Attachment 9.1

Asset Management Strategy

Final Plan 2023/24 – 2027/28

July 2022

AGN_VIC_NSW_FY24-FY28_Asset Management Strategy

400-PL-AM-0003

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Specification Review & Approval	**Prepared By**	**Checked By**	**Approved By**
Asset Systems Lead / Asset Planning Lead	Vanessa Co / Leigh Atkins	Martijn Vlugt	Mark Beech
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Contents

1 Document Overview

1.1 Purpose

The Victoria and New South Wales Asset Management Strategy (AMS) document provides a high-level and long term view of the safe and efficient operation, management and installation of gas network assets. It defines the Asset Management vision (Section 2) and objectives (Section 3), explains the Asset Management Framework, drivers and processes (Section 3), provides an overview of the gas distribution network assets and summarises the main issues and strategies pertaining to these assets (Section 6 through Section 11).

1.2 Coverage

The AMS covers 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), Albury Gas Company networks the Southern New South Wales Networks (in NSW). An overview of the networks covered in Victoria and NSW are in Table 1.

Table 1 – Regulatory Coverage of Networks

Regulatory Coverage	Network Entity
Regulated Assets	Victoria Networks (excluding Albury and Mildura)
Regulated Assets	Albury Gas Company Networks, NSW
Unregulated Assets	Southern NSW Networks (includes Wagga Wagga, Adelong, Bombala, Cooma, Culcairn, Holbrook, Gundagai, Henty, Temora, Tumut, and Walla Walla townships)

1.3 Time Period

This AMS provides a strategic view of the management of assets for the next Access Arrangement Period (AAP) from financial year FY 24 to FY 28. This is a five year period from 1 July 2023 to 1 July 2028.

1.4 Document Review

The AMS 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 Strategy 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.

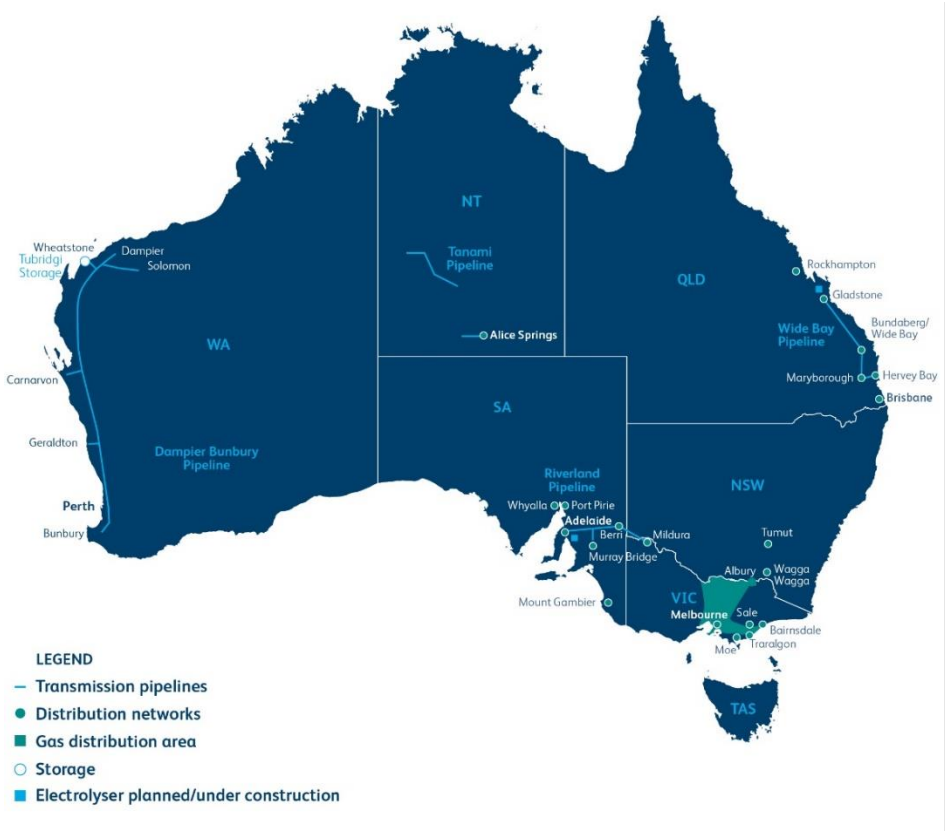
2 Australian Gas Networks

2.1 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.

Figure 1 - AGIG Operations



In Victoria (including Albury Gas Company, but excluding Mildura, Victoria) and Southern NSW Networks, the 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 regulated transmission pipelines.

2.2 Vision

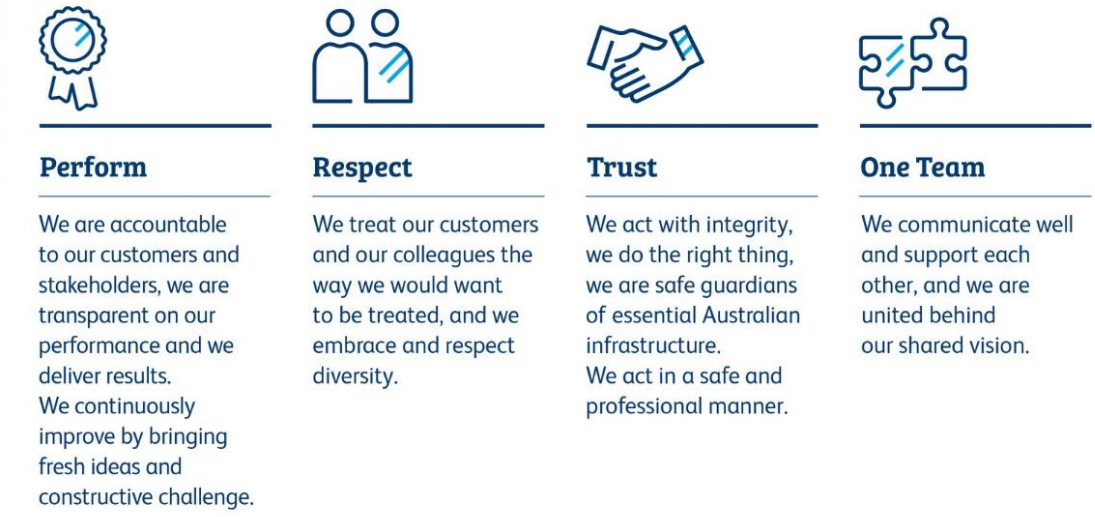
Our vision to be the leading gas infrastructure business in Australia, is shared by all of our networks (outlined in Figure 2).

Figure 2- AGIG Vision

2.3 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 Values



2.4 Key Stakeholders

This AMS is required to address the requirements of key stakeholders that have an interest in the management of AGN's assets in Victoria and NSW.

Table 2 Key Stakeholders

Organisation or Groups	Role
AGN	Network Owner
APA	Network Operator and Asset Manager
Australian Energy Market Operator (AEMO)	Gas Market operator in Victoria.
Energy Safe Victoria (ESV)	Technical regulator of Victorian gas and pipeline safety
Australian Energy Regulator (AER)	Economic Regulator of the VIC regulated networks
Gas retailers and end users	Users of services provided by the assets
Department of Environment Land Water and Planning (DELWP/DPIE) (Vic/NSW)	Provision and administration of Transmission pipeline licenses in Victoria and NSW Drives planning across precincts, infrastructure priorities, open space, the environment, natural resources - land, water, minerals, energy, and growing industries.
Essential Services Commission of Victoria (ESCV)	Provision, administration and enforcement of energy distribution licenses and oversight of the security and reliability of the Victorian networks
Energy and Water Ombudsman Victoria (EWOV)	Customer complaint resolution management in Vic.
Fair Trading (NSW)	Gas appliance safety and certification
Independent Pricing and Regulatory Tribunal (IPART - NSW)	Monitors and reports annually on the performance and competitiveness of the retail electricity and gas markets in NSW
Plumbing Industry Commission (VIC)	Plumbing standards, ensure that plumbing work is carried out safely and competently, and administer the licensing and registration system for Victorian plumbers.
Industry Partners	Sharing industry information for best work practises
Land Holders	Land owners on pipeline easements

The key asset management requirements of each stakeholder are summarised as follows:

- AGN - as asset owner, requires that APA adopts appropriate asset management practices based on regulatory obligations, accepted industry codes and standards, and that these practices are consistent with those of a prudent and efficient network operator. AGN undertakes to manage the network assets in a safe, efficient and economic manner in partnership with its network operator;

- APA - as day-to-day operator and manager of the network assets, ensures that AGN's requirements as described above are fulfilled. APA is responsible for all aspects of the operation and management of the networks in accordance with the licenses, regulatory requirements and applicable industry standards;
- AEMO – as the market operator, provides market settlement data in the Metropolitan Information Bulletin Board (MIBB).
- ESV – as the technical regulators, they require compliance with legislative and industry standards as they apply to the safe operation of the networks;
- AER - as the economic regulator requires economically efficient operating costs and provides oversight such that network charges are reflective of prudent capital investment and comply with the National Gas Rules (NGR) and National Energy Retail Rules (NERR);
- Gas retailers and customers – require provision of a safe, secure and reliable supply of gas at a reasonable cost. Cost of supply should include a high level of service delivery and quick response to gas supply problems and associated issues;
- DELWP / DPI – provide provision and administration of the transmission pipeline licenses. Requires alignment and compliance with AS 2885,
- EWOV – requires prompt response and resolution to end customer complaints; and
- ESCV - regulate AGN's gas distribution operations Victoria through the provision, administration and enforcement of a licensing regime, which is supported by industry codes that Victoria specific requirements that are in addition to the national regulatory framework.
- The AGN-APA organisational structure is presented in Victorian Networks Safety Case – Safety Management System (410-RP-AM-0006) Element 1 Leadership and Commitment and applies to the control of all work. APA's operations and maintenance are conducted in-house except for contract workforce and their one-up supervisor. Construction of new assets including MRP, new mains & new services is managed through the Capital Delivery team with work generally completed by contractors monitored by APA.
- Contractor and supply management processes can be referred to in Victorian Networks Safety Case – Safety Management System (410-RP-AM-0006) Element 4 People Management and Element 10 Contractors and Suppliers.

2.5 Key Corporate Policies

Table 3 shows the corporate policies of AGN and APA that provide context and inform the asset management vision, objectives, processes and performance requirements of our assets.

Table 3 - Guiding Corporate Policies and Plans

	Policy / Plan	Document Number
AGIG / AGN	Compliance Policy	AGIG-POL-Compliance
	Zero HARM Principles	AGIG-POL-HSE-0005
	Health and Safety Policy	AGIG-POL-HSE-0001
	Environment Policy	AGIG-POL-HSE-0002
	Statement of Commitment	AGIG-POL-HSE-0004

	Policy / Plan	Document Number
	Risk Management Policy	AGIG-POL-Risk Management Policy
APA	Health Safety and Environment Policy	APA HSE POL 001
	HSE Non-Negotiables Policy	APA HSE POL 005
	Information and Records Management Policy	APA POL Information and Records Management
	Procurement Policy	APA POL Procurement
	Risk Management Policy	APA POL Risk Management
	Emergency Response Management Plan	APA 320-PL-ER-0001
	Engineering and technical policies, procedures and standards	Refer to Section 3.9 for further details

2.6 Operating Licenses

2.6.1 Gas Distribution License – Victoria and Albury

AGN's Victorian networks are defined in its Gas Distribution License, issued by the ESCV under Section 26 of the Gas Industry Act 2001. AGN's gas distribution licence (for the primary network) was originally issued by the ESCV on 11 December 1997 and is amended from time to time. AGN holds a second distribution license covering the Mildura network, which was originally issued by ESCV on 28 October 1999 and is also varied from time to time.

AGN's Albury NSW distribution system is as defined in its Gas Distribution License, was initially issued by IPART under the Gas Supply (Safety and Network Management) Regulation 2008, but in 2002 was transferred to the Essential Services Commission of Victoria.

The license has several key compliance conditions including the obligations to:

- Comply with the requirements under the Gas Industry Act 1994;
- Prepare, revise and maintain a Safety Case and have this approved by ESV;
- Comply with customer-related standards and procedures; and
- Comply with other applicable codes, standards, rules and guidelines specified by the Commission.

2.6.2 Gas Distribution License – New South Wales

AGN's Southern NSW distribution system is as defined in its Gas Distribution License, was initially issued by IPART under the Gas Supply (Safety and Network Management) Regulation 2013. AGN's gas distribution license was originally issued on 16 September 1998 and is amended from time to time.

The license has several key compliance conditions including the obligations to:

- Comply with the requirements under the Gas Supply Act 1996 and the National Gas Act 2008;
- Comply with applicable codes or rules made under the Essential Services Commission Act 2002;

- Prepare, revise and maintain a Safety and Operating Plan, and have this approved by the DPIE;
- Comply with customer-related standards and procedures; and
- Comply with other applicable codes, standards, rules and guidelines specified by the Commission.

2.6.3 Transmission Pipeline License – Victoria and New South Wales

AGN's transmission pipelines, as defined in Appendix, are licensed in accordance with the requirements of the:

- Pipelines Act 2005 and Pipelines Regulations 2017 in Victoria administered by Department of Environment, Land, Water and Planning (DELWP); and
- Pipelines Act 1967 and the Pipelines Regulation 2013 in NSW administered by Department of Planning, Industry and Environment (DPIE)

The individual licenses contain details of pipe location and route, length, diameter, maximum allowable operating pressure (MAOP) and material specifications.

2.7 Network Operations

AGN is the holder of the gas transmission and distribution licences 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.

APA's operational activities are underpinned by its Health, Safety and Environment (HSE) Policy and Safety Management System "Safeguard", which has been developed to deliver on its HSE commitments, including providing a zero harm work environment.

AGN's transmission and distribution assets must be operated and maintained in accordance with the Safety Management System.

The following documents make up the AGN Victorian Safety Management System:

- AGN Safety Case: Overview (Document 410-RP-AM-0017)
- AGN Safety Case: Formal Safety Assessment (Document 410-RP-AM-0005)
- AGN Safety Case: Facility Description (Document 410-RP-AM-0004)
- AGN Safety Case: Safety Management System (Document 410-RP-AM-0006)

Key network maintenance activities are outlined in the Operate and Maintain lifecycle sections in Section 7 through Section 11 of this document.

3 Asset Management at AGN

Asset Management occurs within the context of our Asset Management Framework (AMF), which delivers a consistent, collaborative and integrated approach to the management of the asset lifecycle to achieve optimum outcomes and ensure efficiency across the network.

This AMS has been developed as part of the AMF and provides a summary of the strategies for the main issues pertaining to our gas distribution network assets.

3.1 Asset Management Definition

Asset management is an evolving area of business practice which focusses on the assets (broadly defined) held by an organisation.

The Asset Management Council (Australia) defines asset management as, "The lifecycle management of physical assets to achieve the stated outputs of the enterprise". This definition specifies a focus upon the delivery of a stated capability in which assets play a key role, and in which the business must manage its physical assets commensurate with the business need for that capability. Thus, the definition is concerned with short, medium and long-term considerations from the conception of the asset's need, through its complete operating life, until its disposal phase.

In the AGN context, this means the recognition of the whole lifecycle of all its gas distribution and transmission assets, together with the internal and external factors which influence that lifecycle, and implementation of processes and procedures to:

- Influence and manage asset lifecycles;
- Intervene to prudently and efficiently correct deficiencies; and/or
- Extend asset lives; or
- Replace assets at the end of their lives

3.2 Asset Management Approach

Our asset management approach is to ensure an optimal balancing of capital and recurrent expenditure, so that maintenance, replacement and augmentation of the gas distribution network, delivers the required level of services at the lowest possible life cycle cost. Gas distribution is capital intensive and so except in the case where outputs are mandated, cost benefit analysis needs to be undertaken in order to assess whether the overall economic value of capital expenditure is positive.

As per rule 79 (3) of the National Gas Rules (NGR), in deciding whether the overall "economic value of capital expenditure is positive", consideration is to be given only to economic value directly accruing to the service provider, gas producers, users and end users". Consistent with this, in assessing the incremental costs we have regard to:

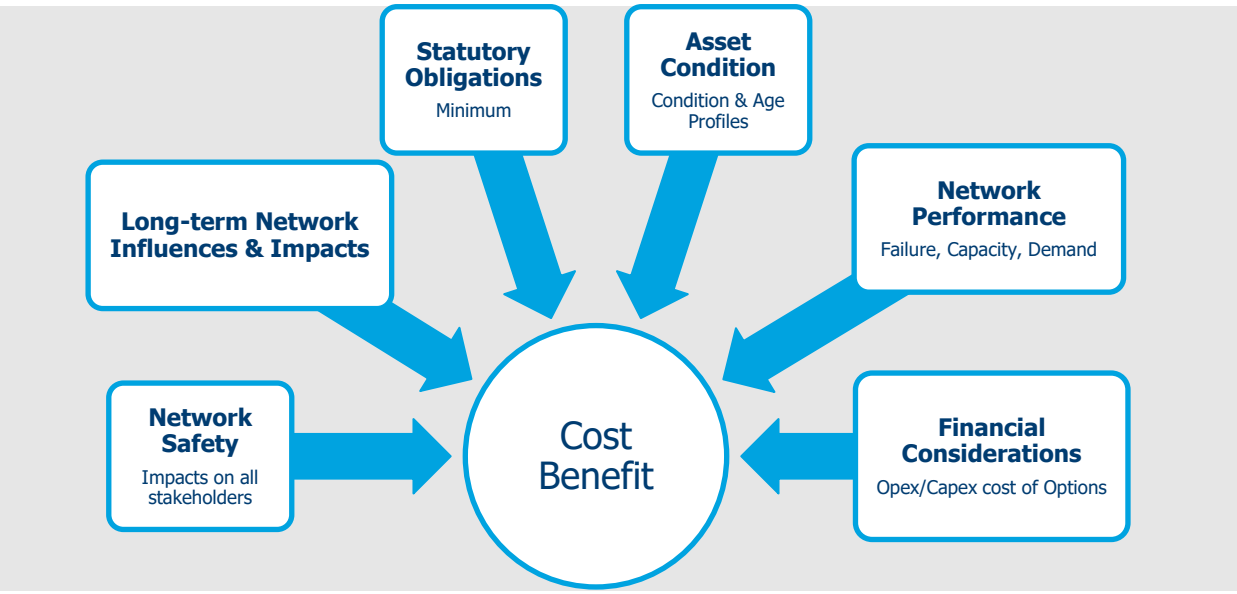
- Direct costs; PLUS
- Allocation of capitalised overheads; PLUS
- Imposed costs stemming from the program, which accrue to network users and end customers.

The latter – incremental benefits – has regard to the full societal benefits, which includes:

- Direct benefits to our customers; PLUS

- Additional benefits stemming from the program, which accrue to network users and end customers.
- Where the delivery of certain outputs is a function of the external obligations placed upon the business (e.g. legislation stipulating network safety requirements), a different approach is undertaken. Often (but not in every case), we adopt a cost effectiveness (least cost) analysis to ensure that where options exist, the output is delivered at least cost. Delivered benefits are a function of the explicit customer value proposition, or proxy via the adoption of minimum performance standards which are stipulated in legislation or other statutory or regulatory instruments.

Figure 4 -Cost Benefit Analysis Drivers



- In our asset management approach, 'Delivered Benefits' are dependent upon optimal works execution through:
- Efficient construction, maintenance and operation of network assets in accordance with the asset strategies, asset management plan and budget;
- Ensure effective management of programs (inspections, etc.); and
- Effective capturing, management and diagnosis of asset condition and performance data.

3.3 Asset Management Framework

We have adopted an AMF that delivers a consistent, collaborative and integrated approach to the management of the asset lifecycle to achieve optimum outcomes in an efficient way across AGN and APA.

Asset management is a year-round process with two parallel streams:

- Monitoring asset performance and condition, and implementation of the previous year's asset projects and programs of work; and
- Review of asset issues, quantifying risks, development of technical solutions, budgeting, and securing approvals for proposed programs of work.

The AMS is a key asset management document within this framework. As indicated in Figure 5 below, the AMS is informed by the four (4) asset lifecycle processes. From these processes, the required capital programs needed to achieve the long-term objectives of the various asset classes are derived.

3.3.1 Asset Management Strategy

The Asset Management Strategy and related lifecycle strategies are derived from the Asset Management Policy, as well as key internal and external inputs.

External influences include:

- Regulatory environment - See Section 4 for further details on legislation, technical standards, and regulatory authorities.
- Customer expectations – Include safe delivery of their requirement, no outages and good customer service. See Section 3.8 and Section 5.1 for further details on long term growth planning and performance indicators.
- Commercial appetite – Includes long term vision of networks. See Section 3.6 for further details on asset management drivers.

Internal influences including lifecycle management processes to manage capacity and growth include:

- Performance & Condition Monitoring
- Asset Related failures and incident investigation
- Compliance Evaluation
- System Audit and Improvement actions
- Growth and capacity analyses
- Asset Retirement

3.3.2 Lifecycle Strategies

The Asset Management Strategy forms the basis for the lifecycle strategies applicable to different classes of network assets. The strategies detail the lifecycle management of those specific assets.

The strategies also ensure that projects are justified under AGIG's values and align with our asset management policy and approach. Details of the lifecycle strategies can be found in Section 7 through Section 11.

3.3.3 Asset Management Plan

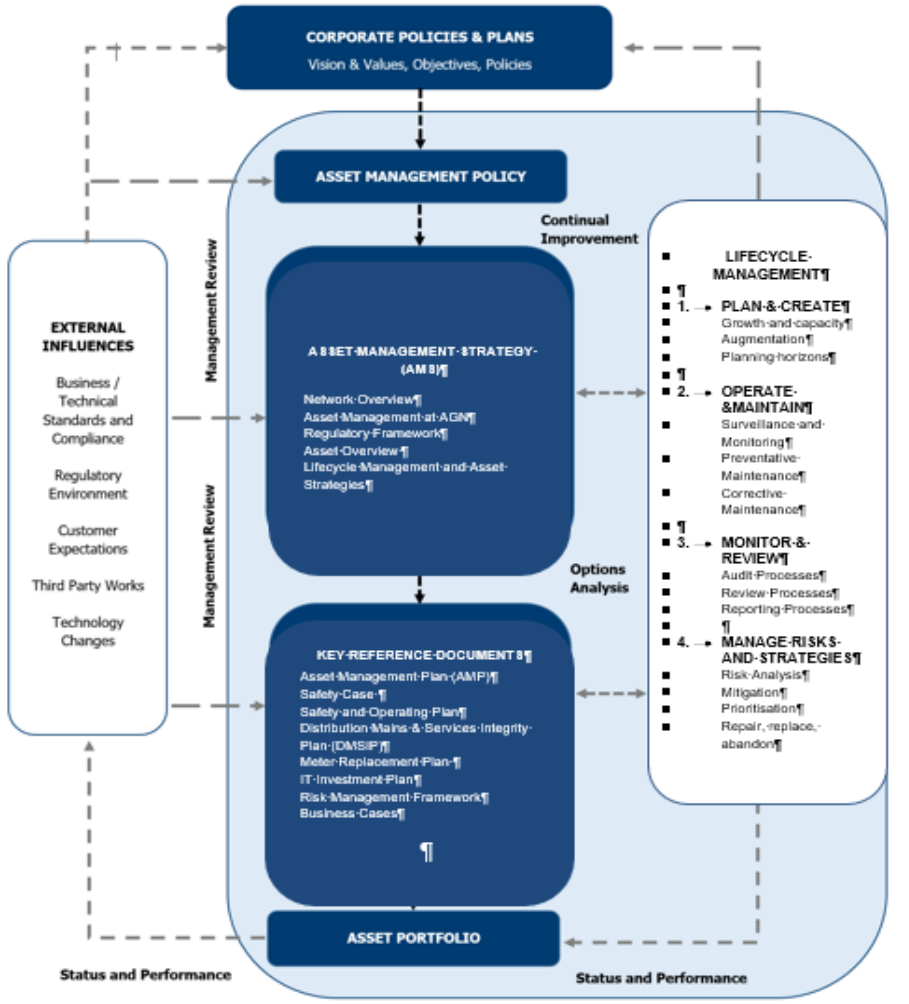
Informed by this AMS and in turn corporate visions, operational performance, business plans and an assessment of the external business environment, the Asset Management Plan (AMP) is central to the delivery of network services to key stakeholders.

The AMP has the following key objectives:

- It defines the linkage between the overarching AMS which contains asset specific lifecycle strategies to business cases at the project or program level; and
- It provides a high-level summary of projects and programs defined within AGN's planned capital expenditure profile for the forecast period of five (5) years.

Refer to the VIC / NSW AGN Asset Management Plan (FY24-FY28) for further details.

Figure 5 - Asset Management Framework



3.4 Asset Management Policy

The Asset Management Policy supports the efficient and effective delivery of value underpinned by the implementation of the AMF which is utilised to develop strategic initiatives aligned to our vision and values, enabling effective Asset Management of our network assets.

APA, as the asset operator, establishes strategic initiatives that collectively enable Asset Management of our assets to balance risk, cost and performance to deliver maximum long term value.

As part of the Asset Management Policy, we adhere to the following:

- We maintain appropriate safety protocols at our assets to ensure our people remain safe and our assets operate safely;
- We take a long term focus on our assets - we will not compromise short term gain for long term detriment of an asset;
- We balance risk, cost and performance when allocating resourcing;
- We meet the commitments we make to regulators, employees and stakeholders; and
- We will not compromise our reputation in making asset decisions.

This Policy and associated AMF are based on ISO 55000 – Asset Management Fundamentals, which are:

- Value: Assets exist to provide value to the organisation and its stakeholders;
- Alignment: Asset management translates the organisational objectives into technical and financial decisions, plans and activities;
- Leadership: Leadership and workplace culture are determinants of realisation of value; and
- Assurance: Asset management assures that assets will fulfil their required purpose.

3.5 Asset Objectives

We align to six (6) asset objectives which are link to our vision and underpin our asset management practices. By achieving these objectives, we deliver for our customers, remain a good employer and are sustainably cost efficient.

Table 4 – Asset Objectives

Operate and invest in our assets to keep the public and our employees safe	We will achieve this by: • Investing in and operating our network in line with our Gas Safety Case, zero harm principle and all laws and relevant industry standards; • Managing known risks to as low as reasonably practicable (ALARP); and • Meeting emergency response Key Performance Indicators (KPIs) (call centre, high priority leaks).
Maintain continuity of supply to our customers	We will achieve this by: • Meeting network availability KPIs; • Maintaining operating pressures through monitoring and augmenting our network; and • Addressing leaks in line with our leak management plan.
Improve our customers' service experience in line with their expectations	We will do this by: • Maintaining accuracy of metering assets within relevant industry standards; • Delivering valued services to customers at the lowest sustainable price; and • Meeting customer KPIs (reliability/outages, safety, complaints, and overall customer satisfaction).
Balance network performance and costs to deliver affordable services	We will do this by: • Optimising overall asset lifecycle management costs; • Maintaining operating efficiency without compromising safety and reliability; • Developing investment plans that consider stakeholder expectations; and • Leveraging people, data and technology to deliver continuous improvement.
Promote gas usage to ensure the networks remain sustainable	We will achieve this by: • Connecting new greenfield expansion projects in a timely manner; • Enabling new urban infill connections; • Engaging with key stakeholders to develop adequate network solutions for future supply options; • Increasing long term competitiveness of networks through higher asset utilisation; and • Promoting use of gas.

Embrace innovation and work towards net-zero emissions	We will achieve this by: • Considering alternative innovative, sustainable and/or lower long-term cost solutions in our investment decisions; • Pursuing research and development opportunities where they facilitate us to meet our vision and objectives; and • Supporting the decarbonisation of our gas supplies and the move to smarter gas networks.

3.6 Asset Management Drivers

The following influence the Asset Management approaches and processes employed:

- Corporate Policies and Plans: The corporate policies listed in Section 2.5 provide direction and guidance for the AMF and processes;
- Safety: Ensuring the safety of the workforce and the community is a primary driver for our asset management activities. Our gas distribution network carries the inherent safety risks associated with transporting natural gas. Any leak can pose a safety risk; however, the greatest risk occurs where mains break or crack, releasing gas into (or beneath) a building where it may collect, be ignited and cause an explosion.

Asset management activities are designed to increase the likelihood of leaks being detected and repair before they can pose a threat to public safety. A key indicator of asset condition can be age. However, asset condition is also heavily dependent on the material, location, and conditions under which the pipe was laid.

We prepare a Safety Case for AGN's Victorian networks and a Safety and Operating Plan (SAOP) for AGN's NSW networks. The Safety Case is required under the Gas Safety Act 1997, prepared in line with the Gas Safety Regulations 2018 and is accepted by Energy Safe Victoria (ESV). The SAOP is required under the Gas Supply Act 1996, prepared in line with the Gas Supply (Safety and Network Management) Regulation 2013 and is provided with a certificate of compliance by the Secretary of NSW Department of Planning & Environment.

We prepare a SRMTMP as part of our regulatory framework, applied to our SA gas networks. The SRMTMP includes work, health and safety (WHS) issues and issues relating to technical standards, operation, maintenance and emergency procedures and management practices with continuing review and improvement.

The SRMTMP describes how we will comply with the requirements of legislation as well as relevant standards and codes. These standards and codes form the technical framework for ensuring high levels of safety and reliability in the operation of our gas distribution network. It provides a mechanism to compare safety and reliability expectations with actual performance. It also provides an auditable quality approach to safety

- Network Growth: On-going growth drives expansion of the network into new areas and includes additional mains and pressure control facilities to augment network capacity. New connections are made to the network every year giving rise to additional network mains, services and meters. Drivers for new residential connections include population and associated housing growth, interest rates, and building codes for homes. The primary driver for new industrial and commercial connections is delivered energy cost compared to the nearest alternative.
- Placeholder: Our networks have experienced continued growth with consistently high penetration rates, in a market where we are shifting to alternative fuels. We still expect growth rates to be similar to previous years…

- Customer Consumption: Residential consumption drivers include weather, retail gas price, microeconomic factors, appliance efficiency and alternative energy appliances. Drivers for commercial and industrial consumption include the retail gas price, micro- and macro-economic factors, and appliance efficiency;
- Asset Useful Life: The useful service life of an asset is the period during which it is expected to be usable for the purpose it was acquired/designed. The term applies to:
- Actual physical life, where beyond this it is not possible to continue operations, or
- Economic life, where the cost of repair and maintenance becomes greater than the cost of replacement.

Within gas networks, assets such as distribution mains and services have very long useful lives (50-60 years), whereas SCADA assets have shorter lives (5-10 years) due to technology improvements and obsolescence;

- Asset Condition: The overall condition of the asset has a bearing on risks that might be apparent as it ages and degrades over time. For example, as mains age increasing expenditure is necessary to repair an increasing frequency of leaks. There is a point where it is more economically viable to replace a main than it is to continue repairing it.
- Security of Supply: Gas networks are typically a complex series of interconnected pipes that generally provide more than one gas supply path to any customer within the network. Network design for extensions, alterations, augmentation and replacement considers scenarios where a single point of failure could result in significant number of customers losing supply. These scenarios are evaluated based on cost and risk, with additional mains, regulators and surveillance equipment installed where considered appropriate;
- Economic Regulatory Frameworks: The economic regulatory requirements of the NGL and NGR impose obligations on us to incur the expenditure in a prudent and efficient manner as well as in accordance with good industry practice; it also requires that the expenditure must be justifiable;
- Technical Regulatory Frameworks:
- Require compliance with the governing Australian Standards, AS 4645 for distribution networks and AS 2885 for transmission pipelines, and
- Influence items such as periodic replacement of gas meters, in line with the requirements of the Victorian Code and AS/NZS 4944:2006 Gas meters - In-service Compliance Testing, which in turn gives rise to an ongoing meter replacement program;
- Third Party Works: Capital works programs by other utilities, local government, road and rail authorities require that from time to time, gas mains be moved, modified and/or replaced. The cost of such works is recovered from the requesting authority.
- Changing Technology: New technology often brings with it significant improvements in functionality and reduced maintenance costs. However, asset management strategies must also consider the implications for older equipment that may become unsupported and therefore obsolete before the end of their intended service lives.

Changes in technology also influence gas demand, where energy efficient technologies and other energy sources such as renewables become more competitive, which often results in a slowing of demand growth.

- Decarbonisation of Networks: One very significant change being faced by AGN and all gas distribution businesses in Australia is climate change. Australia is part to global imperatives, strategies and agreements which seek to limit the effect of climate change by moving away from fossil fuels, of which natural gas is one, to renewable and less emission intense energy

sources. The long-term view is that the use of natural gas may be supplanted by renewable energy sources such as wind and solar and related technologies such as battery storage.

AGN is knowledgeable and understanding of these major global and local trends, but is also aware that gas distribution systems carry more end-use energy than the electricity distribution networks. To completely supplant natural gas with renewable based electricity will require prohibitively large investments (doubling or more) in the electricity distribution networks.

As part of AGIG, we participant in the gas industry's Gas Vision 2050, which in part seeks to "decarbonise" gas distribution networks away from carbon based fuels to more environmentally sustainable energy sources. We have a long term strategy to convert our gas distribution networks to a more renewal basis, actively considering fuels such as hydrogen and bio-gas. We believe we are at the forefront of this strategic shift in industry with our HyP SA, Hyp Gladstone, and Hyp Murray Valley projects, which will inject a blend of natural gas and hydrogen into the South Australia, Queensland, and Victorian / NSW distribution networks. Refer to Section 6 for further details on the Alternative Fuels Strategy.

Conversion of the distribution systems to these types of fuels will have implications for the management of the network.

- Security: Commonwealth and state governments have imposed legal responsibility on both the owners and operators of critical gas infrastructure and to take all necessary preventative security measures to ensure continuity of supply from safety threats, malicious / criminal threats, and accidents / natural disasters. As a result, there are initiatives to enhance security around SCADA controlled network assets.
- Information Management: Big data analytics is the process of examining large and varied data sets to uncover hidden patterns, unknown correlations, market trends, customer preferences and other useful information that can help organisations make more-informed business and asset decisions.
- Distribution analytics spans from operational reporting and analytics through planning analysis through to real-time analytics. Each layer provides additional decision-making capability and analysis services required to support and operate the distribution network in future.
- The service supply industry, based on smart meters, smart grids, and enhanced customer relationship management systems, is generating massive data sets that utility companies are moving to analyse.

3.7 Lifecycle Management of Assets

We deploy our AMF through four (4) major processes, which reflect the lifecycle of an asset from creation to disposal/abandonment:

1 Plan and Create;

2 Operate and Maintain;

3 Monitor and Review;

4 Manage Risks and Strategies

3.7.1.1 Plan and Create

Planning and creation considers current and future customer growth and load demands, asset performance and service needs, and secures the necessary approvals for expenditure. It includes the creation of new assets to:

- Extend the mains network (either small extensions to connect new domestic customers or large extensions to service new step-out developments such as new estates or extension to unserviced areas);
- Provide new network, metering and SCADA facilities; and
- Augment the existing assets as capacity limitations are reached due to demand growth.

Planning Horizons

We use a rolling 5 to 10-year plan for assets. Year one (1) of the plan represents firm requirements for the next budget year, while subsequent year forecasts are indicative reflecting forecast connections, growth and utilisation rates, network performance and condition.

- Mains replacement planning is based on an assessment of risk, performance and condition/integrity;
- Mains extension analyses, including extending mains to new estates or major industrial customers, is based on cost-benefit modelling using a planning horizon applicable to each case; and
- Major network augmentation projects are evaluated using a horizon consistent with the reliability of forecast information.

As an example, our risk-based approach has improved efficiency through prioritising the criticality and urgency of the mains replacement program by developing a high density polyethylene (HDPE) inspection and squeeze off clamping program to cost effectively reduce risk and extend the life of vintage HDPE 575 DN40 and DN50 mains.

Key Financial Controls

Network asset creation is subject to the following financial controls, which ensure that creation of assets only occurs in accordance within established prudent approval processes:

1. All domestic mains extensions, Industrial & Commercial (I&C) connections are evaluated using a Net Present Value (NPV) model, while mains replacement projects are evaluated on a risk-based approach;
2. All capital expenditure projects are subject to a formal business case/justification requiring management approval, and in the case of growth projects, a standard financial model;
3. A defined delegation of authority is in place to determine the approval requirements (by either APA or AGN) for all projects; and
4. APA reports to us monthly on progress against capital budget and schedule for major capital projects.

3.7.1.2 Operate and Maintain (O&M)

Our approach to network operation and maintenance is detailed in the Victorian Safety Case and NSW SAOP. Operation and Maintenance involves three principal sub-processes:

1. Surveillance & Monitoring.
2. Preventative Maintenance; and
3. Corrective Maintenance.

Maintenance of assets is undertaken to ensure that they continue to fulfil their intended functions (performance levels) within their expected lifetime. Maintenance processes and frequencies take into account:

- Asset type, age, history and risk of failure;

- Location and operating environment;
- Manufacturer's recommendations;
- Condition monitoring;
- Australian Standards requirements; and
- Good industry practice.

Operating Manuals, Procedures, Plans and Technical Instructions describe minimum requirements for the maintenance and condition monitoring of network assets. They detail the frequency and scope of work to be carried out and are used in conjunction with relevant codes of practice and equipment manufacturers' instructions.

Operation & Maintenance practices are audited from time to time by external auditors and the ESV. Regional licensed pipelines and networks are regularly audited by APA, AGN, ESV, DPIE, or external consultancy auditors for compliance with the license conditions and AS2885.3 and AS4645 requirements.

We determine our maintenance activities by introducing incremental refinements to established programs as a result of accumulated knowledge of the asset base. From time to time these schedules are revised to cater for external changes (e.g. new legislation) or reviewed from a zero-base (e.g. application of Reliability Centred Maintenance to maintenance schedules).

Maintenance programs are established to minimise the total lifecycle cost of the asset, taking into account the risk and consequence of failure.

Maintenance activity is forecast to reduce in the next 10 years on a per connection basis because of the targeted capital investment planned for the network, particularly the mains replacement program. This investment will result in a reduced number of leaks and reducing the number of activities associated with visits to regulators.

AGN's Maximo Enterprise Asset Management system (EAM) is used to manage the maintenance and inspection regimes for distribution assets. Work orders are issued for the specified work activities and tracked to completion. This tool helps us deliver on our maintenance strategy which is to continue existing maintenance regimes, and undertake reactive repair (or replacement) when new issues or risks are identified.

Surveillance and Monitoring

The aim of surveillance is for early detection of an issue or failure, to allow for timely dissemination of information for corrective actions to be taken. Monitoring involves the intermittent analysis of routine measurements (e.g., monitoring cathodic protection readings) and observations to detect changes in the environment or status of an asset.

Table 5 outlines activities undertaken for surveillance and monitoring.

Table 5 – Activities Undertaken for Surveillance and Monitoring

Process	Activities
Surveillance and Monitoring	Telemetry monitoring (pressures, temperatures, alarms)
	Cathodic protection Monitoring
	Coating survey, Leak survey
	Odorant and gas quality monitoring (National Gas Rules, Part 19 Declared Wholesale Market Rules)
	Pipeline patrol and inspection
	Special crossing inspections
	Camera Inspection of distribution mains
	Inline Inspection (ILI) of transmission mains

Preventative Maintenance

Preventative Maintenance is planned maintenance that prolongs the lifespan of our assets, and equipment. PM is a systemic approach of maintenance activities that are performed routinely and aimed at reducing and preventing failures. Surveillance and condition monitoring play a key role in identifying the PM activities and frequencies.

Table 6 outlines activities undertaken for Preventative Maintenance.

Table 6 – Activities Undertaken for Preventative Maintenance

Process	Activities
Preventative Maintenance	Cathodic protection maintenance
	Meter maintenance (I&C)
	Network Facility Installations
	Telemetry System maintenance
	Regulators and Valves maintenance
	Reinforcement at squeeze off points

Corrective Maintenance

Corrective Maintenance (CM) are maintenance activities are performed in order to rectify and repair issues/ failures on our assets. Unlike Preventative Maintenance, CM activities can be planned and/or unplanned and aim at repairing failures.

Table 7 outlines activities undertaken for Corrective Maintenance.

Table 7 – Activities Undertaken for Corrective Maintenance

Process	Activities
Corrective Maintenance	Repairing leaks and third party damage
	Repairing cathodic protection system faults
	Repairing pipe coating failures/faults
	Clearing water ingress and other blockages
	Telemetry system faults
	Fault finding on network facility installations
	Resolving meter problems / failures
	Reinforcement at leaking squeeze off points
	Resolving supply issues

3.7.1.3 Monitor and Review

All gas distribution assets are continually monitored to review their performance and maintain integrity in line with accepted standards of operation.

Performance aspects include the ability to provide the required capacity to meet customer demands for gas, delivered at required flow rates and pressures.

Assets are monitored to highlight existing and emerging issues related to normal aging over time, accelerated aging or new risk issues.

Operational data is collected on a continuous basis, with programs in place to monitor trends and identify emerging issues. Following risk analysis, new or changed operational procedures are implemented, or capital projects/programs generated.

Audit Processes

Auditing ensures that all activities and processes comply with required industry standards. The results of both internal and external auditing are reported to management.

Key internal audits include:

- Supervisor monitoring audits - To ensure field activities are performed in accordance with internal requirements and relevant legislation;
- Verification audits - Conducted by trained quality and safety auditors, under a certified ISO 9001 management system, independent to the operating function. The purpose of these audits is to verify that audits of task related activities provide credible and consistent results;
- Technical facility audits - Performed by trained quality and safety auditors under an ISO 9001 management system, since the level of exposure of the business tends to be greater with critical gas facilities. Findings from these audits are reported to management through detailed reports; and
- HSE Management system audits - provide evidence that the APA HSE system is effective. These audits are conducted by trained safety auditors and reported to management through reports.

Key external audits include:

- AGN audits - Performed on an "as required" basis to provide confidence that APA is conducting their operational function with due diligence and in compliance with our requirements. The results of these audits are communicated to the APA management team.
- Regulatory audits - Conducted by regulators as a means of ensuring that activities performed conform to legislative requirements. Audit results form an important input to management improvement processes.
- Safety Plan audits – external auditors may be engaged to conduct audits on particular aspects of safety or operating plans.

Review Processes

Formal and informal reviews undertaken throughout the organisation form a vital input into the planning and management processes. The following outline key areas used to assist in planning and management decision making:

- Asset Condition and KPIs - Asset KPIs detailed in Section 5.2 are the primary measures of asset performance, condition and integrity. These are reviewed on a monthly basis in the APA monthly operating and management report and annually through, amongst others, the Distribution System Performance Review (DSPR).
- Skills and Competencies - Skills and competencies of staff and contractors are viewed as critical in the effective management of the assets. Activities in the business have been assessed for risk, and where ranked as critical, are managed through a robust method of individual certification. Critical activities may only be performed by operators who can demonstrate their competence to nationally registered assessors and have been issued with an 'authorisation to operate'. These critical skills are reassessed every two years to ensure competence is maintained and to provide an opportunity to assess the effectiveness of training.

Reporting Processes

Business reporting is largely hierarchical in nature with the key principal of ensuring that the business is meeting its goals and objectives. Reports may be categorised as compliance reports, operational reports, exception reports and financial reports. In general, the vertical reporting structure has the following levels:

- Corporate governance compliance report is a high level acknowledgement that activities and functions provided by the business conform to all legislative and industry expectations. The report is produced six-monthly for AGN's Board and Risk and Compliance Committee;
- The AGN operational report is produced monthly and draws together key operating criteria, system performance, HSE performance, financial measures, internal and external audits, and other predictive measures into a single, extensive document;
- Departmental reports are produced monthly for the General Manager, APA and provide key operational performance information and HSE performance;
- Section reports are also produced monthly and keep departmental managers informed of the activities under their control;
- HSE committee reports are produced by each operating unit to keep all staff informed of the issues that affect their area of operation and control;
- In some situations, the vertical reporting structure is augmented by horizontal reporting methods. Examples of such reporting include hazard alerts, technical bulletins, management presentations, emails and notice boards;

- Budget planning and monitoring is undertaken to ensure planned work is delivered efficiently and within economic constraints. Detailed budgets are prepared annually and monitored on a monthly basis; and
- Regulatory Reporting – The licensed transmission pipelines and distribution networks are included in quarterly and annual regulatory reporting requirements to ESV, ESCV, DEWLP, and DPIE in accordance with the Performance Reporting Guidelines (for Victoria and NSW), and the Gas Distribution Code. The guideline and Code prescribes various operational reports:
  - Major Interruptions;
  - Statistical Information;
  - Technical Information;
  - Key performance indicators;
  - Unaccounted for Gas (UAFG); and
  - Mains replacement progress.

Quarterly and annual reporting requirements for ESV as required by the Information Specification – Performance Indicators: Requirements for Reporting by Victorian Gas Distribution Companies (January 2009)

3.8 Manage Risks and Strategies

3.8.1 Risk Management

We recognise risk management as an integral part of our operations and strategic planning. Risk management, including risk identification, evaluation, treatment and documentation, is undertaken in a systematic manner to comply with ISO 31000.

There is an inherent risk associated with gas mains and services. Whenever a gas main leaks, cracks, or breaks there is the potential for the community and employees to be seriously injured, or for supply to be disrupted. The risk can vary depending on the location, material type, pressure and age of each gas main or service inlet. We review the performance indicators of mains to assess the potential risk associated with deterioration in condition.

We have an ongoing process for systematic identification, analysis, assessment, treatment, monitoring and communication of all credible risks associated with conveyance of gas across the network as well as regulatory compliance and construction and maintenance activities. Risk assessments are regularly updated to reflect new information on asset condition, and the consequent risk rating guides the actions and activities that ensure network safety and compliance is maintained as efficiently and effectively as possible.

The risk management process undertaken is in accordance with the APA Risk Management Policy and Risk Management System. All network assets are regularly assessed for a range of identified risks. Following identification mitigations are implemented to reduce the risks in accordance with the risk management policy. This results in projects which are proposed, approved and regularly tracked to completion, or operational activities which are placed into operational and maintenance work management systems.

In addition, all emergencies and incidents are managed under the guidelines outlined in the Emergency Response Management Plan (APA 320-PL-ER-0001).

3.8.2 Strategies

3.8.2.1 Augmentation

Network reinforcements or augmentations are required as a result of insufficient capacity or redundancy in the network.

3.8.2.2 Repair

Repairs to assets are necessary when they fail to perform the function for which they were created. This can be due to either part failures, third party intervention or age. Typically, parts failures occur on network facilities and SCADA assets, while repairs are necessary on mains and services as a result of third party interventions (damage from excavations by others etc) or asset deterioration.

Repair of leaks on mains and services is one of APA's primary work activities. AGN, APA and the technical regulators in each state closely monitor leak occurrence and repair data, including time to respond to leak reports and repair time for leaks.

3.8.2.3 Replacement

Assets that are approaching the end of their useful service life, or those that experience accelerated deterioration, are identified for replacement. Where feasible (and safe to do so), refurbishment is considered as an option to extend the asset's useful life. The option to replace or refurbish is typically considered as part of the business case process.

The asset replacement decision is driven by the prudent balance between avoiding future costs of maintenance, current replacement cost, risk, regulatory compliance and levels of service. Where replacement is identified as the prudent option, the asset replacement program takes into account the efficient allocation of resources.

In general, useful service lives vary from:

- 5 to 10 years for SCADA assets, which are particularly sensitive to technical obsolescence;
- 10 to 20 years for domestic and I&C meters; and
- 50 to 60 years for distribution mains and services.

3.8.2.4 Abandonment

Where an asset has reached the end of its useful life (and cannot be refurbished), it is decommissioned. Like the commissioning process, our decommissioning process is guided by AS/NZS 4645 (for distribution assets) and AS/NZS 2885 (for transmission assets).

3.9 Capacity Management

Network capacity is managed by:

- monitoring network performance;
- assessing forecast demand; and
- assessing threats to supply.

Network capacity issues are addressed according to the risk they present, and undertaken subject to qualitative and quantitative analysis of costs and benefits. The network requires augmentation when:

- the minimum pressure in a network falls, or is forecast to fall, below the recommended minimum end of main pressure during design load conditions; or

- there is insufficient redundancy within the network, which adversely affects the security of supply to a large number of customers.

The capacity management process involves the following activities:

- Maintaining baseline capacity models – Network configurations within the Geospatial Information System (GIS) are exported into capacity modelling software (Synergi). Network models are validated against actual field conditions using gate station inputs, large volume customer hourly demand, system pressures and derived domestic, commercial and industrial loads. Computer models are iteratively balanced so that modelled pressures match those from the field;
- Design load assessment – Domestic, commercial and small industrial design loads are derived from the validated baseline network load, corrected to allow for additional consumption consistent with a one-in-two probability winter's day. Tariff D customer load is normalised based on variation in consumption during the daily peak hour period throughout winter. In each case the design load is based on a peak hourly load as this is the important parameter for maintaining supply to the network;
- Forecasting load growth – a range of sources, including Planning Authority publications, precinct structure plans, publicly available documentation from "forecast.id" and HIA statistics, as well as internal marketing data, are used to forecast the number and location of new residential connections. Market trend analysis is used to determine the rate of new connections for industrial and commercial, and demand market sectors.

The additional connections are converted to an expected hourly demand within the network to develop an annual load growth profile that is superimposed on the network model to identify future capacity constraints;

- Network scenario modelling – Synergi is used to evaluate various load scenarios and augmentation options. Capacity shortfalls are identified, and solutions modelled to confirm augmentation requirements;
- Mains replacement planning – the output of the mains replacement planning process is combined with capacity and security of supply issues to optimise the location and size of principal supply mains within the network;
- Project initiation – the various capacity, replacement and security of supply issues are reviewed and options considered. These projects are reviewed annually to confirm their timing and scope.

3.10 Key Documents and Data Sources

The following documents and processes in Table 8 provide information to, or draw information from, this AMS.

Table 8 – Document/ Processes providing information to or from the AMS

Document / Process
VIC / NSW Asset Management Plan FY24-FY28
Distribution Mains and Services Integrity Plan (VIC/NSW) (DMSIP)
Meter Replacement Plan (VIC/NSW)
Victorian Gas Safety Case • Overview • Facility Description • Formal Safety Assessment • Safety Management System
Safety and Operating Plan (NSW)
Pipeline Integrity Management Plan (PIMP)
Pipeline Safety Management Studies (SMS)
Formal Safety Assessment (FSA)
Pipeline Remaining Life Reviews (RLR's)
Gas Distribution License
Transmission Pipeline Licenses

4 Regulatory Frameworks

4.1 Legislation

The primary legislation of gas networks in Victoria is the Gas Safety Act 1997. With the Gas Industry Act 2001 establishing the functions of the key Victorian regulatory bodies (Energy Safe Victoria - ESV, Essential Services Commission - ESC, Australian Energy Regulator - AER) and providing the establishment of regulatory instruments, including the gas distribution and retail licenses. The ESC is responsible for licensing participants in the Victorian gas industry.

The key legislation with which we are required to comply is shown in Table 9.

Table 9 – Key Legislation

State	Legislation	Description
Federal	National Gas Law (NGL)	Regulation of Wholesale and Retail Gas Markets
	National Gas Rules (NGR)	Access Arrangement Decisions
	National Energy Retail Rules (NERR)[1]	Govern the sale and supply of energy from retailers and distributors to customers
	National Measurement ACT 1960	Legislation for Australia's measurement system that applies to utility meters
	General Laws	E.g. *Corporations Act 2001*
Victoria	Gas Safety Act 1997	Industry Specific Regulatory Framework Vic
	Gas Safety Regulations 2018	Industry Specific Regulatory Framework Vic
	Gas Industry Act 2001	This Act regulates the Victorian gas industry
	Pipelines Act 2005	Regulatory Framework that applies to transmission pipelines in Victoria
	Pipeline Regulations 2017	Regulatory Framework that applies to transmission pipelines in Victoria
	Essential Service Commission Act 2001	Provides generally for the ESCV's functions and powers
New South Wales	Gas Supply Act 1996	Legislation governing supply of natural gas and LPG in NSW
	Gas Supply (Safety and Network Management) Regulation 2013	Gas Networks reporting guidelines (NSW)
	Pipelines Act 1967 and the Pipelines Regulation	Pipelines licensed under this regulation in NSW
South Australia	Gas Act 1997	Industry Specific Regulatory Framework, SA
	Gas Regulations 2012	Industry Specific Regulatory Framework, SA

[1] Only applicable in New South Wales, Queensland, South Australia, Tasmania and the Australian Capital Territory

State	Legislation	Description
	Petroleum and Geothermal Act 2000	Regulatory Framework that applies to transmission pipelines in SA
	Petroleum and Geothermal Energy Regulations 2013	Regulatory Framework that applies to transmission pipelines in SA
	Essential Services Commission Act 2002	General framework for regulated industries in SA
Northern Territory	Energy Pipelines Act 1981	Regulatory Framework that applies to transmission pipelines in NT
	Energy Pipelines Regulations 2001	Regulatory Framework that applies to transmission pipelines in NT
	Dangerous Goods Act 1998	Legislation that sets out the requirements and allowances for licensing, packaging, storage, transportation and use of fuel gas.
	Dangerous Goods Regulations 1985	Legislation that sets out the requirements and allowances for licensing, packaging, storage, transportation and use of fuel gas.

4.2 Technical Standards

Two key sets of Australian Standards cover the full life cycle operation of MGN's gas network. They are:

- AS 2885 Pipelines - Gas and Liquid Petroleum suite of standards as applicable to systems operating at a pressure greater than 1050 kPa; and
- AS/ANZ 4645 Gas Distribution Networks suite of standards as applicable to systems operating up to the 1050 kPa threshold.

AS 2885 and AS/NZS 4645 standards are complimented by several other Australian and international standards.

We comply with the various Acts, Standards, Codes and regulatory legislation regarding safety, economic, operational, environmental management, and asset security of the distribution networks (as in Table 9 above).

Our Environmental Management System is consistent with expectations detailed within the above and below AS/NZS standards:

- AS/NZS ISO 14001, Environment Management Systems
- AS/NZS 4801, Safety Management Systems

4.3 Regulatory Authorities

The applicable state and national regulator which we work closely with to monitor and discharge our obligations are summarised in Table 10.

Table 10 – Gas Distribution and Transmission Regulators

Regulator	Responsibilities
AER	Economic regulation to ensure compliance with National Gas Law and Rules (NGL; NGR)
	Governing Third Party Access
	Monitors, investigates and enforces compliance with national energy legislation and rules
AEMO	Market and Transmission Systems operator
OTR	Responsible for monitoring gas safety and other technical matters in South Australia
DEM	Administer transmission pipelines legislation in SA
DELWP	Administer transmission pipelines legislation in Vic
DPIE	Administers Pipelines Act and Pipelines Regulation and approves Safety and Operating Plan in NSW.
DPIR	Administer transmission pipelines legislation in NT
EWOSA	Responsible for customer complaints and related issues
ESCOSA	Industry Licensing requirements (Distribution) Gas Distribution Code and Gas Measurement Code in South Australia
ESCV	Industry Licensing requirements (Distribution) Gas Distribution System Code
ESV	Act as the technical regulator for the Energy Industry in Victoria and oversees the safety of employees, contractors, consumers and the general public. •Monitoring and enforcing compliance (with but not limited) to the Gas Safety Act 1997 and the Gas Safety (Safety Case) Regulations 2018.
EWOV	Responsible for customer complaints and related issues
WorkSafe NT	Responsible for monitoring gas safety and other technical matters in Northern Territory

5 Asset Performance Summary

5.1 Asset Class Performance Requirements

The following sections describe the general performance requirements for each asset class.

5.1.1 Transmission & Distribution Mains

1 Transmission capacity sufficient to maintain supply under 1 in 20 year conditions;

2 Distribution capacity sufficient to maintain supply under 1 in 2 year conditions;

3 Gas pressure maintained above recommended minimum values at network extremities.

4 No harm to persons or property due to network failure;

5 Total mains and service leaks reported per km of main reduce over time;

6 The moving annual 12-month UAFG is at a level that is considered acceptable for the characteristics of the network; and

7 The number of third party damages per km of main is consistent with that of a prudent operator.

5.1.2 Network Facilities

1 Networks do not exceed their MAOP;

2 Supply pressures are reliably controlled to maintain adequate end of mains pressures, above recommended minimums, with no loss of supply; and

3 Cathodic protection systems are operated and maintained in accordance with Procedure 9019 Cathodic Protection System Maintenance and Testing, and pipe to soil potentials maintained within the values required by this procedure and associated Work Instructions.

5.1.3 Metering

1 Metering accuracies are maintained within tolerances specified in the Victorian Gas Metering Code and the Gas Distribution System Code for Victoria;

2 Timeframes for installation, upgrading and maintenance are in accordance with the Victorian Gas Metering Code and the Gas Distribution Code;

3 Metering data is supplied within the timeframes specified by the Retail Market Procedures and in accordance with the Victorian Gas Metering Code and GDC; and

5.1.4 SCADA Facilities

1 Sufficient monitoring and control is in place to enable efficient planning, monitoring and emergency response; and

2 Demand customer data is accurate, validated (estimated/substituted) and supplied in accordance to the Retail Market Procedures and the applicable gas metering codes.

5.2 Performance Indicators

Table 11 summarises a range of Performance Indicators (PIs) used for the various asset groups. Performance Indicators are used by the relevant operating departments with Key Performance Indicators (KPIs) reported to senior management, while various KPIs and data are also provided to the technical regulators in each state as required.

Table 11 – Performance Indicators

Primary Asset Group	Performance Indicators (PIs)	KPI
Transmission Pipelines	No. of 3rd party damages	Y
	No. of 3rd party near misses	Y
	% of pipeline patrolled	
	No. of coating faults/km	
	No. leaks reported & repaired	
	Intelligent Pigging Survey Results	
	CP Survey Readings	
	Coating Survey Results	
	Emergency exercises completed	
Distribution Mains & Services	Leaks/km main surveyed	Y
	No. 3rd Party Damage.	Y
	Supply Outages to 5 or more consumers	Y
	No. of gas in building incidents	Y
	No. of fires as result of gas leak	Y
	Onsite response to emergency within prescribed time	Y
	UAFG levels	Y
	No. leaks reported & repaired	
	No. of outstanding leaks	
	No. of services replaced	
	Poor supply incidents/outages	
	No. of over pressurisations	
	No of 3rd party locations	
	CP Survey Readings	
	Km of mains laid	
	Km of mains replaced	
	No of services Laid	
	No of services replaced	
Network Facilities - PRS	No. of PM jobs scheduled but more than 1 month overdue	Y
	% PM Schedule Complete	
Network Facilities - CP	% of CP test points checked	Y
	% of test points outside tolerance	Y
	% TP Protected by CP	
	% HP/MP/LP Network protected by CP	

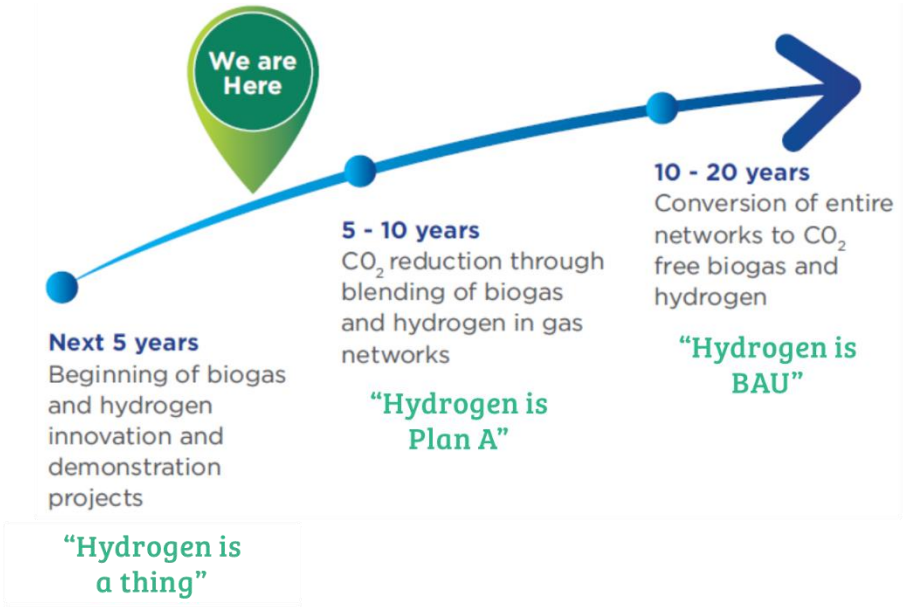
Primary Asset Group	Performance Indicators (PIs)	KPI
Network Facilities - ODOR	% of regulatory odorant surveys conducted	Y
	Odorosity detectable < 20% LEL	Y
Metering Facilities	No. of PM jobs scheduled but more than 1 month overdue	Y
	No. of inaccurate meters detected	
	No. of meter failures	
	No. of time-expired meters replaced	
	No. of meter leaks	
	% of PM Schedule complete	
	No. of meters replaced per annum	
	Other KPIs as set out in the GMMP	
SCADA Facilities	Availability of telemetry systems	

6 Network Adaptation Strategy– Renewable Gas

AGN is actively working towards sustainable gas delivery to minimise the effect of greenhouse gas emissions on global warming. Subsequently, in 2017, in conjunction with Australia's five peak gas bodies, the Gas Vision 2050 was developed. This vision outlined a pathway to achieve near zero emissions in the natural gas industry. Hydrogen and bio-methane are proposed as an alternative fuel sources to natural gas. Hydrogen is carbon free and can be blended with natural gas (to reduce carbon emissions), prior to potentially replacing natural gas with 100% hydrogen. Bio-methane is carbon neutral; it utilises the existing energy potential from organic material (such as agricultural waste and sewerage).

Gas Vision 2050 outlines a three phased approach to transition to a lower carbon gas supply system (see Figure 6 below). This included investing in pilot/demonstration plants in the first five years, blending carbon free gas into our networks in years 5-10, before shifting to potential conversion of entire networks. Phase one is currently on track with a number of hydrogen projects initiated across the country. Phase two has commenced ahead of schedule with planning for large scale commercial renewable gas projects.

Figure 6– Gas Vision 2050 Three Phase Approach



The current AGN strategy is covered in the broader AGIG Network Adaptation Strategy- Renewable Gas- AGIG-SP-0001 FY2023 - FY2028 and aims to achieve:

- 100% green hydrogen product available for new subdivisions by 2025
- All distribution networks on a blend up to 10% zero carbon hydrogen by 2030
- All distribution networks to achieve 100% zero carbon gas by 2040 (stretch target) or by 2050 (base target)

This strategy is in line with the Victorian Government's commitment to net zero greenhouse gas emissions by 2050, with emissions reduction targets of 28% - 33% by 2025 and 45% - 50% by 2030[2].

[2] Victoria State Government, Gas Substitution Roadmap Consultation Paper, June 2021.

- Hydrogen Park Murray Valley located in the Wodonga Waste Water Treatment Plant, has been awarded funding under ARENA's Hydrogen Development Funding Round. The core market for this hydrogen is blending into the nearby Wodonga and Albury gas distribution network in Victoria and NSW respectively, more than 40,000 connections.

A Final Investment Decision (FID) of HyP Murray Valley is planned for completion in 2022.

In order to prepare for the injection of hydrogen at both 10% volume blends and 100% conversion for the AGN 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. 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, 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 Plidco & Smith Clamps 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.

Transmission pressure pipeline 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, which are identified in the table below.

Table 12: Transmission pressure pipelines requiring hydrogen compatibility assessments

Pipeline name / Section Name	Pipeline license	Identified for AA period
Dandenong to Crib Point & adjoining sections	VIC11	Yes
Longford to Sale	VIC43	Yes
Bittern to Dromana	VIC137	Yes
Langwarrin to Frankston	VIC139	Yes
Berri to Mildura Pipeline	VIC226	Yes

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 more broadly used within the AGN network.

Further assessment or investigation required

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.

7 Lifecycle Strategies – Transmission Pipelines (TP)

Lifecycle management details are provided in Section 3.7. General information on transmission pipelines details, specific information to how these assets are managed through their lifecycle, and typical asset strategies are included in this section.

7.1 Asset Description

Transmission pipelines have a maximum allowable operating pressure (MAOP) greater than 1,050 kPa and are covered by Australian Standard AS/NZS 2885.

AGN's transmission pipelines are a primary supply to many of its gas distribution networks and as such are critical to the safe and reliable supply of gas to customers. The consequences of a pipeline failure include potential for serious injuries to the public and loss of supply to large number of customers.

Transmission pipelines are designed, constructed, operated and maintained in accordance with AS/NZS 2885. These pipelines are steel, externally coated and cathodically protected with impressed current or galvanic sacrificial anode systems.

There are 316 km of transmission pressure pipelines in the Victoria and New South Wales AGN Networks as indicated in Table 12 below (as of July 2021). The average age of the transmission mains is 40 years.

Table 13 – TP Pipelines Lengths

Regulatory Coverage	Network Entity	Protected Steel Lengths in km
Regulated Assets	Victoria Networks (excluding Albury and Mildura)	232
Regulated Assets	Albury Gas Company Networks, NSW	20
Unregulated Assets	Southern NSW Networks (see Section 1.2 for further details on townships)	64
	Total	**316**

7.2 Plan and Create

Growth of the TP pipeline system is driven by extensions and augmentation to supply residential, industrial and commercial development. Installation of transmission pipelines are not a common occurrence but are added to our asset management profile after they are installed.

There are plans to continue to duplicate the Dandenong Crib Point (DCP) TP to meet future growth and demands in the next Access Arrangement Period from FY24 to FY28. This is due to the high growth in the south-east corridor of Melbourne, which includes Cranbourne, Frankston, Mornington, Somerville, Hastings and Crib Point regions.

There is no other TP extensions and augmentations planned for the future, as there is sufficient capacity to handle the growth in the DMS for the next 10 years. However, the Wodonga-Albury TP and North Melbourne to Fairfield TP pipelines are nearing capacity. Due to low growth rates in these regions, there is still sufficient capacity for the next 10 years. Both of these TP's will continue to be monitored and reviewed as per the standard lifecycle strategies.

7.3 Operate and Maintain

Transmission pipelines are maintained through a program of inspections and condition monitoring activities as summarised in Table 14.

Table 14 – Transmission Pipelines Inspection and Monitoring Regimes

Maintenance Activity	Frequency
Pipeline patrols	Daily/Weekly/Monthly
Above ground mains inspections	Annually
Cathodic protection (CP) surveys	Monthly (detailed survey every six months)
DVCG coating survey	Every five years (un-piggable pipelines)
Integrity excavations	Condition based
Leak survey (full right of way (ROW))	Every five years Annually for assessed higher risk locations
Inline inspection (pigging)	Every 10-15 years after initial intelligent pig run
External interference management	As required
Remote Telemetry Units and Electrical Equipment Checks	Yearly

Refer to the Networks Pipeline Integrity Management Plans (PIMP) for further details on the operation and maintenance programs on the TP assets.

7.4 Monitor and Review

The integrity of AGN's transmission pipelines is assessed and managed through a system of five yearly location class and safety management studies (SMS), five yearly DCVG coating surveys, ten yearly remaining life reviews (RLR), and annual capacity performance reviews.

Location Class Reviews

Specify the type and nature of land use adjacent to the pipeline route. For an operating pipeline the location class will be affected by change in land use and / or encroachment. It is conducted as part of the SMS review and complies with the requirements of AS 2885 parts 1 and 3. A review of the class location is also conducted on a maximum 5 yearly interval and immediately after the following threats are identified:

- External threat and encroachment;
- New development or subdivision approval request;
- New infrastructure encroachment; and
- Identification of new or modified land use.

Safety Management Studies

In SMS's, pipeline threats are identified and the associated risks are assessed. This is the primary document around which all pipeline operation and management activities are based.

Remaining Life Reviews

The outcome of the RLR will determine any actions and / or recommendations ensuring the pipelines and their facilities are fit for continued service, practices and that processes are in place to enable pipeline and facility operation at least to the end of its design life.

Capacity Performance Reviews

Refer to Section 3.8 for more details on capacity reviews performed on transmission pipelines.

7.5 Risks and Strategies

Common risks and issues for transmission pipelines are mentioned below.

- Railway sleeve crossing remediation
- Corrosion
- Above and below ground coating issues
- Repair of creek crossing washouts
- Insufficient or too much depth of cover
- Third party damage, dents, or gouges
- Pipelines that are unpiggable
- Capacity constraints
- Material/ weld defects
- Faulty transmission valves
- Valve corrosion protection

The normal process of assessing and prioritising these risks (explained in Section 3.7.4) will result in projects and work programs proposed as part of the annual capital budgeting and five-yearly AA processes. This involves development of asset strategies specific to the TP issues involving further assessment of the risks / issues and subsequent development of a strategy to mitigate the risk.

Some background and description to these asset strategies relating to transmission pipelines are provided below.

7.5.1 Capacity Related Strategies

7.5.1.1 Reinforce or Augment Transmission Networks

Transmission pressure pipelines (TP) are the primary supply to high and medium pressure networks supplying consumers.

Continuing growth in some areas have the potential to reduce the pipeline pressure below the recommended minimum. It is essential to maintain a safe and reliable supply to customers. Operating below the recommended minimum pressure could result in the loss of several thousands of customers.

Our strategy is to review augmentation alternatives to reinforce pressures in the networks on a yearly basis. This is to be done in a prudent manner, where we "sweat the assets" as much as practicably possible. Alternatives are evaluated based on cost and risk to ensure the solutions are optimised. Based on this strategy, duplication of the DCP is the only confirmed TP augmentation required to meet future growth and demands.

7.5.2 Integrity Related Strategies

7.5.2.1 Routine Maintenance and Condition Activities on Pipelines

It is important to be able to understand the threats on each pipeline and to be able to locate and repair them to prevent pipeline failure and maintain safe operation. These threats are being managed through various programs including feasibility assessments, direct assessments, coating and potential surveys, excavations and non-destructive examinations, coating and pipeline repairs, and other routine maintenance and integrity activities.

"Some of the biggest threats to pipeline safety are unauthorized construction, development, encroachment and digging activities" or external interference which could result in third party damage to the pipelines. This is being managed through pipeline patrols, special zone surveys, dial before you dig, and by abiding by encroachment and construction guidelines.

7.5.2.2 Pigging of Pipelines

The majority of our TP pipelines were constructed prior to 1982, with two of the pipelines (PL103 and PL49) being approximately 45 and 60 years old. The greatest risk associated with these steel pipelines is third party damage closely followed by corrosion, which can weaken the pipe wall and cause a pipeline failure.

Inline inspection is important to be able to detect, locate, and size defects in the pipelines to be able to repair any harmful defects preventing pipeline failure.

There is a priority ranking for making pipelines piggable based on pipeline age, coating defects, the length of pipeline and whether it is situated in high density or sensitive areas. For the priority pipelines, the existing bend and valve features will be assessed and in field verifications completed. As a result, there would be potential adjustments to the pipelines to make them piggable followed by implementation of an inline inspection program.

There are total of nineteen (19) TP pipelines that are not piggable in Victoria. The plan is to make three (3) of these pipelines piggable over the next AAP from FY24 to FY28.

7.5.2.3 DCVG and Pipeline Dig Ups

Steel TP pipelines are prone to corrosion, which if left untreated can lead to pipeline integrity failure and a major uncontrolled gas escape. The consequences of a major uncontrolled gas escape can be severe, as metropolitan TP pipelines are typically located in or near developed areas and major population centres.

To help mitigate the corrosion risk, one of the methods we use to manage corrosion is to conduct direct current voltage gradient (DCVG) surveys, which detect faults in pipeline coatings. The DCVG surveys are followed by direct inspection excavations (or 'dig ups') of areas where DCVG indicates the pipeline coating has failed.

The entirety of Victorian TP pipelines are surveyed via DCVG every five years.

Pipeline locations with IR readings less than 15% are traditionally deemed low priority and are either not excavated or are deferred until higher risk excavations have been completed.

However, field validation suggests that there is a particularly high chance (99%) of coating defects or corrosion being found at IR levels of less than 15%. Hence, the strategy is now to excavate, examine (and repair where necessary) sites with multiple indications even when the IR reading is less than 15%, as DCVG is currently the primary inspection technique.

Sites will still be prioritised with high priority (greater than 15% IR) identified through the DCVG process to be excavated first, followed by the sites with less than 15% IR.

7.5.2.4 Sleeved Railway Crossings

Within the Victoria and NSW distribution network there is a total of 225 sleeved railway crossings.

Sleeved railway casing pipes are installed in railway corridors to mitigate excessive loading on the pipe. Sleeved crossings are generally low points and as such are prone to corrosion if water makes its way into the casing annulus. If untreated this could lead to pipeline integrity failure and an uncontrolled gas escape. The consequences of a gas escape may be severe, as railway corridors can have a high density of people and repairs can cause high disruption to the public transport network.

Inspection of sleeved railway casing pipes cannot be completed using standard methods such as direct current voltage gradient (DCVG). Similarly the pipelines targeted are unpiggable resulting in limited ability to determine pipe integrity in cased locations. Test points are used to evaluate the cathodic protection present on the sleeved railway casing pipes, however in some instances these test points have failed or are inaccessible. For these reasons, it is important to monitor and mitigate corrosion risks further in these sensitive locations.

The plan is to carry out physical inspections of the highest risk cased crossings, update aged casing seals with link seals to assist in maintaining the integrity of these pipes, and filling the identified transmission pipelines with concrete slurry to mitigate any ongoing corrosion risk. Prioritisation of crossings is based on the pressure regime (e.g. transmission pressures are highest priority), criticality of the supply main and the number of customers impacted in the case of a failure, and age of the assets.

7.5.2.5 Valve Refurbishments / Replacements

In the event of an emergency, such as a pipeline rupture or leak, valves are required to isolate the leak to minimise the impact to customers and enable repairs to be undertaken.

The strategy is to refurbish (on average 3 every 5 years) or replace valves when they are found to be faulty, non-functional, or have inadequate valve spacing (as per AS 2885.1 minimum spacing should be 30km and 15km for pipelines classified as R2 and T1/2 location classes respectfully). Valves should be installed at critical locations to minimise the loss of supply to networks and to ensure these valves are maintained so that they can be accessed safely and reliably when needed.

8 Lifecycle Strategies – Distribution Mains and Services (DMS)

8.1 Asset Description

AGN Victorian distribution networks (including Albury Gas Company) consist of over 12,000 km of mains and approximately 750,000 services of materials operating at pressures from 1.4 kPa to 1050 kPa. These mains and services form the distribution network that deliver gas to residential, commercial and industrial customers.

Distribution trunk mains operating at high and medium pressure tiers form the backbone of the distribution network, feeding smaller mains and more local areas. The consequences of a failure of these trunk mains include potential for serious injuries to the public and/or loss of supply to several hundreds to several thousands of customers.

The installed distribution mains in the Victorian and NSW AGN Networks are summarised in Tables 15 - 17. This data covers the mains installed up to January 2022.

Table 15 – AGN Victorian Natural Gas Networks (excluding Mildura), Installed Distribution Mains (km)

	Cast Iron	UPS	Steel (Protected)	PVC	HDPE PE 500/575	MDPE PE 80	HDPE PE 100	Total
Low	54	6	0	16	0	43	12	131
Medium	15	0	5	2	1	0	19	41
High	0	0	3,083	1,657	4,241	0	3,045	12,027
Total	69	6	3,088	1,674	4,242	43	3,076	12,199

Table 16 – AGN Albury Gas Company Natural Gas Networks, Installed Distribution Mains (km)

	Cast Iron	UPS	Steel (Protected)	PVC	HDPE PE 500/575	MDPE PE 80	HDPE PE 100	Total
Low	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0
High	0	0	200	0	224.0	270.9	70.4	766
Total	0	0	200	0	224	271	70	766

Table 17 – AGN Southern NSW Natural Gas Networks, Installed Distribution Mains (unregulated, km)

	Cast Iron	UPS	Steel (Protected)	PVC	HDPE PE 500/575	MDPE PE 80	HDPE PE 100	Total
Low	53.9	5.8	11.9	43.2	0.2	0.5	15.5	131
Medium	14.8	0.3	19.1		4.8	0.5	1.8	41
High	0	0	2845.0	0.3	2858.6	3970.5	1586.6	11261
Total	69	6	2876	43	2864	3971	1604	11433

Services comprise the service pipe and fittings with transition from the buried service to the aboveground meter via a metallic service upstand, on which an isolation valve is installed so that supply can be shut off in an emergency.

Services generally consist of material of the same vintage of the gas main to which they are connected, as they generally were laid together as one project. That is, when cast iron mains were laid, galvanised steel services would have been laid at the same time (and when such mains were replaced with Polyethylene (PE), the associated services were renewed with PE). It is generally assumed that services have the same age of the main to which they are connected.

Multi user sites (MUS) are a combination of services connected to a sub main or trunk service feeding a number of units/houses within the same property. These are typically located at subdivided properties, aged care homes and government housing.

8.2 Plan and Create

Capacity and engineering assessments are done to maintain a safe and reliable supply of gas to customers while balancing cost effectiveness. The core objectives are as follows:

- To maintain capacity in the distribution networks;
- To forecast load growth and other drivers for network augmentation and
- To determine timing and budget estimates of augmentation projects required to consumers.

Refer to Section 3.8 for more details on capacity reviews performed on distribution networks.

There is approximately 200 km of mostly HDPE PE100 mains added to Victorian AGN Networks each year and along with 18,000 new services. The two large growth corridors include the northern region along the Hume Highway and the south-east region around Pakenham & Cranbourne. These two growth corridors are experiencing very high growth levels, with a combined number of 8,000 new customers each year in just these two networks. This trend is forecast to continue for the next 5 to 10 years as more land is developed and the fringes continue to expand.

Growth is also higher in the regional networks due to the 'sea and tree change' effect of people leaving inner Melbourne, which was accelerated by the coronavirus pandemic in 2020 and 2021. This has led to higher growth numbers in regional Victoria, particularly in Echuca, Traralgon and Wodonga.

Lastly, the speed of the energy transition and the impacts on networks and augmentation is largely unknown. This could come in the form of augmentations required to connect biogas plants and ensure reliable injection capacities and/or the impact of hydrogen blending, which may bring forward augmentation due to the lower heating value and higher flow rates required for end users. Combined with high levels of current growth and uncertainty of energy policies, the next five to fifteen years will be a very exciting time in the gas distribution space.

8.3 Operate and Maintain

Key mains and services operation and maintenance activities are detailed in Table 17.

Table 18 – Distribution Mains Maintenance Activities

Maintenance Activity	Frequency/Target
Gas supply investigations	Proactive checks as a result of network monitoring activities and follow up checks to public reported leaks.
Planned Leak Survey	A rolling 5-year survey of all mains with 6 month and 12-month special surveys of 'high' risk areas. Target is to undertake 100% of planned surveys each year.
Cathodic protection potential checks	Every six months
Winter Pressure Surveys	Annually

8.4 Monitor and Review

8.4.1 Formal Safety Assessments (FSA)

1 Formal Safety Assessments (FSAs) are conducted to cover design, construction, commissioning, and the operation and maintenance life cycle phases. They are carried out on all distribution assets as follows:

2 Identify hazards

3 Identify threats/trigger events that could lead to the hazards

4 Evaluate the potential consequences of each type of gas safety incident

5 Document existing prevention, mitigation, and/or control measures which would prevent the hazards resulting in the identified hazardous event consequences (collectively: controls)

6 Evaluate the overall risk of the incidents when all preventative and mitigation measures are considered ie the effectiveness of the controls

7 Determine, based on the category of risk and the control measures in place, whether the risks for each scenario have been reduced as low as reasonably practical

8 Recommend additional measures/layers of protection if appropriate

8.4.2 Distribution Mains and Services Integrity Plan (DMSIP)

The DMSIP documents the process and results around managing the condition and integrity of the Network's distribution mains and services and monitors / reports progress against regulatory benchmarks.

Network performance and integrity is reviewed annually. Key indicators used to assess the integrity of the network through trends:

1 Mains and service leaks;

2 Mains leaks due to cracks :

3 Gas in building (GIB) incidents;

4 Supply outages; and

5 UAFG

8.5 Risks and Strategies

Below are the distribution mains and services risks and strategies that relate to AGN Victoria Networks' capacity, mains replacement and other integrity management programs.

8.5.1 Mains Replacement Strategies

8.5.1.1 Vintage HDPE 575

There are over 3,000km of vintage HDPE Class 575 mains in the Victoria and New South Wales networks. These mains were installed from 1970 to the mid-1990s. This early grade of polyethylene (PE) did not contain any of the additives that the newer PE 80 and PE 100 grades contain, which make these mains more susceptible to slow crack growth (SCG). SCG initiates from damage inflicted by squeeze offs and/or other stress concentrators. In recent years the occurrence of sudden brittle crack failures of HDPE mains has increased.

There is evidence to suggest that PE mains in Albury and Wodonga are degrading at a higher rate than in other parts of Victoria and are candidates for PE renewal activities. These PE mains are also the oldest in the network and it is expected that this gradual degradation will continue to occur. A pilot program of 16.4 kilometres of inline camera inspections and reinforcement of HDPE mains of these highest risk areas in northern Victoria is planned to occur in the next AAP from FY24 to FY28. This program is based on the success of the same program in South Australia, which has successfully reduced risk by inspection and clamping of the squeeze of points.

Additionally, a Victorian wide sampling and testing program of vintage HDPE 575 will occur during this period, in conjunction with Multinet and AusNet. This program will be co-ordinated by Deakin University and Future Fuels CRC with the aim to create an end of life model for vintage HDPE. This model which will include both the life of the bulk polymer, squeeze of points and the life extension by using inspecting and clamping. This will form the basis of an updated vintage HDPE asset management strategy. The program involves taking 100 samples from the AGN network and will factor in location, age, size, leak rates and the ground type.

8.5.1.2 Thin Wall Protected Steel

Thin wall steel mains are challenging to cathodically protect due to the increased electrical resistance with the smaller cross-sectional area and interruption of the insulating coating including at service connections and tees. Anodes and other CP assets have a reduced "radius of protection", as protective potentials are not able to propagate through the network as effectively.

There are 14,130 km of steel mains throughout the Victoria and New South Wales networks. Overall, there is an increased leak rate on older sections of cathodically protected steel mains, which are between 50-65 years old and located in the coastal areas (particularly Frankston and the Mornington peninsula). These coastal vintage steel mains have a higher potential for deterioration of coating, corrosion (coastal environments) and when it is combined with historic issues of cathodic protection (CP). A higher risk section of 3.5 km in the Frankston CBD has been flagged for replacement, due to the risk of potential Gas In building (GIB) events.

For the rest of the network, the thin walled protected steel mains in the AGN Networks are being investigated further to gain a better understanding of their condition. To achieve this, 50 sample locations have been selected to inspect the condition, wall thickness and coating performance. This information will be used to further develop the asset management strategy of older steel mains (that will eventually lead to the future mains replacement program).

8.5.1.3 Placeholder: High Pressure Regulator Sets

The Cast iron (CI) and unprotected steel (UPS) mains replacement program was completed in the 2017 to 2022 Access Arrangement, removing the highest risk mains from the AGN network. In order to complete this high priority scope on time, there are 28 redundant high pressure regulators remaining within rationalised areas of the network. The most cost-effective approach is to leverage the economies of scale and complete all 28 regulator removals as one single project. These regulators shall be prioritised through a risk-based approach and completed by using a blend of specialist contractors and internal experts.

8.5.2 Augmentation Strategy

As part of the monitor and review strategy, network capacities are assessed yearly. The assessment factors in peak winter flows, network pressures, historic growth levels and forecast growth rates (including PSPs). Networks that are modelled to have pressures fall below 140 kPa during the next AAP FY24 to FY28, are flagged for augmentation. A threshold of 140kPa is the minimum level necessary to maintain a safe and reliable customer supply set by the Victorian Gas Distribution System Code.

On average, historically there has been 6-7 new projects required per year to strengthen the network, which is forecast to continue for the next AAP FY24 to FY28. For this five year window, this typically includes 3-5 new gates stations / upgrades, 2-3 new pressure regulators and 2-3 water bath heater upgrades.

8.5.2.1 MUS Strategies

Multi-user services are services running through unit development and commercial premises that supply gas to multiple users. Prior to 2012, the renewal of internal services at these MUS sites was not captured within the scope of the Mains Renewal Program (MRP). This leaves an inventory of older MUS with old material (cast iron/unprotected steel/earlier grade of PE) that were not replaced during MRP.

After completing desktop review and site survey of all MUS, MUS can be broken down into three Priority groups based on their condition, location, and compliance.

Priority 1: Replacement required as soon as practical due to failure, non-compliance or a location of specific concern;

Priority 2: Assets that are generally compliant but aging will require replacement as they approach the end of their useful life;

Priority 3: Assets that were assumed to be of the same age as the mains but were installed more recently using newer PE materials, meter locations are compliant, or the dwellings within the MUS are supplied with individual service connections direct to the main (as opposed to a boundary regulator and trunk service installation).

Majority (90%) of MUS belong to Priority 3, while there are approximately 170 cases of Priority 1 and 160 of Priority 2. There is a program for the next AAP from FY24 to FY28 to upgrade the Priority 1 to high pressure operation by insertion of the old (trunk) services and removal of black boxes feeding them. The Priority 2 will be upgraded within the next 10 years, and Priority 3 sites in the 10 to 15 year horizon.

9 Lifecycle Strategies – Network Facilities

9.1 Asset Description

The asset subgroups of Network Facilities include gate stations, regulating stations, heater facilities, isolation valves, odorisation facilities, and cathodic protection.

Several of these secondary asset groups have significant effects on gas supply:

- Gate regulator stations, which are the primary supply points for the networks where failure could result in reduced or total loss of supply to tens of thousands of customers;
- Gas heating facilities (usually located at GRS facilities), where failure would have similar effects to failure of GRSs; and
- District regulator stations, which deliver gas into lower pressure networks, where failure could result in reduced or total loss of supply to between hundreds and thousands of customers.

9.1.1 Gate Regulating Stations

These facilities are typically co-located at the APA / GasNet custody transfer points. They reduce and control the upstream transmission pipeline pressures to a level consistent with the MAOP of AGN's downstream transmission pipelines. The pressure regulating facilities are owned by AGN, while metering and odorant facilities are owned and operated by APA / GasNet.

Gate stations consist of filters, isolation, bypass and pressure control valves, and in some instances gas heating facilities. They are located in fenced compounds.

There are 63 gate stations (as of July 2021) within AGN Victoria and NSW distribution networks (including Albury Gas Company Networks and Southern NSW), which range in capacity and pressure regulation depending on the network they feed. The age of these facilities varies between a few years up to more than 40 years.

Gate stations are typically upgraded or replaced when demand from the downstream networks exceeds their capacity or when components are no longer available to adequately maintain the facility.

Placeholder to reference further data in Appendix: Appendix X summarises the locations of AGN's gate regulating stations and the networks they supply.

9.1.2 Gas Heating Stations

Gas heaters are often required at GRSs, where large pressure reductions occur. The Joule-Thompson (JT) effect of this loss of pressure reduces the temperature of the gas to below the safe operating limit of the downstream equipment, requiring the gas to be pre-heated to keep the gas within the safe operating envelope. .

Water bath heaters are the most common type, consisting of gas fired "fire tubes" which heating up a tank of water. The flowing gas stream also passes through this "water bath" in a separate set of tubes, and absorbs heat from the water.

The typical service life of a WBH coil is approximately 25 years, when maintained in accordance with the preventative maintenance schedule. When a coil is assessed as having reached the end of its life, its dimensions are verified, it is replaced into the WBH, and a new coil ordered from the supplier. Once the new coil is received (typically within 2-3 months), the heater is taken out of service and the new coil fitted in place of the old one.

There are 49 heating facilities (as of July 2021) within AGN Victoria and NSW distribution networks (including Albury Gas Company Networks and Southern NSW Networks) as shown in Appendix D showing location and type of heater.

9.1.3 Regulating Stations

Regulating stations control the delivery of gas into the TP, HP, MP, and LP distribution networks within the allowable operating pressure of the downstream network. These facilities consist of filters, isolation, bypass and pressure control valves that are located in either below ground vaults or above ground kiosks.

There are 115 regulating stations (as of November 2021), which range in capacity and pressure regulation depending on the network they feed. The age of these facilities varies between a few years up to more than 40 years.

Regulating stations are typically upgraded or replaced when demand from the downstream networks exceeds their capacity, when they become obsolete due to mains replacement or when components are no longer available to adequately maintain the facility. Tables 18 and 19 summarise the regulating station installations, inlet and outlet pressures as of November 2021.

Table 19 – Regulating Stations in Victoria (including Albury)

Outlet Pressure						
Inlet Pressure	TP	High 1	High 2	Medium	Low	Total
TP	4	42	2	1	0	**49**
High 1	0	0	0	4	13	**17**
High 2	0	8	0	0	0	**8**
Medium	0	0	0	2	8	**10**
Total	4	50	2	7	21	**84**

Table 20 – Regulating Stations in Southern NSW

Outlet Pressure					
Inlet Pressure	High 1	High 2	Medium	Low	Total
High 1	0	0	8	2	**10**
High 2	18	0	3	0	**21**
Total	18	0	11	2	**31**

9.2 Plan and Create

Network growth is reviewed on a regular basis to evaluate the following:

- Whether a new gate station is needed
- To determine whether augmentation projects require new regulators and/or heaters to be installed to boost pressures in the network

Based on historical performance, we expect to see the following added assets:

- There are typically 1-2 new gate stations and 2-3 gate station upgrades planned over a 5 year period.
- On average, an additional 1-2 new pressure regulators are forecasted to be added every 3 years.
- On average 3 heating facilities need to be replaced over a 5 year period. At the Laurimar Park and Wallan City Gates, growth is such that the heaters are either already reaching capacity or will reach capacity during this next AAP FY24 to FY28. For future AA periods, an updated heater strategy will be developed to identify capacity constraints and impacts to risk.
- A number of sites are identified each year where inadequate corrosion protection requires additional CP units/anode beds to maintain adequate protection. Approximately 2 new small anode beds are added to the CP system each year to maintain adequate corrosion protection for the steel pipe network. This is expected to ramp up to 12 anode replacements per year over the next AAP FY24 to FY28.

9.3 Operate and Maintain

A preventative maintenance program is in place, managed through AGN's Maximo Enterprise Asset Management system (EAM). The maintenance strategy is to continue existing maintenance regimes, and undertake reactive repair (or replacement) when new issues or risks are identified.

- Gate and other regulator stations – Maintenance on district regulator stations is carried out on a three-month, annual, and five-year basis. The three monthly and annual checks include inspection, set point and operational checks. The five-yearly maintenance activities include a major overhaul of the regulators, control valves and pilots. All soft seal components are replaced;
- Valve maintenance – Valve maintenance comprises annual inspection and maintenance of transmission and critical emergency isolation valves, and three-yearly inspection and maintenance of other network valves; and
- Corrosion prevention monitoring – Inspection of CP units is carried out in accordance with AS/NZS 2832.1 and AS/NZS 2885. The operational status of galvanic anodes is gathered every six months from control area surveys. Pipeline potentials are provided through impressed current cathodic protection (ICCP) units, which are monitored via the SCADA system. ICCP units provide effective and reliable corrosion protection, particularly in soils with high resistivity, and where high corrosion protection currents are required (e.g. at coating defects).

9.4 Monitor and Review

The performance of gate stations is assessed annually to determine whether the gate station (or components) need to be upgraded and determine timing including future demand. Detailed engineering is required to determine the full scope of the upgrades.

9.5 Risks and Strategies

Below are the Network Facilities risks and strategies that relate to AGN Victoria Networks' capacity and integrity management programs

9.5.1 Capacity Related Strategies

The network facilities are reviewed as part of the periodic network assessment. The key facilities projected flows are taken from the models and reviewed against their capacities. The modelling includes factoring in peak winter flows, network pressures, historic growth levels and forecast growth rates (including PSPs). There are typically 1-2 new gate stations and 2-3 gate station upgrades planned over a 5 year period

City gates and regulators are required to be upgraded once the station capacity is forecast to be exceeded, and the safe and sustainable delivery of gas may be compromised. This could result in the facilities operating at lower than design network injection pressures, low gas temperatures and/or excessive noise from the facility. There are regulatory and code requirements in regards to noise, connection of new customers, and maintaining supply to comply with. Upgrading the five facilities is therefore required to comply with these regulatory obligations. It is also required to maintain and improve the safety of services and maintain the integrity of services.

Heaters are required to be upgraded when the outlet gas temperatures routinely approach the Safe Operating Limits (SOL) of the downstream facilities including pipelines, piping, and regulators and to ensure that customers' supply is not adversely affected. On average, 3 heating facilities need to be replaced over a 5 year period. This is based on the exposure of facilities and distribution assets to low temperatures which can cause failure in these assets and cause a loss of supply to the networks or significant gas leaks.

9.5.2 Integrity Related Strategies

9.5.2.1 Gate and Regulating Station Improvements

In gate and transmission pressure regulating stations, the site grounds and various equipment including water bath heaters, pressure regulator kiosks or pits, pipework, valves, and fittings are aging assets which need to be maintained ongoing.

The external condition of some of the equipment is now reaching a level where touch up painting is no longer sufficient to effectively maintain the coating, with corrosion posing a real risk that can lead to a gas leak and/or component failure, resulting in a potential supply outage and health and safety risks. These issues will be addressed by an in-situ repainting program (i.e. grit blasting and repainting full spools).

With respect to water bath heaters, the coils have an expected life of up to 25 years when the WBH is maintained. When they reach the end of life, they require replacement to avoid becoming corroded with the potential resulting in a leak and subsequent fire or explosion. These heater replacements are part of business as usual and included in the heater numbers above.

Thermal insulation is typically installed on the water bath heater outlet pipework in order to prevent the loss of heat. There is a threat from Corrosion Under Insulation (CUI) caused by the moisture ingress on the external surface of piping.

The plan is to proactively replace WBH coils and to repaint pipe work, including pipe under thermal insulation and at soil to air interfaces) and use more practical thermal insulation applications (e.g. easy to remove insulation) to allow for ease of regular inspections and monitoring of piping condition.

Regarding site remediation works, various refurbishment activities are planned to improve the condition of sites. For example, this may include re-levelling city gate compounds, replacement of the fencing, removal of trip hazards, upgrade of vehicle protection, upgrade of site security, installation of access ladders, upgrade of signage, concrete kiosk repairs, pit lid replacements, equipment replacements, and updating site documentation.

9.5.2.2 Grove Regulator Replacements

The Grove (Model 82) regulator units at regulators and gate stations in AGN's Victorian and Albury Networks are over 35 years old and are at the end of their useful life, posing a risk to operations and supply.

Production of these Grove regulators were discontinued several years ago and 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 not available. If replacement does not occur and the Grove 82 regulators fail, then the inability to get spare parts could cause a loss of supply to a downstream network for an extended time period.

The strategy is to replace the remaining 26 Grove regulators or on five (5) Grove regulators per year over the next AAP FY24 to FY28 with a modern model that is serviceable and with readily available spare parts for preventative maintenance. The replacements will be prioritised based on their criticality to the network.

9.5.2.3 Cathodic Protection

Victorian natural gas distribution networks include approximately 252 km of steel transmission pipelines and 2874 km of distribution pipelines with 1300 sacrificial anodes and 80 cathodic protection units (CPU's) installed. CPU's typically have a 25 year replacement life, whereas the anode beds are replaced based on their 1 monthly and 6 monthly potential survey readings (e.g. replace if voltage criteria is not met).

Cathodic protection (CP) is installed on our transmission pipelines (and distribution pipelines) to maintain an effective CP system and protect the pipelines against corrosion extending their operational life.

Also a new initiative in AGN Networks is installing of remote CP monitoring devices on test points and CPU's to monitor the performance of CP equipment in real time to be able to manage the CP assets and pipelines proactively.

The plan over the next AAP FY24 to FY28 is as follows:

- End of life CP unit replacements (20 CPU replacements)
- End of life anode bed replacements (60 anode bed replacements)
- Adding 11 CP units to protect our ageing steel mains in the Mornington Peninsula coastal region
- Installation of remote CP monitoring of test and cathodic protection units (only on TP pipelines; 207 test point monitors and 6 CPU monitors)

CP installations will be in accordance with AS 2832 standards.

10 Lifecycle Strategies – Metering Facilities

10.1 Asset Description

The metering facility includes the meter isolation valve, pipe and fittings, pressure regulator and the meter. AGN's types of meters are used for domestic, I&C and demand customer metering:

- Diaphragm meters – domestic consumer and smaller I&C customer installations;
- Rotary meters - medium to large I&C customer installations;
- Turbine meters - very large I&C customer installations; and
- Coriolis meters – very large I&C customer installations.

The Gas Distribution System Code requires that:

- The net volume of gas delivered to each delivery point is measured to an accuracy of +2%; and -3%
- There is no systemic bias in metering facilities within the allowable margin of accuracy.

The manufacturer tests all new meters to an accuracy of ±1.0% prior to delivery and installation into AGN's distribution networks.

In accordance with AS/NZS 4944 all diaphragm meters with a capacity up to 25 m3/hr, installed prior to 2006, are deemed to have an initial field life of 15 years. New meter types (or variants thereof) installed after 2006 are required to undergo compliance testing of a meter family sample within a period of three to five years from installation.

Historical practice is that all meters with a capacity greater than 10m3/hr, typically I&C meters, are deemed to have an initial service life of 10 years. This practice is being reviewed for new meters greater than 10m3/hr and up to 25m3/hr to determine if an initial service life of 15 years is more applicable.

Meters greater than 25m3/hr fall outside the standard and meters with small population sizes not large enough to provide a statistically meaningful sample, (<1200 in three consecutive years) fall outside the standard, and can thus be given an initial 15 year life.

Figure 7 and Figure 8 shows the age profile for domestic and I&C meter fleets.

Figure 7 - Age Profile for Domestic meters as at October 2021 (for Victoria and Albury Networks, excluding Southern NSW Networks)

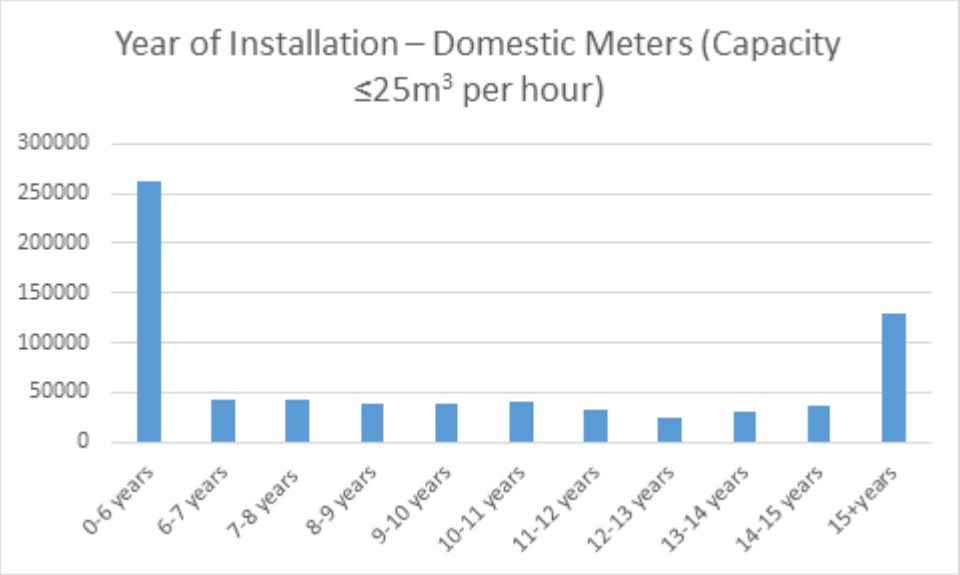
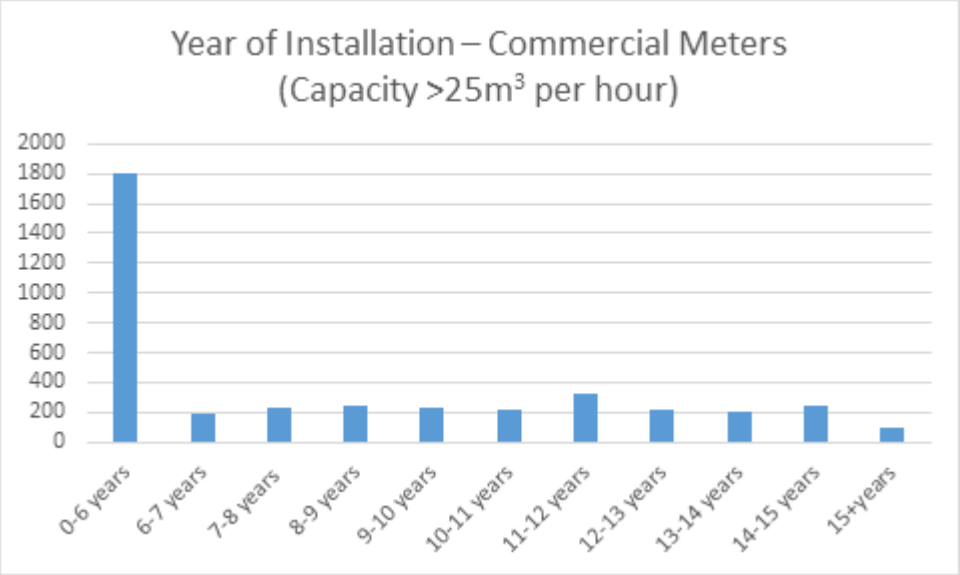


Figure 8 - Age Profile for I&C meters as at October 2021 (for Victoria and Albury Networks, excluding Southern NSW Networks)



In addition, there are approximately 31,000 meters installed in the Southern NSW Networks.

Table 21 – Total Installed Meters (as at January 2021)

Meters	Victoria Networks (including Albury Gas Company Networks)
Tariff V	716,437
Tariff D	386
Totals	716,823

10.2 Plan and Create

Ongoing residential, commercial and industrial customer growth is expected to continue at rates similar to historic growth.

There is an average growth of 2.5% per year in customer meters. This is approximately an additional 15,000 meters which are added to AGN Victorian Networks.

For the most common meter designs, a standard meter list is used to select the type of meter based on the inlet and outlet pressure requirements and the load size. The most common meter installations are as follows:

- Domestic meters are usually the Atlas UG6 or UG10 (depending on the load size required)
- I&C meters are most frequently simple designs such as the AL425 or AL1000 meters, but larger loads may require a more complex rotary meter set design i.e. G40, G65, G100, or G160

10.3 Operate and Maintain

Domestic meter installations are designed not to require routine maintenance other than in-service compliance testing of meter families. Maintenance is limited to responding to isolated meter failures. The maintenance program for industrial and commercial meters includes periodic operational checks, lubrication, and painting.

Maintenance activities for specific types of meter installation are described below.

- Low pressure installations – Low pressure sites are sites that operate at less than 7 kPa. These sites all have smaller diaphragm meters and no routine maintenance is carried out unless the consumer, retailer or APA personnel report a problem
- Elevated pressure installations with remote telemetry and correcting instruments – The sites are visited every six months to check meter accuracy, operation of components and check for leaks:
- Elevated pressure, flow, and temperature installations with flow correcting instruments and no remote telemetry – These installations are checked annually to check meter accuracy, operation of components and check for leaks.
- Elevated pressure installations with no correcting instruments and no remote telemetry – These installations are visited either annually if they have a pressure relief valve or every three years if they do not. These site checks include checking meter accuracy, operation of components and check for leaks. The meter set is also painted if required.

There are no plans to change the maintenance regimes in the next 5 years.

10.4 Monitor and Review

Meter leak repair and remedy trends are look into during the annual distribution performance review. These trends are reviewed resulting in meter strategies.

10.5 Manage Risks and Strategies

Gas meters are replaced in line with the requirements of the Victorian Code. Under the Code, customer meters up to 25 scm/hr (typically residential and small commercial meters) replacement is governed by requirements of AS/NZS 4944.

Customer meters greater than 25 scm/hr are deemed under the Code to have a life of 15 years.

This gives rise to approximately 35,000 periodic meter replacements (referred to as Periodic Meter Change or PMC) per year.

In addition to the PMC program, APA also replaces meters in response to leakage and meter measurement inaccuracy found in response to customer complaints. There are approximately 4,000 reactive meter replacements each year.

Under AS/NZS 4944 meters must undergo accuracy testing within 5 years of being in service. Depending on the accuracy found from this in service testing the meter is given an initial service life of 5, 10, 15, or 18 years.

Field life extension tests (FLE) are used to extend the initial life of residential meters. Depending on outcomes of testing the life of the meter can be extended by 1, 3, or 5 years.

Meters returned from the field are either repaired and tested for re-use, or scrapped if not economical to repair or if parts are no longer available.

10.5.1 Digital Metering Strategy

At this time the Gas Distribution business is isolated from the customer and typically only makes contact with the customer for connection, outages and maintenance. Billing is infrequent and inconvenient for the customer, as gas consumption is captured using old manual methods which are not granular or timely enough resulting in lack of control, billing discrepancies, and customer frustration.

Manual meter readers also travel large distances on foot in an uncontrolled environment and result in Medically Treated Injuries (MTI) and Lost Time Injuries (LTI) due to various hazards e.g. poorly maintained landscapes, dogs, insects, or sun exposure.

Remote digital metering allows for a more consistent method of performing meter readings across the network. Once installed, a remote digital meter can be read by driving past the location. This allows further privacy for the consumer, freedom to the location of the gas meter on their premise, prevents the need for estimated reads, improves accuracy of gas consumption billing and time efficiencies.

The plan is to replace meters at challenging sites with remote meters. These new meters would be offered to existing customers at a small fee, therefore giving customers the choice of more regular and accurate meter readings. This activity will mitigate the moderate health, safety, reputational and customer risks by no longer requiring estimated reads at challenging sites.

11 Lifecycle Strategies – SCADA Facilities

11.1 Asset Description

A SCADA system is used for monitoring and reporting gas flow and pressure. The Victoria and Albury SCADA system monitors 63 gate stations (or CTM's) and 45 regulating stations. Major industrial customers' sites are fitted with either data logging (accessed monthly) or telemetry. A further 40 sites have remote monitoring of fringe point system pressures.

Failure of SCADA monitoring to critical facilities such as gate stations and major DRS would result in the inability to detect (and thus respond to) alarms, although the station would continue to operate as designed. This may put at risk gas supply to several hundreds to tens of thousands of customers, depending on the site if a simultaneous fault at the station was undetected.

SCADA failures at fringe point monitoring sites would result in low network pressures not being detected, potentially resulting in poor or no supply to tens through to thousands of customers.

11.2 Plan and Create

Pressure telemetry is typically installed at all regulators and extremity points in the network. Flow telemetry are installed at all gate stations and critical regulators. Temperature telemetry are installed at most Water Bath Heater facilities.

Based on previous years, an additional 5-6 pressure telemetry locations are forecasted per year.

11.3 Operate and Maintain

The maintenance schedule for SCADA and telemetry systems comprises an annual visit to each site to:

- Test and calibrate all instruments, pressure and temperature transmitters, and verify flow computer calculations;
- Test batteries conditions and earthing systems;
- Clean solar systems and verify functionality; and
- Inspect hazardous area installations.

11.4 Manage Risks and Strategies

Typical issues being found are:

- Batteries requiring replacement;
- Slam shut switches sticking; and
- Rift of pressure transmitter calibration.

Generally, SCADA facilities are replaced as result of technical obsolescence. SCADA facilities have a technical life of about ten years. Over the last five years the move to standard communication protocols (GSM/GPRS) has driven changes to field devices using telecommunications.

The central SCADA facility (hardware/software) was upgraded to the national APA Clear SCADA platform in September 2013.

11.4.1 SCADA Strategies

11.4.1.1 Obsolete RTU's

The AGN SCADA system monitors and reports on the pressure and temperature of gas at gate stations, regulating stations, large customer sites and remote monitoring of fringe pressures. Without this capability operations would be flying blind and would be unable to safely operate sites which may lead to a loss of supply.

There are 140 Remote Telemetry Units (RTU's) or 28 RTU's to be replaced per year over the next AAP FY24 to FY28 in the Victorian networks system which are obsolete and are no longer supported by their manufacturers.

RTU's will be replaced 10 yearly ongoing to reduce the risk of a significant failure of the SCADA system. Replacements are prioritised based on number of customers affected, remote locations, whether they are SCADA controlled (critical stations), age and faults.

Telemetry at Regulators and Fringe Points

Several regulators and network fringe sites in regional areas in AGN's Victorian and Albury network do not have SCADA monitoring equipment. It is therefore not possible to monitor pressures at these sites on an ongoing basis. There are 30 SCADA sites to replace over the next AAP FY24 to FY28.

Real time SCADA monitoring of regulator supply pressures provide a "health" check of these facilities allowing timely diagnosis and rectification of equipment performance issues before problems arise. The goal is to ensure that the minimum supply pressure is maintained at distribution supply points, fringe points and the outlet of the meter.

The plan is to continue to identify critical locations at regulators and fringe points in the network and install SCADA telemetry at these sites.

11.4.1.2 SCADA Security

Currently APA Networks 3G/4G cellular communications system is not secure and exposes field equipment, SCADA and IT Billing Systems to high risk from a successful cyberattack. This could result in an unplanned loss of supply of up to 25,000 customers, unsafe site operation, no SCADA supervision, no slam-shut or critical alarms and no remote reset or valve control functions.

The strategy includes developing new procedures, systems, work instructions, increasing security by implementing cybersecurity countermeasures, and replacing obsolete 3G modems with pre-configured 4G modems connected directly to the secure VPN (virtual private network).

SCADA will be secure and more reliable. In the event of a cyberattack or major disaster all systems will be recoverable, minimising the impact on the business.

Placeholder: Strategy is still to be developed. Will provide high level estimate re strategy development time and implementation time.