Multinet Gas Networks

Attachment 9.18

Gas Heater Strategy

Final Plan 2023/24 – 2027/28

July 2022

Gas Heater Strategy

MG-SP-0015 FY2023 - FY2028, Ver 4.0

Multinet Gas Networks

Preparation record

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Table of Contents

1. Executive summary

This document outlines the maintenance and replacement strategy for the gas heaters on the Multinet Gas Network (MGN). Our aim is to ensure a high level of reliability for gas heaters through preventive and corrective maintenance, coupled with planned refurbishment works where necessary and prudent.

Gas heater assets in the MGN network are generally in good condition. However, ongoing gas heater inspections have identified some minor refurbishment capital works that must be delivered during the next access arrangement (AA) period (2023 to 2028) in order to maintain the assets in working order and address risks associated with these. This includes:

1. Fire tube monitoring conversions at three water bath heaters, addressing a lack of access to the tube internal surface of water bath heaters that prevents effective monitoring and cleaning;
2. Installing burner management system monitoring at three sites, and electric heater management system monitoring at one site, improving the ability to detect faults;
3. Proactively replacing obsolete water bath heater burner management system controllers at two sites, prior to discontinuation of support for the existing controllers in 2025; and
4. Procuring replacement elements for electric heater assets to ensure redundancy and mitigate heater failure during the approximately six-month lead time for manufacture and delivery of a new element.

This program is required to ensure we comply with our obligations under the Gas Safety Case, the Victorian Gas Distribution System Code, Australian Standard 4645 (AS 4645), and Australian Standard 2885 (AS 2885).

1.1. Financial summary

Table 1-1 provides the financial summary of the capital expenditure forecast to be incurred across the financial year period 2023/24 to 2027/28 for each project. Average annual capex over the next five years is $0.14 million.

Table 1-1: Summary of gas heaters program forecast capital expenditure ($'000 real 2021)

Program	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Fire tube monitoring conversion	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Burner and electric heater monitoring	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Electric heater element redundancy	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Heater control replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total direct expenditure	**291**	**140**	**195**	**0**	**76**	**702**

1.2. Efficiency of the proposed solutions

We consider that the proposed gas heater projects are the minimum required to efficiently manage the asset class and mitigate the risk associated with gas heater reduced functionality or failure. We considered alternative options to the proposed program, including not undertaking the proposed program, as well as delaying the electric heater element redundancy aspect of the program until later in the period. However, we submit that the scope and timing of the whole refurbishment program is modest, deliverable, reflects prudent asset management, and makes the most efficient use of resources.

We consider the proposed program satisfies 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 the historical expenditure and project options consider the asset management requirements as per the latest Asset Management Strategy. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

2. Document overview

2.1. Purpose

This document articulates MGN's approach to the managing of its gas heater assets. It is one of several asset strategies developed and maintained for the management of MGN's gas distribution network. The Gas Heater Strategy has the following objectives:

- Articulate the key areas of focus in relation to asset management, risk, investment, cost and service standard outcomes for the network regulating asset class;
- Show alignment of asset management practices with Gas Network Objectives.
- Provide a forecast of CAPEX for the FY2024 to FY2028 forecast period for inclusion in MGN's Asset Management Plan (AMP) and financial budgets.

In delivering these objectives, justification and evidence is provided to demonstrate that the proposed program is prudent and efficient (as per requirements of NGR 79) and are arrived at on a reasonable basis (as per requirements of NGR 74).

The document is intended for use by:

- MGN staff (and its contractors); and
- regulators - technical, safety and economic.

2.2. Scope

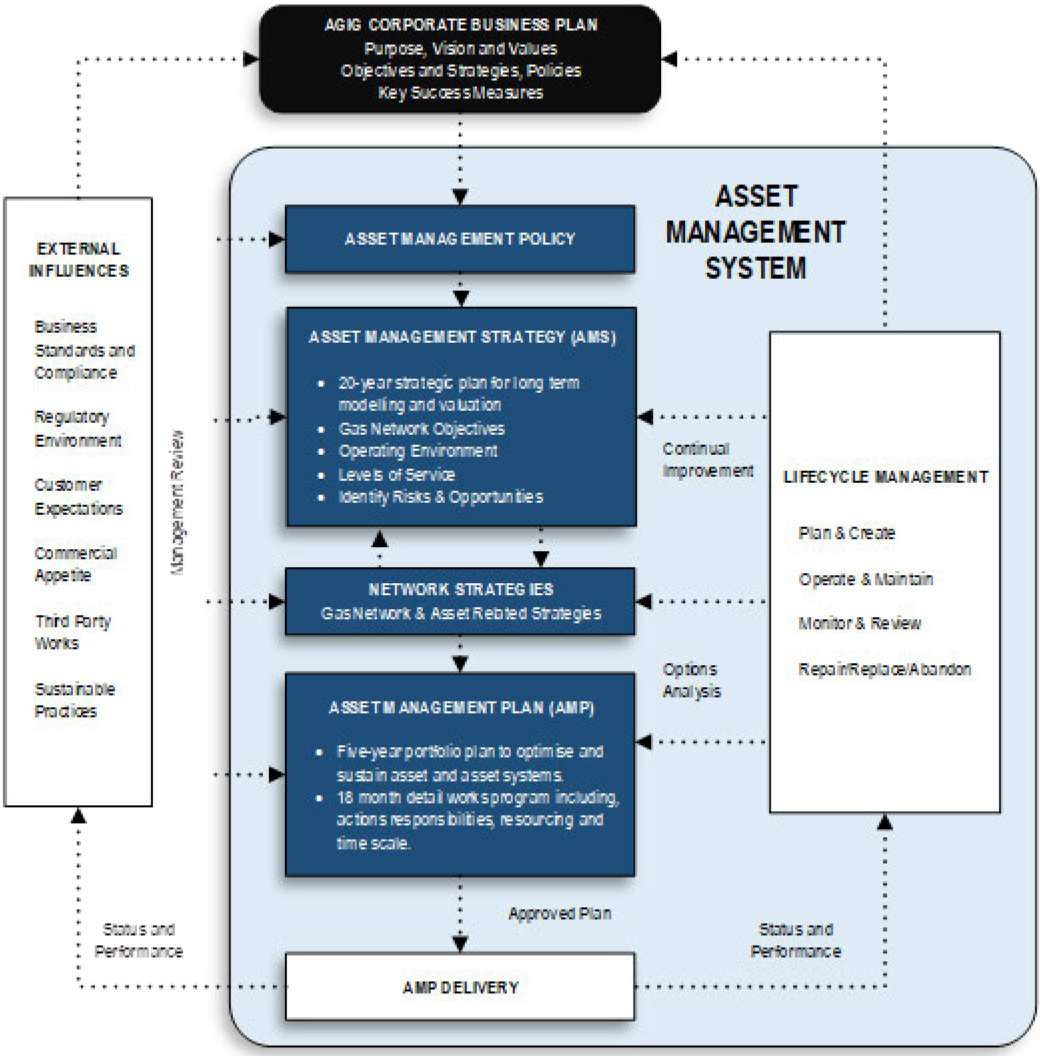
This strategy covers the management of gas heater assets:

- installed at city gate facilities located throughout the MGN distribution network; and
- installed directly within supply regulator facilities.

2.3. Relationship with other key asset management documents

The Gas Heater Strategy is one of a number of key asset management related documents developed and published by AGIG in relation to its gas network. As shown in Figure 2-1 below, detailed network strategies – including the Gas Heater Strategy - informs both the Asset Management Strategy (AMS) and Asset Management Plan (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 unescalated expenditure / cost (reference year = June 2021);
- direct expenditure only (i.e. excludes overheads and finance costs); and
- in units of $1,000 (i.e. ,000).

2.5. Data sources

The following data sources have been drawn on to develop the Gas Heater Strategy:

- SAP – MGN's primary asset management database used to store all equipment related data; and
- Service provider reports.

2.6. References

Regulations governing the obligations of distribution companies to provide gas transportation services and therefore impact on MGN's Gas Heater Strategy include:

- MGN Gas Safety Case;
- Gas Distribution System Code (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 Model;
- MGN - System Operations Manual;
- SCADA Strategy (MG-SP-0002);
- Network Capacity Strategy (MG-PL-0002); and
- Distribution Mains Strategy (MG-SP-0009).

3. Asset overview

3.1. Introduction

The purpose of a heater is to increase the temperature of gas prior to pressure reduction to prevent unacceptably low gas temperatures post pressure reduction. The phenomenon of temperature change within a fluid that occurs during pressure changes is significant. The 'Joule-Thompson effect' summarises the effect on natural gas pressure reduction; 'for every 1,000 kPa drop in pressure there is a 5.4° C drop in temperature'. The higher the mass flow rate of gas, the higher the energy input required to maintain desired outlet gas temperature.

Gas preheating is important to prevent the formation of ice in the pressure regulating facility, and to protect steel pipe from being subjected to temperatures below -29°C, the point at which the properties of steel change. In addition, the fixed factor billing of consumers relies on gas temperature of +15°C at the inlet to the gas meter.

Gas heaters and other heat exchangers are defined by the method of heat generation (gas burners, electric induction) and method of heat exchange (shell and tube water bath, conduction etc.). The design type and ability to meet demand ultimately determines the life of the equipment.

Table 3-1 shows the number of type of heaters in the MGN network.

Table 3-1: Number & Type of Heaters

Heater type	Number of units
Water bath	[redacted]
Boiler and heat exchanger	[redacted]
Electric	[redacted]
Vortex	[redacted]
Total	**13**

The following sections describe how each of the different heater types work.

3.1.1. Water bath heater

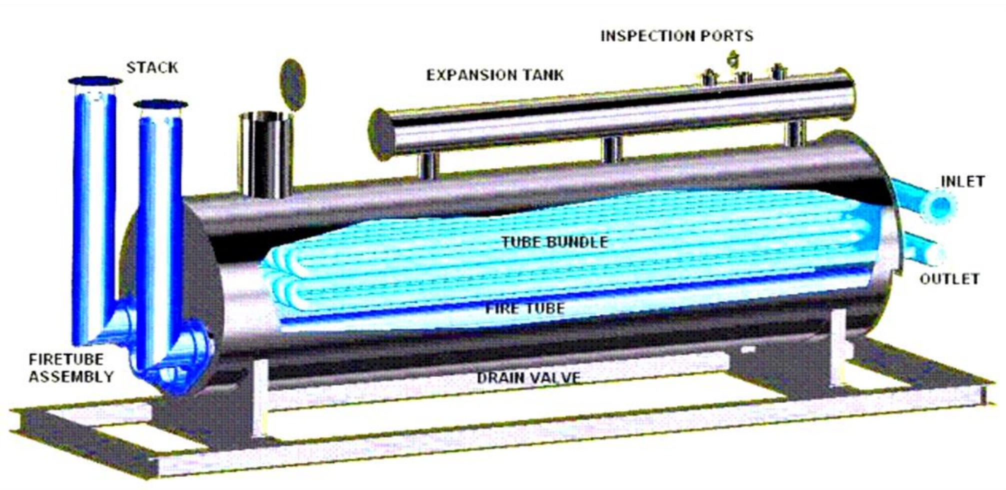
The method of operation is to create a tank filled with water that is heated by fire tubes. Process coils (series of pipes) that carry the high-pressure gas are immersed in the heated water. The fire tubes are pipes filled with hot air from the burning of natural gas. Figure 3-1 shows a typical water bath heater.

The desired outlet temperature of the gas is controlled by throttling the burners to heat the water, which in turn heats the gas. Typically, the water temperature is approximately 50°C and of a large volume. This large volume of water creates long lag times for heating; thus the water is constantly heated to maintain water temperature.

Figure 3-1: Typical water bath heater

The water in the bath has corrosion inhibitors added, and process coils undergo periodic inspections for corrosion. The water also needs a top-up tank to refill the bath to replace water losses due to evaporation. Figure 3-2 shows a cut away view of a gas hot water bath heater.

Figure 3-2: Schematic of a water bath heater



Checks of flue gas temperature and composition are necessary to prevent the condensing of flue gases in the fire tubes, resulting in standing water within the tube. This water could accelerate corrosion of fire tubes. The composition check indicates the efficiency of the burners to optimise performance.

The moderate quantities of gas burnt requires a volume of air to mix for optimum burning, thus the vent inlets and hot chimney stack are considerations for hazardous area design.

The electricity energy requirements for this type of heater are low and the water bath heater is not considered a pressure vessel. Only the process coils operate at a pressure above atmospheric and are considered station piping, similar to other upstream pipework within a City Gate compound. The burner train must be inspected and maintained in accordance with Australian Standards.[1]

Generally, water bath heaters are skid mounted, erected horizontally, are large, heavy, well integrated equipment and best suited to heat large volumes of gas at a reasonably constant rate. Critical internal components include process coils that carry the gas and is immersed in hot water (see Figure 3-3), fire tubes to heat the surrounding water (Figure 3-4), and the water bath heater shell, with fire tubes and process coil installed. The water fills the empty space that can be seen in Figure 3-5.

Figure 3-3: Process coils of the [redacted] Water Bath Heater

[1] Covered by type B appliance, AS 4041, AS 2885 and 4645.

Figure 3-4: Fire tubes of [redacted] water bath heater

Figure 3-5: End view of a water bath heater

3.1.2. Boiler and heat exchanger

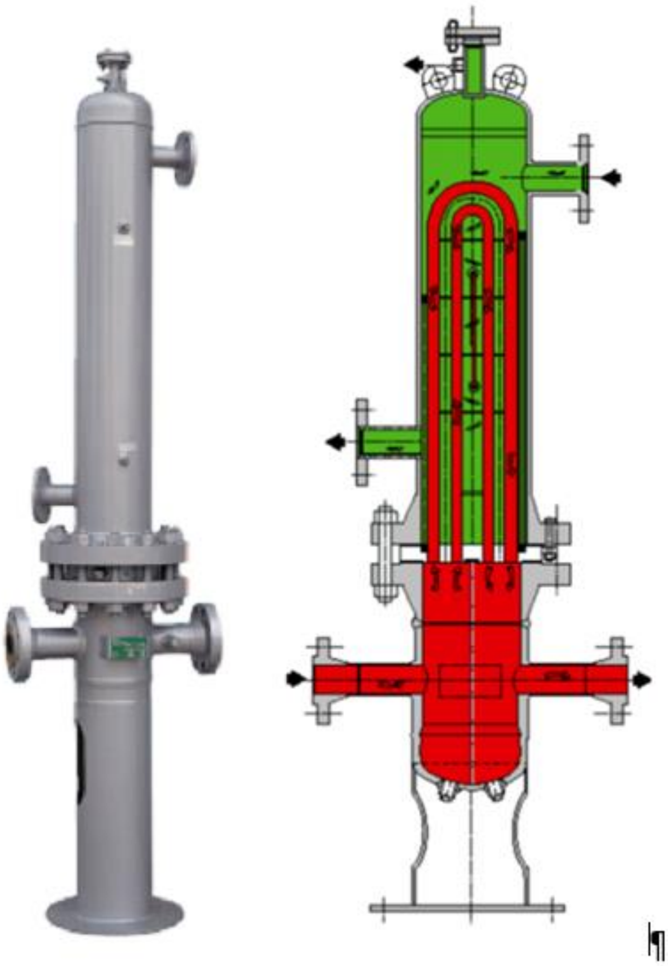
The difference between a boiler/heat exchanger compared to a water bath heater is the water is heated in a boiler, and then pumped into a heat exchanger. This system is not integrated like a water bath heater. It uses a closed loop of water, with the hot water returning to the boiler after passing through the heat exchanger. The small amount of water required (compared to water bath heaters) reduces lag time, so the concept of operating at idle and throttling to meet demand can be implemented. The main advantages of the boiler package (compared to a traditional water bath heater) are:

- closed loop system minimises water/anti-corrosion inhibitor losses and unused heat energy from the heat exchanger is retained, whereas in a water bath heater, some water evaporation occurs;
- fast acting to changes in demand, and thus higher efficiency;
- physical size is reduced;
- noise is reduced; and
- modular design permits incremental upgrades of each component.

The disadvantages of a boiler and heat exchanger are:

- the boiler must be inspected and maintained in accordance with Australian Standards for boilers (Type B appliance);
- electric pumps are required, introducing failure consequences and additional precautions for electrical equipment and hazardous zoning; and
- not yet proven to be cost effective for large continuous demand.

Figure 3-6 Typical water bath heater cut away



3.1.3. Electric heaters

Electric heaters generate their thermal energy from electrical resistance. Generally, electricity is more expensive than gas on a per unit basis and thus not cost effective for large loads. However, their design is not as complex as there is no burning process. This eliminates fuel gas, ventilation, flame arrestors, ignition systems and water induced corrosion issues. However, being an electric device, hazardous area design and maintenance is required.

Electric heaters have been successful in other distribution companies for rural towns as a short to medium term solution until the new town's demand increases enough for a water bath heater or alternate.

Figure 3-7 shows the electric heater installed at [redacted] city gate.

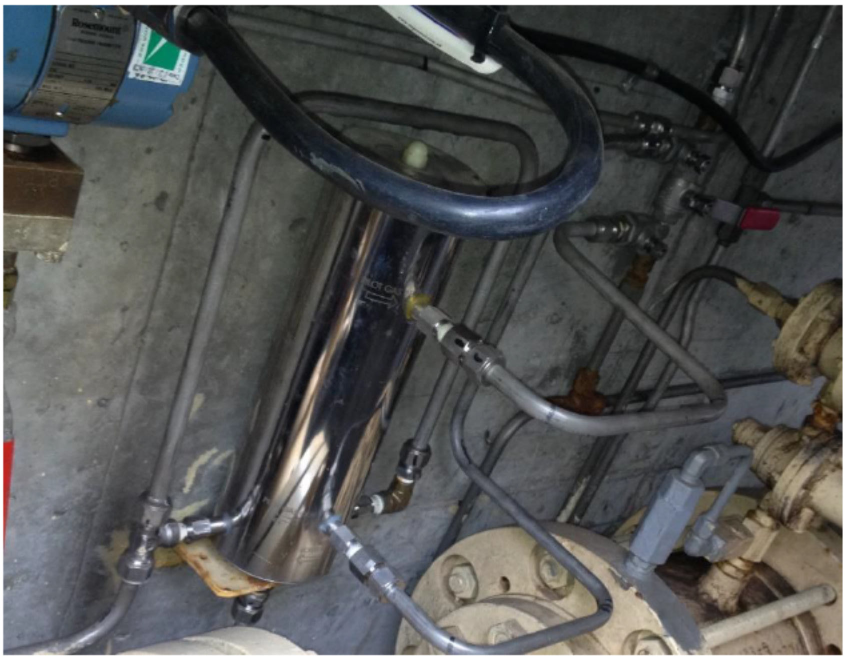
Figure 3-7: [redacted] city gate electric gas heater

3.1.4. Vortex heaters

Vortex heaters have replaced catalytic heaters at six sites where the winter inlet temperature results in poor operation of the regulator control loop, particularly pilot regulators. Vortex heaters operate by reducing gas pressure through a vortex nozzle creating high velocity gas that is then dumped into the downstream (lower pressure) network. The vortex warms the outer casing of the heater which can heat up small volumes of gas. Vortex heaters are a small heater for pre-heating gas before entering pressure control instrumentation.

These heaters are ideal for heating pilots and require little maintenance as there are no moving components. This maintenance is completed as part of the regulator station maintenance, rather than this strategy and as such is not included in further discussions below. Figure 3-8 shows a vortex heater installation.

Figure 3-8: Vortex Heater Installation



3.2. Asset age profile

MGN has [redacted] gas heaters[2] installed at city gate facilities. The location, commission year, type and condition is presented in Table 3-2.

Table 3-2: Heater list

Location	Commissioned	Type	Condition	Next vessel inspection
[redacted]	2007	Water Bath Heater	Good	2025/26
[redacted]	2008	Water Bath Heater	Good	2025/26
[redacted]	2012	Boiler/Exchanger	Good	2021/22[2]
[redacted]	2013	Water Bath Heater	Good	2029/30[3]
[redacted]	2013	Electric	Good	N/A
[redacted]	2014	Boiler/Exchanger	Good	2022/23[1]
[redacted]	2016	Electric	Good	N/A

Notes

...[1] These sites were delayed one year due to personnel availability.

...[2] This site was delayed two years due to personnel availability.

...[3] It is currently not anticipated this inspection will occur in the current AA period however this is assuming availability of spares.

[2] Excluding the [redacted] Vortex heaters which a small component and are maintained as part of the Regulator station

3.3. Asset performance

Gas heater performance is measured by the ability to:

- heat gas to required specification;
- heat gas efficiently and cost effectively;
- maintain low risk profile through high reliability;
- resistance to corrosion; and
- exhibit a minimum technical life of at least 22 years to align with the useful life determined for accounting purposes[3].

All sites are performing well against these criteria, and to date, no major deterioration associated with these gas heaters have been identified. However, the following ongoing concerns exist in relation to these assets:

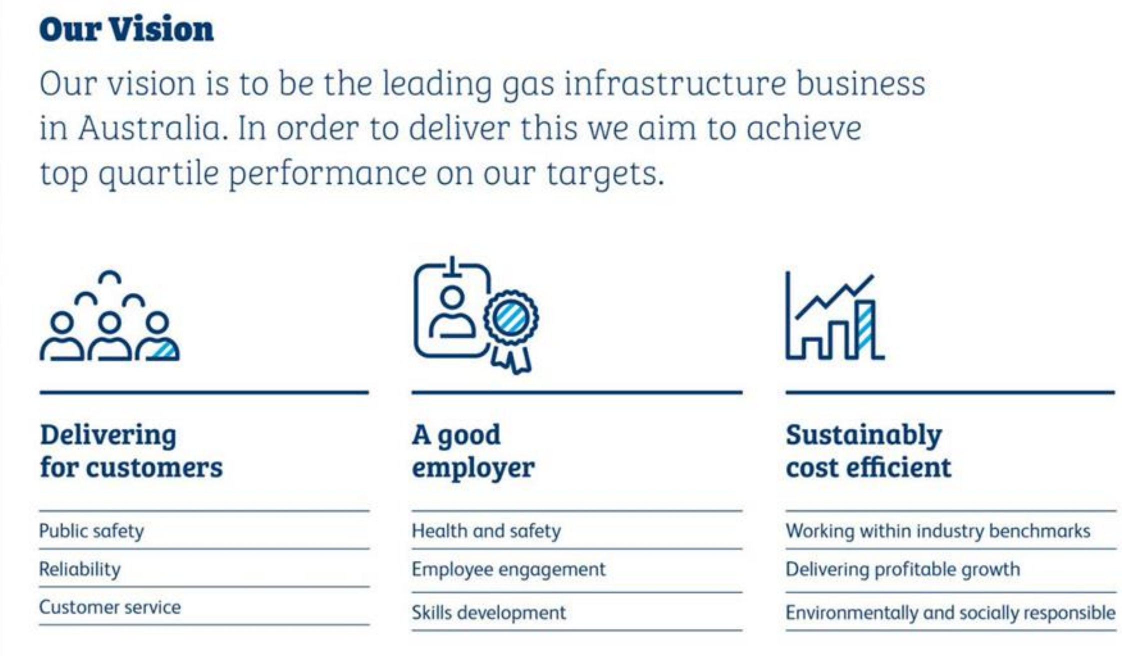
- There is no access to the return leg of the tube internal surface of water bath heaters, and this prevents effective monitoring and cleaning. This has on occasion led to a loss of containment, resulting in water ingress in the fire tubes. This has the potential to compromise all gas heating functionality and could impact on the integrity of the regulators due to the low temperatures experienced downstream;
- The current burner management system for water bath heaters doesn't provide visibility on which burners are operational at any given time. Similarly, the electric heater management system at [redacted] does not provide fault codes when reporting defects, and is unable to remotely restart. This lack of remote monitoring capability reduces the ability to detect faults, may result in heater failure and impact on station performance, and exposes staff to health & safety risks;
- Manufacturer support for the water bath heater burner management system controllers ([redacted]) is being phased out by the manufacturer by 2025, and spares will become unavailable post this date. If spares are unavailable, failure of even one control block will result in the loss of partial control of the heater. This has the potential to impact station performance and cause regulator failure, leading to interrupted supply to customers; and
- The electric heaters at [redacted] utilize three of the four elements installed for operation. Failure of one of the four elements would leave the heater without redundancy during the approximately six-month lead time for manufacture and delivery of a new element. A second failure during this period would result in heater failure, impacting station performance and regulator failure, with the potential for loss of supply to customers.

[3] The technical life of city gate heaters is generally expected to exceed the useful life of 22 years based on continued scheduled maintenance programs and replacement of individual components as deemed necessary.

4. Asset management drivers

4.1. Network vision

Figure 4-1: Network vision and objectives



When developing our work program and asset management strategies for the MGN network, we consider how the work we conduct and investments we make will help achieve the three key vision objectives outlined in the figure above.

These vision objectives and how they relate to the gas heater program is summarised in the following sections.

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 and transmission pressure 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.

Maintaining and periodically replacing our gas heaters assets is integral to this, as it allows us to mitigate temperate drop and prevent damage occurring to downstream steel assets. This reduces the risk of service interruptions or safety incidents

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.

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.

Table 4-1: Summary of MGN network objectives

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:

- MGN Safety Case
- AS 4645 series - Gas Distribution Networks
- AS 2885 series – Gas and Liquid Petroleum
- AS 3788 - Pressure equipment in-service code
- Gas Distribution System Code

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

The gas heater 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 the historical expenditure and project options consider the asset management requirements as per the latest Asset Management Strategy. The estimate has therefore been arrived at on a reasonable basis and represents 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 components:

1. Plan and create
2. Operate and maintain
3. Monitor and review
4. Repair, replace, abandon

These are discussed in the following sections.

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/upgrade/replace existing assets.

For gas heaters, the focus is on identifying the most prudent time to replace heater assets, and to identify the most appropriate type of heaters to install at new and existing city gates.

4.5.2. Operate and maintain

Operation and maintenance processes for gas heaters are described in the following sections.

4.5.2.1. Preventative maintenance overview

The three types of gas heater present three different maintenance schedules.

Water bath heaters:

- four-monthly checks;
- eight-year burner train scheduled maintenance on all water bath heaters; and
- four-year initial inspection and then based on an assessment, six to eight years for subsequent inspections.

Boiler and heat exchangers:

- six-monthly checks;
- annual check by a boiler inspector; and
- four-year internal inspections and then based on an assessment, six to eight years for subsequent inspection.

Electric heater:

- a six-monthly check which is aligned to routine SCADA maintenance.

Water bath heater operational check - winter and summer:

- Regulators are to be checked for correct operation and settings
- Strainers and instrument filters are to be removed, inspected, and cleaned
- All pipework and joints are to be checked for leaks with the site being leak free on exit
- Relief valves are to be checked for correct operation and settings
- Water bath temperature is to be checked using a suitable thermometer and adjusted if necessary
- Flue gases are to be analysed using a suitable gas analyser before and after conducting operational check
- Fluid contained in water bath is to be circulated
- Confirmation of receipt of alarms by the control room must be carried out and logged. Shut down alarms to be checked
- The spark arrester is to be removed and thoroughly cleaned
- Visually inspect fire tube for scale and rust. Clean and remove scale and rust as required

- Water and corrosion inhibitor are sampled, and levels are confirmed. Re-dosing occurs as required

Shell & tube heater operational check - winter and summer:

- Regulators are to be checked for correct operation and settings
- Strainers are to be removed, inspected and cleaned
- All pipework and joints are to be checked for leaks with the site being leak free on exit
- Relief valves are to be checked for correct operation and settings
- Water temperatures are to be checked using a suitable thermometer and adjusted if necessary
- Flue gases are to be analysed using a suitable gas analyser before and after conducting operational check. As these units are classified as a Type B appliance
- Fluid contained in water bath is to be circulated
- Confirmation of receipt of alarms by the control room must be carried out and logged. Shut down alarms to be checked
- The spark arrester is to be removed and thoroughly cleaned
- Water and corrosion inhibitor are sampled, and levels are confirmed. Re-dosing occurs as required

Vortex heater operational check - all works undertaken as part of the regulator station operational check

- Regulators are to be checked for correct operation and settings
- All pipework and joints are to be checked for leaks with the site being leak free on exit

4.5.2.2. Scheduled full maintenance

This activity consists of the same activities as an operational check as well as replacing all 'soft spares' (gas burner regulator train). In addition, a wall thickness test is conducted as part of the six to eight yearly inspections to check for signs of corrosion or damage. Some designs of water bath heater suffer from rubbing of fire tubes caused by thermal expansion and contraction.

An overview of the scheduled full maintenance is shown below.

- The [redacted] city gate water bath heaters both received a strip down inspection in 2017 and were found to be in good condition. As a result, the next strip down inspections of these heaters will be scheduled for 2025/26
- The [redacted] city gate water bath heater is scheduled for its first strip down inspection during 2021/22.
- The [redacted] city gate heat exchanger has been rescheduled for its first strip down inspection during summer 2022/23
- The [redacted] city gate heat exchanger is scheduled for its first inspection in 2022/23

4.5.2.3. Corrective maintenance

Corrective maintenance on heaters is driven by failure alarms. All heaters are connected to SCADA and these alarms are detected by the control room. Usually, these alarms are for flame blow outs or depleted water levels. These call outs are infrequent for heaters with automatic relight capability.

4.5.3. Monitor and review

Monitoring

Monitoring of assets includes the following:

- Monitoring 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

The performance of a water bath, boiler or electric type gas heater is measured by maintaining the desired outlet gas temperature. For heaters with long lag time (water bath and electric type) the peak demand (maximum gas flow) needs to be predicted and then a control setting activated to schedule full heating load prior to the peak demand. Vortex heater performance is not measured other than during installation or maintenance when the heater can be physically viewed or monitored.

Based on the heater design and maintenance regimes MGN expects that all heaters will deliver an outlet gas temperature above 0^{o}C.

Audits

Key internal audits include:

- supervisor monitoring audits;
- verification audits - The purpose of these audits is to verify that audits of task related activities provide credible and consistent results; and
- technical facility audits Findings from these audits are reported to management through detailed report.
- 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.

Reviews

Review includes:

- review of real time data;
- review of field reports and assessments;
- review of asset performance, condition and integrity key performance indicators (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 (DSPR); and
- review of quarterly and annual regulatory reports.

4.5.4. Repair, replace, abandon

From time to time, based on assessment, there is a requirement to undertake significant repair, replacement or abandonment of an asset. Any significant programs that are not considered as part of routine repair or maintenance are outlined in the capital works program.

Planned replacement depends on the results of the six/eight-yearly detailed inspections for water bath heaters, and the annual boiler inspection for boilers. Unplanned or ad-hoc replacements only occur due to failure of individual parts requiring immediate replacement after a breakdown; these are rare and usually confined to auxiliary services such as fuel gas regulators or temperature and pressure sensors.

The assumption made during design and selection of a gas heater is that the economic life will be driven by the ability of the heater to meet load. Typically, heaters will operate for at least 22 years; however, the load may increase to a level where the heater can no longer maintain gas heating requirements. This either demands a replacement or installation of secondary heating. Generally, it is not cost effective to install a heater designed for greater than 22 year expected load, as the capital cost is high, and the heater would operate at less than ideal efficiency at low loads for many years.

Replacement is therefore driven by current performance. All the heaters on the MGN are performing within requirements and therefore replacement or augmentation is unlikely in the next five years. We do not anticipate any near-term abandonment of heater assets given their ongoing requirement and importance in protecting downstream regulators, ensuring control, and protecting downstream pipework from low temperatures.

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

Planned capital expenditure of gas heaters is usually driven by their inability to meet current demand or that the condition of the equipment is likely to be deemed unserviceable in the near future.

As described in section 3, all gas heater assets have been installed in the last 15 years and all are in good condition for the areas that can be inspected. However, several ongoing concerns exist in relation to the assets, including:

- lack of access to the return leg of the tube internal surface of water bath heaters, preventing effective monitoring and cleaning;
- lack of remote monitoring capability of burner operations and therefore reducing the ability to detect faults;
- the ending of manufacturer support for the water bath heater burner management system controllers, leading to a lack of spare part availability for these critical assets; and
- the inability to procure replacement elements for electric heaters in a timely manner.

As such, MGN has developed several projects to address these issues and remain consistent with the Gas Safety Case, Gas Distribution System Code, AS 4645 and AS 2885. All the solutions proposed within each project are deemed to be:

- reducing the risk to an acceptable level;
- consistent with the National Gas Objective and Rules.
- aligned with the network vision; and
- maintaining security of supply.

Table 5-1 provides a breakdown of capital expenditure from 2023/24 to 2027/28 by program.

Table 5-1: Gas heater refurbishment program $'000 real 2021

Site/Asset	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Gas heater refurbishment	291.0	140.0	195.0	-	76.0	702.0
Total	**291.0**	**140.0**	**195.0**	**-**	**76.0**	**702.0**

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. With this in mind, our gas heater refurbishment program is designed to minimise the risk of disruption to customer supply by ensuring gas heater assets are fit for purpose, supported and have reliable supplies of spare parts to allow us to address any operational issues quickly.

5.3. Estimating efficient costs

The costs derived for these projects have been estimated based on historical costs incurred in completing similar projects. In order to achieve efficiency in design, engineering and project management, most projects in the program are bundled together as a package for the service provider.

The projects under the gas heater program are also staggered across multiple years to achieve the best possible outcome for the business and customers in terms of asset utilisation, risk reduction, timing of the works and resource availability. 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 in this strategy have typically achieved a labour to material split of 40:60 percent. This breakdown is then applied to the forecast below.

Table 5-2: Cost breakdown, Gas Heater Strategy $'000 real 2021

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Labour	116	56	78	-	31	281
Materials	175	84	117	-	45	421
Total	**291**	**140**	**195**	**-**	**76**	**702**

All expenditure related to the program covered by this strategy is capex. This cost is based on the following factors:

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

5.4. Gas heater refurbishment

5.4.1. Program summary

Forecast capital expenditure of the gas heater refurbishment program is shown in Table 5-3.

Table 5-3: Gas heater refurbishment program ($'000 real 2021)

Site/Asset	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Fire tube monitoring conversion	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Burner and electric heater monitoring	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Heater control replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Electric heater element redundancy	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]
Program expenditure	**291.0**	**140.0**	**195.0**	**-**	**76.0**	**702.0**

Each of the program elements are described in the following sections.

5.4.1.1. Fire tube monitoring conversion

All water bath heaters consist of fire tubes that contains heated natural gas. For the heaters installed at the [redacted] city gate sites, there is currently no access to the tube internal surface, preventing effective monitoring and cleaning. Historical performance issues have included loss of containment resulting in water ingress in the fire tubes resulting in reactive maintenance.

This project will install an inspection flange on the outlet elbow of the fire tube at each of these sites (refer to Figure 3-2). The modification will provide access to the fire tube internals in-situ, and will enable more effective monitoring program for timely proactive maintenance.

5.4.1.2. Burner and electric heater management monitoring

All heaters have an associated management system which are integral to heater operation by providing notifications when there are faults or anomalies. For the heaters installed at the [redacted] sites, the burner management system doesn't provide visibility on which burners are operational at any given time. As the heater only needs one burner for normal operation, failure of a burner will not result in a fault being reported. Similarly, the electric heater management system at [redacted] does not provide fault codes when reporting defects, and is unable to remotely restart.

We intend to address this lack of monitoring capabilities and mitigate the risk of undetected issues on the heater systems by:

1) Upgrading the BMS system monitoring capabilities that allow for collation of data to assess burner efficiencies and obtain visibility on which burners are in operation at any given time; and

2) Retrofitting the existing electric heater management system at [redacted] to achieve the same functionality [redacted], which gives us consistency across our assets, but also aligns us to industry good practice. This will result in more granularity in fault information and allow for remote restart.

5.4.1.3. Heater control replacement

The BMS (Burner Management System) currently fitted to the water bath heaters at the [redacted] city gates uses [redacted]. Each heater has two associated control blocks and failure of just one block will result in partial loss of heater control.

These controllers are due to be phased out by the manufacturer by 2025. As such, MGN will replace these obsolete controllers with the new [redacted] and modify the control panel to house the unit.

5.4.1.4. Electric heater element redundancy

The electric heaters at [redacted] and [redacted] city gate sites are designed for three phase heating (currently have four elements installed). Failure of one of the four elements would leave the heater without redundancy during the approximately six-month lead time for manufacture and delivery of a new element. A second failure during this period would result in heater failure, impacting station performance and regulator failure, with the potential for loss of supply to customers.

MGN plans to procure and store additional heater elements for these heaters. The heater elements will require a test vessel to hydrostatically test each unit. The heaters at each facility are also two different sizes, hence both will be purchased at the same time.

Unit costs used in forecasting future expenditure estimates for the works have been based on quotation and an estimate of overhead and prime contractor supervisory labour.

5.4.2. Recommended option

The refurbishment program outlined above is the most prudent option.

We looked alternative options, including not undertaking this work, and an option to defer procurement of the electric heater elements (see Appendix A). However, we consider undertaking all four gas heater projects – including procuring the additional heater elements - 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 (ALARP). 'Doing nothing' does not address supply risks associated with any of these projects, while deferring procurement of the electric heater elements exposes customers to supply risk upon failure given the long lead times for these parts;
- 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 consistent with our vision of being a good employer;
- it is aligned to good industry practice and maximises asset integrity and life; and
- it is deliverable.

Appendix A Gas Heater refurbishment program – Options analysis

Options considered

The following options have been identified to address the risk associated with keeping the network operational with current water bath heater design with limited access to the fire tube.

- Option 1 – Complete the [redacted] monitoring projects and the heater control replacement project
- Option 2 – Complete all [redacted] projects, including the electric heater element redundancy project
- Option 3 – Do nothing

A.1.1 Option 1 – Complete the 2 monitoring projects and the heater control replacement project

Option 1 involves completion of the following projects:

- Fire tube monitoring conversions at [redacted] city gate sites;
- Installation of burner management system monitoring at [redacted], and electric heater management system monitoring at [redacted]; and
- Replacement of obsolete water bath heater burner management system controllers at [redacted] city gate sites with the new [redacted] and modification of the control panel housing.

Under Option 1 we would not proactively purchase additional elements for electric heaters. We would instead only purchase these parts upon identifying performance issues or if any of the elements fail.

Cost assessment

The total forecast capital expenditure for these projects is summarised in the following table. The unit costs have been estimated based on material costs from other projects of similar complexity across the industry.

Table Appendix 1: Capital expenditure forecast – Option 1, $'000 real 2021

Site/Asset	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Fire tube monitoring conversions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Burner and electric heater monitoring	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Heater control replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program expenditure	**40.0**	**140.0**	**195.0**	**-**	**76.0**	**451.0**

The monitoring projects significantly improve the detection of defects, preventing loss of containment and therefore water ingress in the fire tubes by providing:

- ability to access fire tube internals, allowing effective cleaning of fire tubes for blockages and debris without disassembling the heater;
- remote monitoring ability and more detailed fault detection capabilities across both the gas burners and electric heaters; and
- more granularity in fault data, allowing MGN to undertake more pre-emptive corrective and preventative actions preventing a major incident or supply disruption.

The heater control replacement project provides for the continued reliable operation of heater controllers following the upcoming discontinuation of support and spare part availability post 2025.

Risk assessment

The key risk event being addressed by these projects is heater reduced functionality or outage, leading to a failure of regulators due to the low temperatures experienced downstream. This has the potential to result in a significant uncontrolled gas escape, and/or potential loss of supply to 1,000 customers. Lack of monitoring also results in additional onsite manual intervention, exposing personnel to travel and onsite health and safety risks.

Table Appendix 2: Risk assessment – untreated risk

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

Option 1 reduces the frequency to remote, which in turn reduces the overall risk to low. However, there would remain some supply risk (albeit low) should any elements in the electric heaters fail. The lead time for new elements is six months. While the risk associated with elements is substantial enough to increase the overall risk rating to moderate under the MGN risk matrix, it should be noted that Option 1 carries a slightly higher risk than the recommended option (Option 2).

Table Appendix 3: Risk assessment – Option 1

MGN Operational Risk Matrix							
Option 1	**People**	**Supply**	**Environment**	**Reputation**	**Financial**	**Compliance**	**Overall Risk**
Frequency	Remote	Remote	Remote	Remote	Remote	Remote	Low
Severity	Minor	Severe	Trivial	Minor	Trivial	Severe	
Risk Level	Negligible	Low	Negligible	Negligible	Negligible	Low	

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	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	-
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	-

While Option 1 would address the risk of loss of supply associated with lack of monitoring and obsolete assets, it does not address the lack of redundancy associated with electric heater elements. It is therefore inconsistent with *Delivering for Customers*.

If one or more elements fail, it is feasible we would need to pay a premium to get the new elements into stock quickly to address the network fault. This would be a more expensive option than purchasing additional elements proactively and therefore not *Sustainably Cost Efficient*.

A.1.2 Option 2 – Complete all 4 projects, including the electric heater element redundancy project

Option 2 includes the project to procure additional electric heating elements for [redacted] and [redacted] City Gate facilities, in addition to completing the monitoring and end-of-life replacement projects proposed in Option 1.

Cost assessment

The total forecast capital expenditure for the four projects is summarised in Table Appendix 5. The unit costs have been estimated based on material costs from other projects of similar complexity across the industry.

Table Appendix 5: Capital expenditure forecast – Option 1, $'000 real 2021

Site/Asset	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Fire tube monitoring conversions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Burner and electric heater monitoring	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Heater control replacement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Electric heater element redundancy	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program expenditure	291.0	140.0	195.0	-	76.0	702.0

The Fire tube monitoring, Burner and electric heater monitoring and heater control replacement projects have been aligned with scheduled inspection/strip down activities in order to minimize heater downtime and achieve efficiencies..

Unit costs used in forecasting future expenditure estimates for the works have been based on quotation and an estimate of overhead and prime contractor supervisory labour.

Risk assessment

In addition to addressing Option 1 risks, Option 2 will eliminate the risk associated with the 20 week lead times for manufacture of electric heater elements. Operating the heater without redundancy should one of the elements fail gives rise to the potential for heater failure, impacting station performance and regulator failure.

This option reduces the risk to low and is therefore consistent with the requirements of our risk management framework and meets the test of a prudent asset manager/network business. While the granularity of the risk matrix does not show a lower risk, the fact that electrical elements will be in stock means the overall risk with Option 2 is lower than that achieved by Option 1.

Table Appendix 6: Risk assessment – Option 2

MGN Operational Risk Matrix							
Option 1	**People**	**Supply**	**Environment**	**Reputation**	**Financial**	**Compliance**	**Overall Risk**
Frequency	Remote	Remote	Remote	Remote	Remote	Remote	Low
Severity	Minor	Severe	Trivial	Minor	Trivial	Severe	
Risk Level	Negligible	Low	Negligible	Negligible	Negligible	Low	

Alignment with vision objectives

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

Table Appendix 7: Alignment with vision – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
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	-

Option 2 aligns with our objective of *Delivering for Customers - Reliability* as it reduces the risk to gas supply caused by not fit-for-purpose or unknown poor condition of MGN's gas heater assets, or lack of timely redundancy for electric heater elements.

The work involved in the program is also common across the industry and thus works within industry benchmarks and aligns with the MGN vision of being *Sustainably Cost Efficient*. This option is aligned to good industry practices and maximizes asset integrity and life.

A.1.3 Option 3 – Do nothing

This option involves not undertaking the program and continuing to operate gas heater assets in their current state.

Cost assessment

There are no capital costs associated with this option. However this option may result in higher maintenance costs, as increased frequency and coverage of Non Destructive Testing (NDT) will be required in the absence of internal visual inspections. Additionally, the increased risk of failure may result in lost revenue due to regulator shutdown.

Risk assessment

This option does nothing to address the untreated risk. It means we would be operating the network with the significant possibility of partial or full failure of gas heater assets. This has the potential to impact station performance and cause regulator failure, leading to interrupted supply to customers.

Option 3 does not reduce the risk to low or ALARP and is therefore inconsistent with the requirements of our risk management framework.

Table Appendix 8: Risk assessment – Option 3

MGN Operational Risk Matrix							
Option 3	People	Supply	Environment	Reputation	Financial	Compliance	Overall Risk
Frequency	Frequent	Occasional	Occasional	Occasional	Occasional	Occasional	Intermediate
Severity	Minor	Severe	Trivial	Minor	Trivial	Severe	
Risk Level	Intermediate	Intermediate	Low	Low	Low	Intermediate	

Alignment with vision objectives

The following table shows how Option 3 aligns with our vision objectives.

Table Appendix 9: Alignment with vision – Option 3

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	-

Option 3 does not align with any of our vision objectives. Any short-term financial benefits from saved capital expenditure would result in significant increases in future costs, as well as creating unacceptable risks to the public and employees.

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.