Multinet Gas Networks

Attachment 9.16

# Cathodic Protection Strategy

## Final Plan 2023/24 – 2027/28

July 2022

Multinet Gas Networks

# Cathodic Protection Strategy

MG-SP-0013 FY2023 – FY2028, Ver 4.0

# Preparation record

Controlled Copy Register

| | |
|---|---|
| Version | 4.0 |
| Issue Date | Jun 2022 |
| Document Number | MG-SP-0013 |

Amendment Record

| Version | Date | Amended by | Description of Change |
|---|---|---|---|
| 1.0 | 08/03/2012 | Mark Beech | First Issue |
| 2.0 | 19/12/2016 | Izzy Shepherd | Final version – issue for use. |
| 3.0 | 25/06/2020 | Nathan Hearn | Full update of strategy and template |
| 4.0 | 29/06/2022 | Nathan Hearn | Update to reflect 2023-2028 works program |

Originated by

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# 1. Executive summary

This cathodic protection strategy details the lifecycle management of Multinet Gas Networks' (MGN) cathodic protection (CP) systems, which are used to prevent corrosion of MGN's gas distribution and transmission pressure assets. This strategy applies to all CP assets and services located throughout the MGN distribution and transmission pressure networks, including impressed current cathodic protection (ICCP) units, test points, anodes, and ancillary equipment.

All steel pipelines and assets are susceptible to corrosion. One of the most effective and proven methods of preventing corrosion in gas networks is to use CP systems. CP systems work by using electrical current to reduce the electrochemical potential of a metal (either via using sacrificial anodes or impressed current), which inhibits corrosion attack. It is therefore essential CP systems are properly maintained and periodically replaced to ensure steel assets remain protected.

As a prudent asset manager, and to maximize the useful life of our steel assets, we undertake an ongoing capital expenditure (capex) program to ensure our CP systems are fit-for-purpose and the gas network is protected. CP capex may include the following activities:

- installing new and replacing ICCP units;
- relocating ICCP units;
- replacing anode beds at ICCP unit locations;
- installing new and replacing CP test points;
- installing new and replacing depleted sacrificial anodes;
- surge protection works; and
- installing and replacing remote telemetry systems.

These works help maintain the effectiveness of our CP systems, which in turn help keep the gas distribution network safe and reliable. It also ensures we remain compliant with our regulatory obligations under the Gas Distribution System Code, AS4645, AS2885 and a number of CP related standards.

The CP capital program for 2023/24 to 2027/28 has two components:

1. CP asset replacement – including installation of new and replacement ICCP units, anode beds, test points and surge protection; and
2. CPU telemetry – installation of remote telemetry solutions on all ICCP units.

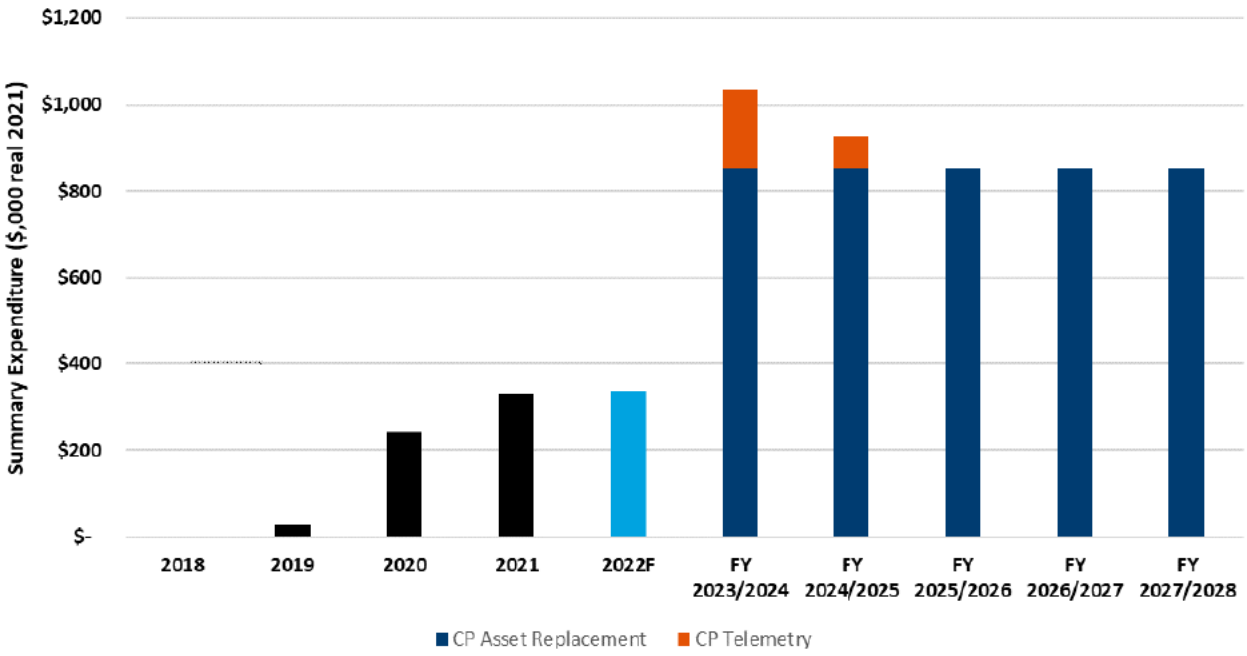
## 1.1. Financial summary

Table 1-1 summarises the proposed capex on these two programs.

Table 1-1: Summary of capital expenditure, $'000 real 2021

| Program | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|
| CP asset replacement | 853 | 853 | 853 | 853 | 853 | 4,266 |
| CPU telemetry | 183 | 73 | 0 | 0 | 0 | 256 |
| **Total** | **1,036** | **926** | **853** | **853** | **853** | **4,522** |

Figure 1-1: Forecast and historical CP program by activity, $'000 real 2021




## 1.2. Program breakdown

### 1.2.1. CP asset replacement program

The forecast CP asset replacement program for 2023/24 to 2027/28 is based on historical installation and replacement rates, and the results of periodic CP potential surveys. Table 1-2 summarises the proposed works.

Table 1-2: Summary of CP asset replacement program, $'000 real 2021

| Activity | Volume | Cost estimate ($'000) |
|---|---|---|
| Install new ICCP units | [redacted] | [redacted] |
| Replace ICCP units | [redacted] | [redacted] |
| Relocate ICCP units | [redacted] | [redacted] |
| Replace ICCP anode beds | [redacted] | [redacted] |
| Install new and replace test points | [redacted] | [redacted] |
| Install new sacrificial anodes | [redacted] | [redacted] |
| Replace depleted sacrificial anodes | [redacted] | [redacted] |
| Install or replace varistor / spark gap combinations (surge protection) | [redacted] | [redacted] |
| **Total** | | **4,266** |

Unit rates are based on the latest market-tested prices, updated to reflect recent price increases in copper, electronics, labour and materials experienced across Australia in the wake of the COVID-19 pandemic. Forecast costs reflect recent vendor estimates where available.

CP replacement volumes reflect an increase compared to previous periods. The increase is driven by:

- compliance obligations to ensure steel assets are protected as specified by Australian Standard 2832.1;
- the age/condition of the assets, with a high number of ICCP units reaching end-of-life during the next five years;
- the increase in sections of stranded steel, as more PE is introduced into the network; and
- the need to relocate ICC units from higher risk pole-mounted positions to ground level, in line with good health and safety practice.

The delivery program is smoothed over the period, and reflects a prudent and deliverable rate of replacement. Asset replacement is prioritised by risk, with the riskiest/poorest condition assets being targeted for replacement first.

### 1.2.2. CP telemetry

There are [redacted] ICCP sites currently in the MGN network. Of these, [redacted] are fitted with AEGIS data loggers. The remaining [redacted] ICCP units have no data loggers. We propose to install [redacted] remote data loggers to the remaining [redacted] ICCP units, and replace the [redacted] AEGIS data loggers with [redacted] units too.

We have found the [redacted] units to be more reliable, cheaper, and has a better user interface than the AEGIS units. Moving the entire fleet to [redacted] will also mean we are operating a single platform, which will improve consistency and reliability of data. Consolidating in this way will also make the telemetry system more efficient to operate and maintain.

As shown in Table 1-3, installations are split over the first two years, and will be installed efficiently as part of routing maintenance site visits.

Table 1-3: Summary of CP telemetry program, $'000 real 2021

| Activity | | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|---|
| Install [redacted] data loggers | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| **Program expenditure** | | **183** | **73** | **-** | **-** | **-** | **256** |

Unit rates to purchase and install the data loggers are informed by recent market testing (110 [redacted] loggers were recently purchased as part of the Victorian Electrolysis Committee Area Testing Program).

## 1.3. Efficiency of the proposed solution

We consider the proposed CP asset replacement and telemetry programs are the minimum required to efficiently manage the asset class and mitigate the risk associated with steel pipeline failure due to corrosion.

As shown above, the overall CP program represents an increase from prior periods.

This increase is driven by an uplift in CP asset replacement compared with prior periods, coupled with the higher unit rates currently experienced in the market.

Historically, investment in CP asset replacement has been minimal. A recent review of CP asset age and performance highlighted the need for an uplift in replacement rates for ICCP units and anode beds over the next five years. This uplift is due to the higher number of new high and low output ICCP units required to offset deterioration in CP coverage provided by current assets, and to ensure sections of stranded steel are fully protected.

AS 2832.1 states that a fully protected structure should be more negative than -850mV using a saturated copper/copper-sulphate reference electrode. Recent survey data shows that a number of our assets are performing below these levels, therefore an increase in ICCP installations and anode beds is required over the next five years to bring our CP coverage up to standard.

The next AA period also sees a greater focus on employee health and safety, by accelerating the rate at which we relocate ICCP units from high risk (pole mounted) locations to safer, more accessible ground locations. We propose to relocate [redacted] ICCP units over the next five years, compared to the [redacted] undertaken in the current period. Relocating these assets is consistent with good management practice.

The increase in ICCP and anode bed works is offset to some extent by a reduction in works to replace/install test points and surge protection. However, the overall CP asset replacement program is larger (by volume) than the subsistence level of works conducted in prior periods.

Given the need to ramp up investment to bring our CP up to standards, one of the alternative options we considered was to undertake a larger replacement program based on the limits of our delivery capability over the next period. This equates to a ~50% increase in volumes. However, we considered that while this stretch target would address the CP issues more quickly, the additional spend required to resource the larger program, coupled with the risk it may pose to delivery of other asset management programs, we did not consider this to be the preferred option.

The CP telemetry investment represents an increase compared to prior periods. The investment in telemetry is driven by the need to capture better and more reliable information about our assets and the way they are performing. Historically, expenditure on telemetry has been minimal, the proposed investment for the next AA period is design to bring our CP management into line with good practice.

We submit that the relatively small amount of proposed expenditure in telemetry over the next AA period represents a prudent investment given the significant improvement it will offer in data quality and asset information. We can use the enhanced information and insight provided by the single-platform data logger system to inform future CP asset replacement programs and identify the most efficient asset replacement rates over the coming decades.

We considered smoothing the telemetry program over five years rather than two. However, we submit that installing the Pervasive data loggers within the first two years reflects prudent asset management and makes [redacted] efficient use of resources. Delaying the program offers no savings and only serves to delay the time it will take for us to get a more complete picture of our CP asset performance.

We consider the proposed CP 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 latest market rate testing and project options considering 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

The Cathodic Protection Strategy articulates our approach to the lifecycle management of the CP assets and services applied to the transmission pressure, high pressure, medium pressure and low pressure steel piping systems located throughout the network.

It 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 (2023/24 to 2027/28).

The document is intended for use by:

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

## 2.2. Scope

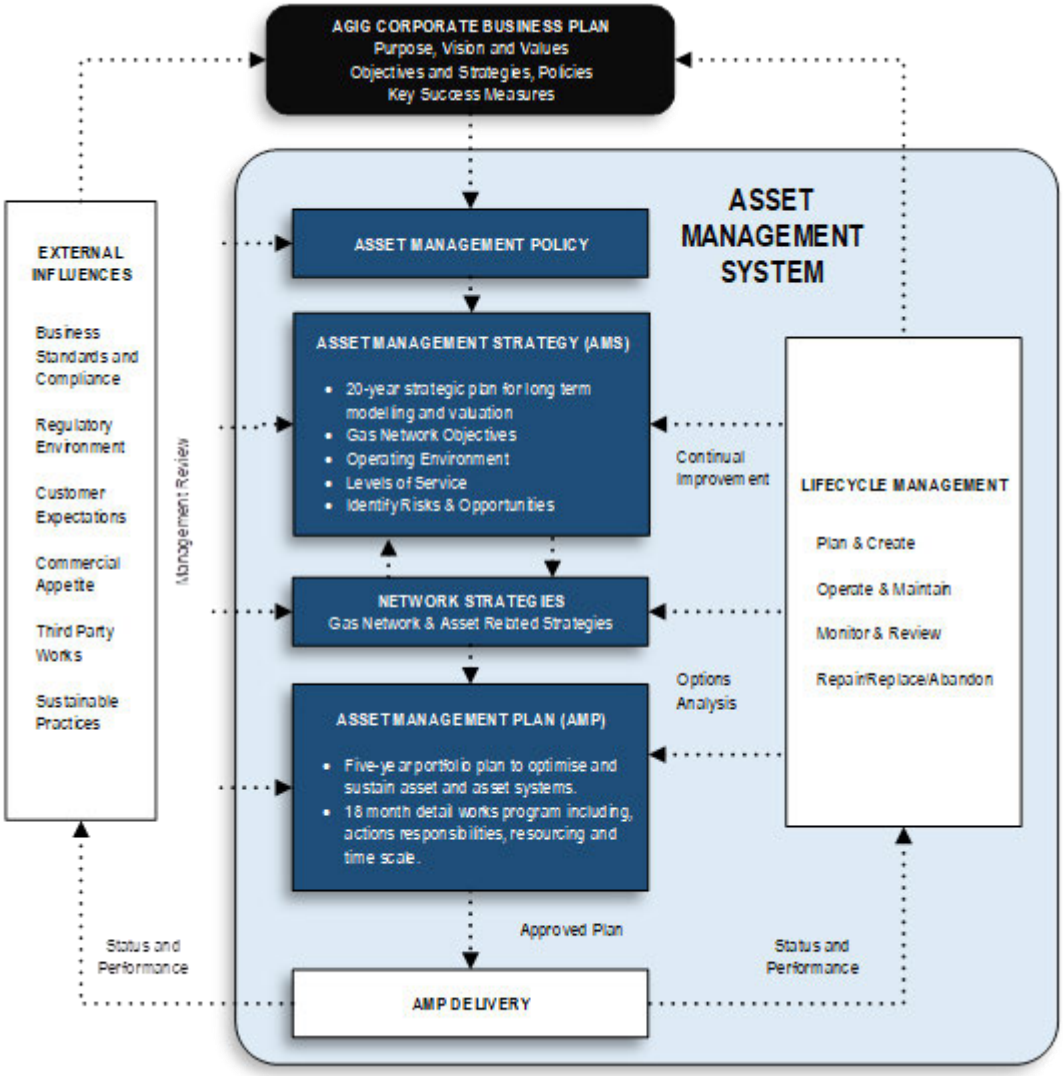
This strategy applies to our CP assets and services located throughout the distribution and transmission pressure networks, including:

- ICCP units
- test points;
- anodes; and
- ancillary equipment, including telemetry systems.

## 2.3. Relationship with other key asset management documents

The Cathodic Protection Strategy is one of several key documents developed and published by MGN in relation to its gas networks. As shown in Figure 2-1 detailed network strategies including the CP Strategy, inform both the Asset Management Strategy (AMS) and Asset Management Plan (AMP) of the programs needed to achieve the long-term objectives of the gas transmission and distribution networks.

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, are:

- 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 CP Strategy:

- SAP - the MGN primary asset management database;
- Service provider monthly reports; 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

- Gas Safety Case
- Gas Distribution System Code Ver. 15.0
- AS 4645 – Gas Distribution Network Management
- AS 4645.2 - Installation and maintenance of steel pipe systems for gas
- ET-CM-2314 Guide – Cathodic Protection Distribution System
- AS 2832.1 – Cathodic Protection of Metals Part 1: Pipes and Cables
- AS 2885 Series – Pipelines Gas and liquid Petroleum
- ESV Code of practice for electrolysis mitigation and cathodic protection.

# 3. Asset overview

## 3.1. Introduction

CP is a system designed to use direct current (DC) to protect metallic structures from corrosion. This can comprise of a galvanic anode cathodic system or an impressed current cathodic protection system (ICCP). It is the secondary method of reducing the natural corrosion process on exposed steel pipe surfaces; the primary method being the protective coating of the steel pipe itself. CP uses DC current to redirect the flow of electrons that cause oxidation on the metal surface onto a sacrificial anode instead.

Our legacy low pressure (LP) and medium pressure (MP) gas networks are mainly constructed from coated mild steel, cast iron and wrought iron. These types of materials are more prevalent in the low-pressure areas where all systems currently operating these materials are gradually being replaced with high density polyethylene (HDPE) or high strength steel pipe where required.

The majority of metallic pipework within the MGN area is subject to stray current from the DC railway or tramway traction systems. This means an effective protection system and monitoring program is essential to maintain integrity.

The former Gas and Fuel Corporation of Victoria (GFCV) implemented cathodic protection on its licensed transmission pressure pipelines in the 1960s. This was then extended to the high-pressure system during the 1970s and then onto the medium pressure in the 1990s.

Extensive work was carried out to electrically isolate the cast iron, wrought iron and other uncoated pipework from the various distribution systems. The CP method applied uses ICCP and sacrificial galvanic anodes. This method increases the negative potential on a steel structure to mitigate corrosion occurring.

MGN's transmission, high, medium and low pressure (partial) steel pipelines are cathodically protected. The breakdown of the cathodically protected mains length by network pressure is shown in Table 3-1.

Table 3-1: CP length by network

| Network pressure | Length of main protected (km) |
|---|---|
| Transmission pressure | 165 |
| High pressure 2 | 78 |
| High pressure | 2,571 |
| Medium pressure | 441 |
| Low pressure | 78 |
| **Total** | **3,333** |

In total, 3,333 km of the total network is cathodically protected. The breakdown of CP equipment is shown below:

Table 3-2: CP system details

| CP equipment type | Units |
|---|---|
| ICCP high output | 51 |
| ICCP low output | 156 |
| Sacrificial galvanic anodes | 34 |
| Test points | 2610 |
| Telemetry (data loggers) | 62 |

The GFCV had a specialist Corrosion Mitigation Group responsible for the design, installation, monitoring, and maintenance of the CP systems and stray current drainage bonds.

The pipeline operating divisions of the GFCV generally followed recommendations made by the Corrosion Mitigation Group. This group (later known as Corrosion Protection Services Group) continued to provide these services throughout the disaggregation and privatisation of the GFCV, which took place in 2000. From there, corrosion mitigation responsibilities were handed over to MGN's designated contractor. The same level of service has been maintained under these changes.

The Millennium Drought, which started in 1996 and lasted more than a decade, progressively dried the Melbourne soil at depths where mains and anode beds are typically laid. This has resulted in a progressively higher soil resistance level, forcing more current to be impressed into steel mains to maintain cathodic protection. The drought ended in 2010 and rainfall has had a positive and progressive effect on soil resistivity.

The dry soil conditions at depth, has masked the effect of corrosion at points of coating defect and inferior CP in recent years. The lack of moisture has resulted in less surface corrosion where there would otherwise be. A return to average rainfall should have a reverse effect of the drought.

### 3.1.1. ICCP units

ICCP units are required when the output required to maintain an adequate level of CP cannot be supplied by a simple connection to a magnesium anode. These units typically include a cabinet with electrical componentry (e.g., power source, voltmeters/amp meters) and silicone anodes. They can be classified as low output and high output units, with high output units requiring more anodes and a bigger geographical footprint. All CP installations have to be registered and licensed with Energy Safe Victoria, who restrict the output of the unit according to detrimental effects on asset of others.

ICCP units are categorised into either high or low output where high output is greater than 2 Amps output. The technology doesn't change between high and low output units, only the number of anodes in the bed and the output amperage; where high have more anodes and higher output amperage.

### 3.1.2. ICCP anode beds

Beds of silicone iron anodes are typically utilised with impressed current systems. The higher the output required the more anodes required for the system to maintain its potential. Low output beds

consist of 1-2 anodes whereas the high output beds use around 10 anodes. These anodes need to be replaced as time goes by as they are continuously consumed to protect the pipe. Silicone iron anodes have a longer lifespan compared to the lower cost magnesium anodes, due to the impressed current.

### 3.1.3. Test points

Test points are required to ensure CP can be monitored in smaller geographical footprints. These are typically useful as the MGN network grows and the replacement of steel mains with polyethylene effectively isolate some parts of the steel network. The installation of new test points is usually dependent on detection of gaps in coverage, however, some allowance must be made for replacement of test points due to third party damage or construction activities.

Test points and cross bonding (connecting separate parts of infrastructure to reduce the risk of electrical faults that may cause electrocution) are also used to mitigate the risks from stray current. These test points will be determined by gaps in coverage or other asset/traction drainage requirements as per AS 2832.1.

### 3.1.4. Sacrificial anodes

Sacrificial anodes are typically used where a smaller current and footprint is required to maintain protection levels. Typically, the need for new or replacement sacrificial anodes is dependent on gaps in coverage, which could be a result of changing electrochemical conditions in the area or an anode in the existing area being corroded or used up. These beds typically consist of 2-4 magnesium or zinc anodes.

Installed on isolated lengths of steel pipework, sometimes after gas network augmentation, sacrificial anodes are also used to maintain protection on cased crossings. A cased crossing is a protective steel casing around a pipe that experiences frequent overhead stress such as railway lines or tram crossings. The steel casing that provides structural protection does not form part of the steel network but it still requires cathodic protection, especially if in the vicinity of stray current.

### 3.1.5. Surge protectors

Various electrical sources may create transfer electrical current to the pipeline. Such currents may originate from lightning, earth fault currents on adjacent power transmission structures, or from induced voltages due to both fault and load currents in high voltage power lines, cables or DC and AC traction systems.

Installation and replacement of varistor / spark gap combinations at a number of regulator pits, cathodic protection units and insulating flanges on the network are used to negate these surges.

Electrical surges on the network may cause the following:

- electrical arcing which may be an ignition source for escaping gas;
- damage to insulating fittings such as isolating flanges, coupling, unions and monolithic joints;
- electric shock of field crew working on pipe; or
- coating damage on pipes.

## 3.2. Asset age profile

Due to legacy data and record management, the official age of most sites in undeterminable as details of more granular components were not recorded.

However, due to the complexities and variables that can influence the life of the assets there is no definitive age of failure, and age is not the primary driver for replacement. The physical location and the load impressed on the assets are the greatest contributing factors that affect the life span and therefore regular inspection and maintenance is completed on all assets to check on performance.

## 3.3. Asset performance

The application of cathodic protection on steel gas mains has been successful in reducing the rate of corrosion on the network. AS 2832.1 states that a fully protected structure should be more negative than -850mV using a saturated copper/copper-sulphate reference electrode. MGN's designated service provider manages and monitor the performance of the network for deficiencies or faults on the corrosion protection systems to AS 2832.

# 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


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 CP 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 our CP systems and telemetry assets is integral to this, as it allows us to prevent and detect corrosion issues before they turn into 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:<br>• Investing in and operating the network in line with the Gas Safety Case, zero harm principle and all laws and relevant industry standards;<br>• Managing known risks to as low as reasonably practicable (ALARP); and<br>• 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:<br>• Meeting network availability KPIs;<br>• Maintaining operating pressures through monitoring and augmenting MGN's network; and<br>• 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:<br>• Maintaining accuracy of metering assets within relevant industry standards;<br>• Delivering valued services to customers at the lowest sustainable price; and<br>• 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:<br>• Optimising overall asset lifecycle management costs;<br>• Maintaining operating efficiency without compromising safety and reliability;<br>• Developing investment plans that consider stakeholder expectations; and<br>• Leveraging people, data and technology to deliver continuous improvement. |
| ***Promote gas usage to ensure the networks remain sustainable*** | MGN will achieve this by:<br>• Connecting new greenfield expansion projects in a timely manner;<br>• Enabling new urban infill connections;<br>• Engaging with key stakeholders to develop adequate network solutions for future supply options;<br>• Increasing long term competitiveness of networks through higher asset utilisation; and<br>• Promoting use of gas. |
| ***Embrace innovation and work towards net-zero emissions*** | MGN will achieve this by:<br>• Considering alternative innovative, sustainable and/or lower long-term cost solutions;<br>• Pursuing research and development opportunities where they facilitate us to meet MGN's vision and objectives; and<br>• Supporting the decarbonisation of MGN's gas supplies and the move to smarter gas networks. |

## 4.3. Regulatory requirements

### 4.3.1. Technical obligations

The dangers associated with electrical hazards, stray currents, and other electrical interferences give rise to the importance of cathodic protection. As such, there are a number of standards to adhere to regarding the use of cathodic protection and its individual components. These include (but are not limited to):

- MGN Safety Case
- AS/NZS 2885:2018 Pipelines - Gas and liquid petroleum - Design and construction
- AS/NZS 4645.1:2008 Gas distribution networks - Network management
- AS/NZS 4645.2:2008 Gas distribution networks – Steel Pipe Systems

- AS 2832.1:2015 Cathodic protection of metals - Pipes and cables
- AS 2239:2003 Galvanic (sacrificial) anodes for cathodic protection
- Electricity Safety (Cathodic Protection) Regulations 2009
- V/Line, VicTrack and Metro Trains Standards and Clearances
- Energy Safe Victoria "Code of Practice for electrolysis mitigation and cathodic protection 2014

### 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 proposed CP 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 latest market rate testing 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. 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.

Figure 4-2: Risk management principles


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.

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 a credible, primary risk event to test the level of investment required. Where that 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 has 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 CP, the focus is on identifying the most prudent time to replace anodes, ICCP units and anode beds to ensure the steel network is sufficiently protected, and to identify what CP assets must be installed to protect any new steel pipelines.

### 4.5.2. Operate and maintain

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

#### Surveillance and monitoring

- Maintenance of corrosion protection systems

  All buried steel gas distribution pipework shall be adequately monitored to ensure the level of corrosion protection is satisfactorily maintained. The following criteria are to be applied in determining if effective corrosion protection has been achieved.

- CP criteria

  Effectiveness of cathodic protection shall be assessed in accordance with the requirements of AS 2832.1 "Cathodic Protection of Metals Part 1: Pipes and Cables".

- Protection potential

  A steel structure may be considered to be protected when the potential on all parts of its surface is equal to or more negative than -850 mV relative to a saturated copper/copper sulphate reference electrode. Measurement of this potential is only considered valid when

not affected by any significant voltage gradients between the reference electrode and the structure.

- Fluctuating potentials

  Where structures are subject to fluctuating potentials (such as in stray current electrolysis areas), the structure may be considered to be protected, provided the average potential is more negative than -850 mV, and anodic excursions more positive than -850 mV do not occur for more than 5% of the time in any 24-hour period. Furthermore the anodic excursions should be limited to a few continuous periods, and should be interspersed with frequent excursions more negative than -850 mV.

- Testing and control of all stray current effects will be conducted according to the ESV Code of Practice.

  Where deficiencies in protection levels are identified, a thorough technical investigation shall be carried out to determine the cause(s) for the loss in protection and to recommend appropriate corrective action. In some cases, the installation of additional equipment may be required to restore effective protection.

## Preventative maintenance

- Frequency

  CP levels within the distribution area are be monitored at six-monthly intervals. This frequency is in accordance with industry standard practice for high reliability onshore pipelines in populated areas. It provides an acceptable level of surety that the overall level of protection is being maintained, taking into account economic considerations, the reliability of protection systems (frequency of faults), compliance with standards, and consequences of loss of protection.

- Monitoring of protection equipment

  All impressed current cathodic protection equipment and traction drainage equipment are be monitored at monthly intervals. All identified faults are being repaired, and the equipment returned to service a soon as practicable. All installations and equipment is be maintained in good working order.

## Corrective maintenance - faults and defects

- Fault investigation

  Where an unsatisfactory level of protection is identified from the routine monitoring surveys, the causes and exact location for the loss of protection are be investigated. When assessed as being appropriate, electromagnetic coil surveys will be used for identifying losses of protection caused by faulty electrical insulation or contact with foreign structures. Such surveys are be carried out by officers with the required technical skill, suitable experience and a detailed knowledge of the gas distribution system.

- Equipment faults and protection

  Faults in corrosion protection equipment and faults causing loss of effective protection are being promptly repaired. Suitably qualified and experienced personnel must undertake such repairs. Qualified electricians are be used for repairs of electrical equipment when appropriate.

## 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 - data assessment

CP levels within the distribution area are monitored at six-monthly intervals. A part of this monitoring includes gathering sufficient data to allow for the assessment of the effectiveness of both cathodic protection and traction drainage systems. The percentage of test points protected are used to estimate the length of main in the distribution area, which meets the specified criteria for effective protection.

Test data from sections of main not meeting the required level are further assessed to determine the priority of work required to restore effective protection. Such assessments shall be based on the criticality of the main, the percentage of the 24-hour recordings which meet the required level of protection, or in areas not subject to fluctuating potentials, on spot potential readings.

### Data recording and reporting, information to be recorded

Design and installation details, including correspondence with other authorities and structure owners, results of testing for effects on other structures, required permits and location details shall be recorded and retained.

AS 2832.1 provides requirements for information to be recorded.

Location details of all test points, and monitoring results are maintained for each area, and the data made available in SAP. Faults identified are also recorded in SAP 'Corrosion Protection Notifications'. Output readings of cathodic protection units shall also be recorded in SAP.

### Reporting

At the end of each month a report is prepared summarising the results of all surveys completed, with assessments and comments on areas where protection is identified as inadequate. All faults identified from monitoring and investigations are reported and appropriately referred for repair. These reports are the property of MGN and are auditable by ESV.

### 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. Replacement of cathodic protection equipment is carried out when cathodic protection monitoring and testing results indicate the stipulated level of protection is no longer able to be provided by the existing installations. This will include items such as ICCP units, anode beds and miscellaneous other equipment.

# 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

The CP capital program for 2023 to 2027 has two components:

1. CP asset replacement
2. CP telemetry

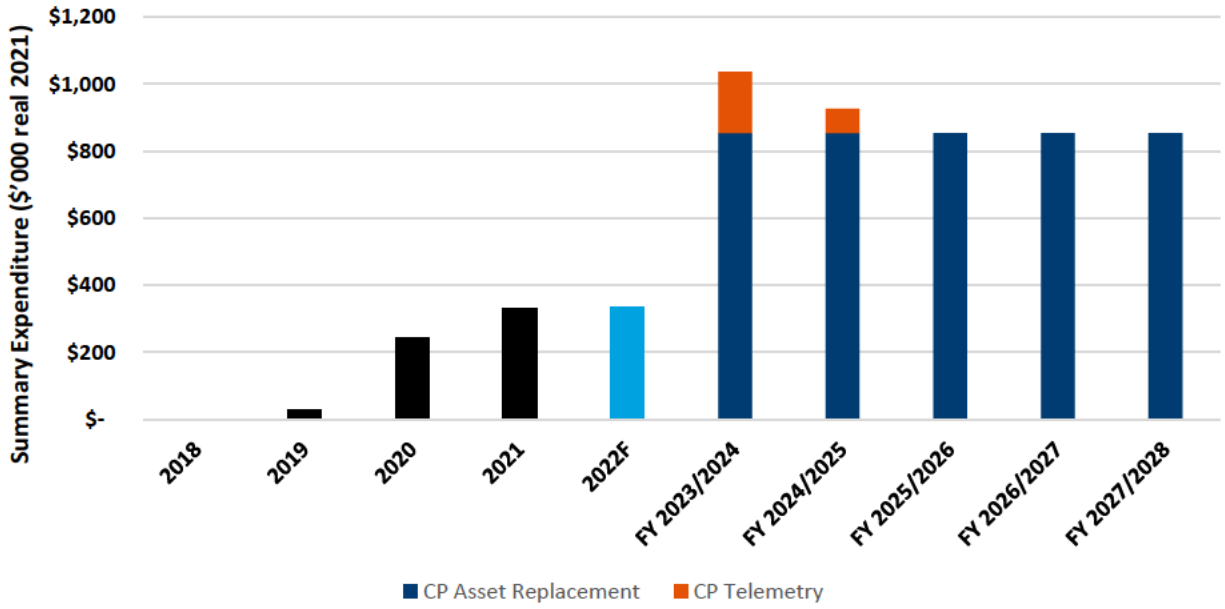
Table 5-1 summarises the proposed expenditure on these two programs.

Table 5-1: CP program forecast capex, $'000 real 2021

| Program | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|
| CP asset replacement | 853.2 | 853.2 | 853.2 | 853.2 | 853.2 | 4,266 |
| CP telemetry | 183 | 73 | 0 | 0 | 0 | 256 |
| **Total** | **1,036.2** | **926.2** | **853.2** | **853.2** | **853.2** | **4,522** |

Figure 5-1 shows how this proposed investment compares with that undertaken over the last five years.

Figure 5-1: Forecast and historical CP program by activity, $'000 real 2021




The uplift in the overall program is driven primarily by the required increase in volumes of ICCP and anode bed replacements to ensure our CP systems are consistent with AS 2832.1, and by the increased number of ICCP unit relocations necessary to help keep our employees safe.

Unit rates are based on the latest market-tested prices, updated to reflect recent price increases in copper, electronics, labour and materials experienced across Australia in the wake of the COVID-19 pandemic. Forecasts costs reflect recent vendor estimates where available.

The delivery program is smoothed over the period, and reflects a prudent and deliverable rate of replacement. Asset replacement is prioritised by risk, with the riskiest/poorest condition assets being targeted for replacement first.

## 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 cathodic protection strategy is designed to minimise the risk of disruption to customer supply by ensuring metallic mains are protected from corrosion, and using our CP systems to detect issues before they result in asset failures.

## 5.3. Delivery capacity

The ability to deliver the proposed body of works will require additional resourcing and maintenance efficiencies. Resourcing will be managed in two ways:

- Comdain Infrastructure is employing additional internal personnel to manage the increase in workload; and
- certain activities associated with CP works can be sub-contracted out to third parties where cost efficiencies and on time delivery can still be achieved.

With respect to maintenance efficiencies the data logger program will be the driver here. By installing the dataloggers, the frequency associated with physically inspecting the units can be dramatically reduced as the automated (remote) reporting will advise the operating conditions of the units. This allows resourcing to be diverted to capital delivery programs.

## 5.4. Estimating efficient costs

These costs are developed using actual costs and the standardized approach through MGN's Operation, Maintenance and Services Agreement (OMSA), in place with its field services provider. The unit rates assumed in this program are based on the latest market rates, updated to reflect current higher costs for copper, electronics and other materials resulting from the pandemic-driven supply issues experienced globally.

These costs are inclusive of end-to-end delivery of all field works, MGN approved sub-contractors, any materials and other procurement costs and SAP (asset data) updates.

The forecast cost breakdown is shown in the table below.

Table 5-2: Forecast capex – Cathodic protection, $'000 real 2021

| | 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** | **1,036.2** | **926.2** | **853.2** | **853.2** | **853.2** | **4,522** |

## 5.5. CP asset replacement

### 5.5.1. Program summary

The CP asset replacement programs for the next AA period represents a step increase in prior periods. Historically, CP asset replacement has been minimal, operating essentially at subsistence levels. While this low level of investment has not resulted in any material incidents to date, it has led to a situation where the levels of cathodic protection on parts of our network are below Australian Standards. AS 2832.1 states that a fully protected structure should be more negative than -850mV using a saturated copper/copper-sulphate reference electrode. Recent survey data shows that a number of our assets are performing below these levels, therefore an increase in ICCP installations and anode beds is required over the next five years to bring our CP coverage up to standard. Maintaining CP replacement at historical rates is not a prudent or viable option.

The program outlined in Table 5-3 allows for $853k per year. While the nature of CP asset replacement may vary from year to year, this rate of expenditure allows for the completion of all planned works. We will aim to smooth the actual delivery profile, where practicable.

Table 5-3: Summary of CP asset replacement program 2023/24 to 2027/28 , $'000 real 2021

| Program categories | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|
| ICCP unit installations and relocations | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| ICCP unit anode beds | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| Test point installations | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| Sacrificial anodes | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| Surge protection | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| **Total expenditure** | **853.2** | **853.2** | **853.2** | **853.2** | **853.2** | **4,266** |

### 5.5.2. ICCP units

This scope of work involves the following CP infrastructure:

- [redacted] new ICCP unit installations
- [redacted] replacement ICCP units
- [redacted] ICCP unit relocations

The program volume of units and expenditure is shown in Table 5-4.

Table 5-4: ICCP unit installation and replacement program, $'000 real 2021

| Activity | | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|---|
| New ICCP unit installations – high output | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | Exp. ($'000) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | 613 |
| New ICCP installations – low output | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | Exp. ($'000) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | 729 |
| Replacement of existing CPUs | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | Exp. ($'000) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | 482 |
| CPU relocations – Pole Mounted to Ground Mounted | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | Exp. ($'000) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | 964 |
| **Program expenditure** | | **557.4** | **557.4** | **557.4** | **557.4** | **557.4** | **2,787** |

The following sections provide more information on the proposed ICCP installations, replacements and relocations.

## New ICCP installations

New units are typically installed as a result of cathodic protection effectiveness surveys. Where a specific area has been identified as having inadequate protection, as per Australian Standards, we install additional ICCP units to ensure the assets are sufficiently protected against corrosion. Given the ageing profile of MGN steel assets, investment in new cathodic protection assets is expected and essential in extending asset lives.

Further, as more PE is introduced into the network, the number of continuous steel sections reduces, resulting in areas of 'stranded' steel. It is therefore imperative CP systems are introduced to these stranded sections to ensure network integrity.

The following high output areas have been identified as requiring new ICCP units:

Table 5-5 highlights the results of recent potential surveys of these high output areas.[1] The inadequate protection levels (highlighted in red) indicate they will benefit from additional high output ICCP unit installations.

Table 5-5: Recent potential survey results of high output ICCP areas

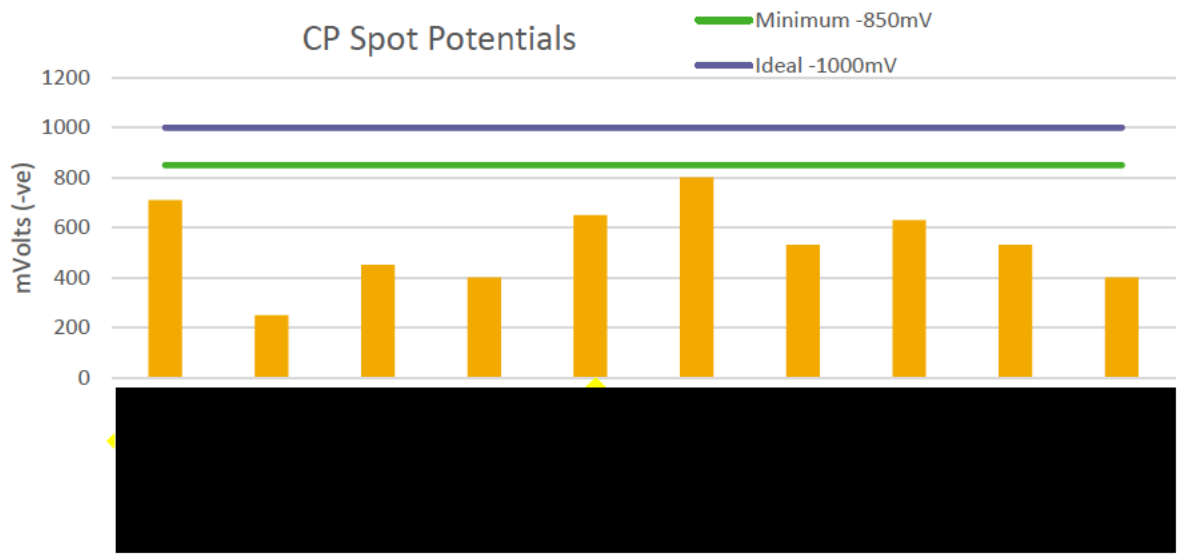
| ID | Area | Kms of main | Test points | Protection level % | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018 (2) | 2019 (1) | 2019 (2) | 2020 (1) | 2020 (2) | 2021 (1) | 2021 (2) |
| [redacted] | [redacted] | 33 | 23 | 72.7 | 59.1 | 100.0 | 77.3 | 82.6 | 68.2 | 82.6 |
| [redacted] | [redacted] | 77.1 | 46 | 89.4 | 50.0 | 88.9 | 66.7 | 67.4 | 48.9 | 79.5 |
| [redacted] | [redacted] | 78.5 | 26 | 69.2 | 61.5 | 61.5 | 56.0 | 72.0 | 48.0 | 84.0 |
| [redacted] | [redacted] | 75.8 | 51 | 84.0 | 66.7 | 96.0 | 91.7 | 81.3 | 79.2 | 76.1 |
| [redacted] | [redacted] | 38.6 | 16 | 100.0 | 71.4 | 100.0 | 75.0 | 100.0 | 68.8 | 82.4 |
| [redacted] | [redacted] | 57 | 23 | 52.2 | 60.9 | 56.5 | 45.5 | 52.2 | 47.8 | 65.2 |
| [redacted] | [redacted] | 17.5 | 9 | 44.4 | 44.4 | 66.7 | 88.9 | 100.0 | 88.9 | 100.0 |

The following low output areas have been identified as requiring new ICCP units:

Figure 5-2 highlights the recent potential surveys of these low output areas. The inadequate protection levels indicate they will benefit from additional low output ICCP unit installations.

[1] The list might not directly correlate to the sites in Table 5-5 as the new installs don't need to be in the same location as the affected sites listed in the table. The new installs will either increase the wider system or relieve the neighbouring systems.

Figure 5-2: Recent potential survey results of low output ICCP areas




AS 2832 requires protection levels to be a minimum of -850mV, where MGN strives for -1000mV (or more) from the ICCP unit to ensure around -900mV at the furthest test point on the CPUs subnetwork.

## ICCP replacements

Units are required to be replaced where these that no longer provide an adequate level of protection, or if there is some failure of componentry, or substandard condition of above ground equipment.

Table 5-6 shows the sites where the existing ICCP units need to be replaced based on age and general internal component condition.

Table 5-6 ICCP units requiring replacement

| Equipment no. | CPU no. | Location | VEC max output (Amps) | Year of installation |
|---|---|---|---|---|
| [redacted] | [redacted] | [redacted] | 15 | 1981 |
| [redacted] | [redacted] | [redacted] | 15 | 1981 |
| [redacted] | [redacted] | [redacted] | 15 | 1981 |
| [redacted] | [redacted] | [redacted] | 30 | 1981 |
| [redacted] | [redacted] | [redacted] | 20 | 1981 |
| [redacted] | [redacted] | [redacted] | 20 | 1982 |
| [redacted] | [redacted] | [redacted] | 25 | 1982 |
| [redacted] | [redacted] | [redacted] | 25 | 1982 |
| [redacted] | [redacted] | [redacted] | 15 | 1984 |
| [redacted] | [redacted] | [redacted] | 15 | 1985 |

The photos below provide an indication of the age and condition of the proposed replacements.

Figure 5-3; Photos of aged/poor condition ICCP units

## ICCP relocations

There are approximately [redacted] pole mounted cabinets existing on the network. These cabinets are difficult to access and their height from the ground presents a safety hazard for field personnel. As a good employer, our aim is to reduce health and safety risks where practicable. Our focus for the next period is to increase the number of safety-driven relocations over the next five years to [redacted] (up from [redacted] over the current period), with a view to relocating all [redacted] cabinets within the decade.

Nine units per year ([redacted] over the period) shall be relocated to ground locations for ease of access, and to avoid potential falls from height. This is a manageable volume of replacement that can be accommodated within the planned maintenance program.

The following table lists sites have been identified as requiring relocation from a pole mounted unit to a ground mounted unit.

Table 5-7: List of sites requiring ICCP unit relocation from pole to ground.

| Equipment # | CPU | Address | Area # |
|---|---|---|---|
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |

| Equipment # | CPU | Address | Area # |
|---|---|---|---|
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] |

Figure 5-4 Photos of pole mounted and ground mounted cabinets

## 5.5.3. ICCP anode beds

This program covers the replacement of existing high and low output anode beds. The volumes for replacement are based on survey information on the age and performance of existing anode beds, and cost estimates from the market tested service provider. The program expenditure is estimated as provided in Table 5-8.

Table 5-8: ICCP anode bed replacement program, $'000 real 2021

| Activity | | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|---|
| High output – replacement | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | Exp. ($'000) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| Low output – replacement | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | Exp. ($'000) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| **Program expenditure** | | **203** | **203** | **203** | **203** | **203** | **1,015** |

## 5.5.4. Test point installations

The program of works includes:

- installation of [redacted] new test points; and
- replacement of [redacted] existing test points

The programs expenditure is estimated as provided in Table 5-9. These works are largely unplanned and arise from network augmentation or third-party damage or alteration. Instances could include:

- polyethylene renewals creating isolated sections of steel;
- sections of continuous steel mains which require a small increase in cathodic protection (whereby it is often more efficient to install a test point with anodes);
- third party damage where the connected cable is disconnected or damaged; and
- third party works nearby which require minor changes to the CP system in the vicinity.

Table 5-9: Test point installation and replacement program, $'000 real 2021

| Activity | | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|---|
| Install new test points | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | Exp. ($'000) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| Replace existing test points | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | Exp. ($'000) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| **Program expenditure ($'000)** | | **23.4** | **23.4** | **23.4** | **23.4** | **23.4** | **117** |

## 5.5.5. Sacrificial anodes

This program covers the installation of [redacted] new sacrificial anodes as well as the replacement of [redacted] end-of-life sacrificial anodes. The volumes are forecast using survey data on anode age and performance, and costs are market tested estimates from the service provider. See Table 5-10.

Table 5-10: Sacrificial anode installation and replacement program, $'000 real 2021

| Activity | | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|---|
| New sacrificial anodes | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | Exp. ($'000) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| Replace existing sacrificial anodes | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | Exp. ($'000) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| **Program expenditure ($'000)** | | **37** | **37** | **37** | **37** | **37** | **185** |

### 5.5.6. Surge protection

This program involves the installation and replacement of [redacted] varistor / spark gap combinations at a number of regulator pits, cathodic protection units and insulating flanges on the network. In doing these works the sites will also be brought up to current specifications, including installation of new above ground test points.

Unit costs are market tested estimates from the service provider. Program expenditure is estimated as shown in Table 5-11.

Table 5-11: Surge protection program, $'000 real 2021

| Activity | | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|---|
| Surge protection | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| **Program expenditure ($'000)** | | **32.4** | **32.4** | **32.4** | **32.4** | **32.4** | **162** |

### 5.5.7. Recommended option

The cathodic protection program outlined above is the most prudent option.

We considered alternative options to the proposed program (see Appendix A) including a larger CP replacement program (a ~50% increase in volumes), or moving to entirely reactive (replace on failure) replacement. However, we submit that the proposed rate of CP asset replacement to bring our CP systems up to standard reflects prudent asset management and makes the most efficient use of resources.

The proposed volumes of replacement are the most cost-effective option that reduces risks to an acceptable level, and is consistent with MGN's vision. Not performing the required works could risk the required levels of protection on MGN's metallic pipelines therefore increasing the chance of corrosion, which lowers the safety and reliability of the network and significantly increases the risk.

## 5.6. CP telemetry

### 5.6.1. Program summary

This program involves installing remote telemetry solutions (data loggers) on all CP units in the MGN distribution network, and moving to a single platform/technology type to ensure data consistency and more efficient monitoring.

All of MGN's CPUs and test points are measured on a monthly basis across the network. While monthly testing is good practice, it still poses an element of risk as isolated incidents could occur before or after the time of measurement. As such, MGN would not be aware of any incidents until the subsequent CP reading the following month. Remote monitoring addresses this problem by providing a constant feed of data on asset performance and potential faults. It also allows any unusual spikes in DC transition systems to be detected and analysed, helping us understand how these spikes may affect the network.

While risk is a factor, it should be noted that risk is not the primary driver for the telemetry replacement program. The driver for the telemetry program is to uplift our CP asset management capabilities in line with industry good practice. Having accurate, real time visibility of how our CP assets are performing improves the quality of data on which we can make investment decisions.

This promotes prudent and efficient asset management activities and will allow us to provide network services at the lowest sustainable cost.

Remote telemetry units are commonly used by other gas network operators and are already installed permanently on our transmission pressure pipelines, as well as temporarily on the moving area tests in conjunction with ESV and the Victorian Electrolysis Committee (VEC). Remote monitoring technology costs have reduced significantly over the last few years, resulting in a viable and affordable program that will enable MGN to align to established industry good practice, and incrementally improve asset data and CP control.

There are [redacted] ICCP sites currently in the MGN network. Of these, [redacted] are fitted with AEGIS data loggers. The remaining [redacted] ICCP units have no data loggers. Under this program we will purchase [redacted] data loggers and install them at the remaining [redacted] ICCP sites. We will then replace the current [redacted] AEGIS data loggers with the new [redacted] models.

[redacted] units are currently used as part of the VEC Ares Testing program, and we have found them to be more reliable, cheaper, and have a better user interface than the AEGIS units. The AEGIS online servers have experienced outages a couple of times per year. This outage can be a couple of hours to a few days, during which time, no data is being collected. The [redacted] AEGIS loggers are on the transmission pressure pipelines, replacing these with a better unit and backend system is prudent given the criticality of the pipelines they are monitoring.

Moving the entire fleet to [redacted] will also mean we are operating a single platform, which will improve consistency and reliability of data. Consolidating in this way will also make the telemetry system more efficient to operate and maintain.

Installations will be split over the first two years. Our approach will be to install the [redacted] units at the locations without telemetry first, and then replace the AEGIS units by year two.

Having all ICCP locations telemetered as soon as reasonably practicable allows access to network performance data more quickly, thereby informing more accurate asset management strategies going forward. Installing all the data loggers more rapidly would not be feasible without additional field resources.

The new units will be installed efficiently as part of routing maintenance site visits.

Table 5-12 CPU telemetry (data logger) installation program, $'000 real 2021

| Activity | | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|---|
| Install [redacted] data loggers | Units | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| **Program expenditure ($'000)** | | **183** | **73** | **-** | **-** | **-** | **256** |

## 5.6.2. Recommended option

We considered a number of CP telemetry options, including a telemetry program over five years rather than two, and only replacing the AEGIS loggers at end of life. However, we consider the option is to install [redacted] units over two years, including the AEGIS replacements, is the most prudent option because:

- it provides real time data and visibility of MGN's CP units;
- it moves our telemetry solution on to a single platform more quickly;

- it reduces the requirement to manually visit each CPU multiple times yearly even if the unit is functioning correctly;
- it provides faster resolution to failing CPUs, which would only be picked up on scheduled site visits;
- the real time data can be used for historical troubleshooting and for the events leading up to failure;
- it is the most cost-effective option with respect to CPU data loggers;
    - MGN has already tested the market with respect to price, performance, data acquisition, user interface and supplier support;
    - the market test was performed on the acquisition of 110 remote data loggers for VEC Area Testing. These 110 [redacted] units are used on a roaming basis where they are moved and installed on temporary parts of the network while ESV (and other coordinated VEC participants) test the greater intra-networks of Victorian Electrolysis Systems.
- it is consistent with the MGN vision;
- it is deliverable, as evidenced by the 110 data logger application for VEC Area Testing.

# Appendix A CP asset replacement – options analysis

## A.1 Options considered

We considered the following options to manage the ongoing replacement and installation of CP assets:

- Option 1 – Replace end-of-life and install new CP assets to bring CP performance up to standard
- Option 2 – Replace end-of-life and install new CP assets at accelerated rate
- Option 3 – Do not install new or replacement CP assets

Each of these options are discussed in the following sections.

### A.1.1 Option 1 - Replace end-of-life and install new CP assets to bring CP performance up to standard

This is the preferred option as outlined with the main body of this strategy.

#### Cost assessment

Table Appendix 1: Option 1- CP asset replacement program 2023/24 to 2027/28, $'000 real 2021

| Program categories | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|
| ICCP installations | 557.4 | 557.4 | 557.4 | 557.4 | 557.4 | 2,787 |
| ICCP unit anode Beds | 203 | 203 | 203 | 203 | 203 | 1,015 |
| Test point installations | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 | 117 |
| Sacrificial anodes | 37 | 37 | 37 | 37 | 37 | 185 |
| Surge protection | 32.4 | 32.4 | 32.4 | 32.4 | 32.4 | 162 |
| **Total expenditure** | **853.2** | **853.2** | **853.2** | **853.2** | **853.2** | **4,266** |

#### Risk assessment

The primary risk associated with depleted sacrificial anodes and ICCP units is that means steel pipelines are unprotected against corrosion. Without cathodic protection, corrosion can accelerate and cause pipeline failure, which has the potential to result in a significant uncontrolled gas escape, resulting in fatality or permanent injury and/or loss of supply to >1,000 customers.

The untreated risk[2] rating is presented in the table below.

[2] Untreated risk is the risk level assuming there are no risk controls currently in place. Also known as the 'absolute risk'.

Table Appendix 2: Risk assessment – CP replacement – untreated risk

| Untreated risk | MGN Operational Risk Matrix | | | | | | Overall risk |
|---|---|---|---|---|---|---|---|
| | People | Supply | Environment | Reputation | Financial | Compliance | |
| Frequency | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | High |
| Severity | Major | Severe | Minor | Severe | Minor | Major | |
| Risk Level | High | Intermediate | Low | Intermediate | Low | High | |

In certain circumstances, insufficient cathodic protection can result in asset failure and a gas release that may cause a significant safety incident causing serious permanent injury, or supply interruption to >1,000 customers. This gives rise to a risk likelihood of unlikely and a consequence of major. As a result, the overall untreated risk rating is high.

This would also result in a major compliance risk as we would not be compliant with our regulatory obligations under the Gas Distribution System Code, AS4645, AS2885 and a number of CP related standards. There is potential for MGN to be found in breach of its operating licence, with significant punitive measures from Energy Safe Victoria (ESV).

The preferred option reduces the risk to an acceptable level, is aligned to good industry practice and maximises asset integrity and life. This option is consistent with the requirements of our risk management framework, and meets the test of a prudent asset manager/network business.

Table Appendix 3: Risk assessment – CP replacement Option 1

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

## Alignment with vision objectives

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

Table Appendix 4: CP replacement 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 aligns with our objectives of *Delivering for Customers*, as it protects the public from corroding and failing high pressure pipelines and increases the overall reliability of the network by minimises the opportunities for loss of supply caused by pipeline failure.

This option provides for the electrical safety of our operatives and the general public and therefore is consistent with being *A Good Employer*.

This is option is consistent with good industry practice, working within industry benchmarks. This option therefore aligns with our objective to be *Sustainably Cost Efficient*.

### A.1.2 Option 2 - Replace end-of-life and install new CP assets at an accelerated rate

The option is similar to the preferred option, however, it proposes a 50% increase in replacement volumes over the period. This accelerated program is designed to address the risk associated with failing CP assets more quickly, and establishing a new rate of replacement going forward.

The scope of this option would be:

- [redacted] new ICCP unit installations
- [redacted] replacement ICCP units
- [redacted] ICCP unit relocations
- [redacted] Anode Bed Replacements
- [redacted] Test Point Installations
- [redacted] Sacrificial Anode Beds
- [redacted] Surge Protection Sites

#### Cost assessment

Table Appendix 5: Option 2 - CP asset replacement program 2023/24 to 2027/28, $'000 real 2021

| Program categories | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|
| ICCP unit installations | 850.5 | 850.5 | 850.5 | 850.5 | 850.5 | 4,252.5 |
| ICCP unit anode beds | 304.5 | 304.5 | 304.5 | 304.5 | 304.5 | 1,522.5 |
| Test point installations | 35.7 | 35.7 | 35.7 | 35.7 | 35.7 | 178.5 |
| Sacrificial anodes | 55.8 | 55.8 | 55.8 | 55.8 | 55.8 | 279 |
| Surge protection | 49.2 | 49.2 | 49.2 | 49.2 | 49.2 | 246 |
| **Total expenditure** | **1,295.7** | **1,295.7** | **1,295.7** | **1,295.7** | **1,295.7** | **6,478.5** |

#### Risk assessment

The preferred option reduces the risk to an acceptable level, is aligned to good industry practice and maximises asset integrity and life. This option is consistent with the requirements of our risk management framework, and meets the test of a prudent asset manager/network business

Table Appendix 6: Risk assessment - CP replacement Option 2

| | MGN Operational Risk Matrix | | | | | | Overall risk |
|---|---|---|---|---|---|---|---|
| **Option 2** | **People** | **Supply** | **Environment** | **Reputation** | **Financial** | **Compliance** | |
| **Frequency** | Remote | Remote | Remote | Remote | Remote | Remote | Low |
| **Severity** | Severe | Severe | Minor | Trivial | Minor | Minor | |
| **Risk Level** | Low | Low | Negligible | Negligible | Negligible | Negligible | |

## Alignment with vision objectives

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

Table Appendix 7: Alignment with vision – CP replacement Option 2

| 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 | N |
| Sustainably Cost Efficient – Delivering Profitable Growth | - |
| Sustainably Cost Efficient – Environmentally and Socially Responsible | Y |

Option 2 aligns with our objectives of *Delivering for Customers*, and being *A Good Employer*, as it addresses the safety and supply risks associated with these assets.

However, this option would not be consistent with our objective to be sustainably costs efficient, as the cost is significantly greater than Option 1, while not delivering a materially better risk outcome. Further, the larger program is near the limit of our delivery capability, which may attract a premium if the replacement rates fall behind and we need to catch up.

### A.1.3 Option 3 - Do not install new or replacement CP assets

Not replacing cathodic protection systems at their end of life, nor installing new systems in areas identified through cathodic protection survey was considered.

#### Cost assessment

There is no capital cost associated with this option, however reactive maintenance costs would escalate, and should sections of mains require replacement urgently, this would significantly increase the replacement cost.

While it is not possible to estimate precisely how many asset failures will occur during the next five years, broad cost estimates can be developed based by escalating the cost of the proposed works program if delivered reactively. It is a generally accepted asset management principle that delivery of works reactively is significantly more expensive that undertaking proactive or preventative works.

Various sources cite the increase in reactive costs compared with proactive can be between two and five times[3] more than undertaking the same works proactively.

## Risk assessment

This option is a high-risk option that would result in extreme safety risks for the public and our employees, but also this approach would be in non-compliance to both AS/NZS 2885.1 and AS/NZS 4645. Essentially, Option 3 would do little or nothing to address the untreated risk and is therefore not a prudent course of action.

Table Appendix 8: Risk assessment - CP replacement Option 3

| | MGN Operational Risk Matrix | | | | | | Overall risk |
|---|---|---|---|---|---|---|---|
| **Option 3** | **People** | **Supply** | **Environment** | **Reputation** | **Financial** | **Compliance** | |
| **Frequency** | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | High |
| **Severity** | Major | Severe | Minor | Severe | Minor | Major | |
| **Risk Level** | High | Intermediate | Low | Intermediate | Low | High | |

## Alignment with vision objectives

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

Table Appendix 9: Alignment with vision – CP replacement 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 | N |

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

We would be operating areas of the network in non-compliance to AS/NZS 2885.1 and/or AS/NZS 4645.1, and in doing so we would fail NGR79 2(c)(iii), and also be at risk of punitive measures from ESV.

[3] Marshall Institute, Omega engineering, ARMS reliability.

# Appendix B CP telemetry – options analysis

## B.1 Options considered

The following options have been enable remote monitoring of CP assets:

- Option 1 – Install [redacted] data loggers and proactively replace AEGIS data loggers over 2 years
- Option 2 – Install [redacted] data loggers and proactively replace AEGIS data loggers over 5 years
- Option 3 – Install [redacted] data loggers but do not proactively replace AEGIS data loggers
- Option 4 – Do not install CP telemetry

Each of these options are discussed in the following sections.

### B.1.1 Option 1 – Install [redacted] data loggers and proactively replace AEGIS data loggers over 2 years

This is the preferred option as outlined with the main body of the strategy

#### Cost assessment

Table Appendix 10: Option 1 - CP telemetry program 2023/24 to 2027/28, $'000 real 2021

| Activity | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|
| Install [redacted] data loggers (no. of units) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| **Total expenditure ($'000)** | **183** | **73** | **-** | **-** | **-** | **256** |

#### Risk assessment

The untreated risk associated with this program is low. It should be highlighted that risk is not the primary driver for this program. The installation of a single, consolidated telemetry system for our assets is consistent with good practice, and is a prudent a relatively low cost program that will improve our asset management and investment decision capabilities.

Table Appendix 11: Risk assessment – CP telemetry – untreated risk

| | MGN Operational Risk Matrix | | | | | | Overall risk |
|---|---|---|---|---|---|---|---|
| **Untreated risk** | **People** | **Supply** | **Environment** | **Reputation** | **Financial** | **Compliance** | |
| **Frequency** | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Low |
| **Severity** | Minor | Trivial | Trivial | Trivial | Trivial | Trivial | |
| **Risk Level** | Low | Negligible | Negligible | Negligible | Negligible | Negligible | |

Risk is not the driver for the telemetry program. Option 1 does not materially reduce the risk associated with undetected asset failure.

Table Appendix 12: Risk assessment – CP telemetry – Option 1

| MGN Operational Risk Matrix | | | | | | | Overall risk |
|---|---|---|---|---|---|---|---|
| Option 1 | People | Supply | Environment | Reputation | Financial | Compliance | |
| Frequency | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Low |
| Severity | Minor | Trivial | Trivial | Trivial | Trivial | Trivial | |
| Risk Level | Low | Negligible | Negligible | Negligible | Negligible | Negligible | |

### Alignment with vision objectives

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

Table Appendix 13: Alignment with vision – CP telemetry Option 1

| 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 | Y |
| A Good Employer – Employee Engagement | - |
| A Good Employer – Skills Development | - |
| Sustainably Cost Efficient – Environmentally and Socially Responsible | - |
| Sustainably Cost Efficient – Delivering Profitable Growth | - |
| Sustainably Cost Efficient – Working within Industry Benchmarks | Y |

Option 1 would align with the *Delivering for Customers* aspect of our vision, as the installation of proactive monitoring on cathodic protection systems prevents undetected corrosion that may result in a loss of containment or loss of customer supply.

The proposed solution is also *Sustainably Cost Efficient,* as the benefits for long term asset management and the avoidance of short term reactive work significantly outweigh the relatively small investment in monitoring equipment.

### B.1.2 Option 2 – Install [redacted] data loggers and proactively replace AEGIS data loggers over 5 years

This option is consistent with Option 1, however the installation of units is spread evenly over five years.

## Cost assessment

Table Appendix 14: Option 2 - CP telemetry program 2023/24 to 2027/28, $'000 real 2021

| Activity | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|
| Install [redacted] data loggers (no. of units) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| **Total expenditure ($'000)** | **51.2** | **51.2** | **51.2** | **51.2** | **51.2** | **256** |

While this program smooths the delivery profile, there is no material cost benefit associated with spreading the works as the total volume of replacements is manageable as part of routing maintenance. Delaying the replacement of all data loggers offers no cost saving and only results in deferring MGN's access to a full suite of consistent data.

## Risk assessment

As discussed, risk is not the driver for the CP telemetry program.

Table Appendix 15: Risk assessment – CP telemetry – Option 2

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

## Alignment with vision objectives

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

Table Appendix 16: Alignment with vision – CP telemetry Option 2

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

Option 2 would align with the *Delivering for Customers* aspect of our vision, as the installation of proactive monitoring on cathodic protection systems prevents undetected corrosion that may result in a loss of containment or loss of customer supply. However, it should be noted that Option 2 does not align with the customer service aspect of Delivering for Customers, as poor performing assets

may go undetected for longer, which may impact service levels if assets do fail and the issue is not detected quickly.

The proposed solution is *Sustainably Cost Efficient,* as the benefits for long term asset management and the avoidance of short term reactive work significantly outweigh the relatively small investment in monitoring equipment.

### B.1.3 Option 3 – Install [redacted] data loggers but do not proactively replace AEGIS data loggers

This option proposes the same new installations of [redacted] data loggers as Option 1, however the [redacted] AEGIS data loggers will not be proactively replaced. We will instead replace the AEGIS data loggers at the end of their useful life as part of scheduled asset replacement, or upon failure.

Option 3 reduces replacement volumes and therefore costs during the period, however, we will forego the opportunity to replace the less reliable AEGIS loggers efficiently as part of the broader program. Replacing the AEGIS loggers reactively, at end-of-life is less efficient because they are considered an inferior system. [redacted] have been found to be a more intuitive and robust telemetry system both in a hardware sense and the backend software sense. We have been finding regular outages of the AEGIS systems and we are yet to experience an outage with [redacted] Streamlining the entire fleet into the same system provides reporting efficiencies for both MGN and the CP contractor.

#### Cost assessment

Table Appendix 17: Option 3 - CP telemetry program 2023/24 to 2027/28, $'000 real 2021

| Activity | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|
| Install [redacted] data loggers, do not replace AEGIS (no. of units) | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| **Total expenditure ($'000)** | **183** | **0** | **0** | **0** | **0** | **183** |

#### Risk assessment

As discussed, risk is not the driver for the CP telemetry program.

Table Appendix 18: Risk assessment – CP telemetry – Option 3

| | MGN Operational Risk Matrix | | | | | | Overall risk |
|---|---|---|---|---|---|---|---|
| **Option 3** | **People** | **Supply** | **Environment** | **Reputation** | **Financial** | **Compliance** | |
| **Frequency** | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Low |
| **Severity** | Minor | Trivial | Trivial | Trivial | Trivial | Trivial | |
| **Risk Level** | Low | Negligible | Negligible | Negligible | Negligible | Negligible | |

### Alignment with vision objectives

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

Table Appendix 19: Alignment with vision – CP telemetry Option 3

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

Option 3 would align with the *Delivering for Customers* aspect of our vision, as the installation of proactive monitoring on cathodic protection systems prevents undetected corrosion that may result in a loss of containment or loss of customer supply. However, it should be noted that Option 3 does not align with the reliability or customer service aspect of *Delivering for Customers*, as the poor performing AEGIS data loggers would remain in the network for longer. This may result in information integrity issues, which may limit our ability to monitor CP assets effectively.

The proposed solution is not *Sustainably Cost Efficient,* as it foregoes an opportunity to replace the AEGIS date loggers for the lowest sustainable cost.

## B.1.4 Option 4 – Do not install CPU Telemetry

This means the risks to CP performance as a result of non-continuous monitoring is not addressed. Under Option 4 there remains the potential for CP faults to go undetected, which means steel pipelines may be susceptible to corrosion for the same period.

The efficiency of ICCP units would also be left undetermined.

### Cost assessment

There are no additional upfront costs associated with this option beyond what is incurred as part of ongoing surveying/maintenance. However, CP system failure can lead to undetected accelerated corrosion, which may result in reactive repairs or mains isolation.

A reactive replacement resourcing approach is significantly more costly. In addition to this, any undetected corrosion will almost certainly be more progressed than it otherwise would be. Reactive repairs will therefore be compounded with an increasing scope of works.

## Risk assessment

As discussed, risk is not the driver for the CP telemetry program.

Table Appendix 20: Risk assessment – CP telemetry – Option 4

| | MGN Operational Risk Matrix | | | | | | Overall risk |
|---|---|---|---|---|---|---|---|
| **Option 4** | **People** | **Supply** | **Environment** | **Reputation** | **Financial** | **Compliance** | |
| **Frequency** | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Low |
| **Severity** | Minor | Trivial | Trivial | Trivial | Trivial | Trivial | |
| **Risk Level** | Low | Negligible | Negligible | Negligible | Negligible | Negligible | |

## Alignment with vision objectives

The following table shows how Option 4 aligns with our vision objectives.

Table Appendix 21: Alignment with vision – CP telemetry Option 4

| 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 | 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 |

Option 4 would not align with our objective of *Delivering for Customers*, as it would not address the lack of visibility of asset performance in parts of our network, as well as the issues with the poor performing AEGIS data loggers. Having substandard telemetry would limit our ability to detect corrosion and poor performance, which may result in a loss of containment or loss of customer supply.

The costs of installing proactive monitoring have reduced over recent years and therefore not undertaking the project would not align with our objective to be *Sustainably Cost Efficient*. We would not realise the long term asset management investment benefits of having more reliable data on our assets, nor avoid shorter term reactive costs.

# 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 |

| Term | Meaning |
|---|---|
| Cathodically protected (Distribution) area | An electrically isolated area within the distribution system, of size convenient and practicable for assessing and maintaining the effectiveness of corrosion protection |
| 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. |

| Term | Meaning |
|---|---|
| FIRB | Foreign Investment Review Board |
| 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. |

| Term | Meaning |
|---|---|
| IO | Input output |
| 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 |

| Term | Meaning |
|---|---|
| PIG | Pipeline Inspection Gauge |
| 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. |

| Term | Meaning |
|---|---|
| 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 |
| 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. |