Multinet Gas Networks

Attachment 9.14

Supply Regulators Strategy

Final Plan 2023/24 – 2027/28

July 2022

Multinet Gas Networks

Supply Regulators Strategy

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Originated by

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1. Executive summary

This document outlines the maintenance and replacement strategy for the supply regulators on the Multinet Gas Network (MGN). Our aim is to ensure supply regulators remain safe and reliable through preventive and corrective maintenance, coupled with planned replacement capital works.

We have identified the following planned replacement capital works that must be delivered during the next access arrangement (AA) period (FY2023 to FY2028):

1. Hydraulic regulator replacement;
2. Obsolete supply regulator replacement[1]; and
3. Miscellaneous works.

These programs are required to ensure we comply with our regulatory obligations under the Gas Safety Case, the Victorian Gas Distribution System Code of Practice, Australian Standard 4645 (AS/NZS 4645), and Australian Standard 2885 (AS/NZS 2885). These programs are ongoing, with the work proposed during the next AA period continuing from works conducted in the current period.

Note a number of district regulators that will become redundant following the removal of low pressure cast iron and unprotected steel mains from the network. These redundant regulators will be decommissioned as part of the planned main replacement program, and therefore do not feature in the program of work covered by this Supply Regulator Strategy.

The capital expenditure (capex) works for the next AA period are summarised in the following sections.

1.1 Financial summary

Table 1-1 provides a summary of the capex forecast to be incurred across the next AA period for each program. Average annual capex over the next five years is circa $0.3 million.

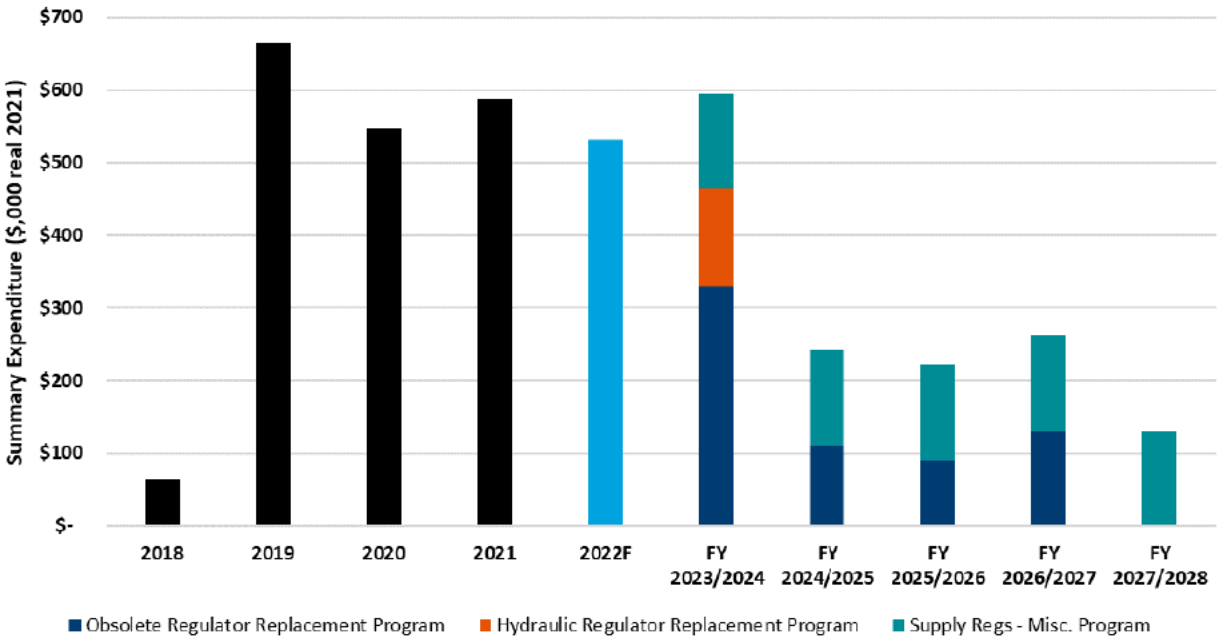
Table 1-1: Forecast supply regulator capital expenditure, $'000 real 2021

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Hydraulic regulator replacement	133.5	-	-	-	-	133.5
Obsolete regulator replacement	330.0	110.0	90.0	130.0	-	660.0
Miscellaneous works	131.0	131.0	131.0	131.0	131.0	655.0
Total expenditure	**594.5**	**241.0**	**221.0**	**261.0**	**131.0**	**1,448.5**

The overall program is consistent with historical expenditure and rates of replacement (see Figure 1-1). The initial peak in obsolete regulator replacement in 2023/24 is a continuation of the end of current period volumes, with a decline in volumes forecast as critical sites are replaced and subsequently diminish in volume.

[1] Note this program is distinct from the obsolete large consumer regulator replacement program, which is covered in the MG-SP0005 large Consumer Regulator Strategy.

Figure 1-1: Historical and forecast capex – supply regulators, $'000 real 2021



1.2 Program Breakdown

1.2.1 Hydraulic regulator replacement program

Hydraulic regulators use hydraulic fluid to control natural gas pressures. These types of regulators provide good performance at high flows and low temperatures and are commonly installed at City Gates[2].

Hydraulic regulators, while effective, are costly to maintain. The hydraulic fluid used in the regulators is susceptible to gas ingress. Over time, gas ingress can change the overall properties of the fluid, making it more compressible. This results in poor control and reduced pressure regulation functionality. To prevent this degradation, hydraulic regulators are overhauled every three years. This means maintenance and overhaul is considerably more intensive and more expensive than other types of regulators.

Hydraulic regulators also rely on controllers that vent gas to atmosphere as part of normal operation.

Given these ongoing maintenance issues, our strategy is to replace these hydraulic regulators where prudent to do so. There are four hydraulic regulator sites remaining in our network. Hydraulic regulators at three of these sites are being replaced as part of the Vermont Stage 1 and 2 augmentation projects over the course of the next two AA periods[3]. [redacted]

[2] Refer to Section 3.1.3 for the definition of a City Gate.
[3] Refer to MGN's Network Capacity Strategy (MG-PL-0002)

[redacted] The hydraulic regulator replacement program for 2023/24 to 2027/28 is summarised in Table 1-2. Refer to Section 5.4 for additional details on this program.

Table 1-2 Summary of hydraulic regulator replacement program, $'000 real 2021

Hydraulic regulator replacement	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Number of sites	[redacted]					
Cost ($'000)	[redacted]					
Program expenditure	**133.5**	**-**	**-**	**-**	**-**	**133.5**

1.2.2 Obsolete supply regulator replacement

Obsolete supply regulator replacement is an ongoing program to replace field, district or city gate regulators that are no longer supported by the manufacturer, or that have become non-compliant with contemporary standards or industry practices.

There are currently 179 supply regulators sites in our network. These sites host a range of different types and brand of regulator. There is a particular brand of regulator (Grove) that is no longer supported by the manufacturer. Grove has ceased production of some critical parts and no longer provides appropriate spares or technical support. This unavailability of spare parts places customers at risk of extended outages and disruption to gas supply if these regulator sites fail.

We have already commenced our program of Grove regulator replacement, with 19 of the highest risk, highest pressure Grove sites replaced during the current period. We have identified a further [redacted] that require replacement during the next AA period. These [redacted] are predominantly field regulator sites, regulating pressure from TP – MP, HP2 - HP, HP – MP, HP - LP and supplying tens of thousands of customers. We therefore propose they are all replaced during the next AA period.

Grove replacements will be prioritised by pressure, with transmission pressure fed regulators being replaced first, following by high/medium pressure regulators. This practice of prioritising replacement by pressure tiers is consistent with historical practice, and helps ensure those regulators that have the potential to disrupt supply to the greatest numbers of customers (upon failure) are addressed first. The obsolete supply regulator replacement program for 2023/24 to 2027/28 is summarised in Table 1-3. Refer to Section 5.5 for additional details on this program.

Table 1-3 Summary of obsolete supply regulator replacement program, $'000 real 2021

Obsolete supply regulators	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Number of sites	3	2	3	4	-	12
Unit rate ($'000)	110.0	55.0	30.0	32.5	-	
Program expenditure	**330.0**	**110.0**	**90.0**	**130.0**	**-**	**660.0**

The variable unit rate forecast for the Obsolete supply regulator replacement program is reflective of the number of regulators to be replaced at each site and whether the site is fed from Transmission

Pressure (TP) or High Pressure (HP). Sites fed by TP incur more project management, preparation of relevant approval documentation for submission to ESV and DELWP which results in a higher overall cost per site.

1.2.3 Miscellaneous works

Miscellaneous works covers expenditure for minor refurbishments identified as part of ongoing supply regulator inspections. For example, while the regulator itself may be in good working order, we may find that ancillary components such as slam shut panels and sense lines need replacing or adjusting. The miscellaneous works program allows us to conduct the necessary refurbishments outside of a major overhaul or replacement programs.

We have identified the following "minor miscellaneous" works required over the next AA period:

- updating hazardous area dossiers;
- district regulator sense line adjustments;
- Huber Yale insulation union installs;
- slam shut panels replacements; and
- noise improvement works.

The miscellaneous works program for 2023/24 to 2027/28 is summarised in Table 1-4. Refer to Section 5.6 for additional details on this program.

Table 1-4 Summary of miscellaneous works, $'000 real 2021

Site/Asset	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Miscellaneous items	131.0	131.0	131.0	131.0	131.0	655.0
Program expenditure	**131.0**	**131.0**	**131.0**	**131.0**	**131.0**	**655.0**

1.3 Efficiency of the proposed solutions

We consider that the proposed supply regulator programs reflect the minimum required to efficiently manage the asset class and mitigate the risk associated with regulator failure and leakage due to obsolete regulators and lack of manufacturer support.

Alternative options to the proposed program were considered, including utilising regulators until failure. However, MGN submits that maintaining the current rate of replacement reflects prudent asset management and makes the most efficient use of resources.

The supply regulator programs satisfy the requirements of the following National Gas Rules:

- **NGR 79(1)** – the proposed solution is consistent with good industry practice, several practicable options have been considered, and market rates have been tested to achieve the lowest sustainable cost of providing this service.
- **NGR 79(2)** – proposed capex is justifiable under NGR 79(2)(c)(ii), as it is necessary to maintain the integrity of services.
- **NGR 74** – the forecast costs are based on historical expenditure and latest market rate testing and project options consider:
    - all concurrent MGN strategies and plans
    - customer requirements and engagements
    - any third-party engagements

  Estimates are therefore arrived on a reasonable basis and represent the best estimate possible in the circumstances.

2. Document overview

2.1 Purpose

This document articulates MGN's approach to the management of its existing supply regulating assets and associated components. Supply regulators are inclusive of MGN's City Gates, Field Regulators and District Regulators. Refer to Section Glossary and definitions.

This Supply Regulator Strategy has the following objectives:

- identify the capital works program for 2023/24 to 2027/28;
- present cost estimates for the works program;
- provide justification and evidence that demonstrates the proposed program is prudent and efficient (as per requirements of NGR 79);
- demonstrate that the program cost and volume estimate have been arrived at on a reasonable basis (as per requirements of NGR 74); and
- provide a record of the proposed works program to help inform program delivery and asset management during the period.

The document is intended for use by:

- MGN staff (and its service providers); and
- Regulators – technical, safety and economic.

2.2 Scope

This strategy covers the management of MGN's existing supply regulating assets (both above ground and below ground) and their associated components. The strategy focuses on gas pressure regulating devices installed at:

- District Regulator sites – a District Regulator can supply gas to a reticulation system at an outlet pressure of up to 7 kPa;
- Field Regulators sites – a Field Regulator can supply gas at an outlet pressure greater than 7 kPa and is not supplied from a Class 600 transmission pipeline; and
- City Gates – a City Gate regulator can supply gas at an outlet pressure greater than 7 kPa and is supplied from a Class 600 transmission pipeline.

Strategies that are complementary to the Supply Regulator Strategy includes the:

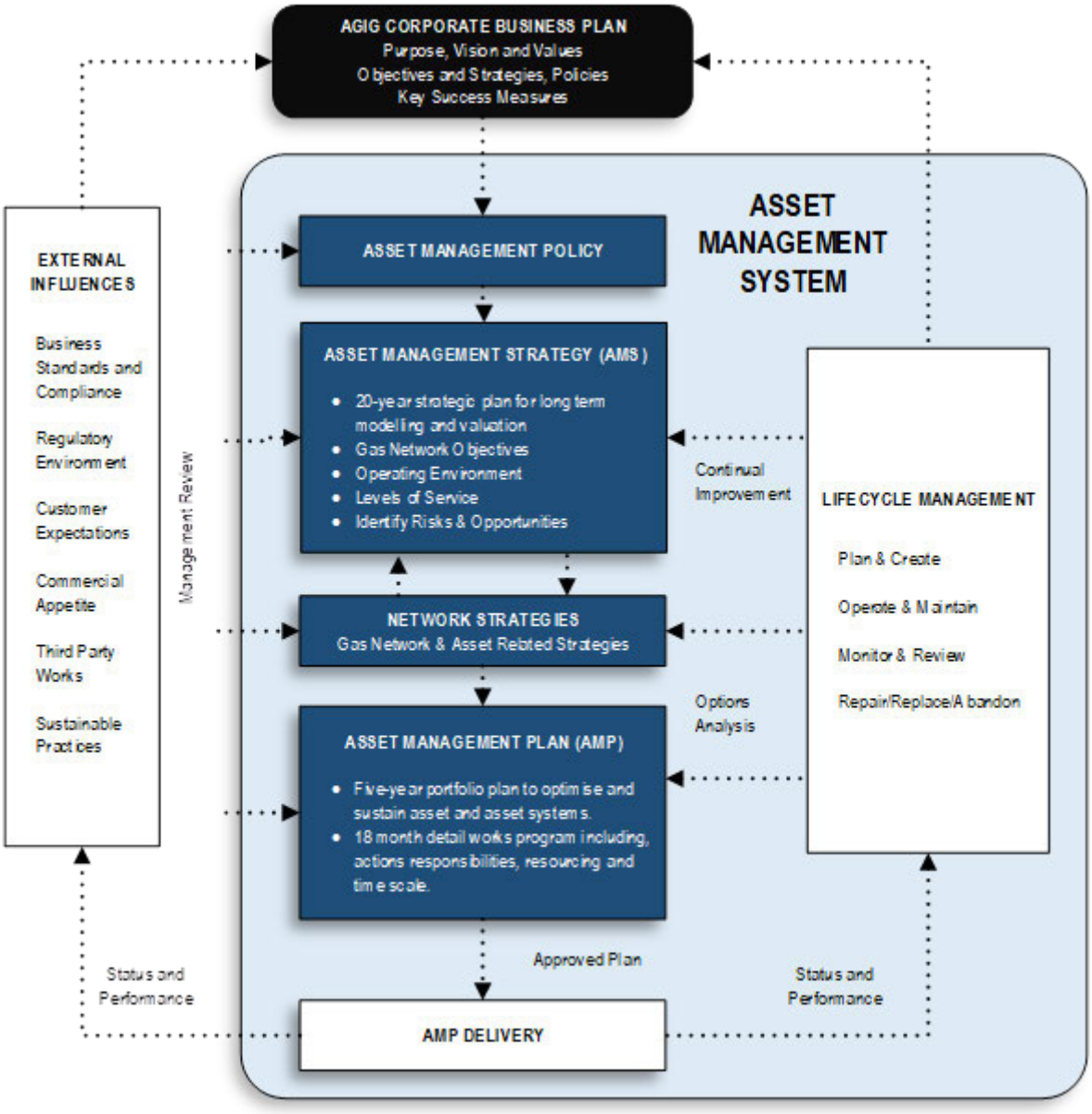
- installation of telemetry or SCADA related components – refer SCADA Strategy (MG-SP-0002);
- management of gas heating installations – refer to the Gas Heater Strategy (MG-SP-0015);
- installation, replacement and upgrade of custody transfer meters (CTM's) – Refer to the Metering Strategy (MG-SP-0007);
- replacement/refurbishment of large consumer pressure regulating facilities, which supply gas to end consumers – refer to the Large Consumer Regulator Strategy (MG-SP-005);
- revision of MGN's site security protocols, including key management – Refer to the Plant and Equipment Strategy (MG-SP-0014)

- replacement of mains within MGN's low pressure network – Refer to the Mains and Services Strategy (MG-SP-0009); and
- refurbishment of supply regulator enclosures, including pits, compounds and kiosks – refer to the Plant & Equipment Strategy (MG-SP-0014).

2.3 Relationship with other asset management documents

The Supply Regulator Strategy is one of a number of key asset management related documents developed and published by MGN in relation to its gas network. As indicated in Figure 2-1 below, detailed network strategies – including the Supply Regulator Strategy - informs both the Asset Management Strategy (AMS) and AMP of the required capital programs needed to achieve the long-term objectives of the gas distribution network.

Figure 2-1: Asset management framework



2.4 Financial figures used in this document

All financial figures quoted within this document - unless otherwise specifically stated - have the following characteristics:

- real un-escalated expenditure / Cost (reference year = June 2021);
- direct expenditure only (i.e. excludes overheads and finance costs);
- in units of $1,000 (i.e. $'000); and
- all years are denoted in financial year format (July to June), unless otherwise stated.

2.5 Data sources

The following data sources have been drawn on to develop the Supply Regulators Strategy:

- SAP - the MGN primary asset management database used to store all equipment related data; and
- Tableau - uses an extract (duplicate) of the SAP database so reporting can be performed in real time without diminishing the available bandwidth of SAP for business-as-usual processes.

2.6 References

Regulations governing the obligations of Distribution companies to provide gas transportation services and therefore impact on MGN's Supply Regulator Strategy include:

- MGN Gas Safety Case;
- Gas Distribution System Code of Practice (Version 15);
- Gas Safety Act 1997;
- Gas Pipelines Act 2005;
- National Gas Law; and
- National Gas Rules.

Other references include:

- AS/NZS 4645 series - Gas Distribution Networks;
- AS/NZS 2885 series – Gas and Liquid Petroleum;
- MGN Risk Management Plan;
- MGN - System Operations Manual;
- SCADA Strategy (MG-SP-0002);
- Gas Heater Strategy (MG-SP-0015);
- Plant & Equipment Strategy (MG-SP-0014);
- Network Capacity Strategy (MG-PL-0002); and
- Distribution Mains and Services Strategy (MG-SP-0009).
- Gas Metering Strategy (MG-SP-0007)

3. Asset overview

3.1 Introduction

Supply regulators (i.e. supply regulating stations) include District, Field and City Gate regulators. They are typically housed in buildings, kiosks and compounds. Their function is to regulate and maintain network pressures, and as such, they form a vital part of the gas supply backbone infrastructure. We have 179 regulator station sites in our distribution network. Table 3-1 shows the breakdown of the sites by type.

Table 3-1 Number of in-service supply regulator sites as of April 2022

Regulator type	Number in service
District regulator	68
Field regulator	104
City gate regulator	7
Total	**179**

3.1.1 District Regulators

A district regulator is a pressure regulating station that supplies gas to MGN's low pressure network at an outlet pressure of up to 7 kPa. We have 68 district regulators, mainly located in older areas of the network. We also have five relocatable district regulators for temporary installation during projects or for emergency use.

District regulators can supply anywhere between 1,000 and 10,000 customers (depending on location and local network configuration) and have the pressure configurations summarised in Table 3-2.

Table 3-2: District regulator pressure configurations

Inlet pressure	Outlet pressure
High pressure 2 (HP2)	Low pressure (LP)
High pressure (HP)	Low pressure (LP)
Medium pressure (MP)	Low pressure (LP)

3.1.2 Field Regulators

A field regulator supplies gas at an outlet pressure greater than 7 kPa and is not supplied from a Class 600 transmission pipeline. We have 104 Field regulators in service in the network. We also have five relocatable field regulators for temporary installation during projects or for emergency use. Field regulators can supply more than 10,000 customers (depending on location and network configuration) and have the pressure configurations summarised in Table 3-3.

Table 3-3: Field Regulator pressure configurations

Inlet pressure	Outlet pressure
Transmission Pressure (TP)	High Pressure (HP)
Transmission Pressure (TP)	Medium Pressure (MP)
Transmission Pressure (TP)	High Pressure 2 (HP2)
High Pressure 2 (HP2)	High Pressure (HP)
High Pressure 2 (HP2)	Medium Pressure (MP)
High Pressure (HP)	High Pressure (HP)
High Pressure (HP)	Medium Pressure (MP)
Medium Pressure (MP)	Medium Pressure (MP)

Field regulators are located relatively evenly across the MGN distribution area, supplying district regulators, industrial/commercial sites and domestic consumer networks.

3.1.3 City Gate Regulators

A City Gate regulator supplies gas at an outlet pressure greater than 7 kPa and is supplied from a Class 600 transmission pipeline. City gates typically supply more than 10,000 customers (depending on location and network configuration) and have the pressure configurations summarised in Table 3-4.

Table 3-4: City gate regulator pressure configurations

Inlet pressure	Outlet pressure
Transmission Pressure (TP)	Transmission Pressure (TP)
Transmission Pressure (TP)	High Pressure (HP)

[redacted]

City gates also feature gas heaters, which are used to heat the gas (prior to pressure reduction) to prevent low operating gas temperatures following the substantial step down in pressure. Gas heaters have their own maintenance and replacement strategy.[4]

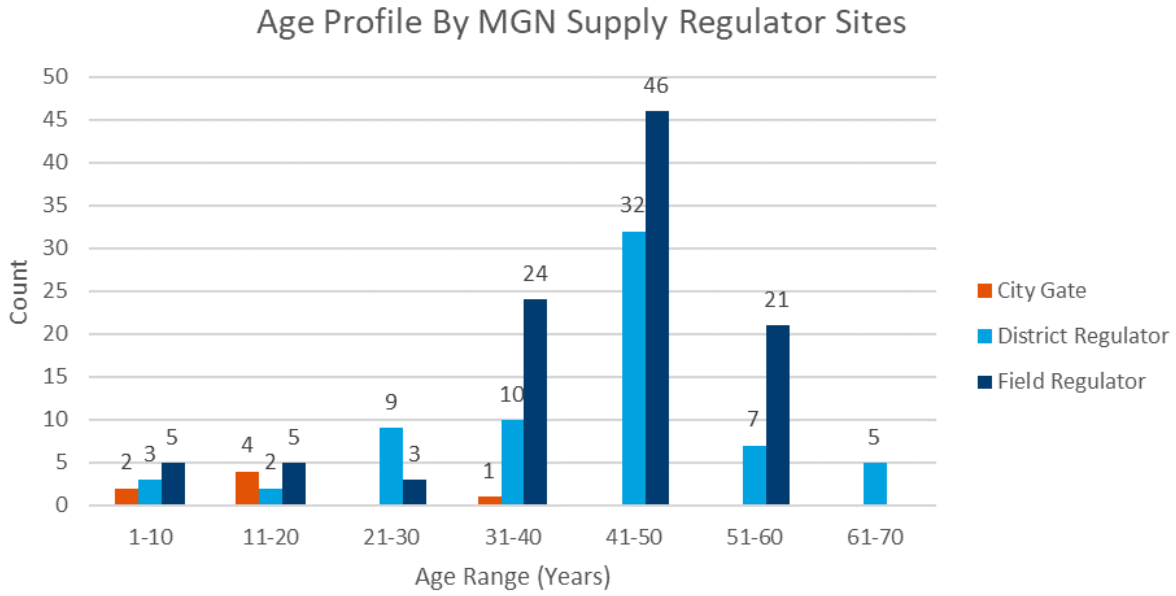
Gas throughput at City Gates is measured by Custody Transfer Meters (CTMs) which are owned and operated by APA Group (the operator of Victoria's Declared Transmission System). Refer to MGN's Metering Strategy (MG-SP-0007) for further details in CTMs.

[4] Refer MGN's Gas Heater Strategy (MG-SP-0015).

3.2 Asset age profile

The supply regulator age profile encompasses a broad timespan, with the oldest sites installed in the late 1950s by the former Gas and Fuel Corporation. Figure 3-1 shows the age profile for supply regulators, with more than 80% of the sites now being over 30 years old.[5]

Figure 3-1: Asset age profile for supply regulators



Refer to Appendix A for a breakdown of supply regulators by installation year.

3.3 Asset performance

The condition of supply regulator installations is predominantly good. This is due to regular maintenance practices that enable proactive addressing of most minor issues prior to risk escalation. The maintenance strategy for these assets encompasses both functional checks and full strip downs.

Full strip downs are conducted every 6 to 12 years, depending on the asset, and comprise a comprehensive overhaul of the regulator and associated assets (cleaning, painting, check valves, replace gaskets and corroded parts, etc.). This maintenance approach has proven to be an excellent strategy to maximise the asset life of the regulators in our portfolio.

Despite the ongoing maintenance program, asset age remains a factor. Older installations (30+ years) periodically require repair and/or re-coating, particularly those containing lead. Some installations installed during the early 1980s suffer from component corrosion due to age and material quality. Corrosion and coating issues are rectified as part of full strip down maintenance activities as and when they occur, and may result in maintenance being prudently brought forward to avoid asset failure.

[5] When considering 'average age' it should be noted that in some cases, commissioning date was based on when the conversion from manufactured gas to natural gas occurred as the original commissioning date is unknown. Individual components also may have been replaced multiple times since original commissioning date.

Generally, our preference is to use this maintenance and strip down schedule to extend the life of supply regulators where safe to do so. However, the ability to fully service and strip down supply regulators is impacted by the availability of parts and support.

As manufacturers develop their products, they will periodically cease to produce parts or offer technical support for older products, particularly those that have been superseded. This means the spare parts required to conduct asset overhauls can be difficult to source.

As a result, when an asset is due for a strip down one of the key considerations is whether the regulator is still supported, and a supply of spares is available. Where parts and support are available, we will conduct the full strip down as planned. Where the manufacturer has ceased support or has indicated it will cease support in the near future, we may opt to replace the obsolete regulator to ensure a sustainable approach to lifecycle management.

Other factors can influence whether a regulator is replaced rather than overhauled. For example, changes in industry practice or technical standards such as installation of over pressure shut of devices may necessitate a new regulator where there are currently no such controls in place.

3.3.1 District regulators

The overall condition of district regulators is predominantly good, with ongoing (minor) surface coating issues addressed during scheduled maintenance activities.

Our current management strategy for district regulators is to extend the life of the assets (where safe to do so) rather than replace them. This is because under our current mains replacement program we are removing all the low pressure cast iron and unprotected steel mains in our network, and replacing them with polyethylene pipe that can operate at higher pressures. When the low-pressure mains are removed, the low-pressure district regulator that supplies that section of network is no longer required and is decommissioned as part of the mains replacement program. The current plan is to remove all these low-pressure mains by 2032.

Wherever possible, we will manage the current fleet of low-pressure district regulators so that they can remain in service until they are scheduled for decommissioning as part of mains replacement. We will only replace a low-pressure district regulator upon failure, or where that particular regulator is obsolete and the risk of extending its life further is not tolerable.

3.3.2 Field regulators

The majority of these regulators are in good condition, with a small number requiring surface coating maintenance. Coating maintenance is an ongoing issue as pipework is continually damp during normal operation due to the pressure differential across the regulators as a result of the Joule-Thompson effect.

3.3.3 City gate regulators

All city gates are operated and maintained in accordance with Australian Standard AS 2885.3 – 2012. The regulators are in good condition due to the provision of above ground and indoor locations with gas pre-heating, and regular inspection.

3.4 Obsolete regulator models

Several different brands and models of regulators are used across the distribution network. As manufacturers develop new models, they will periodically cease support for older models of regulators, which can make spare parts difficult to source. As a prudent asset manager, we continually monitor development in regulator technologies and availability of spares, to ensure we can refurbish regulators with minimum disruption to customers and identify the most efficient window for replacement.

Most of the supply regulators currently within our network are still supported by manufacturers, and/or will remain serviceable within the next five years. However, we have identified a small number of models that have become or will shortly become obsolete and should be replaced. These obsolete models are discussed in the following sections.

3.4.1 Grove regulators

Grove regulators are installed on Field and District regulator sites. A number of these sites are installed with sleeve "201-03029-814". These sleeves are no longer in production, leading the manufacturer (Grove), to recommend sleeve "201-03024-814" as a replacement. We have found availability of these replacement sleeves to be limited, and the sleeve itself is ill-fitting and not fit for purpose. We have therefore commenced a program since 2017 to replace these Grove regulators with more suitable and supported assets.

As part of the Grove Replacement program, TP-TP, TP-HP and TP-MP sites have been prioritised over the current period for replacement based on their risk profile (19 sites in total). HP-MP Grove regulator sites will be scheduled for replacement from 2024 onwards.

3.4.2 Reynolds regulators

Reynolds regulators model 670 and 678 are predominantly District Regulators used to supply the Low Pressure network. The Reynolds 670 and 678 regulators are no longer in production and spare parts have been unavailable since 2001. Despite this, we have been able to maintain our fleet of Reynolds regulators by salvaging spare parts from district regulators that were decommissioned as part of the mains replacement program.

For Reynolds 670/678 regulators only seven sites are currently in operation. This year two will be decommissioned and one will be upgraded. The remainder will be removed over the next few years through the mains replacement program.

4. Asset management drivers

4.1 Network vision

The MGN vision informs the way we manage and invest in our assets.

Figure 4-1: Network vision and objectives

4.1.1 Delivering for customers

Our aim is to continue to deliver customers the service they want and value. This includes keeping people safe from harm, maintaining a reliable gas supply, and providing quality customer service.

The MGN gas distribution network is located in densely populated areas. This means we have a duty of care to make certain our assets are functioning properly, and that we can detect and prevent any potential safety issues.

This Supply Regulator Strategy aims to achieve a high level of customer satisfaction and service by providing a reliable means of gas supply to the distribution network. Central to this is ensuring the regulators remain operable and can be maintained/repaired without impacting customer supply any more than is absolutely necessary.

4.1.2 A good employer

We strive to be a leader in health and safety by ensuring employees and contractors are mindful of the factors affecting their physical and mental health. This is done through strict health and safety procedures, incentive programs and regular workshops and health screenings.

Wherever practicable and prudent to do so, we aim to apply technologies such as telemetry and remote monitoring, which helps limit our employees' and contractors' exposure to manual and sometimes hazardous network management activities. We also focus on maintaining asset integrity, reducing the risk of leaks and/or failure which carry the potential for harm.

We aim to ensure high employee engagement by keeping employees up to date with relevant town halls and workshops of the entire business. Skills development is also a focus, ensuring both contractors and employees have the relevant skills and requirements for performing their roles.

4.1.3 Sustainably cost efficient

We aim to be sustainably cost efficient, working within benchmarks while still providing benefits to the customer and to shareholders. We intend to ensure natural gas remains a competitive, value-for-money fuel option in line with customer interests and expectations.

The maintenance and replacement strategies outlined in this document are aimed at improving the efficiency of the MGN network – providing the lowest cost of service to network users. We aim to deliver these programs for the lowest practicably sustainable cost, and consider a range of options before committing to a course of action.

We are also mindful of our environmental and social responsibilities, and will test our asset management strategies and work practices against relevant environmental, sustainability and societal obligations.

The regulator replacement program targets certain regulators and aims to replace them with suitable newer models for which parts are adequately supported by the manufacturer. This program will ensure that the older model regulators are being replaced in a cost-efficient manner and will build a suitable level of strategic spares that can be used in the event of any breakdown of a similar model on the network. The timing of replacement of these regulators is planned to coincide with the dates of their planned strip down maintenance to ensure that these regulators are replaced in the most cost-efficient manner.

4.2 Network objectives

We manage the network in line with six asset objectives, which are linked to the AGIG vision and underpin our asset management practices. Achieving these network objectives enables us to provide good customer service, remain a good employer and be sustainably cost efficient.

Operate and invest in assets to keep the public and MGN's employees safe	MGN will achieve this by: • Investing in and operating the network in line with the 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 MGN's customers	MGN will achieve this by: • Meeting network availability KPIs; • Maintaining operating pressures through monitoring and augmenting MGN's network; and • Addressing leaks in line with MGN's leak management plan.
Improve MGN's customers' service experience in line with their expectations	MGN 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

MGN 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

MGN 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

MGN will achieve this by:

- Considering alternative innovative, sustainable and/or lower long-term cost solutions;
- Pursuing research and development opportunities where they facilitate us to meet MGN's vision and objectives; and
- Supporting the decarbonisation of MGN's gas supplies and the move to smarter gas networks.

4.3 Technical and regulatory requirements

4.3.1 Technical obligations

This strategy aims to achieve a high level of technical compliance by ensuring that all maintenance and replacement activities are carried out to meet the requirements of the:

- MGN Safety Case;
- AS/NZS 4645 series - Gas Distribution Networks;
- AS/NZS 2885 series – Gas and Liquid Petroleum; and
- Victorian Gas Distribution System Code of Practice (V.15).

4.3.2 Consistency with the National Gas Objective and the National Gas Rules

In developing these forecasts, we have had regard to the National Gas Objective (NGO) and Rule 79/91 and Rule 74 of the National Gas Rules (NGR). With regard to all projects, and as a prudent asset manager/network business, we give careful consideration to whether capex is conforming from a number of perspectives before committing to capital investment.

National Gas Objective

This strategy furthers the NGO by promoting efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas.

National Gas Rules (NGR)

The supply regulator programs satisfy the requirements of the following National Gas Rules:

- **NGR 79(1)** – the proposed solution is consistent with good industry practice, several practicable options have been considered, and market rates have been tested to achieve the lowest sustainable cost of providing this service.
- **NGR 79(2)** – proposed capex is justifiable under NGR 79(2)(c)(ii), as it is necessary to maintain the integrity of services.
- **NGR 74** – the forecast costs are based on historical expenditure and latest market rate testing and project options consider:
    - all concurrent MGN strategies and plans
    - customer requirements and engagements
    - any third party engagements

  Estimates are therefore arrived on a reasonable basis and represent the best estimate possible in the circumstances.

4.4 Risk management

Risk management is a constant cycle of identification, analysis, treatment, monitoring, reporting and then back to identification (as illustrated in Figure 4-2). When considering risk and determining the appropriate mitigation activities, we seek to balance the risk outcome with our delivery capabilities and cost implications. Consistent with stakeholder expectations, safety and reliability of supply are our highest priorities.

Our risk assessment approach focuses on understanding the potential severity of failure events associated with each asset and the likelihood that the event will occur. Based on these two key inputs, the risk assessment and derived risk rating then guides the actions required to reduce or manage the risk to an acceptable level.

Figure 4-2: Risk management principles

MGN's risk management framework is based on:

- AS/NZS ISO 31000 Risk Management – Principles and Guidelines;
- AS 2885 Pipelines-Gas and Liquid Petroleum; and
- AS/NZS 4645 Gas Distribution Network Management.

The Gas Act 1997 and Gas Regulations 2012, through their incorporation of AS/NZS 4645 and the Work Health and Safety Act 2012, place a regulatory obligation and requirement on MGN to reduce risks rated high or extreme to low or negligible as soon as possible (immediately if extreme). If it is not possible to reduce the risk to low or negligible, then we must reduce the risk to as low as reasonably practicable (ALARP).

When assessing risk for the purpose of investment decisions, rather than analysing all conceivable risks associated with an asset, we look at credible, primary risk events to test the level of investment required. Where a credible risk event has an overall risk rating of intermediate or higher, we will undertake investment to reduce the risk.

Six consequence categories are considered for each type of risk:

1. **People** – injuries or illness of a temporary or permanent nature, or death, to employees and contractors or members of the public.
2. **Environment** (including heritage) – impact on the surroundings in which the asset operates, including natural, built and Aboriginal cultural heritage, soil, water, vegetation, fauna, air and their interrelationships
3. **Supply –** disruption in the daily operations and/or the provision of services/supply, impacting customers
4. **Compliance** – the impact from non-compliance with operating licences, legal, regulatory, contractual obligations, debt financing covenants or reporting / disclosure requirements
5. **Reputation** – impact on stakeholders' opinion of MGN, including personnel, customers, investors, security holders, regulators and the community
6. **Financial** – financial impact on MGN, measured on a cumulative basis

Note that risk is not the sole determinant of what investment is required. Many other factors such as growth, cost, efficiency, sustainability and the future of the network are also considered when we develop engineering solutions. The risk management framework provides a valuable tool to

manage our assets, and prioritise our works program, however it is not designed to provide a binary (yes/no) trigger for investment. As prudent asset managers, we apply our experience and discretion to manage and invest in our distribution networks in the best interests of existing and potential customers.

4.5 Lifecycle management

Lifecycle management is broken up into four key components. These are described below.

4.5.1 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 network;
- provide new network, metering and SCADA facilities; and
- augment existing assets as capacity limitations are reached due to a customer requiring an increased peak flow, or volume, of gas.

4.5.2 Operate and maintain

Operation and maintenance involves three principal sub-processes. These are described below.

Surveillance and monitoring

Inspection activities are dependent on-site type and configuration as follows:

- District regulator sites with fixed outlet pressure – these sites are inspected monthly, via 'chart rounds'. The inspection covers housing integrity, regulator operation, gas leakage and water ingress, in accordance with AS/NZS 4645. These sites receive scheduled pressure change visits which are coordinated to cater for seasonal demand.
- District regulator sites with time clock modules & data logger – these sites are inspected bi-monthly. The inspection covers housing integrity, regulator operation, gas leakage and water ingress, in accordance with AS/NZS 4645. These sites receive scheduled pressure changes visits coordinated to cater for seasonal demand.
- District regulator sites with SCADA – these sites are inspected annually for housing integrity, regulator operation, gas leakage and water ingress, in accordance with AS/NZS 4645. These sites currently receive two scheduled pressure changes visits coordinated to cater for seasonal demand.
- Field regulator sites without SCADA – these sites are inspected every six months for housing integrity, regulator operation, gas leakage and water ingress, in accordance with AS/NZS 4645 and AS/NZS 2885.3. Slam Shut Panels (where fitted) are checked for correct actuator operation.
- City gate & field regulator sites with SCADA – these sites are routinely inspected every four months and receive an operational check every eight months to ensure integrity. Inspections are scheduled to occur between operational checks.

Other equipment located at City Gates:

- Heaters – refer to the Gas Heater Strategy (MG-SP-0015) for information on gas heater inspection frequencies.
- CTMs – refer to the Metering Strategy (MG-SP-0007) for information on CTM maintenance and inspection frequencies.

Preventative maintenance

- District Regulators – preventive maintenance is carried out on the following basis:
    - all sites receive a twelve-monthly operational check as well as a ten-yearly full strip down maintenance; and
    - most sites receive pressure schedule change visits, scheduled to occur twice a year. The variation in seasonal load dictates when these visits are to occur; an area specific maintenance plan is used to schedule this work. Not all sites are visited during this activity, as the site setting may not require changing.

  The full strip down maintenance schedule for district regulators (with and without SCADA) was extended from six years to ten years in 2017 following a review of existing maintenance frequencies and a risk assessment. Equipment performance is tested annually with remedial measures implemented at this time.
- City Gate and Field regulators – preventive maintenance is carried out on the following basis:
    - sites without SCADA receive six-monthly operational check and ten-yearly full strip-down maintenance (mandatory soft spare replacement);
    - sites with SCADA receive a four-monthly site inspection, an eight-monthly operational check; and
    - depending on the type of regulator installed and its criticality within the distribution system, a scheduled full strip-down (mandatory soft spare replacement) is performed every three years e.g. Sir William Fry Reserve and Aughtie Dr Sites, and regulators containing hydraulic fluid.

The above maintenance activities were changed in 2017 following a review of existing maintenance frequencies and a risk assessment. Changes were:

- the full strip-down maintenance schedule for field regulators without SCADA was extended from six years to ten years;
- the site inspection schedule for field regulators with SCADA was extended from three-monthly site visits to four-monthly site visits; and
- the operational check schedule for field regulators with SCADA was extended from six-monthly to eight-monthly site visits.
- the full strip-down maintenance frequency for district regulators was extended from six years to ten years in 2017 following a review of existing maintenance frequencies and a risk assessment. An RCM process similar to that applied to other industrial & commercial regulators has been applied to supply regulators as well.

Corrective maintenance

Supply regulator faults and defects are generally reported and rectified as follows:

- by the control room through SCADA alarms received from site;
- by the review of operational data;
- by the maintenance crew, who rectify any defects as far as practicable during scheduled maintenance activities;
- during routine or random inspections/audits;
- rectifications of defects occur during the next scheduled maintenance or by a special visit if warranted;
- faults are rectified as a priority over scheduled works; and
- by the public if there is a smell of gas or excessive noise on site.

4.5.3 Monitor and review

Monitoring of assets includes the following:

- capacity to meet customer demands for gas, delivered at required flow rates and pressures;
- highlighting existing and emerging issues related to normal ageing over time, accelerated aging or new risk issues;
- continuous collection of operational data, trend monitoring for emerging issues and amendment to operational procedures or capital program recommendations post risk analysis;
- auditing to ensure activities and processes comply with required industry standards. The results of both internal and external auditing are reported to management;
- performance measures – supply regulator performance is measured during regulator performance trials, prior to acceptance and use by MGN. Individual regulator site performance is measured and recorded during scheduled and corrective maintenance works. These measures are analyzed on a regular basis to ensure the correct strategies are being applied.

Our reviewing activities include:

- review of real time data;
- review of field reports and assessments;
- review of asset performance, condition and integrity KPIs. These are reviewed on a monthly basis in the monthly operating and management report and annually through, amongst others, the Distribution System Performance Review.
- review of quarterly and annual regulatory reports

Key internal audits include:

- supervisor monitoring audit;
- verification audits - The purpose of these audits is to verify that audits of task related activities provide credible and consistent results;

- technical facility audits - Findings from these audits are reported to management through detailed reports; and
- MGN audits - as required to provide confidence that contractors are operating with due diligence and in compliance with requirements. The results of these audits are communicated to the AGIG management team.

Key external audits include:

- 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; and
- Safety Management Plan audits – external auditors may be engaged to conduct audits on particular aspects of safety or operating plans.

4.5.4 Repair, replace, abandon

From time to time there is a requirement to repair, replace or abandon an asset. Any significant programs that are not considered as part of routine repair or maintenance are captured in this Supply Regulator Strategy.

Refurbishment of supply regulators and associated components is usually undertaken as a capital project. To promote efficient delivery of the work, regulator refurbishment is aligned with scheduled maintenance activities, where practicable.

Supply regulator components vary widely with regards to age, type, function and utilisation. Refurbishment is therefore determined on a case-by-case basis. The primary drivers for refurbishment are:

- failing to maintain lock-up and/or set pressure;
- gas leakage – internal and/or external;
- reduced operational capabilities;
- improving maintenance efficiencies;
- aligning to industry good practice; and
- availability of spare parts.

Replacement or abandonment of supply regulators and associated components is primarily driven by:

- **availability of serviceable spare parts.** As critical equipment replacement parts become unavailable, equipment can no longer be maintained to satisfactory levels. Equipment must be replaced with suitable commercially supported units to mitigate the risk of longer loss of supply incidents. Replacement will be based on the forecast availability of spares and the current level of regulator family exposure;
- **ability to meet capacity requirements**. As gas load/volume changes occur within the distribution network, so does the ability of the supply regulator to meet capacity requirements. As such, regulator upgrade or replacement is undertaken when a site's component(s) rated capacity is forecast to be exceeded and is likely to cause an increased risk in gas supply outage.

  The forecast for capacity related station upgrades (considered Augmentations) is contained within the MGN Network Capacity Strategy (MG-PL-0002).

- **ability to meet operational, safety and regulatory requirements**. District regulators installed prior to the formation of the Gas and Fuel Corporation have limited or no regulated bypass facilities. These sites no longer meet MGN standards and require re-work/replacement in order to meet current operational requirements.

It is important to note that the replacement of a supply regulator may be deferred if there are mains replacement projects planned for the near future which will result in the site being decommissioned. These sites will continue to receive operational checks to ensure integrity, however full strip down maintenance will not be carried out on them.

4.6 Network adaptation – renewable gas

In line with MGN's objective to support energy sector decarbonisation, our asset management practices consider the introduction of hydrogen into MGN's network. Where practicable, when replacing gas distribution network equipment and components, we purchase parts that are compatible with hydrogen and renewable gas, taking a prudent and incremental approach to making the network 'hydrogen ready'.

This incremental approach allows us to facilitate the energy policy direction to decarbonise Australia's energy sector, and to do so in an efficient manner. Gas transmission and distribution pipelines are among Australia's most important energy transportation systems. It is vital these high value assets keep pace with the energy transition happening right across the country, and we ensure the gas networks are ready to transport renewable gas.

5. Capital program – 2023/24 to 2027/28

5.1 Program overview

We have identified the following programs that must be delivered during the next access arrangement (AA) period (2023 to 2028):

- Hydraulic regulator replacement;
- Obsolete supply regulator replacement; and
- Miscellaneous works.

These programs are required to ensure we comply with our regulatory obligations under the Gas Safety Case, the Victorian Gas Distribution System Code of Practice, AS/NZS 4645 and AS/NZS 2885. These programs are ongoing, with the work proposed for the next AA period continuing on from works conducted during the current period.

A number of District Regulators will become redundant following the removal of low pressure cast iron and unprotected steel mains in the network. These redundant regulators will be decommissioned as part of the main replacement program, and therefore do not feature in this Supply Regulator Strategy program of work.

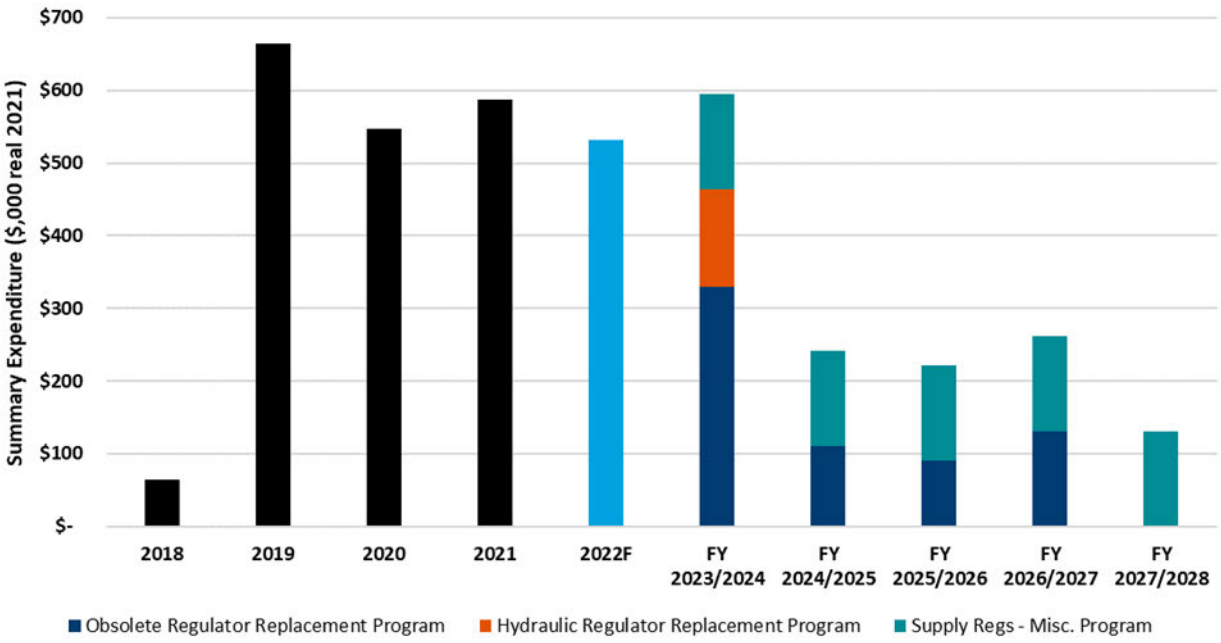
From time to time, Supply Regulator sites that are subject to obsolescence are also identified for capacity upgrade under the MGN Network Capacity Strategy (MG-PL-0002). Where this is the case, assessment is undertaken on the timing of capacity constraints against the timing of age/obsolescence replacement. To ensure efficient expenditure, site upgrades are scoped and timed to ensure the most efficient outcome. This may include partial upgrade via a staged approach to resolve obsolescence whilst considering future capacity requirements, or full upgrade if both obsolescence and capacity requirements are required to be resolved.

Table 5-1 and Figure 5-1 provides a breakdown of capital expenditure from 2023/24 to 2027/28 by program. The majority of expenditure for supply regulators is driven by obsolete supply regulator replacement and miscellaneous works program. Average annual expenditure is $0.3 million for the period.

Table 5-1: Forecast supply regulator capex program, $'000 real 2021

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Hydraulic regulator replacement	133.5	-	-	-	-	133.5
Obsolete regulator replacement	330.0	110.0	90.0	130.0	-	660.0
Miscellaneous works	131.0	131.0	131.0	131.0	131.0	655.0
Total direct expenditure	**594.5**	**241.0**	**221.0**	**261.0**	**131.0**	**1,448.5**

Figure 5-1: Historical and forecast capex – supply regulators, $'000 real 2021



Unit costs are based on the historical costs previously incurred in completing similar regulator replacement projects.

5.2 Customer and stakeholder engagement

MGN is committed to operating the network in a manner that is consistent with the long-term interests of our customers. To facilitate this, we conduct regular stakeholder engagement to understand and respond to the priorities of our customers and stakeholders. Feedback from stakeholders is built into our asset management considerations and is an important input when developing and reviewing our expenditure programs.

Our customers have told us their top three priorities are price/affordability, reliability of supply, and maintaining public safety. The asset management activities outlined in this strategy are primarily associated with maintaining reliability of supply at the lowest practicable cost.

Our customers rely on a continuous gas supply to be able to heat their homes and operate their businesses. Any disruption to supply can adversely impact residential customers and carry significant financial consequences for our industrial and commercial customers. Our obsolete regulator replacement program is designed to minimise the risk of disruption to customer supply by ensuring regulators are supported and/or have a reliable supply of spare parts to allow us to address any supply issues quickly.

5.3 Estimating efficient costs

The costs derived for these programs have been estimated based on historical costs incurred in completing similar projects. To achieve efficiency in design, engineering and project management, most projects in the replacement program are bundled together to ensure common skill sets and project delivery teams are used for similar works, thereby delivering the most efficient service.

The projects under the obsolete regulator replacement program are programmed to continue the replacement of critical sites at a similar rate to the CY 2021 and CY 2022 program with a decline in

future years as critical sites are replaced. We consider this profile will achieve the most efficient outcomes for the business and customers in terms of asset utilisation, risk reduction, timing of the works and resource availability.

All expenditure related to the programs covered by this strategy is capex. Cost estimates are based on the following factors:

- vendor quotes for equipment;
- historical project costs for internal or external labour and estimated effort;
- design, engineering, construction and commissioning costs; and
- other ancillary materials.

The unit rates used for all projects managed within this program of work include the internal labour, external labour, materials, design, engineering, construction, project management and commissioning costs forecast.

Historical projects completed under this strategy have typically included 40:60 labour / materials split. The forecast works program is very similar to historical works scope, which makes this 40:60 split a reasonable assumption for the expenditure going forward. This labour / material split is shown in Table 5-2 below.

Table 5-2: Cost breakdown, Supply Regulator Strategy, $'000 real 2021

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Labour	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Materials	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total expenditure	**595**	**241**	**221**	**261**	**131**	**1,448.5**

Table may not sum due to rounding

5.4 Hydraulic regulator replacement

5.4.1 Program summary

Hydraulic regulators use hydraulic fluid to control natural gas pressures. These types of regulators provide good performance and high flows and low temperatures, and are commonly installed at City Gates.

The hydraulic fluid used in the regulators is susceptible to the ingress of gas. Over time, gas ingress can change the overall properties of the fluid, making it more compressible. This results in poor control and reduced pressure regulation functionality. To prevent this degradation, hydraulic regulators are overhauled every three years. Hydraulic regulators rely on controllers that also vent gas to atmosphere as part of normal operation; which is not ideal.

Due to the frequency of overhauls, and the costly and intensive nature of maintenance, it is proposed to replace these assets.

We have four Jetstream hydraulic regulator sites remaining at City Gates on our network. Three stations at Vermont (both legs) and one station at [redacted] (both legs). Jetstream regulators are particularly susceptible to gas ingress, and have been prioritised for replacement.

The three Vermont regulator stations are being replaced as part of the Vermont Stage 1 and 2 projects. Vermont Stage 1 is an augmentation project within our Network Capacity Strategy (MG-PL-0002) during the current AA period, with Stage 2 being delivered in the next AA period.

The Jetstream hydraulic regulators at [redacted] have been earmarked for replacement and are the focus of this Supply Regulator Strategy. In addition to the general issues with hydraulic regulators described above, Jetstream regulators do not offer flow control within a tight range, and has caused operating parameters to be exceeded at the downstream CTMs owned by APA. Though the parameter exceedance has been intermittent, if it continues it will result in the need for a costly CTM upgrade. Therefore, the most prudent and efficient course of action is to replace the hydraulic regulators at [redacted] with more reliable, lower maintenance assets.

Table 5-3 summarises the proposed capex for this hydraulic regulator replacement program. We have prioritised the [redacted] regulator for replacement in the first year of the next AA period.

Table 5-3 Capex forecast for hydraulic regulator replacement. $'000 real 2021

Site/Asset	ID	2023/24	2024/25	2025/26	2026/27	2027/28	Total
[redacted]	P6-002	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total expenditure		**133.5**	**-**	**-**	**-**	**-**	**133.5**

5.4.2 Recommended option

Our recommended option to address the risk associated with the Jetstream hydraulic regulator at [redacted] is to replace it proactively. As an alternative option we considered allowing the regulator to run to failure, maintaining it with spare parts where practicable and only replacing the full regulator reactively. However, this does not mitigate the potential requirement for a requested CTM upgrade by APA at MGN's cost due to the CTM intermittently operating outside its measurement parameters.

While reactive replacement would enable us to defer upfront costs, it exposes customers to greater risk of supply outages, as well as carrying a greater inherent safety risk. The Jetstream regulators are installed at City Gates, which supply tens of thousands of customers. This means there is potential for a major supply risk event if the regulator fails.

Spare parts are becoming increasingly difficult to source, which means it may not be prudent to extend the life of the asset further. Reactive replacement is also typically more expensive than scheduled replacement, therefore running the asset to failure would not reflect the lowest sustainable cost of providing services.

Proactive replacement of the Jetstream hydraulic regulators is considered the most prudent option because it:

- mitigates control issues potentially impacting APA's CTM operating parameters;
- significantly reduces the strip down maintenance intervals with the new regulators and hence reduce opex costs;
- maintains security of supply;
- maintains alignment with network objectives of safety, compliance and efficiency;
- replaces aging assets with new and better technology. (The Jetstream regulators were introduced into the network in 1960s and were installed up to 2007);
- is the only option that reduces risks to an acceptable level; and

- will support lower overall costs of delivering services which is sustainably cost efficient and in the long-term interests of customers.

The unit rate for this program is based on recent pricing for projects currently underway [redacted]. For [redacted], activities include station design, procurement of four control valves, associated pipework, valve actuator replacement, overall construction and associated system operations labour costs.

5.5 Obsolete supply regulator replacement

5.5.1 Program summary

The MGN network currently has 179 supply regulator sites[6]. MGN has been replacing obsolete regulator models and configurations at these sites since 2012. We have identified [redacted] that have, or will have, unsupported equipment or non-compliant factors that require replacement and/or upgrade. Where regulators have fallen out of manufacturer support, parts and technical service will no longer be available for these regulators, placing the customers at risk of extended outages and disruption to gas supply if the regulators fail.

Supply regulators can supply tens of thousands of customers. If a field regulator or a similar transmission/high pressure regulator fails, it carries a significant supply risk. We therefore plan to replace regulators at all [redacted] identified sites during the next AA period.

Replacements will be prioritised by pressure, with transmission pressure fed regulators being replaced first, following by high/medium pressure regulators. This practice of prioritising replacement by pressure tiers is consistent with historical practice, and helps ensure those regulators that have the potential do disrupt supply to the greatest numbers of customers (upon failure) are addressed first.

The [redacted] identified for regulator replacement all contain Grove regulators. The Grove regulators are no longer supported by the manufacturer and have obsolete and/or defective sleeves. By proactively replacing these obsolete regulators, MGN can install the current manufacturer supported models of regulators and build up a suitable level of strategic spares for the remaining population of the obsolete regulator models still operating in the network.

[redacted] of the [redacted] are field regulator stations. These Field Regulators are HP-fed and supply tens of thousands of customers. We have therefore prioritised these sites for regulator replacement during the first three years of the next AA period. The remaining three sites are HP-fed District Regulators supplying the low pressure network.

While the strategy for the majority of our District Regulators is to decommission them as part of the ongoing low pressure mains replacement program (through to the following AA period), these three Grove sites are not scheduled for decommissioning as part of mains replacement during the next AA period. Given the scarcity of parts, known issues with sleeves, and lack of manufacturer support, we consider the risk to customer supply posed by failure of these obsolete assets is above reasonable risk tolerances. We will therefore replace these obsolete Grove regulators during the next AA period

The unit rates for obsolete supply regulator program are based on historical expenditure incurred in similar replacement projects in the current access arrangement period. Moreover, the estimated

[6] April 2022

costs will be lower due to the reduced technical complexity in developing project documentation as these sites will be predominantly HP fed and will not require ESV approval.

The forecast volumes reflect the current run rate of regulator replacement we're achieving during this current period. The number of regulators to be replaced at each site varies, though most sites targeted for the replacement program have only one Grove regulator in them. The forecast capex for the program is presented in Table 5-4.

Table 5-4: Capex forecast for Obsolete regulator replacement program, $'000 real 2021

Site/Asset	ID	Model	Site type	23/24	24/25	25/26	26/27	27/28	Total
[redacted]	P3-004	Grove	Field	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	P4-023	Grove	Field	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	P2-119	Grove	Field	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	P2-132	Grove	Field	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	P2-143	Grove	Field	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	P2-200	Grove	Field	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	P2-204	Grove	Field	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	P2-093	Grove	Field	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	-	Grove	District	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	P2-014	Grove	Field	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total expenditure				**330**	**110**	**90**	**130**	**-**	**660**

5.5.2 Recommended option

We considered an alternative option, including moving to reactive replacement only. This alternative option is discussed in Appendix C.

However, we consider the recommended option of proactively addressing all 12 identified obsolete supply regulator sites is the most prudent and efficient course of action because:

- it is consistent with the requirements of our risk management framework as it reduces risk to an acceptable level;
- it delivers a balanced portfolio of work for a proven delivery rate;
- it is the most cost-effective option of reducing the risk of equipment failure to as low as reasonably practicable;

  it is consistent with our vision of being a good employer;
- it will support lower overall costs of delivering services which is sustainably cost efficient and in the long-term interests of customers; and
- it is aligned to good industry practice and maximises asset integrity and life.

5.6 Miscellaneous works

5.6.1 Program summary

Miscellaneous works covers expenditure for minor refurbishments identified as part of ongoing supply regulator inspections. For example, while the regulator itself may be in good working order, we may find that ancillary components such as slam shut panels and sense lines need replacing or adjusting. The miscellaneous works program allows us to conduct the necessary refurbishments outside of a major overhaul or replacement program.

As supply regulator components vary with age, type, function and utilisation, these works are determined on a case-by-case basis. Works are undertaken as a project and where possible aligned with scheduled maintenance activities.

The key elements of the miscellaneous works program identified for the next AA period are summarised below.

Hazardous area dossiers

Supply regulators with SCADA or electrical equipment are considered hazardous areas under Australian Standards. These standards demand a dossier with full description of the hazards and potential ignition sources. Maintaining these dossiers with the latest standards and changes to individual sites is an ongoing project forecast to cost approximately $8,000 per year, which provides for 4 sites.

District regulator sense lines

The level of district regulator capacity utilisation has led to the need to relocate regulator sense lines to outside of the enclosure, allowing more accurate pressure control during high/low conditions. This modification is relatively [redacted] and is conducted

on an 'as required' basis, typically one site per year. This modification will not be made to any district regulators scheduled for decommissioning as part of the low-pressure mains replacement program during the next AA period.

Huber Yale insulation unions

Insulation unions are installed in supply regulator stations together with insulating flanges to ensure the electrical separation of structures. The Huber Yale insulation unions were installed over a number of years and have been found to fail under moderate fault conditions. This is due to a relatively small external spark gap that is susceptible to dirt and moisture accumulation. These insulation unions will be replaced as part of any capital programs pertaining and the cost captured as part of this strategy. The forecast cost is approximately [redacted]

Slam shut panels

The increased utilisation and reliance on SCADA control at Field Regulators and City Gates has revealed a new failure mode. The use of SCADA control on both regulator runs masks the traditional drop in outlet pressure when a regulator run reaches maximum capacity. If an older style slam shut panel closes the "B" leg actuator, then the station is forced to run only on the "A" leg unless it is manually reset. We therefore plan to replace the older style slam shut panels with newer versions and eliminate the failure mode mentioned above. The forecast cost for this project is [redacted], which allows for [redacted] units to be replaced per year. A total of [redacted] sites with the older slam shut panels exist in operation currently.

Noise improvement works

In 2004, MGN initiated a study involving noise testing of 30 supply regulator sites. The results have been used as the basis of MGN's Environmental Improvement Plan (EIP) – Gas Noise, completed in July 2005. A correlation study was conducted to extrapolate the data gained from the study across the broader population of Supply Regulator sites. As a result, a further 26 sites were tested. Engineering solutions for the identified 'noisy' sites have been implemented, providing a range of potential solutions and outcomes given similar situations.

Due to the nature of MGN's operations, there is an ongoing risk of non-compliance with the State Environment Protection Policy (SEPP) N-1 Control of Noise from Commerce, Industry and Trade. There is also an ongoing possibility of receiving complaints from residents situated within close proximity to supply regulator sites, exacerbated in areas where there is residential building encroachment. A watching brief is being maintained on developments at such locations.

Currently, MGN's loudest supply regulator is at Aughtie Drive; however there are no known complaints for the regulator. Aughtie Drive Regulator is not situated close to any residences or areas of consistent public presence.

MGN is currently trialling new silenced regulators to determine the cost / benefit. The use of silenced regulators is considered during the design stage of every new or replacement regulator.

To address ad-hoc noise related issues and to continue development of noise abatement solutions we have forecast [redacted], which will allow us to develop solutions and install at [redacted] site per year.

Other minor works

It is not feasible to account for every small specific event or incident that could impact the network. We therefore propose an allowance of [redacted] be set aside to cover for such events. This is consistent with historical spend and allows us to complete the most urgent reactive minor works on sites as necessary. The capex forecast for miscellaneous works is provided in Table 5-5.

Table 5-5 Capex forecast for miscellaneous works, $'000 real 2021

Site/Asset	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Miscellaneous items	131.0	131.0	131.0	131.0	131.0	655.0

5.6.2 Recommended option

The proposed miscellaneous works program outlined above is our recommended option as this program of minor works allows MGN to mitigate ongoing asset risks at a relatively low cost.

We considered the alternative option of not conducting these works proactively, instead addressing any asset issues reactively or as part of a larger capital project on that asset (e.g. regulator replacement works). However, moving to a reactive environment is less cost efficient than proactive works, as the cost of conducting repairs/replacements reactively are typically higher than scheduled replacement. There is also the potential consumer impact to consider if we allow assets to run to failure.

We therefore consider undertaking the proactive miscellaneous works as proposed is the most prudent and efficient course of action.

Appendix A Installations by year

Year	Units Installed	Year	Units Installed	Year	Units Installed
1958	2	1980	5	2002	3
1959	1	1981	13	2003	1
1960	1	1982	5	2004	1
1961	1	1983	4	2005	2
1962	1	1984	4	2007	1
1964	1	1985	2	2008	2
1965	1	1986	5	2010	1
1966	1	1987	6	2012	1
1968	4	1988	2	2014	1
1969	11	1989	3	2015	1
1970	6	1990	2	2017	6
1971	3	1991	2	2018	1
1972	5	1992	9	2019	
1973	6	1993	1	2020	1
1974	2	1994	2	2021	1
1975	2	1996	1	2022	2
1976	13	1997	2		
1977	22	1998	2		
1978	2	1999	1		
1979	8	2000	3		

Note: This table includes 10 temporary relocatable regulators used for projects and emergencies. The number of sites in service at any one time can vary as projects are ongoing. This table provides an exhaustive list of installations by year, hence the total (190) may vary from the total in service currently.

Appendix B Regulator Types – Model by Quantity

Regulator Make and Model	Year	Units Installed
Cocon 26	1998-Ongoing	3
Fisher 298T (EG, ET, EK and K)	1968-still	34
Fisher 166	1958-1959	1
Fisher 66	1964-1990	19
Reliance 3000	1958-1969	1
Reliance 3010	1968	1
Grove Model 80	1962-1972	130
Grove Model 81	1970-1983	
Grove Model 83	1993-1994	
AMC Axial Flow Valve	1961-Ongoing	289
Jetstream	1966-1980	16
Welker jet	1989-Ongoing	6
Reynolds 670 / 678	1958-1986	9
Reynolds 682 series	2002-Ongoing	10
Apperval	2003-Ongoing	7
Reval	2003-Ongoing	3
GFC Butterfly	1958-1998	28
Gorter / Enraf R100S(M)	2008-Ongoing	12
Reval 182	2014-Ongoing	
PF Reflux 819 FO	2014 - Ongoing	4

Appendix C Obsolete supply regulator replacement – Options analysis

C.1 Options considered

The following options have been identified to address the risk associated with keeping the network operational with obsolete model supply regulators.

- Option 1 – Carry out the obsolete regulator replacement program; or
- Option 2 – Reactively replace obsolete regulators upon failure.

These options are discussed in the following sections

C.1.1 Option 1 – Carry out the obsolete regulator replacement program

This option involves replacing 12 identified obsolete supply regulator sites within the next access arrangement period.

Cost assessment

The capital cost of this option is $0.66 million. The table below provides the planned profile of replacements across the period. This has been profiled by risk, with the highest operating pressures and potential magnitude of loss of supply being considered. Following our risk based approach, the high pressure regulators will be completed first, with the next regulators to be completed being those that feed medium pressure networks, followed by low pressure networks.

This project will be delivered by a mix of internal and external authorised contractors.

Table Appendix 1: Option 1 capex forecast – Obsolete supply regulator replacement, real $'000

Site/Asset	ID	Model	Site type	23/24	24/25	25/26	26/27	27/28	Total
[redacted]	P3-004	Grove	Field	[redacted]					
[redacted]	P4-023	Grove	Field	[redacted]					
[redacted]	P2-119	Grove	Field	[redacted]					
[redacted]	P2-132	Grove	Field	[redacted]					
[redacted]	P2-143	Grove	Field	[redacted]					
[redacted]	P2-200	Grove	Field	[redacted]					
[redacted]	P2-204	Grove	Field	[redacted]					

Site/Asset	ID	Model	Site type	23/24	24/25	25/26	26/27	27/28	Total
[redacted]	P2-093	Grove	Field	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	-	Grove	District	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	P2-014	Grove	Field	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Direct Expenditure ($'000)				330	110	90	130	-	660

Risk assessment

The key risk event is that a field regulator will fail causing a loss, or overpressure, of the distribution network. Not having available spare parts or suitable replacements units would significantly extend the gas off supply time.

This could lead to several possible outcomes including a risk to the health and safety of the customer or field personnel, loss of supply to customers, and environmental concerns due to the release of natural gas to the atmosphere as a result of deteriorating or substandard parts.

A supply loss to >1,000 customers, or sensitive customers such as hospitals, nursing homes, and industrial sites presents a credible risk scenario. The untreated risk (i.e. with no controls to expedite repairs in place) is considered an intermediate supply risk, coupled with a related 'intermediate' reputational risk as customer dissatisfaction grows. The intermediate risk is not considered ALARP.

Table Appendix 2: Risk assessment – untreated risk

MGN Operational Risk Matrix							
Untreated	People	Supply	Environment	Reputation	Financial	Compliance	Overall Risk
Frequency	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Intermediate
Severity	Trivial	Severe	Trivial	Trivial	Trivial	Minor	
Risk Level	Negligible	Intermediate	Negligible	Negligible	Negligible	Low	

Option 1 reduces the likelihood of a prolonged return to service to hypothetical, which results in the overall supply and reputational risk assessment being negligible. This option is consistent with the requirements of our risk management framework, as it allows MGN to systematically address risks associated with obsolete regulators in a descending risk profile.

Table Appendix 3: Risk assessment – Option 1

MGN Operational Risk Matrix							
Option 1	People	Supply	Environment	Reputation	Financial	Compliance	Overall Risk
Frequency	Hypothetical	Hypothetical	Hypothetical	Hypothetical	Hypothetical	Hypothetical	Negligible
Severity	Trivial	Trivial	Trivial	Trivial	Trivial	Trivial	
Risk Level	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	

Alignment with vision objectives

The following table shows how Option 1 aligns with our vision objectives.

Table Appendix 4: Alignment with vision – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	-
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

Option 1 would align with our objectives of *Delivering for Customers*, as it would address the risk of these regulators failing as well as maintaining a reliable supply of natural gas for customers on the network

The replacement of these regulators would also improve the health and safety of field personnel working at these sites and therefore would be consistent with being *A Good Employer*.

The program is a common across the industry and thus works within industry benchmarks and aligns with the MGN vision of being *Sustainably Cost Efficient*. It also manages the risk of poor pressure control which allows MGN to be environmentally and socially responsible.

C.1.2 Option 2 – Reactively replace the obsolete regulators upon failure

This option entails continuing to operate obsolete supply regulator models on the network rather than replacing them. We will only replace the regulators and/or components upon failure. Selection of this option will mean few spare parts will be available for scheduled overhaul maintenance or breakdown maintenance.

Cost assessment

This option has no up-front capital cost. Without available spare parts, operating maintenance costs will likely reduce in the short-term as regulators will not be able to be maintained adequately. However replacing the units reactively on failure will likely cost significantly more than if done so proactively due to additional procurement, materials and reactive (likely outside of normal working hours) labour costs.

Risk assessment

This option does little to address the untreated risk, as the potential for the aged and obsolete regulators to fail remains, as will the potential for extended outage times as we attempt to source spare parts/replacements.

Failure may result in poor pressure control and possible supply outages during peak periods or the station supplying peak pressures, while reactive replacement is completed. This leads to the potential for industrial and commercial customers supply to be cut off, causing customer outrage and financial impacts resulting in significant compensation payments and the associated risk to reputation.

Option 2 does not reduce the risk to low or ALARP, and is therefore inconsistent with the requirements of our risk management framework.

Table Appendix 5: Residual risk – Option 2

MGN Operational Risk Matrix							
Option 2	**People**	**Supply**	**Environment**	**Reputation**	**Financial**	**Compliance**	**Overall Risk**
Frequency	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Intermediate
Severity	Trivial	Severe	Trivial	Trivial	Trivial	Minor	
Risk Level	Negligible	Intermediate	Negligible	Negligible	Negligible	Low	

Alignment with vision objectives

The following table shows how Option 2 aligns with our vision objectives.

Table Appendix 6: Alignment with vision – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	-
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

Utilising the regulators until failure would not align with our objectives of *Delivering for Customers*, as it would/would not address the risk of these regulators failing thus not maintaining a reliable supply of natural gas for customers on the network.

In addition, this option would not improve the health and safety of field personnel working at these sites and therefore would not be consistent with being *A Good Employer*.

This option is not within industry benchmarks and does not align with the MGN vision of being *Sustainably Cost Efficient*. It also does not manage the risk of poor pressure control which does not allow MGN to be environmentally and socially responsible.

Glossary and definitions

The table below is a comprehensive list of asset management terminology and acronyms commonly used at AGIG. Note not all these terms may appear in this document.

Term	Meaning
AA	Access arrangement
ACIF	Australian Construction Industry Forum
AEMO	Australian Energy Market Operator: Responsible for the administration and operation of the wholesale national electricity market in accordance with the National Electricity Code.
AER	Australian Energy Regulator: Responsible for the economic regulation of energy networks.
AGIG	Australian Gas Infrastructure Group
AGN	Australian Gas Networks
AHC	Australian Hydrogen Centre
ALARP	As low as reasonably practicable
AMP	Asset Management Plan
AMS	Asset Management Strategy
ARS	Ancillary Reference Service - Standard services offered by Multinet Gas at fixed charges
AS/NZ	Australian/New Zealand Standards
AUS EX	Australian Program for the Certification of Equipment for Explosive Atmospheres
Available testing	Testing of a non-faulty meter returned from the field less than 10 years old from purchase or repair tested in a meter testing facility before being re-installed in the field to complete its in-service life.
Capex	Capital expenditure
Cathodic protection	Prevention of corrosion by application of direct electric current to the surface of a metal.
Cathodic protection unit (CPU)	A device providing cathodic protection current, powered from an external energy source. Such energy sources include mains power, solar, etc. Cathodic protection units require permits and registration in accord with the Electricity Safety (Cathodic Protection) Regulations 2009
Cathodically protected	An electrically isolated area within the distribution system, of size convenient and practicable for assessing and maintaining the effectiveness of corrosion protection

Term	Meaning
(Distribution) area	
CI	Cast iron
Coating quality survey	A survey conducted by traversing directly above a coated main along its length using equipment and techniques designed to identify any defects in the coating. Methods in common use include "Pearson" and Direct Current Voltage Gradient (DCVG)
Coil (Electromagnetic coil) Survey	An electromagnetic tracing technique for locating points of failed insulation or electrical contact to other metallic structures.
Corrosion	The deterioration of metal caused by its electrochemical reaction with its environment
CP	Cathodic Protection
CPU	Cathodic Protection Units
CTM	Custody Transfer Meter. A large capacity meter installed at every injection point from the DTS to MGN's network.
Current AA period	Jan 2018 to June 2023
Data logger	Interval metering equipment that counts pulses from the mechanical meter index and records gas volume.
Direct Current Voltage Gradient (DCVG) Survey	A type of coating quality assessment survey conducted by traversing above the pipeline using equipment that applies pulsating DC electrical signals to identify coating defects.
Drainage Bond	An electrical connection via cable from a point in the distribution system to tram or train substations to prevent adverse effects from stray currents. These installations include equipment to control the direction and magnitude of current flowing.
DTS	Declared Transmission System
EDMI	Meter manufacture and supplier to MGN
EFT	Economic Feasibility Test
Electrical isolation	The electrical separation of structures to be protected from other structures and/or electrical systems. This is achieved by the installation of insulating flanges, monolithic insulating joints and insulating couplings
ESV	Energy Safe Victoria. A government body responsible for the safety and technical regulation of energy networks in Victoria.
FIRB	Foreign Investment Review Board

Term	Meaning
FLE	Field Life Extension. Alternative name for Sample Testing Program/in-service compliance testing of diaphragm meters <30m3/hr.
Flow corrector	Interval metering equipment which can correct gas flow to energy with the help of live pressure and temperature values.
FY	Financial year
Galvanic (Sacrificial) anode	A block of metal which provides protection by preferentially sacrificing itself instead of allowing the steel to corrode.
Gas meter	Mechanical device (usually) used to measure the volumetric flow rate of gas that passes the device. The volume of energy that passes through the meter is dependent on both gas pressure and temperature when the volume is measured
GDSC	Gas Distribution System Code
GFC	Gas and Fuel Corporation
GFCV	The Gas and Fuel Corporation of Victoria
GIS	Geographic Information System
GJ	Giga Joule, 1 Giga Joule = 1,000,000 Joules
GPC	Group Pressure Control
GPRS	General Packet Radio Services
GSC	Gas Safety Case
GSM	Global System for Mobile Communications
HDPE	High density polyethylene
HP	High pressure (140 to 515 kPa)
HP2	High pressure 2 (600 to 1050 kPa)
I&C	Industrial and Commercial
IEC EX	International Electrotechnical Commission System for certification to Standards Relating to Equipment for Use in Explosive Atmospheres
ILI	In line inspection
Interval meter site	Installation which is large enough (with respect to gas usage) to warrant the use of hourly metering data via a data logger of flow corrector.
IO	Input output

Term	Meaning
kPa	KiloPascals
L&G	Landis & Gyr – Meter manufacture and supplier to MGN
Large meter	Meter with capacity greater than >10 sm^3/hr.
LP	Low pressure (1.4 to 7 kPa)
MAOP	Maximum allowable operating pressure
Meter family	A group of the same meter brand and type installed in the same calendar year.
Meter type	Refers to the technique employed to measure gas flow i.e. Rotary, Turbine, Diaphragm.
MG	Multinet Gas
MGN	Multinet Gas Networks
MHQ	Maximum Hourly Quantity
MIBB	Market Information Bulletin Board
MP	Medium pressure (35 to 210 kPa)
MPE	Maximum Permissible Error
NATA	National Association of Testing Authorities
NCC	Network Control Centre
Next AA period	July 2028 to June 2028
NGL	National Gas Law
NGR	National Gas Rules
NMI	National Measurement Institute
Non-reference Service	Non-standard services offered by MGN provided at fair and reasonable cost.
OEM	Original Equipment Manufacturer
OMSA	Operational and Management Services Agreement between MGN and Service Provider
Opex	Operating expenditure
PE	Polyethylene
PIG	Pipeline Inspection Gauge

Term	Meaning
PMC	Periodic meter change
PVC	Poly vinyl chloride
RAB	Regulated asset base
RF	Radio Frequency
RTU	Remote Telemetry/Terminal Unit
Sample testing program	Annual program whereby sample meters from each meter family population are tested as per AS/NZS 4944 to determine their on-going or extension to their in-service life in the field
SAP	An Enterprise Resource Planning tool which used recording asset data and maintenance management.
SCADA	Supervisory control and data acquisition
SEPP	State Environment Protection Policy
Shared assets	Shared network assets – for example, Mains in the street
SIOS	SCADA Input Output Schematic
sm^3/hr	Standard cubic meters per hour (either Gas or Air).
Small meter	Meter with capacity less than 10 sm^3/hr. Normally used for Residential (domestic) purposes.
SMS	Safety Management Study
Spot potential reading	A measurement of pipe-to-soil potential taken at a given location at a particular point in time. Such readings can be used to assess protection status where potentials do not vary with time. However, in circumstances where potentials fluctuate due to telluric or stray current influences, recordings of potential over a period of time (usually 24 hours) are necessary
Stray current electrolysis	Is the effect of stray currents on buried metallic structures
Tariff D	Tariff D applies to customers using greater than 10,000 GJ a year or more than 10 GJ MHQ.
Tariff L	Tariff L is open to customers who consume more than 1,000 GJ per annum or less than 10,000 GJ per annum and have an MHQ demand of less than 10 GJ per hour.
Tariff V	Applies to customers using less than 10,000 GJ a year and less than 10 GJ MHQ.
Test point	A conveniently located termination point for electrical cables connecting to a buried pipeline. This allows measurement of the pipeline potential, and is the principal method of assessing the effectiveness of corrosion protection. Test points are also required for coating quality surveys and electromagnetic coil surveys to investigate losses in protection

Term	Meaning
Thyristor drainage unit (TDU)	Electrical equipment, usually installed in tram or train substations, to provide sufficient negative voltage for drainage bonds to be effective. The output voltage of TDUs is normally controlled so as to vary in accord with substation load
TJ	Terajoule
TP	Transmission Pressure (Pressure Range: Above 1050 kPa)
UAFG	Unaccounted for gas
UPS	Unprotected steel
Variable conductance drainage bond (VCDB)	Electronic equipment used to control the current in a drainage bond. The output current of VCDBs is normally controlled to maintain a set level of protection on a structure
Victorian Electrolysis Committee (VEC)	The Victorian Electrolysis Committee comprises membership of all parties affected by or causing stray current electrolysis. It is responsible for co-ordination of testing and adjustment required to maintain effective protection from stray currents and to control interference between adjacent cathodic protection systems. It is also responsible for administration of cathodic protection permits and regulations under the authority of Energy Safe Victoria.