestic Meters:

Volumes	2023	2024	2025	2026	2027	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**

5.3.7 Forecast PMCs for Commercial Meters

The estimated number of meters of size >25m3/h that will need to be replaced in the next AA period is presented in Table 22. The meters assumed to be replaced after the end of their 15th year of service, consistent with the standard life set out in the Victorian Code.

Table 22: Victorian and Albury Networks: PMCs for meters sized >25m³/hour

Volumes	2023	2024	2025	2026	2027	Total
Commercial meters reaching 15 years of age	246	245	347	262	257	1,357

5.3.8 Forecast Cost of the Meter Replacement

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 of $212 per domestic meter and $2,059 per Commercial meter.

Table 23 Table 23provides an annual forecast of Meter Replacement capital expenditure for the next AA period.

Table 23: Victoria and Albury Network: Meter replacement cost estimate, $,000 real 2021

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

5.3.9 Remote Digital Meter Solution

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. 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.

Table 24 shows the capital cost estimate for installing 4,693 digital meters at currently inaccessible sites.

Table 24: 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 ($,000)	[redacted]					
Total capex ($,000)	[redacted]					

Table 25 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 25 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 ($,000)	[redacted]					
Total capex ($,000)	[redacted]					

5.3.10 PMC Capex Program Summary

Table 26 sets out the forecast capital cost of the PMC and digital meter programs.

Table 26: Victoria and Albury Network: Meter replacement capex estimate, $,000 real 2021

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
PMCs						
Domestic meters	[redacted]					
Commercial meters	[redacted]					
Total PMC program	5,294	7,183	8,091	7,157	7,213	34,939
Remote digital meter reading						
Inaccessible meters	[redacted]					
Opt-ins	[redacted]					
Digital meters in new estates						
Incremental costs to purchase and install digital meters	[redacted]					
Total meter replacement program	**7,651**	**8,177**	**8,280**	**7,346**	**7,402**	**37,606**

5.4 Augmentation

AGN has an obligation to manage the supply of natural gas to its customers in accordance with the Gas Safety Case (which complies with the Gas Safety Act 1997 and the Gas Safety Regulations 2008) and the GDSC.

At the highest level, AGN is required to use all reasonable efforts to maintain network pressures above targeted levels detailed in the GDSC. The need for network augmentation is identified by AGN's Network Planning team and is the outcome of modelling activities which identify the need and timing of each project.

Augmentation comprises:

Network Reinforcement – the installation of new gas mains to reinforce areas of poor supply or installation of valves to optimise network flow dynamics. This section includes the construction of new network supply points to allow for additional feeds to our networks.

Network city gate capacity upgrades – the upgrading of regulating stations to allow for increased throughput of a station.

Heater Upgrades – the upgrading of heater component of a regulating stations to allow for increased throughput of a station.

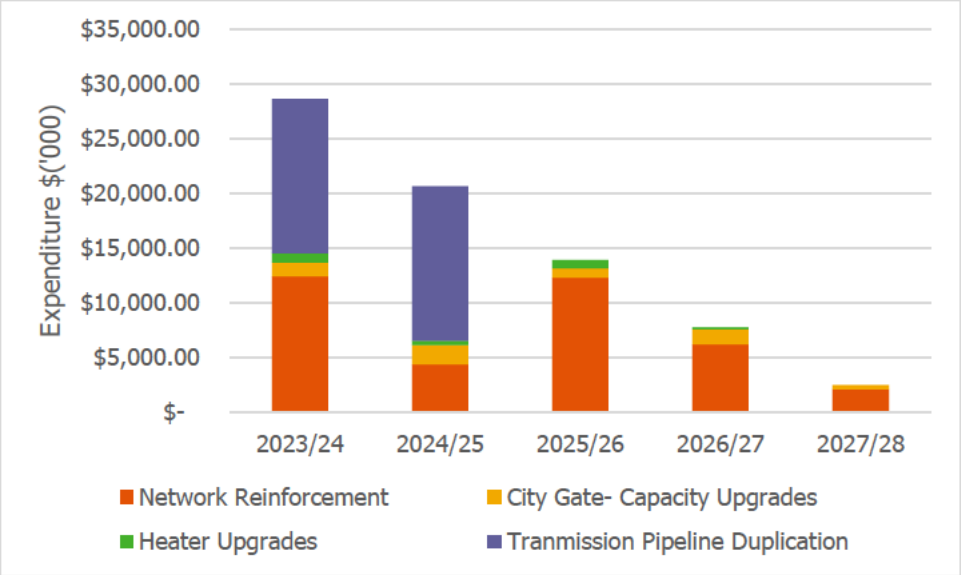
Transmission Pipeline Duplication – the installation of a duplicate licensed pipeline to reinforce areas of poor supply

AGN's forecast expenditure for network augmentation is summarised in Figure 20 and profiled in Figure 21.

Figure 20: Augmentation- Capital Forecast Summary

Project	Business Case #	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Network Reinforcement	V.03.CD	12,408	4,355	12,275	6,171	2,080	37,289
City Gate- Capacity Upgrades	V.02.CD & V.04.CD	1,246	1,764	870	1,387	381	5,648
Heater Upgrades	V.01.CD	844	403	765	191	0	2,202
Transmission Pipeline Duplication	V.05.CD	14,110	14,110	0	0	0	28,220
Total		**28,608**	**20,632**	**13,910**	**7,749**	**2,461**	**73,359**

Figure 21: Augmentation Capital Forecast Summary



5.4.1 Network Reinforcement

Pressure can decline gradually over time due to network growth. As more customers connect to the network and more gas is consumed at the same time, delivery pressures in parts of the distribution network can fall, particularly at peak consumption times. Network reinforcement involves the installation of new gas mains to reinforce areas of poor supply.

This growth-driven delivery pressure risk is especially pertinent if a large number of new customers connect in the same area (for example a new housing estate). Put simply, the HP gas supply fed into that section of the network gets spread more thinly, and pressures decline.

Typically, the growth-driven delivery pressure risk is addressed by adding connection points, or extending trunk mains feeding the affected section of distribution network, or by upgrading regulators to increase supply (or a combination of both).

A further consideration as the network grows is the level of back feeds in the distribution network. As the number of connections increase and new sections of distribution network are built, it is important to provide for the capacity to conduct for critical maintenance work or mains replacement without having to disrupt supply to large numbers of customers due to limited or no back feeds within the network design.

The series of projects covered in the tables below are designed to address this risk of growth-driven pressure drop and capacity shortage.

Table 27: Network Reinforcement Program Breakdown

Project	Business Case	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Cranbourne Network	V.03.CD	0	359	4,870	3,488	651	9,368
Thomastown Network	V.03.CD	5,890	0	962	807	0	7,659
Eltham Network	V.03.CD	907	0	0	107	0	1,014
Wallan Network	V.03.CD	473	0	0	524	291	1,288
Wodonga Network	V.03.CD	560	0	0	0	0	560
Traralgon Network	V.03.CD	1,082	0	0	0	1,138	2,220
Berwick Network	V.03.CD	1,141	0	0	0	0	1,141
Echuca Network	V.03.CD	768	0	0	0	0	768
Howlong HP Network	V.03.CD	1,587	0	0	1,245	0	2,832

The drivers for all of these projects are essentially the same, and are addressing the same risk – mitigating growth-driven delivery pressure decreases in parts of the downstream distribution network.

Table 28: Summary of proposed high pressure network augmentations 2023/24 to 2027/28

Project	Summary description
Cranbourne HP network augmentation	Install 6.4km of HP mains and a new Field Regulator located on Hall Rd.
Echuca HP network augmentation	Install 1km of PE main on McKenzie Road, duplicating existing DN200 steel main.
Thomastown HP network augmentation	Install a new City Gate in Wollert near Andrews Rd, 1km of Steel supply main and 1km of PE main in Rockfield St and in Yann Dr.
Wallan HP network augmentation	Install 720m of PE mains in the township.
Traralgon HP network augmentation	Duplicate 4.4 km of main in Firmin St, Latrobe Cres, Davidson St, Gordon St, Burn St, Cross's Rd and Grubbs Av
Wodonga HP network augmentation	Install 600m of PE main from Victoria Cross Parade to Balmoral Dr along Beechworth Rd.
Berwick HP network augmentation	Transfer the Clyde North Network load to the Huckerby Dr City Gate.
Eltham HP network augmentation	Install 680m of PE mains within Plenty, Lower Plenty and Montmorency.
Howlong HP network augmentation	Duplicate 5.3 km of existing mains in the township with PE.
Pakenham HP network augmentation	Install a new City Gate central to future growth area near Dore Rd.
Somerville HP network augmentation	Install a new field regulator at Eramosa Road East.

5.4.2 Network city gate capacity upgrades

There are three regulator upgrade projects identified for the next AA period, which will ensure the security of supply and maintenance of fringe pressures in accordance with GDSC requirements. These are outlined in Table 29

Table 29: Capital Cost Summary of City Gate Upgrades

Project	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Hume Street	1,026	367	-	-	-	1393
Morewell	220	960	213	-	-	1393
Lyndurst	-	-	220	950	223	1393
Total	**1,246**	**1,327**	**433**	**950**	**223**	**4,179**

The Morwell, Wodonga and Lyndhurst gates all require upgrades due to growing network demand, thereby exceeding the original design capacity of the regulator stations. The growth forecasts are based on a range of sources, including growth recorded over the last ten years, information from developers and local council.

5.4.3 Heater Upgrades

City gates are the transfer point of gas supply from high-flow transmission pipelines to our distribution network, stepping down supply pressures. The drop in pressure and flow as it passes through the gate station causes natural gas to cool (the Joule-Thompson effect). If the gas gets too cold, it can damage equipment downstream or even the regulator at the gate station itself. Delivery of low temperature gas also impacts the accuracy of customer metering, and therefore billing. It can also affect the accuracy of Unaccounted For Gas (UAFG) estimates.

We therefore use heaters to warm the gas, so it remains above the network's safe operation limit. The amount of heating and therefore the size of the heater unit required is a function of the pressure reduction as well as the volume of gas throughput.

Load growth at two of our city gates – Laurimar Park and Wallan – means throughput has increased and the heaters are reaching their maximum capacity. The Laurimar Park and Wallan City Gates supply approximately 14,550 customers. Cost and timing are outlined in the table below.

Table 30: Capital Cost Summary Heater Upgrades

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Scope	Replace Laurimar Park heater		Replace Wallan heater		-	Replace heaters at Wallan and Laurimar Park
Labour	153.84	402.5	640.0	190.7	-	1387.0
Materials	690.0	-	125.0		-	815.0
Total	**843.8**	**402.5**	**765.0**	**190.7**	**-**	**2,202.0**

5.4.4 Transmission Pipeline Duplication

The Dandenong to Crib Point (DCP) transmission pressure (TP) pipeline is the primary supply to high pressure networks in the Mornington Peninsula, supplying gas to over 140,000 consumers. The southern corridor and Mornington Peninsula areas continue to experience high growth, with ongoing growth forecast over the next five years.

Over the past thirteen years, we have been delivering the DCP duplication project, in which we are taking a staged approach to duplicating (looping) the pipeline in order to bring more supply capacity to the area. Each stage to date has delivered the forecast benefits and allowed us to continue to connect new residential and commercial customers, without impacting supply to existing customers.

The final stage of the DCP duplication – Abbotts Road to the DCP – was originally planned (and approved by the AER) for construction in readiness for winter 2021. However, network flows were less than forecast during the current period. This allowed us to re-evaluate the timing of the project and defer construction to 2025 without impacting customer supply.

Since this initial deferral, growth has continued in the area, which means this final stage of the DCP duplication can be deferred no further. High levels of housing and commercial construction along the pipeline corridor and subsequent increasing gas demand, means that if no action is taken, pipeline pressures are forecast to fall below the recommended minimum required to maintain a safe and reliable supply to customers. To avoid this, augmentation (delivering the final stage of the DCP duplication) is required before winter 2025.

- Allowing the DCP to operate below the recommended minimum pressure could result in the disruption or loss of supply to potentially tens of thousands of customers. Augmentation is necessary to ensure we meet our obligations to:
- maintain network pressures above the distribution supply point minimum specified in the Victorian Distribution System Code (Code). Failure to do so would be considered a breach of AGN's license condition;
- Maintain and improve the safety of services to consumers. Failure to do so could result in serious injury or damage to property;
- Maintain a reliable supply to consumers. Failure to do so would incur Guaranteed Service Level (GSL) payments and have potential, in the long term, to harm the reliable reputation of natural gas, encouraging customers to switch to alternative energy sources;
- Connect customers that are within infill areas as required by the Code. Failure to do so would be considered a breach of AGN's license condition.

This project is anticipated to cost $28.2M, refer to table below for expenditure forecast.

Table 31: DCP Abbots Rd Duplication Capital Expenditure

Project	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Abbotts duplication	14,110	14,110	0	0	0	28,221

5.5 Telemetry

AGN uses a supervisory control and data acquisition (SCADA) system to monitor and report on the gas flow, pressure, and temperature of gas in real time. The effective operation of our SCADA system is necessary to ensure we have visibility of the network. In turn this improves our ability to

manage our assets in a safe and reliable way and address any issues on the network as they arise. Capital expenditure incurred in the replacement or upgrade of our SCADA and Telemetry systems are contained within this expenditure category. SCADA facilities include:

- Pressure monitoring and control equipment;
- Network fringe point control; and
- Demand customer monitoring (including telemetry)

Refer to table below for a forecast of our network monitoring program, with each program summarised thereafter.

Table 32: Summary Capital Expenditure Telemetry

Program	Business Case	2023/24	2024/25	2025/26	2026/27	2027/28	Total
SCADA Equipment Replacement	V.06.OP	654.3	459.8	439.4	443.5	396.9	2,393.9
Additional Network Pressure Monitoring	V.07.OP	361.0	361.0	363.0	363.0	365.0	1,813.0
Total Program Expenditure		**1,015.3**	**820.8**	**802.4**	**806.5**	**761.9**	**4,206.9**

5.5.1 End of life SCADA equipment replacement

AGN uses a supervisory control and data acquisition (SCADA) system to monitor and report on the gas flow, pressure, and temperature of gas in real time. We currently have SCADA at 154 critical sites in the Victorian and Albury network. This includes city gate stations, regulating stations and fringe of grid sites. 36 of these sites also allow remote control of pressure.

The effective operation of our SCADA system is necessary to ensure we have visibility of the network. In turn this improves our ability to manage our assets in a safe and reliable way and address any issues on the network as they arise.

The information provided through our SCADA system is also used in planning future investments to allow us to prudently invest in our network and is crucial to our mandatory compliance and operational reporting activities.

A functioning SCADA system is vital to AGN meeting its obligations in the Victorian Gas Distribution System Code, which requires us to use all reasonable endeavors to ensure minimum prescribed pressures are maintained at gas delivery points. SCADA is also critical to providing safe and reliable network service to our customers in accordance with AS 4645 and AS 2885.

SCADA equipment typically has a technical life of around 10 years. We are required to maintain our SCADA equipment in line with AS 60079, which sets the industry standards for the maintenance of electrical equipment in explosive atmospheres.

Within the next five years, remote terminal units (RTUs) at [redacted] sites will need to be replaced. The Kingfisher RTUs is no longer in production, is unsupported and at end of life. Coupled with inaccurate legacy design drawings and non-standard/inaccurate RTU code, there is an increasing need for the replacement of these RTUs with a modern RTUs of standardised design.

In addition, [redacted] sites require cabinet replacement, and [redacted] sites require transmitter replacement. This equipment will be at or beyond the original equipment manufacturers' technical design life. The age of SCADA equipment is a good indicator of its condition. The older the asset, the more likely it is to fail. Where an asset is beyond the technical design life, there is also limited support and replacement parts for equipment.

Having end-of-life and unsupported SCADA increases the likelihood of the SCADA system failing and a pressure incident affecting the safety and reliability of services to customers.

We have conducted a desktop review and found that 19 sites also have old electrical equipment (such as junction boxes and wiring) that do not meet the Hazardous Areas requirements under AS 3000:2018.

We have an ongoing proactive replacement program for SCADA, under which we will address these end-of-life and non-compliance issues.

Table 33: Summary End of Life SCADA Replacement

$'000 real 2021	2023/24	2024/25	2025/26	2026/27	2027/28	Total
# of Cabinets						
# of Transmitters						
# of Hazardous Area Upgrades						
# of RTU upgrades						
Replace end-of-life SCADA equipment $('000)	654.3	459.8	439.4	443.5	396.9	2,394
Total $('000)	**654.3**	**459.8**	**439.4**	**443.5**	**396.9**	**2,394**

5.5.2 Additional Network Pressure Monitoring

The effective operation of our SCADA system is required to ensure we have visibility of the network. In turn this improves our ability to manage our assets in a safe and reliable way, and address any issues on the network as they arise. The information provided through our SCADA system is also used in planning future investments to allow us to prudently invest in our network, and is crucial to our mandatory compliance and operational reporting activities.

The forecast network monitoring and control program for the next AA period is the continuation of a well-established program of work expanding the amount of real-time information we have for use in monitoring and controlling pressure in our network. Within this program AGN will address high priority SCADA and communications deficiencies in rural and regional locations by continuing the ongoing SCADA fringe of grid program by installing new SCADA points at the [redacted] highest priority sites; and improving network coverage in rural and regional areas by installing 4G signal boosters at [redacted] locations.

Table 34: Summary SCADA additional pressure monitoring

$,000 real 2021	2023/24	2024/25	2025/26	2026/27	2027/28	Total
SCADA fringe of grid	295	295	295	295	295	1,475
4G comms boosters	66	66	68	68	70	338
Total	**361**	**361**	**363**	**363**	**365**	**1,813**

5.6 Information Technology

Capital expenditure relating to our Information Technology (IT) platforms is contained within the "Information Technology" capital expenditure category.

The AGN IT investment Plan (Attachment 9.9) outlines the key IT investments forecast for the next AA period. The plan covers traditional IT such as enterprise applications, IT hardware, corporate data and managed infrastructure, as well as the operational technology (OT) systems for our Supervisory Control and Data Acquisition (SCADA). The forecast IT expenditure is designed to maintain the existing IT environment and services, reduce a range of IT safety and security risks, improve the service experience of our customers and transition a number of core systems in line with our AGIG IT Strategy and other key business strategies.

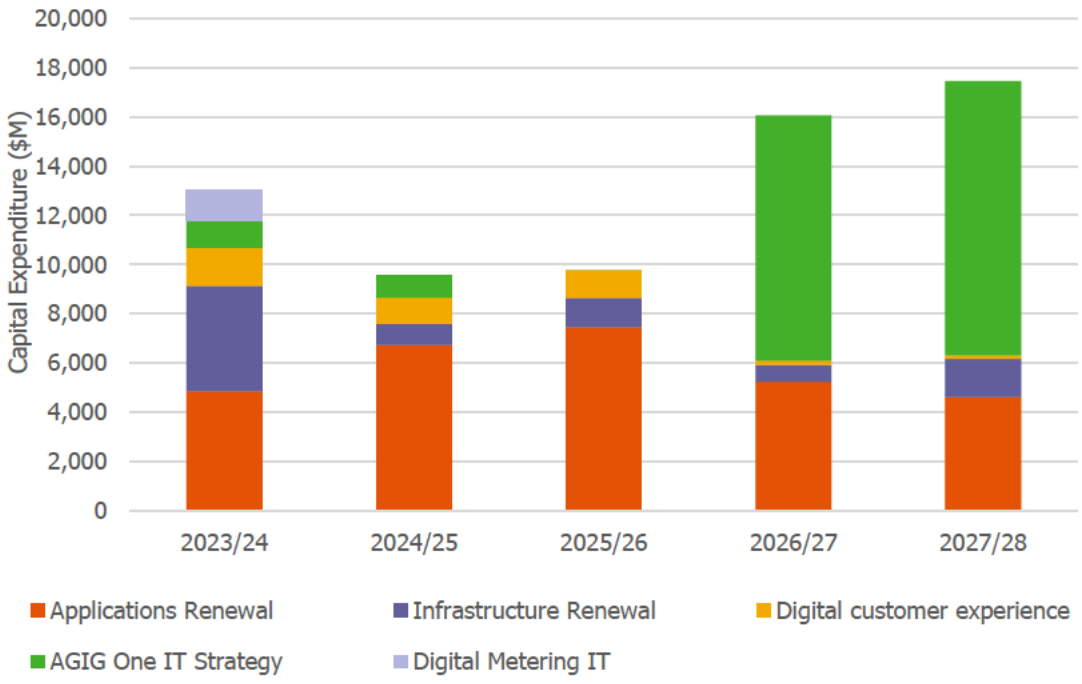
Over the AA period, AGN will renew its critical applications and IT infrastructure in line with good industry practice, and implement a number of system improvements that will further us on our journey to transform the AGIG-wide IT environment.

AGN's IT expenditure forecast for the next AA period is summarised in Table 35 and profiled in Figure 22.

Table 35: Information Technology Expenditure Summary

Program	Ref #	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Recurrent Programs – Maintaining current levels of IT services							
Applications Renewal		4,842	6,738	7,445	5,244	4,615	28,884
Infrastructure Renewal		4,205	846	1,193	655	1,494	8,393
AGIG Strategy & Roadmap - Cyber		1033	1175	1043	881	881	5013
Non-recurrent Program – Efficient and effective service delivery							
AGIG One IT Strategy		1,121	929	5	9,965	11,144	23,164
Digital customer experience		1,536	1,075	1,121	170	149	4,051
Digital Metering IT		1,251	0	0	0	0	1,251
Total Program Expenditure $ ('000)		**13,987**	**10,763**	**10,807**	**16,915**	**18,284**	**70,756**

Figure 22: Information Technology Expenditure Summary



5.6.1 Recurrent versus non-recurrent expenditure

Broadly, IT expenditure can be categorised either:

- Recurrent programs – investments targeted at maintaining the current levels of IT services. This includes application and infrastructure renewals.
- Non-recurrent programs – investments that are seeking to improve the efficiency and/or the effectiveness of our operations

Figure 23: Information Technology Expenditure Summary – Recurrent / Non-recurrent Expenditure

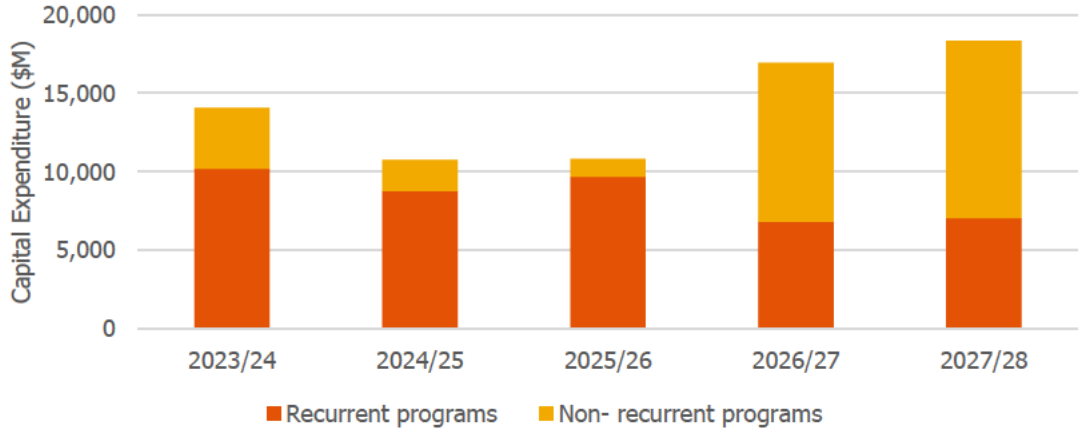
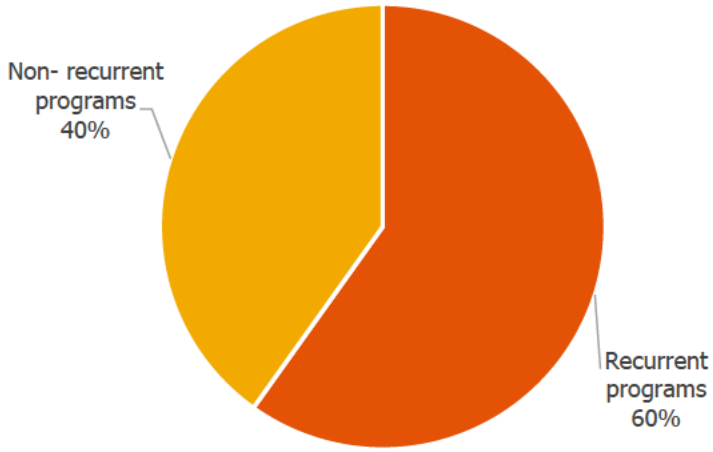


Figure 24: Information Technology Expenditure Summary – Recurrent / Non-recurrent Expenditure



Recurrent programs, exhibiting a relatively flat profile, represent 60% ($42.5M) of AGN's forecast IT expenditure for the next AA period. The three recurrent IT programs which are sumarised in section 2.2.1 of the IT investment plan.

Non-recurrent programs represent 40% ($28.5M) of AGN's forecast IT expenditure for the next AA period. The three non-recurrent IT programs are sumarised in section 2.3.1 of the IT investment plan.

Refer to AGN's IT Investment Plan (Attachment 9.9) for further details on all programs.

5.6.2 Application Renewals

The applications renewal program is recurrent 'stay in business' expenditure that involves periodic updates to critical business software applications, in particular, vendor version updates. The updates ensure we have reliable, resilient, compliant and efficient business processes and systems, which preserves the ongoing integrity of our services. It includes ensuring any known issues, including security vulnerabilities, can be addressed.

The forecast cost of application renewals over the next AA period is $29 million.

Refer to Table 36 for a forecast of our infrastructure renewals program for the next AA period. Refer to AGN's IT Investment Plan (Attachment 9.9) for further details.

Table 36: Capex Summary Applications Renewal

Applications renewal	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Geospatial Information System Upgrade	790	-	294	1,587	1,587	3,761
Geospatial Information System Conflation		928	-	-	-	928
Dial Before You Dig	-	-	180	180	-	540
Enterprise Asset Management	-	-	-	784	1,569	3,137
FRC Gateway (Webmethods)	-	199	398	199	199	1,392
Licenses Growth	93	200	214	230	238	1,120
Meter & Billing	547	1,319	2,337	1,722	-	6,510
Middleware (Biztalk)	159	-	930	930	-	1,860
Mobility Upgrade	965	293	293	293	293	1,467
Mobility Applications	-	1,609	1,467	1,001	1,001	6,080
Business Intelligence	141	293	293	293	293	1,467
HCM refresh	-	332	226	64	-	622
Total	**4,842**	**6,738**	**7,445**	**5,244**	**4,615**	**28,884**

5.6.3 Infrastructure Renewals

The infrastructure renewal program is a 'stay in business' program that involves periodic renewal of OT, network and end-user devices such as SCADA, laptops, audio/visual equipment, telephony, internet links and servers that support critical business functions. The updates ensure we continue to maintain reliable, resilient, compliant and efficient network and end-user devices, and preserve the ongoing integrity of our services.

The forecast cost of infrastructure renewal over the next AA period is $8.6 million. This investment provides for AGN's allocation of shared infrastructure and direct costs of AGN OT and office end user equipment.

Refer to Table 37 for a forecast of our infrastructure renewals program for the next AA period. Further details are provided in AGN's IT Investment Plan (Attachment 9.9).

Table 37: Capex Summary Infrastructure Renewal

Infrastructure renewal	2023/24	2024/25	2025/26	2026/27	2027/28	Total
OS Currency	677	-	340	249	249	1,515
Active Directory Consolidation and functional uplift	84	-	-	-	73	157
Data Centre Strategy/ Upgrade/Replacement and Cloud Migration	677	-	340	249	249	1,515
Standard Operating Environment (SOE) image upgrade & deployment	183	-	-	-	183	366
SQL DB Currency	-	370	-	-	-	370
Collaboration Upgrades (SharePoint, MS Teams)	-	196	-	-	-	196
Nutanix Platform Replacement	1,408	-	316	-	654	2,378
Core network strategy and carrier upgrade/replacement	456	-	-	-	-	456
Citrix Farm Upgrade	417	-	-	-	-	417
Infrastructure Tools Replacement	283	137	87	-	-	507
Office Equipment Replacements	112	141	120	180	137	690
Total	**4,297**	**844**	**1,203**	**678**	**1,545**	**8,567**

5.6.4 AGIG One IT – Cyber Security uplift

The cyber security program is a continuation of activities underway to uplift our cyber capabilities across AGIG to ultimately achieve and maintain MIL 3 maturity as measured against the Australian Energy Sector Cyber Security Framework (AESCSF) which sets out good practice in cyber security management for our industry.

This program is also supported by several opex initiatives which are further outlined in the AGIG One IT Business Case.

Refer to Table 38 for a forecast of our cyber security program for the next AA period. Further details are provided in AGN's IT Investment Plan (Attachment 9.9).

Table 38: AGIG One IT – Cyber Security uplift

Cyber Uplift	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Total Capex	1,033	1,175	1,042	881	881	5,012

5.6.5 Digital Customer Experience

The digital customer experience project is AGN responding to customer needs to enhance the scope of digital communication with customers. AGN will develop a flexible customer relationship management (CRM) solution with some SMS and self-service capability. In particular, this includes:

- catering for tailored responsive support, confidentiality and proactive reporting for life support and vulnerable customer segments. This is driven by increased customer needs as well as an increasing regulatory expectation of communication with vulnerable customers (accelerated in more recent times due to COVID-19); and
- updating customer communications and notification from the predominantly one-way, highly manual and paper-based processes, to digital communication. This is consistent with regulatory and customer expectations. The new digital services will increase the likelihood customers are aware of information relating to works at their premises or in their community, enable our customers to engage with us as and when they want, and ensure contemporary data security and privacy standards are met

The investment in new digital customer services will cost approximately $3 million.

Refer to Table 39 for a forecast of the digital customer experience program for the next AA period. Further details are provided in AGN's IT Investment Plan (Attachment 9.9).

Table 39: Capex Summary Digital Customer Experience

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Digital customer experience	1,425	885	909	-	-	3,220

5.6.6 Remote/ Digital meter reading

This project involves system enhancements required to support the collection, storage and integration of meter data from the remote-read meters we plan to install in the next AA period (Refer to Section 5.2.6). It assumes IT integration into CC&B from a vendor head-end system of meter index reads of the same format and frequency currently collected via manual, on foot meter reading (i.e. no interval data to be integrated into CC&B).

The forecast cost to establish the required head-end system is $1.25M.

For more detail on remote meter reading, refer to AGN's Metering Strategy (Attachment 9.8).

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Remote and Digital metering	1,251	-	-	-	-	1,251

5.7 Growth

Capital expenditure relating to the connection of new customers or users of our distribution network is contained within the "Growth" capital expenditure category.

Growth expenditure can be broken down into two broad categories:

- **New Connections** involves incremental growth of the networks, typically involving small mains extensions to service new subdivisions and properties, urban renewal and infill projects within or adjacent to our existing network.
- **Contributed Connections** are the incremental cost of more complex connections which may involve larger main extensions to service new regions of network growth or where there are other complexities that cause a higher connection cost than the standard connection, and the economic test identifies an upfront contribution is payable.

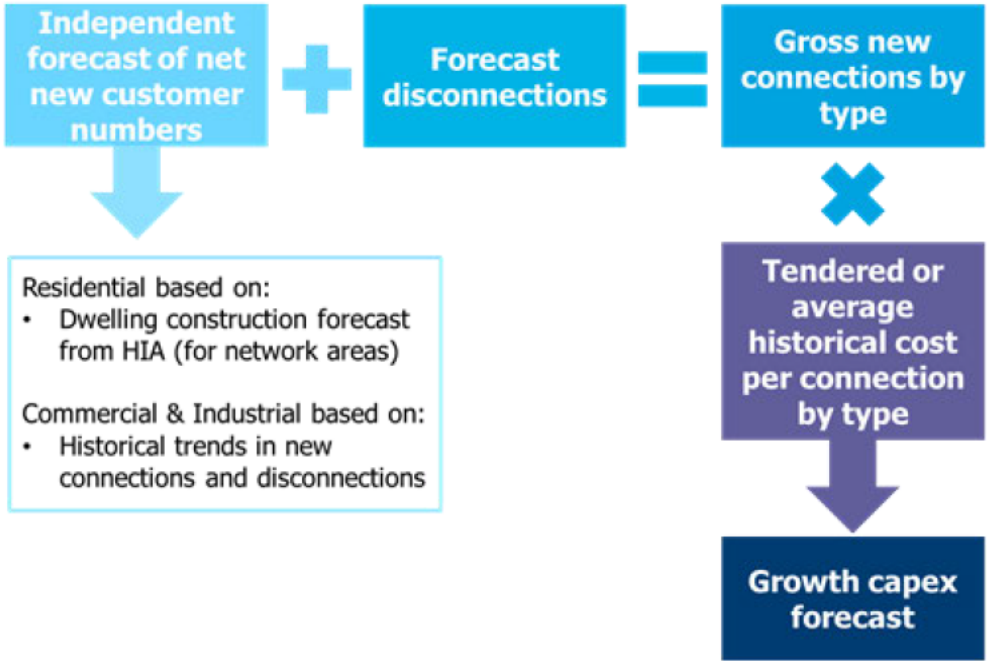
Due to the geographic footprint of the AGN network both organic growth where much of the new connections come from infill projects and contributed connections are observed.

For forecasting, growth expenditure is broken down by connection types:

- **Residential Connections** – customers who use gas for domestic purposes.
- **Commercial Connections** – customers who use less than 10 TJ per annum and use gas for non-domestic purposes.
- **Tariff D Connections** – Customer who use more than 10 TJ per annum, typically considered industrial connections.

Tariff D connections are considered self-funding, i.e. the connecting customer pays upfront for all dedicated connections assets. There is no incremental investment required for these connections, hence it is not included in our capital forecasts.

Figure 25: Growing the Network – Forecasting Approach



Our growth expenditure forecasts are calculated with reference to our forecast of gross connection volumes (outlined above) and forecast unit rates incurred for the installation of mains, services and meters required to connect new customers.

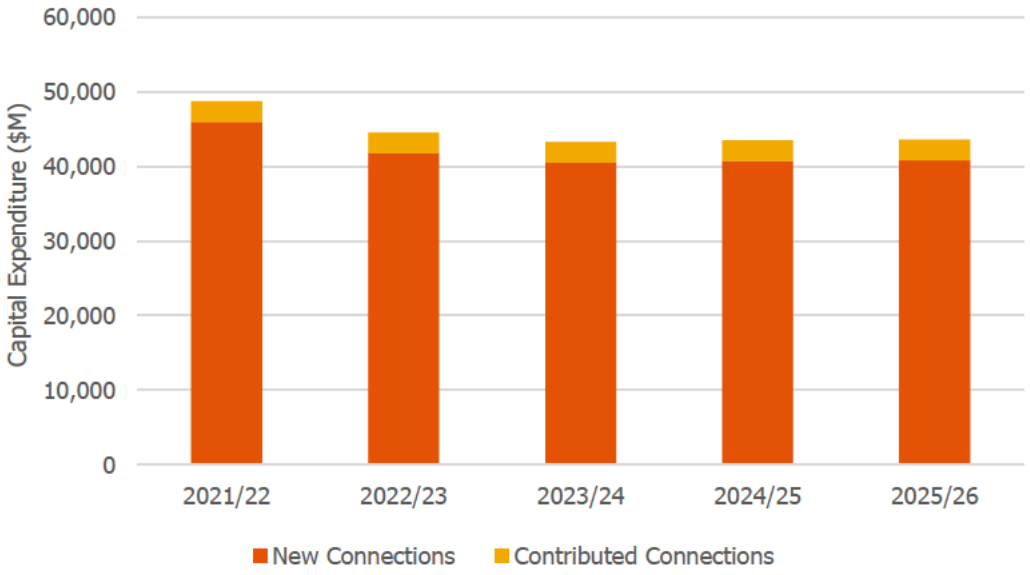
Our total expenditure forecast for growth (by category) for the coming AA period is contained in Table 40 and profiled in Figure 26.

Table 40: Capex Summary Growth $('000)

Category	2023/24	2024/25	2025/26	2026/27	2027/28	Total

New Connections	45,969	41,776	40,523	40,751	40,838	**209,857**
Contributed Connections	1,512	1,512	1,512	1,512	1,512	**7,560**
Total $('000)	**47,481**	**43,288**	**42,035**	**42,263**	**42,350**	**217,417**

Figure 26: Capex Summary Organic Growth & New Growth Areas



5.7.1 New Connections

At the aggregated level, the average cost per connection is around $[redacted] per domestic connection and around $[redacted] per I&C connection for the next AA period.

Our total expenditure forecast for new connections (by connection type) for the coming AA period is contained in Table 41.

Table 41: Growth Assets – Capital Forecast Summary

New Mains		2023/24	2024/25	2025/26	2026/27	2027/28	Total
New Residential Connections (New Estate)	Length (m)	186,944	167,318	161,217	162,155	162,423	840,057
	Unit Rate ($/m)	[redacted]					
	subtotal	[redacted]					
New Residential Connections (Existing Area)	Length (m)	1,998	1,785	1,718	1,728	1,730	8,959
	Unit Rate ($/m)	[redacted]					
	subtotal	[redacted]					
New Commercial Connections (I&C <10TJ)	Length (m)	2,303	2,283	2,295	2,307	2,319	11,507
	Unit Rate ($/m)	[redacted]					
	subtotal	[redacted]					
	Total New Mains $('000)	**12,158**	**11,000**	**10,650**	**10,712**	**10,734**	**55,254**

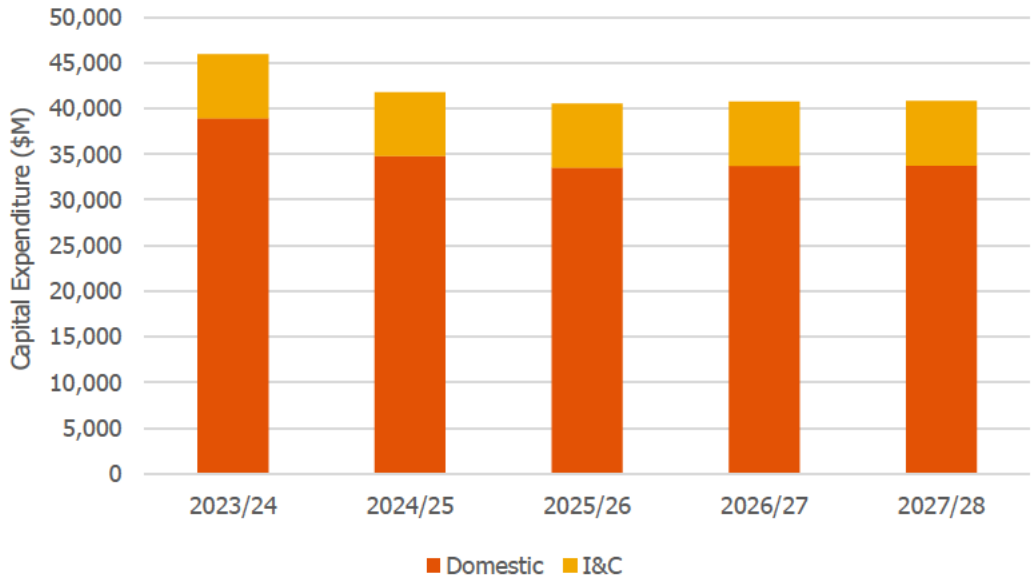
New Services		2023/24	2024/25	2025/26	2026/27	2027/28	Total
New Estate Connections	Service	14,539	12,999	12,518	12,589	12,608	65,253
	Unit Rate ($/service)	[redacted]					
	subtotal	[redacted]					
Existing Home	Service	461	412	396	399	400	2,068
	Unit Rate ($/service)	[redacted]					
	subtotal	[redacted]					
Multi User	Service	444	395	379	381	382	1,981
	Unit Rate ($/service)	[redacted]					
	subtotal	[redacted]					
I&C <10Tj	Service	403	400	402	404	406	2,015
	Unit Rate ($/service)	[redacted]					
	subtotal	[redacted]					
	Total New Services $('000)	**28,039**	**25,378**	**24,573**	**24,710**	**24,757**	**127,456**

New Meters		2023/24	2024/25	2025/26	2026/27	2027/28	Total
New Meter - Domestic	Meters	16,774	14,991	14,432	14,514	14,535	75,246
	Unit Rate ($/Meter)	[redacted]					
	subtotal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
New Meter - I&C	Meters	403	400	402	404	406	2,015
	Unit Rate ($/Meter)	[redacted]					
	subtotal	[redacted]					
	Total New Meters ($'000)	**5,772**	**5,398**	**5,300**	**5,330**	**5,347**	**27,147**

Due to the cost disparity between domestic and commercial connections, domestic connections contribute 17% of forecast expenditure, but 3% of total connection volumes.

Total expenditure by connection type is shown in Figure 27.

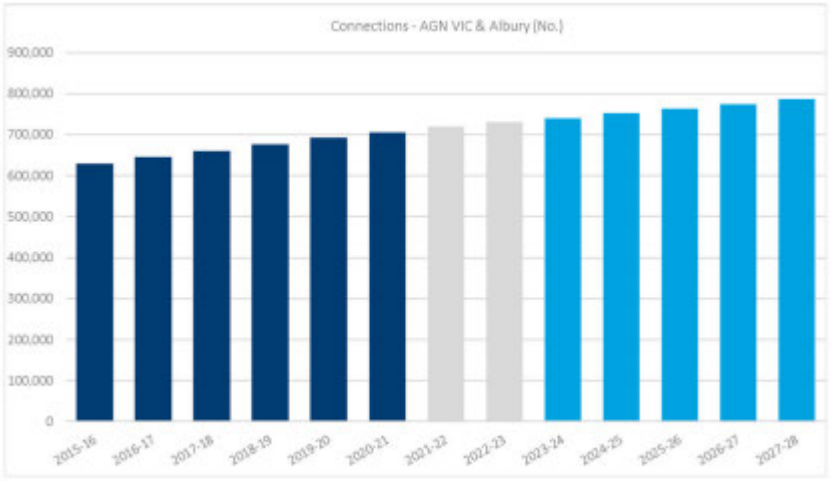
Figure 27: Growth – Expenditure



Residential Connections

Residential customers are defined as those "who use gas primarily for domestic purposes". As of the end of 2021 AGN has circa 715,000 residential connections. Residential connections (net of forecast disconnections) will grow by 1.5% per year in the next AA period, reaching 785,000 by the end of the period.

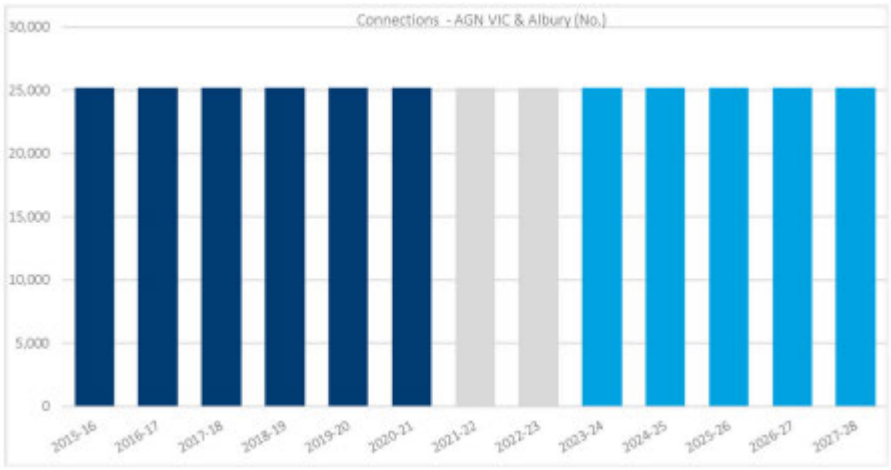
Figure 28: Residential Growth Forecast



Commercial Connections

Commercial Connections are those "who use gas primarily for non-domestic purposes". As of the end of 2021 AGN has circa 25,000 I&C connections. The is expected to be disconnections of 0.5% per annum in line with the ten-year pre-COVID growth trend.

Figure 29: Commercial Growth Forecast



5.8 Other Assets

"Other Assets" includes capital expenditure not included in the subsequent expenditure categories. It is a diverse portfolio of work, drawing on programs from the following AGN business cases:

Table 42: Summary Other Programs

Program	Business Case #	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Non-Piggable Pipeline Alteration Program	V.10.CD	893	0	7,169	850	0	8,912
Pipeline Inline Inspection* (PIGGING Programs)	V.10.CD	0	1,120	0	1,120	0	2,240
Transmission Valve Replacement	V.13.CD	653	593	0	0	0	1,246
Refurbishment of Cased Crossings	V.08.OP	572	572	477	477	477	2,422
DCVG Survey driven Coating Repairs *	V.11.OP	920	920	920	920	920	4,600
Replacement of Grove Regulators	V.12.OP	304	254	337	254	277	1,425
Water Bath Heater Replacement	V.20.OP	260	0	0	260	0	520
City Gate Operational Assets	V.19.OP	191	148	182	162	230	912
City Gate Compound Assets	V.18.OP	465	494	481	315	425	2,180
Hydrogen Readiness	Attach 9.10	1,905	1,715	2,471	2,371	458	8,920
CP Remote Monitoring	V.15.OP	174	157	149	80	0	560
CP Asset Replacement	V.16.OP	506	506	506	506	506	2,529
I&C Meter Set Refurbishments	V.09.OP	303	303	303	303	297	1,509
Plant and Equipment Renewal	V.17.OP	0	0	0	0	120	120
Depot Office Refurbishment	V.14.OP	705	705	1,410	1,410	0	4,230
	Total Program Expenditure	**7,851**	**7,486**	**14,405**	**9,028**	**3,708**	**42,478**

*These projects are Capex to Opex and also discussed in section 5.9

5.8.1 Non-piggable Pipeline Alteration Program

AGN has 252km of regulated transmission pipelines in Victorian and Southern NSW. Currently, only 36.7 km or three of our TP pipelines cater for ILI. This includes the inner ring main (PL201 and PL208) and the PL11 loop. Transmission pipelines are licensed by the Department of Environment, Land, Water and Planning (DELWP) and Energy Safe Victoria (ESV), and require a permit in accordance with the Pipelines Act 2005 for their operation.

AGN has an obligation to periodically demonstrate the integrity of its licensed pipelines. This is documented in AGN's Pipeline Integrity Management Plan- 410-PL-AM-0001.

AGN has risk assessed its licensed pipelines and identified pipeline 49 (PL49) to target for in-line inspection. This pipeline was designed and constructed in such a way that it cannot be pigged without alterations. The alterations include (at a minimum):

- The replacement of tight radius bends and/or mitered bends to induction bends to permit a pig to pass;
- A valve configuration at the identified location of the pipeline to allow a pig launcher and receiver to be fitted.

Due to the high cost of removing all the features along PL49 to make it fully piggable a particularly high-risk 5.4km subsection section of PL49 is planned to be modified to allow a pig to pass as opposed to the entire length.

Two pipelines (PL11 Loop & PL49) require minor additions of temporary pig traps to the pipeline to facilitate inline inspection. An investigation will also be completed on the original section of PL11 to determine the feasibility of pigging this section in the subsequent AA. Refer to AGN's Transmission Pipeline Business Case (V.10.CD) for further details.

Table 43: Capex Summary Tranmission Pipeline Modification

Project	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Install ILI trap facilities (PL 11 Loop & PL49)	893		850			1,743
Modify 5.4 km of PL49			6,319			6,319
Preliminary investigation (PL 11 original)				850		850
Total capex $('000)	**893**		**7,169**	**850**		**8,911**

5.8.2 Pipeline Inline Inspection (ILI)

To ascertain transmission pipeline integrity and condition, internal inspection utilising an intelligent inline inspection (ILI) tool provides a thorough analysis of pipeline defects and locations. This information is critical for AGN to ascertain the remaining life of its transmission assets as per the requirements of the Pipelines Act and AS/NZS 2885.

Table 44 summarises the capital expenditure and timing associated with AGN's pipeline inline inspection program. Refer to AGN's Transmission Pipeline Business Case (V.10.CD) for further details.

Table 44: ILI Summary

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Pipeline #		**11 Loop**		**49**		
Pigging (opex)		1,120		1,120		**2,240**
Total expenditure		**1,120**		**1,120**		**2,240**

5.8.3 Transmission Valve Replacement

Australian Standards AS 2885 and AS/NZS 4645 require Transmission Pressure pipeline and distribution network operators to install and maintain isolation valves to allow the pipeline or network to be isolated for emergency and maintenance purposes. The quantity and location of valves depends on the design of the asset, the valve location (urban vs rural), the pipe material used, and the consequences of any loss of containment.

Pipeline PL11 between Dandenong and Crib Point has two valves (T013-BV03A and T115-BV03) that are currently inaccessible, and so are unable to be operated in a timely manner for isolation purposes. Non-operability of these valves means that up to 120,000 residential customers plus two large commercial customers are at risk of loss or interruption of supply in the event of an event requiring emergency isolation (depending on incident location). The inoperable valves also mean we are non-compliant with AS 2885 requirements for minimum spacing between working isolation valves for this stretch of pipeline.

Pipeline PL49 between Dandenong and Frankston was constructed in 1965. Valves installed along this pipeline are now well past their design life. These valves have been maintained in accordance with our asset management plans and as a result, we have managed to prudently extend the lives of the assets. However, even with good maintenance practices, these valves have a trend of seizing - more than half of the valves on this line have ongoing reliability issues. AGN will replace T14-LV06 which is currently composite wrapped to address ongoing reliability concerns with isolation valves along this pipeline.

Table 45: Capex Summary Tranmission Valve Replacement

Project	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Refurbish 2 valves on PL11	653.4	-	-	-	-	653.4
Replace 1 valve on PL49	-	592.8	-	-	-	592.8
Total	**653.4**	**592.8**	**-**	**-**	**-**	**1,246.2**

5.8.4 Refurbishment of Cased Crossings

AGN has 252km of regulated transmission pipelines in Victorian and Southern NSW. Currently, only 36.7 km or three of our TP pipelines cater for ILI. This includes the inner ring main (PL201 and PL208) and the PL11 loop. Transmission pipelines are licensed by the Department of Environment, Land, Water and Planning (DELWP) and Energy Safe Victoria (ESV), and require a permit in accordance with the Pipelines Act 2005 for their operation. Across the Victorian Transmission and Network pressure pipelines there are 225 rail crossings.

AGN has an obligation to periodically demonstrate the integrity of its licensed pipelines. This is documented in AGN's Pipeline Integrity Management Plan- 410-PL-AM-0001. The highest risk 27 of these crossings have been identified for assessment. This consists of 7 Transmission pressure pipelines and 20 High Pressure network pipeline crossings.

Inspection of sleeved railway casing pipes cannot be completed using standard methods such as direct current voltage gradient (DCVG). Similarly, most TP pipelines and HP pipelines are unpiggable resulting in limited ability to determine pipe integrity in cased locations. Electrical test points have been installed to evaluate the cathodic protection present on the sleeved railway casing pipes, however, cathodic protection readings may not clearly indicate if corrosion is occurring. Cathodic protection failure data is often a lagging indicator; therefore, it is imperative to use other measures to mitigate corrosion risks in these sensitive locations.

AGN will inspect and rectify protection issues on 27 high-risk pipeline crossings. This involves inspecting the 27 locations and installing new link seals, as well as filling the 7 identified transmission pipelines with a concrete slurry to mitigate water ingress and prevent corrosion.

Table 46: Capex Summary Cased Crossing Upgrade

$'000 real 2021	23/24	24/25	25/26	26/27	27/28	Total
Survey and refurbish 27 sleeved railway casing pipes	572	572	477	477	477	2,574

5.8.5 DCVG Survey driving Coating Repairs

AGN has 252km of regulated transmission pipelines in Victorian and Southern NSW. Currently, only 36.7 km or three of our TP pipelines cater for ILI. Transmission pipelines are licensed by the Department of Environment, Land, Water and Planning (DELWP) and Energy Safe Victoria (ESV), and require a permit in accordance with the Pipelines Act 2005 for their operation.

Australian Standard (AS) 2885.3-2012 (section 5.2) requires AGN to have a Pipeline Integrity Management Process (PIMP). An outcome of the PIMP is continued monitoring of pipelines that cannot be inspected via an in-line inspection process, includes surveying of these TP pipelines using Direct Current Voltage Gradient (DCVG) every five years. DCVG surveys are surveys that detect faults in pipeline coatings. The surveys are followed by digging up areas where the DCVG survey indicates the pipeline coating has likely failed and repairing the coating.

Analysis of historical data has indicated that a reduced number of [redacted] dig ups per annum is expected, compared to the average number in the current AA of [redacted] dig ups per annum. This reduced number of sites is expected to be adequate to investigate the number of coating defects uncovered during DCVG. The DCVG program was brought up to date in the current AA after inspections and repairs lagged behind in the previous AA resulting in a higher than usual average to recover that is not expected to continue. Sites will be prioritised, with high priority sites identified through the DCVG process to be excavated first. The total cost of the [redacted] excavations and coating repairs during this period is forecast in Table 47 at $4.6M.

Table 47: Capex Summary Coating Repairs

$'000 real 2021	2023/24	2024/25	2025/26	2026/27	2027/28	Total
[redacted] excavations /year	920	920	920	920	920	4,601

5.8.6 Replacement of Grove Regulators

There are currently 104 Grove 82 regulator units located at 26 field regulator and city gate sites in AGN's Victorian and Albury Networks. All of these regulator units are past the end of their useful life (over 35 years old).

Production of Grove regulators model 82 was discontinued several years ago. Consequently, direct replacement units are no longer available in the market. Spare parts are also becoming increasingly difficult and costly to obtain and in some cases are simply not available.

The only viable option is replacement of these obsolete regulators with a new and currently available alternative with readily available spares. This will ensure the pressure control

components of field regulators and city gates remain current and serviceable, with spare parts available for preventative maintenance.

If we do not replace the Grove 82 regulators and they subsequently fail, the inability to get spare parts poses a risk to operations, potentially causing a loss of supply to a downstream network.

Business Case V34 in AGN's Victorian and Albury Networks previous access arrangement (AA) submission endorsed replacement of all obsolete Grove 82 units across the current (2017-2022) and next (2023-2028) AA periods. V.12.OP proposes the completion of that program, with all Grove 82 regulators across the 26 outstanding sites still planned to be replaced by 2028.

Table 48 provides a summary of the continuing obsolete regulator replacement program to 2028.

Table 48: Capex Summary Grove Regulator Replacement

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Number of sites	5	5	6	5	5	26
Total $('000)	**303.5**	**254.3**	**336.6**	**254.3**	**276.5**	**1,425.4**

5.8.7 Water Bath Heater Replacement

AGN owns and operates 38 Water Bath Heaters (WBHs). A WBH contains coils, immersed within a water bath, which are heated by gas burners so that the gas network supply flowing through the WBH is warmed. This offsets the temperature loss caused by the pressure cut and avoids damage of downstream pipework.

Temperatures below acceptable levels can result in embrittlement or corrosion of piping and fittings, formation of ice and the formation of hydrates within the pipe, with a potential for blockage of filters, regulators and valves seats. This has the potential to generate gas leaks and subsequent fire and/or explosion.

Inspections on WBH and their components are performed as part of ongoing maintenance activities, and minor issues are addressed during these inspections.

A recent inspection identified the Benalla City Gate WBH as having multiple corrosion defects on its internal components, including the fire tube, shell, and bath. This WBH is beyond repair maintenance and requires full replacement.

Recent inspections on WBH at other gate stations have also shown increasing evidence of corrosion, particularly on the coils. To date, this corrosion has not been considered significant enough to warrant full replacement at the time of inspection. Operational repairs, by cutting out and repairing sections of WBH coils, have been able to be performed to enable prudent deferral of replacement.

However, by the end of the next AA period, 15 WBH coils (40% of the population) will be older than their forecast 25-year life, and seven of these will be older than 40 years. While our condition-based replacement and repair strategy has extended their useful operating lives, the age profile of WBHs within the AGN network is now such that minor maintenance on all these assets is not always possible.

Given the increasing incidence of corrosion, and the increasing age profile of this asset class, we consider it prudent to allow for a modest replacement program of WBH components, allowing for one further full WBH replacement in addition to the Benalla City Gate replacement, refer Table 49 for cost and timing.

Table 49: Capex Summary Water Bath Heaters

$,000 real 2021	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Replace Water Bath Heater	260.0	-	-	260.0	-	520.0

5.8.8 City Gate Operational Asset Refurbishment

AGN has 113 city gate and transmission pressure (TP) field regulator stations within its Victorian and Albury regulated networks, including those in above ground kiosks, open air compounds and located within pits. These facilities perform the pressure reduction and control functions from higher pressure transmission pipelines owned by other pipeline businesses, into AGN's Victorian and Albury distribution networks.

The city gate and field regulator station assets are subject to periodic inspection and monitoring. Based on these inspections, we have an ongoing asset refurbishment and replacement program, treating the assets as necessary. Our preference is to refurbish assets, for example by re-coating or touching up protective paintwork. However, where an asset has reached end of life, or is becoming inoperable, we will install replacement parts. Typically items under this program fall under 4 categories

- Repainting- Blasting and painting (offline if needed) is required to properly treat the pipework for effective corrosion mitigation.
- Corrosion under insulation inspection and insulation replacement- Insulated pipework is inspected periodically to monitor any localised corrosion damage caused by moisture ingress on the external surface of piping. The pipe insulation is fixed, which makes it difficult to inspect the pipeline surface. As such, corrosion can remain undetected until the damage is significant, which can lead to asset failure.
- Isolation valve replacement- Inlet/outlet isolation valves are required in regulating facilities to isolate and/or control parts of the network during emergencies or maintenance activities. End of life or damaged valves are replaced as required
- Pipe repair- where the extent of corrosion means pipework cannot be repainted, and needs to be remediated with composite sleeves

Recent inspections have identified the following city gate/regulator stations refurbishment and replacement works required during the next access arrangement period:

- [redacted] sites where the condition of paint coating on pipework is poor, and corrosion is therefore a threat;
- [redacted] sites at which piping beneath the insulation is likely to be corroded due to moisture ingress on the external surface;
- [redacted] sites at which there is no insulation on pipework;
- [redacted] sites where the extent of corrosion means pipework cannot be repainted, and needs to be remediated with composite sleeves; and
- [redacted] sites where valves have either seized or become inoperable, requiring 8 valves to be replaced in total.

Table 50: Summary City Gate Compound Capex

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total

Repainting corroded pipework	68.2	77.2	77.2	63.0	54.0	339.7
Repainting corroded pipework - CUI	34.7	17.3	17.3	34.7	34.7	138.8
Installing/ replacement of thermal insulation	10.1	14.3	9.7	11.6	11.4	57.0
Remediation using composite sleeve	-	-	-	13.9	13.9	27.8
Replacing isolation valves	77.6	38.8	77.6	38.8	77.6	310.4
Total $('000)	**190.6**	**147.7**	**181.8**	**161.9**	**191.5**	**873.5**

5.8.9 City Gate Compound Refurbishment

AGN has 113 city gate and transmission pressure (TP) field regulator stations within its Victorian and Albury regulated networks. Of these, 51 sites are contained within fenced compounds that house various assets, including water bath heaters, pressure regulator equipment and above ground pipework.

Some of these site assets have now reached or exceeded end of life or are in poor condition. Additionally, industry practices, engineering and safety standards, and maintenance regimes over the life of the station have resulted in many no longer meeting current engineering and industry standards. This exposes personnel to health and safety risks, as well as presenting a potential supply risk through failure of city gate station equipment or components.

The city gate compound refurbishment program seeks to mitigate the high health, safety and operational risks associated with poor condition or poorly documented assets by:

- Refurbishing highest priority city gate and TP field regulator assets to comply with current Australian Standards (AS2885, AS1657) and the Victorian Occupational Health and Safety (OH&S) Regulations; and
- Updating as-built P&IDs for existing city gates and field regulator stations where required.

The following other items have been identified as being in poor condition or not complying with safety standards:

- kiosks (15 sites);
- water bath heater ladders (1 sites);
- emergency exit gate (1 site);
- pit lids (22 sites);
- signage (1 site);
- impact protection (1 site); and
- uneven surface grading site (2 sites)
- replace padlocks (46 sites)

Table 51: Capex Summary City Gate Compound Refurbishment

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Sites perimeter fencing upgrade	255	255	255	255	255	1,275
Sites other refurbishment work	72	101	85	60	50	369
P&IDs	138	138	141	-	-	416
Total $('000)	**465**	**494**	**481**	**315**	**305**	**2,060**

5.8.10 Cathodic Protection Remote Monitoring

All steel assets can corrode. Our steel pipelines range from 30 to 60 years old, with many of them located in coastal areas and other environments conducive to corrosion. As required by Australian Standards 2885.1:2018 and 2885.3.2012, we use cathodic protection (CP) assets to help prevent (or at least inhibit) corrosion. These assets consist of galvanic sacrificial anodes and impressed current cathodic protection (ICCP) units, and are monitored by test points installed along the pipelines. The network contains over 1,400 galvanic sacrificial anodes and 86 ICCP units. Of these, 12 ICCP units and 344 sacrificial anodes are on the transmission pressure network, with the remainder on the distribution network.

As a prudent asset manager, it is important to be able to monitor the ongoing performance of the CP systems. Monitoring units (data loggers) can be installed at test points to measure the performance of sacrificial anodes, and at ICCP unit locations. These units allow continuous remote monitoring of the CP system and therefore early identification of CP failure.

By understanding how the CP assets are performing and identifying faults quickly, we can ensure the steel pipelines remain fully protected, and mitigate corrosion that may cause leaks and pipeline failure. Having access to contemporary asset data also allows development of better-informed management plans to optimise asset life.

While once CP monitoring was expensive and unreliable, in recent years CP monitoring technology has matured and significantly reduced in cost.

This program proposes installing remote monitoring units on all test points on all our transmission pressure pipelines (344 in total), and 12 ICCP units, over the next 10 years, with the remote monitoring on the most critical assets installed across the next 5 year period.

Table 52: Capex Summary CP Remote Monitering

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Scope	PL 28, 501, 502,1-2, 219	PL 43,44,103	PL 215, 11	PL 49 and 84	-	
Total	**174.4**	**156.7**	**149.3**	**79.7**	**-**	**560.2**

5.8.11 Cathodic Protection Asset Replacement

The Victorian and Albury covered natural gas distribution networks contains 1,300 galvanic sacrificial anodes and 79 ICCP units. Both forms of CP use electrical current to change the electrochemical potential of metals to inhibit corrosion, the key difference being that ICCP requires an external power source, whereas sacrificial anodes do not.

Using ICCP is accepted industry good practice and is our preferred solution. Though ICCP units are more expensive to install per unit, they have a longer useful life than sacrificial anodes (25 years vs 10-12 for sacrificial anodes). They are also a more effective and far-reaching corrosion inhibitor, requiring fewer units to protect per area of pipeline. However, ICCP cannot be implemented at all locations, as it can be constrained by network configuration.

Sacrificial anodes can be deployed at all locations, regardless of network configuration. Each sacrificial anode installation cannot protect as much of the pipeline, per unit, as ICCP. Therefore, the option of installing ICCP or sacrificial anode is considered and designed on a case-by-case basis.

Recent CP survey and asset data have identified 60 sites where sacrificial anodes will reach end-of-life during the next five years. We have also identified 20 ICCP units that are reaching end-of-life.

Further, surveys and inspections have identified that sections of the steel network in and around the Mornington Peninsula are not fully cathodically protected and are showing signs of corrosion. Eleven new ICCP units are required to address this risk in the Mornington Peninsula, which is home to 140,000 customers.

This program considers options to replace existing end of life CP systems, and to increase cathodic protection measures at the failing Mornington Peninsula locations.

The proposal is to replace 60 sacrificial anode sites, replace 20 ICCP units and install 11 new ICCP units, at an estimated cost of $2.53 million as shown in Table 53: Capex Summary CP asset replacement and upgrade

Table 53: Capex Summary CP asset replacement and upgrade

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Scope	Install 7 x ICCP Replace 12 anode sites	Install 6 x ICCP Replace 12 anode sites	Install 6 x ICCP Replace 12 anode sites	Install 6 x ICCP Replace 12 anode sites	Install 6 x ICCP Replace 12 anode sies	Install 31 ICCP units Replace 60 anodes sites
Total Expenditure $ ('000)	**505.7**	**505.7**	**505.7**	**505.7**	**505.7**	**2,528.5**

5.8.12 I&C Meter Set Refurbishments

The Victorian gas distribution network has 746,426 metering facilities. Approximately 3,250 of these operate at high or transmission pressures. I&C metering facilities are critical to accurately measure the high volumes of gas from the network delivered to AGN's large customers. Metering facilities typically consist of the meter unit itself and the meter set. The meter set comprises the large regulators, filters, pilots and over pressure shut off (OPSO) valves, and connecting pipework. While the meters on these sets are changed as per the Metering Plan, the meter set remains in place, with some installations over 40 years old.

The external condition at many I&C meter sets is now reaching a level where touch up painting is no longer sufficient to effectively maintain these assets. This is because the extent of the protective paint has deteriorated to a stage that patching it is no longer viable and corrosion of meter assembly pipe works, regulators, valves and fittings is becoming a problem.

To address the risks posed by the corrosion, we refurbish the meter sets by grit blasting and applying a new coat of protective paint. This extends the life of the meter sets and is a critical ongoing program necessary to manage the integrity of the I&C gas supply points on our network.

We are proposing to implement a meter set management program targeting to refurbish the highest risk I&C meter sets based on leak rates and reports of assets in poor condition. These facilities are mainly located in a more corrosive environment such as the coastal southern and

eastern regions of our network. In total [redacted] I&C metersets require treatment during the next AA period.

Treatment involves addressing corrosion and inhibiting further deterioration by repainting corroded pipework and components. This will bring these in service up to standard, and help ensure they meet their design life. Table 54 provides a summary of the I&C meter set refurbishment program.

Table 54: Capex Summary I&C Meter Refurbishment

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Refurbishment volumes	[redacted]					
Cost ($,000)	303	303	303	303	297	1,509

5.8.13 Plant & Equipment Renewal

A standard suite of plant and equipment is required on an ongoing basis to enable our workforce to conduct repair and alteration work on the pipelines and other gas asset infrastructure. This equipment is used for activities such as underground asset detection, working in confined spaces, gas leak detection, welding and fusion, excavation and backfill, coating fault repairs, hot tap/stoppling, and pressure monitoring and testing.

As existing plant and equipment age, they must be replaced before they become unfit for purpose (either due to wear or obsolescence).

There are three categories of plant and equipment (P&E) expenditure:

- Small P&E – general (small value) replacement and new plant and equipment items that require ongoing purchase each year;
- Vehicles – trucks and other vehicles, which are replaced as and when they become unsafe, or it becomes inefficient to continue to use and maintain them.
- Gas-specific equipment – The gas specific equipment is critical equipment that is used during emergencies (gas leaks) and needs to be reliable when used either to isolate gas supply to make repairs, or work in a gas free environment, more than often, in an unplanned situation.

Table 55: Capex Summary Plant & Equipment shows the expenditure associated with AGN's Plant & Equipment Renewal program.

Table 55: Capex Summary Plant & Equipment

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
General Small P&E	553.9	553.9	553.9	553.9	553.9	2,769.4
Vehicles	88.0	130.0	211.0	73.0	139.0	641.0
Gas-specific equipment	394.0	217.1	89.0	34.5	34.5	769.2
Total $('000)	1,035.9	901.1	853.9	661.4	727.4	4,179.6

5.8.14 Depot Office Refurbishment

We operate our Victorian network out of a combined depot and office site located at Wood Street, Thomastown. The office facilities were originally built in 1987, with limited refurbishment and

building extension undertaken in 1997. AGN's Victorian head office requires ongoing work to bring it back up to a suitable standard and to comply with relevant legislative and regulatory obligations.

Under this program we will undertake selected critical mechanical, internal and external works, including:

- replace end-of-life HVAC units to the building;
- undertake roof repairs as required;
- refurbish accessible amenities;
- upgrade internal fit-out, including work station and office furniture; and
- complete external works, such as carpark safety and outdoor lunch areas.

Table 56shows the expenditure associated with AGN's Depot Office Refurbishment.

Table 56: Summary Depot Upgrades

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
HVAC	365	365	365	183	-	1,278
Roof repairs as required	15	15	15	15	-	60
Amenities	22	-	-	-	-	22
Internal fit-out	73	73	-	-	-	146
External works	42	42	-	-	-	84
Total $('000)	**334**	**495**	**380**	**380**	**-**	**1,590**

5.8.15 Hydrogen Readiness

The energy transition is underway in Australia and the AGN networks needs to be ready for renewable gas in order to meet government ambitions, and customer expectation. In order to prepare for the injection of hydrogen at both 10% volume blends and 100% conversion for the AGN Victoria network, necessary changes to our asset management practices and processes to ensure hydrogen compatibility is addressed prior to its introduction are required. These include.

Hazardous Area Equipment

Compared to natural gas, hydrogen and hydrogen blends require a larger minimum hazardous area size in open spaces. Hydrogen will require a change to the equipment group, due to the reduced ignition energy compared to natural gas. This solution involves replacing Cat. II A & B rated equipment with Cat. IIC, hydrogen ready equipment.

AGN operates 300 network facilities with hazard areas (such as pressure reduction sites) of which 195 will be target for replacement. AGN also operates 400 metering facilities with hazardous areas (such as interval metering sites). Under our staggered implementation approach, 260 sites will be targeted for upgrade for compatibility with hydrogen during the next AA period.

Replace Incompatible Parts

Hydrogen can cause embrittlement of some metals, leading to a reduction in tolerance to crack-like defects and an acceleration of fatigue failure. We have identified that components with parts made from copper alloys, most aluminium alloys, and stable austenitic stainless steels are suitable for 10% and 100% hydrogen service. Other metals with poor performance such as cast irons, high

strength carbon steels (e.g. chrome-moly), martensitic stainless steels and nickel alloys also may not be compatible with hydrogen.

Working with the manufacturers to eliminate as many components as possible, AGN has identified that there are only 232 incompatible parts within its network that require remediation to allow for the safe introduction of a hydrogen blend, detailed in the table below. Under the staggered approach, we will replace 151 incompatible parts in the next AA period.

Weld procedures and hardness testing

A compatibility review found that most of AGIG's pipelines (>1,050kPa) with design factors below .04 and Network steel piping (<1,050kPa) can safely be used to transport hydrogen blends or pure hydrogen. However, existing weld procedures will not be appropriate and must be re-qualified.

We must develop weld procedures for 21 steel pipelines identified in Table 1-5 below, to ensure the safe operation of our steel pipelines. We must also undertake hardness testing for a random sample of welds in each pipeline, to show compliance with the hardness limits of ASME B31.12.

Pipeline repair equipment

Further work is required to assess compatibility of transmission pipeline repairs undertaken with [redacted] and purchase compatible equipment. This project will be delivered during the first two years of the AA period, as the information will assist in developing forward looking upgrade or replacement asset management plans.

Table 57 shows the expenditure associated with AGN's Hydrogen Readiness Program

Table 57: Capex Summary Hydrogen

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Hazardous area equipment	705	705	1410	1410	-	4,231
Replace incompatible parts	252	252	503	503	-	1,510
Weld procedures & hardness testing	798	758	558	458	458	3,030
Pipeline repair equipment	150	-	-	-	-	150
Total $('000)	**1,905**	**1,715**	**2,471**	**2,371**	**458**	**8,921**

5.9 Operational Expenditure – Regulated Networks

AGN's network and asset strategies identify programs of work required for the ongoing lifecycle management of AGN's networks. This includes capital investment works (outlined in sections 5.1 to 5.8) and operational activities (outlined in this section). Operational activities are no less important to their capital counterparts but have been items to allow for transparency in the AA expenditure forecasts.

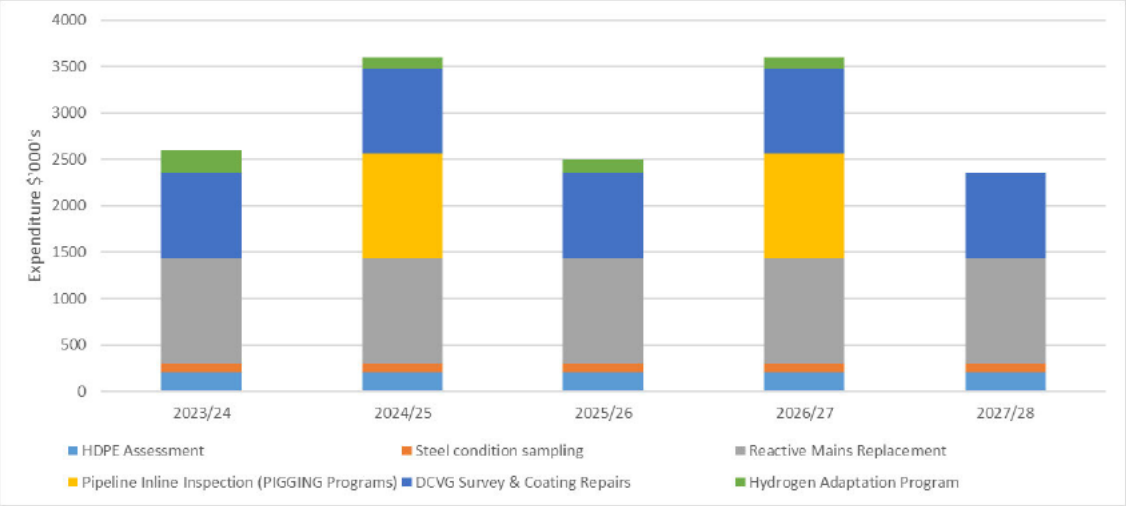
Table 58 summarises five operational programs identified for delivery in the coming AA period that will be Capex to Opex transfers. This is further profiled in Figure 30.

Table 58: OPEX Projects Expenditure Summary

Program	Reference #	2023/24	2024/25	2025/26	2026/27	2027/28	Total

HDPE 575 HP Mains Sampling and Assessment	200	200	200	200	200	998
Steel Condition Sampling and Assessment	100	100	100	100	100	500
Reactive Mains Replacement	1,138	1,138	1,138	1,138	1,138	5,690
Pipeline Inline Inspection (Pigging)		1,120		1,120		3,340
DCVG Coating Repairs	920	920	920	920	920	4,600
Total capex to opex activities step change	**2,358**	**3,478**	**2,358**	**3,478**	**2,358**	**14,028**
Hydrogen Adaptation Program	239	122	150	123	-	635

Figure 30: Other Assets Expenditure Summary



5.9.1 HDPE Mains Sampling and Assessment

The HDPE mains sampling and assessment program will be jointly delivered by the three Victorian distribution networks and Deakin university.

This program involves taking HDPE 575 mains samples for laboratory testing to develop an end-of-life model for these mains. The results and model will help inform our long-term strategy to maintaining this asset class. Please see section 5.1.2 and the Distribution Mains and Services Integrity Plan at Attachment 9.7 for more information.

5.9.2 Steel Condition Sampling and Assessment

Within the Victorian AGN network there is more than 3,000 km of protected and unprotected steel mains across the network. These steel mains are typically PE coated and are predominantly used for the high-pressure system. The overall risk of this asset class is escalating with time due to their age and increasing leak rates. The original protected steel mains are now 55 to 70 years old and are showing an increased leak rate trend. The steel piping on the network is not designed to be pigged and often unsuitable for other inspection methods such as DCVG. 50 steel main samples

will be selected from across the AGN networks and the integrity of coating and material tested. Results will build a condition register and provide critical data to develop a long-term integrity-based program. Please see section 5.1.1 and the Distribution Mains and Services Integrity Plan at Attachment 9.7 for more information.

5.9.3 Reactive Mains Replacement

The reactive mains replacement program allows for the piecemeal renewal of mains outside the planned mains replacement program(s). These minor works result when reactive maintenance (i.e. repairing a leak) is deemed unsafe and inefficient considering the deteriorated condition of the asset which limits the effectiveness to repair the fault. Please see the Distribution Mains and Services Integrity Plan at Attachment 9.7 for more information.

5.9.4 Pipeline Inline Inspection (Pigging)

To ascertain transmission pipeline integrity and condition, internal inspection utilising an intelligent inline inspection (ILI) tool provides a thorough analysis of pipeline defects and locations. This information is critical for AGN to ascertain the remaining life of its transmission assets as per the requirements of the Pipelines Act and AS/NZS 2885. Please section 5.8.2 and the Pipeline modification for ILI Business Case (Capex V.10.CD) at Attachment 9.13 Other Capex Business Cases for more information.

5.9.5 DCVG Coating Repairs

Australian Standard (AS) 2885.3-2012 (section 5.2) requires AGN to have a Pipeline Integrity Management Process (PIMP). An outcome of the PIMP is for the continued monitoring of pipelines that are not capable of being inspected via an in-line inspection process, and this includes surveying of these TP pipelines using DCVG every five years. The surveys are followed by digging up areas where the DCVG survey indicates the pipeline coating has likely failed and repairing the coating. Refer to section 5.8.5 and the Dig up and repair TP pipeline locations Business Case (V.11.OP) for more information on this program of works.

5.9.6 Hydrogen Adaptation Program

AGIG's Network Adaptation Strategy (AGIG-SP-0001) articulates AGN's approach to facilitating the introduction of renewable gas, specifically hydrogen, into the Victorian gas distribution networks. Refer to Attachment 9.10 Hydrogen Network Adaptation Strategy for more information.

TP compatibility assessment

Most of the AGN Victoria and Albury transmission pressure pipelines have already been assessed for hydrogen compatibility as part of the Australian Hydrogen Centre (AHC technical assessment, or as part of the HyP Murray Valley Project. Several pipelines were excluded from these scopes due to their complexity, however, they still require suitable assessment prior to the introduction of hydrogen. For AGN Victoria & Albury this impacts five pipelines.

Hazardous areas extents

We must conduct a technical review of 150 Pressure Reduction Sites. This work will require a qualified engineer to review each site and provide recommendations to the business. This activity is prioritised for first two years of the next AA period, as the information will assist in developing forward looking upgrade or replacement asset management plans.

Document updates

We must ensure documentation complies with the introduction and operation of a hydrogen blend. For AGN Victoria & Albury, the following types of documentation have been identified:

- pipeline associated documentation, for example procedure 9066, pipeline defect assessment;
- an updated SMS for each affected pipeline;
- update procedures - AGN LMP for 100% H2 in alignment with the HyP Murray Valley hydrogen pipeline; and
- updates to the Geospatial Information System to indicate blended hydrogen areas.

The project shall be completed within first three years of the next AA period to allow safe operations from 2025 onwards, when hydrogen will be actively used within the AGN network.

Further assessment or investigation

Further assessments are required to ensure the safe and progressive introduction and operation of a hydrogen blend into gas networks. For AGN the following areas have been identified as requiring further assessment:

- assess cast iron components currently in use >7kP for use with hydrogen;
- perform risk assessments on possible loss of isolation for all components containing nickel alloys, any untested aluminium alloy or elastomers;
- review capacity of 150 pressure regulating stations; and
- investigate mechanical joint compatibility and performance in the AGN network (<1050kPa).

This activity is phased to align with the 'replace incompatible parts' project to optimise the available workforce. The project increases over the period to balance the overall portfolio of works and to ensure that efficiencies and learnings are applied as the program progresses.

Glossary & Definitions

Term / Abbreviation	Definition
AA	Access Arrangement
AER	Australian Energy Regulator
AMP	Asset Management Plan
Augmentation Expenditure	AER defined expenditure category (MGN Regulatory Information Notices)
CAPEX	Capital expenditure
CI	Cast Iron
CP	Cathodic Protection
CPU	Cathodic Protection Unit
CRM	customer relationship management
DELWP	Department of Environment, Land, Water and Planning
DTS	Dandenong Terminal Station
EDD	Effective Degree Day
EDMI	Company suppling metering equipment and supplies
ESC	Essential Services Commission of Victoria
ESV	Energy Safe Victoria
FLE	Field Life Extension
GAAR	Gas Access Arrangement Review
GDSC	Gas Distribution System Code
GJ	Giga Joule 1 GJ = 1000 MJ
Growth Assets	Capital expenditure relating to the connection of new customers or users of our distribution network is contained within the "Growth" capital expenditure category
I&C	Industrial and Commercial
kPa	Kilopascals
LP	Low Pressure
HDPE	High Density Polyethylene
HP	High Pressure
HP	High Pressure 2

Term / Abbreviation	Definition
ICCP	Impressed Current Cathodic Protection
Mains Replacement Expenditure	AER defined expenditure category including all proactive and reactive mains and service replacement. (MGN Regulatory Information Notices)
MAT code	Maintenance Activity Type code
MP	Medium Pressure
Meters Expenditure	AER defined expenditure category including (MGN Regulatory Information Notices)
NGR	National Gas Rules
NIEIR	National Institute for Economic and Industrial Research
OEM	Original Equipment Manufacturer
Other Expenditure	AER defined expenditure category (MGN Regulatory Information Notices)
OPEX	Operating expenditure
OT	Operational technology
PE	Polyethylene
PVC	Polyvinyl Chloride
RTU	Remote Telemetry Unit
SCADA	Supervisory Control and Data Acquisition
Sm^3/hr	Standard cubic meters per hour
SMS	Safety Management Study
SMS	Short Message Services – i.e. a Text Message
Telemetry	AER defined expenditure category (MGN Regulatory Information Notices)
TJ	Tera Joules, 1 TJ = 1000GJ
UPS	Unprotected steel