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CY2017 – CY2022

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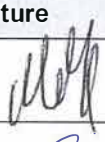
Originated By

Title	Name	Signature	Date
Asset Engineer	Prateek Kateelkar		19/12/2016

Reviewed & Approved By

	Title	Name	Signature	Date
Reviewer	Senior Technical Officer	Max York		19/12/2016
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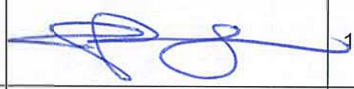
Endorsed	Head of Gas Network Strategy and Performance	Troy Praag		19/12/2016
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Executive Summary

This document outlines the maintenance and replacement strategy for the Supply Regulators on the Multinet Gas network. This strategy primarily aims to achieve a high level of safety and reliability for the Supply Regulators operating on the Multinet Gas network through preventive & corrective maintenance coupled with planned replacement works.

The following key programs are delivered by Multinet Gas to maintain alignment with the Network Objectives (as detailed in Section 3.1), and compliance with regulatory obligations contained in the Gas Safety Case, Gas Distribution System Code, AS 4645 and AS 2885:

1. Hydraulic Regulator Replacement Program;
2. Obsolete Supply Regulator Replacement Program;
3. Sub Standard Field Regulator Decommissioning;
4. Sub Standard District Regulator Decommissioning;
5. Environmental Noise Improvement Investigation Program;
6. Valve Actuator Replacement; and
7. Miscellaneous Works.

Table 0-1 provides the financial summary of the capital expenditure which is to be incurred in the calendar year period 2017 to 2022. Table 0-1 includes a breakdown of direct, overheads and cost escalators for the purpose of reconciliation with that of the overview documentations which support our forthcoming Access Arrangement submission (2018-22).

Table 0-1: Summary of Capital Expenditure ($'000)

Program Name	CY2017	CY2018	CY2019	CY2020	CY2021	CY2022
Hydraulic Regulator Replacement Program	-	$500	-	-	-	-
Obsolete Supply Regulator Replacement Program	$1,040	$700	$550	$590	$440	$440
Sub Standard Field Regulator Decommissioning	-	-	-	-	-	-
Sub Standard District Regulator Decommissioning	-	-	-	-	-	-
Environmental Noise Improvement Investigation Program	$10	$10	$10	$10	$10	$10
Valve Actuator Replacement	$33	$33	-	-	-	-
Miscellaneous Works	$50	$50	$50	$50	$50	$50
Total Direct Expenditure	**$1,133**	**$1293**	**$610**	**$650**	**$500**	**$500**
Overhead	$68	$78	$37	$39	$30	$30
Subtotal	**$1,201**	**$1,370**	**$647**	**$689**	**$530**	**$530**
Real cost escalation	-	$8	$3	$5	$6	$7
Total Expenditure	**$1,201**	**$1,379**	**$650**	**$694**	**$536**	**$537**

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1. Document Overview

1.1. Objectives

This document articulates Multinet Gas' approach to the management of its existing Supply Regulating assets and their associated components. It is one of several asset strategies developed and maintained for the management of Multinet Gas' existing Gas Distribution Network.

It has the following objectives:

- The Strategy articulates the key areas of focus in relation to asset management, key risks, key CAPEX programs, costs and service standard outcomes for the asset group; and
- Show alignment of asset management practices with Gas Network Objectives.

The document is intended for use by:

- Multinet Gas staff (and it's contractors); and
- Regulators – Technical, Safety and Economic

1.2. Scope

This strategy covers the management of Multinet Gas' existing Supply Regulating assets (both above ground and below ground) and their associated components.

The strategy focuses on gas pressure regulating devices installed at:

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

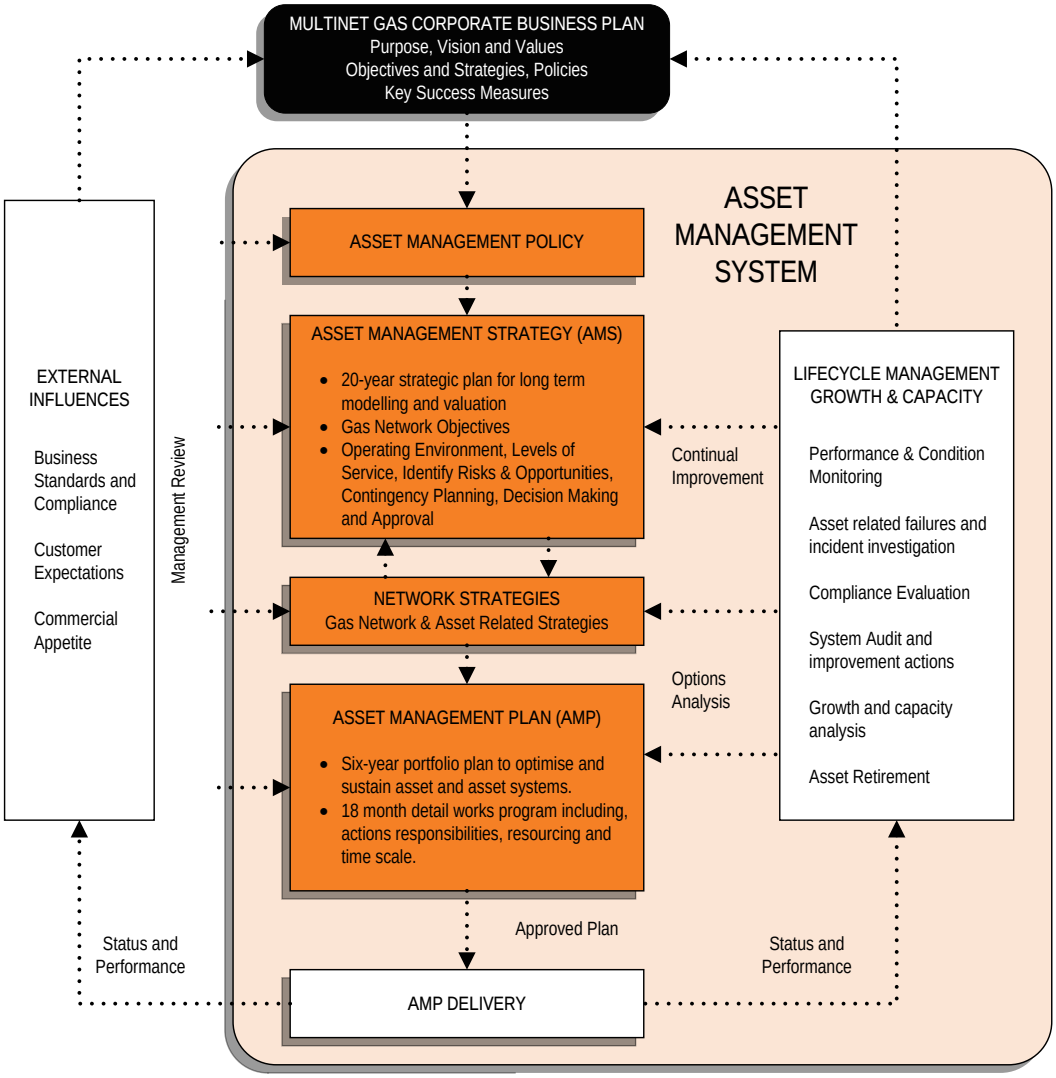
The strategy does not cover:

- SCADA related components– Refer SCADA Strategy (MG-SP-0002);
- Gas Heaters – Refer Gas Heaters Strategy (MG-SP-0015); or
- Supply regulator enclosures, including pits, compounds and kiosks – Refer Equipment Enclosures Strategy (MG-SP-0014).

1.3. Relationship with other Key Asset Management Documents

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

Figure 1-1: Asset Management Framework



1.4. Phasing and Financial Disclosure

All program defined within this strategy are presented in calendar years consistent with the reporting requirements of the Australian Energy Regulator (AER) and where applicable the Gas Distribution System Code (Version 11).

Where required for conversion to financial year (July to June), dollars and volumes can be estimated using a 50:50 expenditure split.

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

- Real Expenditure / Cost (reference year = 2017);
- Direct Expenditure only (i.e. excludes overheads and finance costs);
- In units of $1,000 (i.e. '000); and
- All years are denoted in Calendar Year format.

Total values shown in tables and referred to in the text of this document may not reconcile due to rounding.

Conversion factors used in the escalation of historic expenditure to real 2017 equivalent expenditure is provided in Table 1-1. Cumulative conversion factors have been provided by Multinet Gas' Regulatory department.

Table 1-1: CPI Conversion Factors

	2012	2013	2014	2015	2016	2017
CPI Index - $2017	1.09619	1.07465	1.05192	1.02819	1.01296	1.00000

1.5. Data Sources

The following data sources have been drawn upon in development of the Supply Regulator Strategy:

- SAP: ERP tool used for data collection, analysis and maintenance management of MG assets

1.6. References

- AS 4645 series - Gas Distribution Networks;
- AS 2885 series – Gas and Liquid Petroleum;
- Multinet Gas Risk Model; and
- Multinet Gas - System Operations Manual.
- SCADA Strategy (MG-SP-0002)
- Gas Heaters Strategy (MG-SP-0015)
- Equipment Enclosures Strategy (MG-SP-0014)
- Capital Growth Plan (MG-PL-0002)
- Distribution Mains Strategy (MG-SP-0009)

1.7. Document Review

This document shall be reviewed every two (2) years or earlier if required. The next review is due on or before 31 December 2018.

2. Asset Overview

2.1. Introduction

Supply regulators are spread evenly across, forming a vital part of the gas supply backbone infrastructure of the Multinet Gas distribution network.

Supply regulators are inclusive of District, Field and City Gate Regulators. Their function is to regulate and maintain network pressures, and are typically housed in buildings, kiosks and compounds.

A breakdown of Multinet's 258 individual regulating stations is provided in Table 2-1.

Table 2-1: Number of In-service existing Sites of Supply Regulators

Supply Regulator Description	Number In-Service	Number With SCADA	Number With Fringe Control
District Regulator	133	128	0
Field Regulator	118	106	49
City Gate Regulator	7	7	2
Total	**258**	**241**	**51**

2.1.1. District Regulators

A District Regulator is a pressure regulating station that supplies gas to Multinet Gas' low pressure network an outlet pressure of up to 7 kPa. Multinet has 133 District Regulators predominantly located in older areas of the network as some were originally used in conjunction with manufactured gas and gasometers.

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

Replacement rates of District Regulators are higher than for Field Regulators, however decommissioning rates due to mains upgrade supersedes like for like replacement rates and is the preferred option.

District Regulators can have the pressure configurations summarised in Table 2-2

Table 2-2: District Regulator Pressure Configurations

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

2.1.2. Field Regulators

A Field Regulator supplies gas at an outlet pressure greater than 7 kPa and is not supplied from a Class 600 Pipeline.

Field Regulators are located relatively evenly across the Multinet Gas distribution area, supplying District Regulators, Industrial/Commercial sites and Domestic consumers. The majority of Field Regulators are in good condition, with a small number requiring surface coating maintenance. Coating maintenance is an ongoing issue as pipework is continually damp during normal operation.

Field Regulators can have the pressure configurations summarised in Table 2-3.

Table 2-3: Field Regulator Pressure Configurations

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

2.1.3. City Gate Regulators

A City Gate Regulator supplies gas at an outlet pressure greater than 7 kPa and is supplied from a Class 600 Pipeline.

[redacted]

All City Gates are operated in accordance with Australian Standard AS 2885.3 – 2012.

Gas Heaters are used to heat the gas (prior to pressure reduction) to prevent low operating temperatures and to maintain distribution gas temperature above zero. Gas heaters are currently located at 7 City Gates. Gas Heaters have their own maintenance and replacement strategy. Refer MG-SP-0015.

City Gates can have the pressure configurations summarised in Table 2-4.

Table 2-4: City Gate Regulator Pressure Configurations

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

2.1.4. Fringe Point Control

A regulator is in Fringe Point Control when the fringe point of the network controls the supply regulator instead of the regulator being set to deliver a constant output pressure. A fringe point pressure is set and the supply regulator modulates the outlet pressure to keep a constant fringe pressure. 49 Field Regulators and two City Gates have fringe point control and many more are planned as part of the SCADA strategy.

2.2. Asset Age Profile

The Supply regulator age profile encompasses a broad time-span, with the older sites installed in the late 1950's. The majority of these sites were installed / constructed by the former Gas and Fuel Corporation (GFC) and are spread throughout the Multinet Gas distribution network.

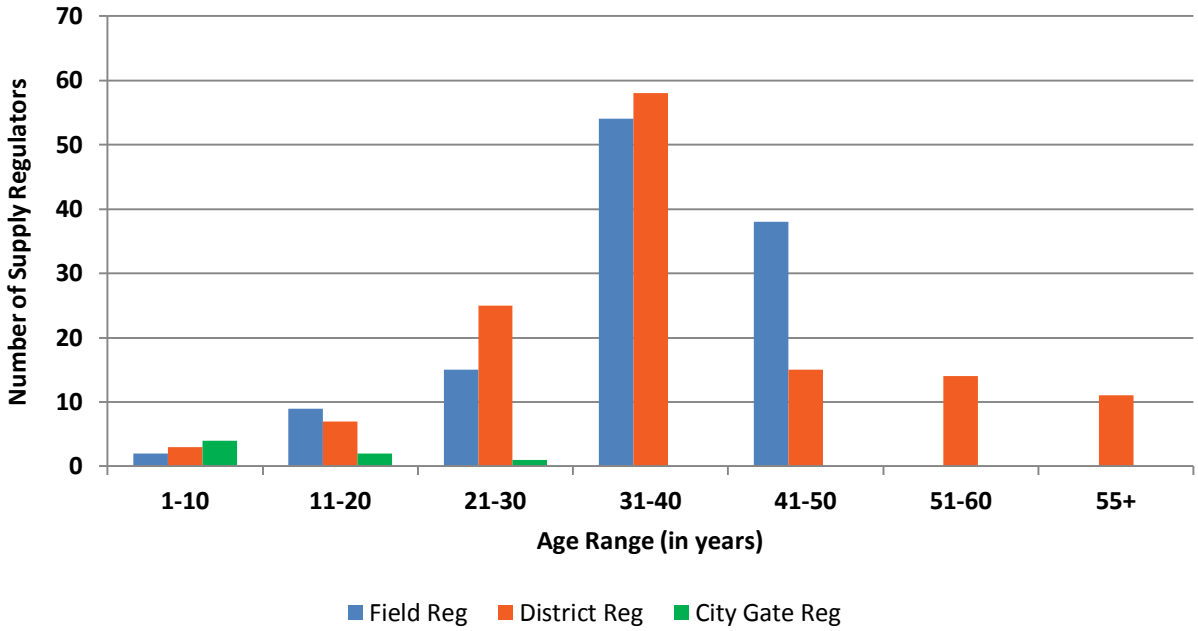
The total number of supply regulator sites is 258. The average site age is 36 years, with 74% of sites more than 30 years old.

When considering 'average age' the following should be taken into account:

- The site's commissioning date, in some cases, was based on when the conversion from manufactured gas to natural gas occurred, as the original commissioning date is unknown
- Individual components may have been replaced many times since original commissioning date.

The age profile for supply regulators is depicted in Figure 2-1.

Figure 2-1: Asset Age Profile for Supply Regulators



Refer to the Appendix for a breakdown of Supply Regulators by installation year (Section 5.2) and model (Section 5.3).

2.3. Asset Performance

Regulators do not tend to exhibit a useful life or end-of-life failures. Their refurbishment / replacement is typically driven by their inability to be serviced due to critical spare parts not being available or specific operational requirements.

The current condition of Supply Regulator installations is predominantly good with the following exceptions and comments:

- A number of the older installations (30+ years old) display aged coatings that will require repair and / or re-coating. Some existing coatings may contain lead and will need to be conducted by suitably qualified contractors. (Sites to be determined).
- A number of installations, predominantly installed during the early 1980's, are suffering from corrosion due to some components (steel fittings, fasteners etc.) being of an inferior quality.

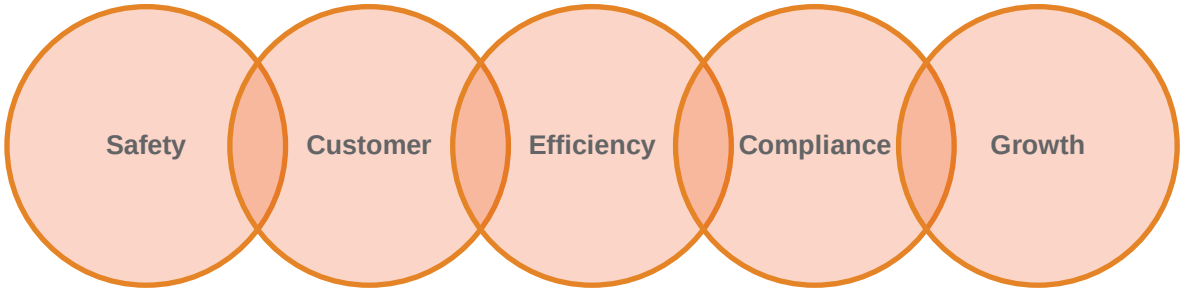
Refer to the Appendix (Section 5.3) for a list of regulators by type and year installed.

3. Asset Management Drivers

3.1. Network Objectives

Multinet Gas has established five (5) network objectives that govern how the network is operated and maintained. This is reflected mostly in regulatory obligations and in some cases prudent and responsible behaviour, justifiable on economic grounds. Achievement of these objectives ensures the sustainable and reliable operation of the gas distribution network.

Figure 3-1: Gas Network Objectives



The alignment between network objectives and the Supply Regulator strategy is detailed below.

3.1.1. Safety – Achieve Zero Harm, while maintaining current levels of network safety.

This strategy aims to achieve a high level of reliability and personnel / public safety through inspection, preventive and corrective maintenance, and asset replacement. All planned maintenance activities are underpinned by the need to ensure safety for the customer, general public and the field personnel who carry out maintenance activities.

The Sub-Standard Field and District Regulator Decommissioning programs are carried out to improve the existing safety, bypass arrangements, over pressure protection and redundancy levels at these sites.

Each City Gate site is subject to a five yearly Safety Management Study (SMS) review as per AS 2885 standard requirements. The purpose of the SMS is to identify threats to the City Gate and apply controlling measures to either mitigate or control threats to acceptable levels of risk. Actions resulting from this SMS are managed and closed off by Multinet.

The Miscellaneous works program takes into account the replacement or refurbishment of supply regulator associated components and fittings. These components are replaced or refurbished on a “case-by-case” basis to rectify any safety related issues.

3.1.2. Customer – Effortless Customer Experience

This strategy aims to achieve a high level of customer satisfaction and experience by providing a reliable means of gas supply to the customer. The planned maintenance activities are designed to maintain network continuity with no interruptions of supply to end customers.

The objective of the Obsolete Regulator Replacement program (Section 4.3) is to target the old regulator models for which spare parts are difficult to obtain and replace them with newer models to ensure ongoing gas supply for the customer.

The Environmental Noise Improvement Investigation Program (Section 4.5) aims to manage the ongoing risk of noise complaints from residents living within close proximity of existing Supply Regulator assets.

3.1.3. Efficiency – Sustainable and prudent network investment

The strategies outlined in this document are aimed at improving the efficiency of the Supply Regulators installed in the network.

The maintenance strategies outlined in this document are aimed at improving the efficiency of the Supply Regulators installed in the MG network.

The Obsolete Regulator Replacement program targets certain regulators (e.g. Reynolds 678, 688, 680 and Grove's) and aims to replace them with suitable newer models for which Original Equipment Manufacturer (OEM) parts are adequately supported by the manufacturer. This program will ensure that the older model regulators are being replaced in a cost efficient manner and build a suitable level of strategic spares which can be used in the event of any breakdown of a similar model on the network.

The Hydraulic Regulator Replacement Program (Section 4.2) aims to achieve higher operating efficiency by replacing them with a newer model regulator which needs lesser maintenance and a reactive overhauling strategy rather than currently overhauling them every 3 years.

The Valve Actuator Replacement Program (Section 4.7) reduces maintenance activities while increasing network performance thus increasing the operational efficiency of the network.

3.1.4. Compliance – Maintain regulatory and technical compliance

This strategy aims to achieve a high level of regulatory and technical compliance by ensuring that all maintenance and replacement activities are carried out to meet the requirements of MG Safety Case, AS 4645, AS 2885 and the Gas Distribution System Code.

The drivers for the Sub-Standard Field and District Regulator Decommissioning program and Hydraulic Regulator Replacement program have compliance driven aspects to them. In particular, the Sub-Standard District Regulator Replacement program is driven by the need to make certain old sites comply with modern day engineering standards as these sites were built with no or limited bypass facilities and some sites exceed bypass pipework capacity.

3.1.5. Growth – Seek opportunities for new growth

This strategy currently does not address any growth corridors for Supply Regulators.

3.2. Lifecycle Management

The maintenance strategy assigned to City Gates, Field Regulators and District Regulators is its third, six-year cycle. Analysis of this strategy and its performance over time has been proven to give satisfactory results. An RCM process similar to that applied to other Industrial & Commercial Regulators is proposed for this class of asset.

3.2.1. Inspection

Inspection activities are dependent on site type and configuration.

(a) District Regulator Sites with Fixed Outlet Pressure

These sites are inspected monthly, via 'chart rounds'. The inspection covers housing integrity, regulator operation, gas leakage and water ingress, in accordance with AS 4645. These sites receive scheduled pressure change visits which are coordinated to cater for seasonal demand.

(b) District Regulator Sites with Time Clock Modules & Data Logger

These sites are inspected annually. The inspection covers housing integrity, regulator operation, gas leakage and water ingress, in accordance with AS 4645. These sites receive scheduled pressure changes visits coordinated to cater for seasonal demand.

(c) District Regulator Sites with RTU

These sites are inspected annually for housing integrity, regulator operation, gas leakage and water ingress, in accordance with AS 4645. These sites currently receive 2 scheduled pressure changes visits coordinated to cater for seasonal demand.

(d) Field Regulator Sites without SCADA Control

These sites are inspected every six months for housing integrity, regulator operation, gas leakage and water ingress, in accordance with AS 4645 and AS 2885.3. Slam Shut Panels (where fitted) are checked for correct actuator operation.

(e) City Gate & Field Regulator Sites with SCADA Control

These sites are routinely inspected every six months. Inspections are scheduled to occur between operational checks.

(f) Heaters

Refer to the Gas Heater Strategy (MG-SP-0015) for information on gas heater inspection frequencies.

3.2.2. Preventive Maintenance

(a) District Regulators

District Regulator Preventive Maintenance is carried out on the following basis:

All sites receive a twelve-monthly Operational Check as well as a six-yearly Full Strip-Down Maintenance; and

Most sites receive Pressure Schedule Change visits, scheduled to occur twice a year. The variation in seasonal load dictates when these visits are to occur; an area specific maintenance plan is used to schedule this work. Not all sites are visited during this activity, as the site setting may not require changing.

(b) City Gate & Field Regulators

City Gate & Field Regulator Preventive Maintenance is carried out on the following basis:

Sites without SCADA receive six-monthly Operational Check and six-yearly Full Strip Down Maintenance (mandatory soft spare replacement);

Sites with SCADA receive six-monthly Operational Checks and receive Breakdown Maintenance as required; and

Depending on the type of regulator installed and its criticality within the distribution system, a scheduled Full Strip Down Maintenance (mandatory soft spare replacement) is performed every three years e.g. Highett and Aughtie Dr Sites, and regulators containing hydraulic fluid.

3.2.3. Corrective Maintenance - Faults and Defects

Supply Regulator faults and defects are generally reported and rectified by Service Providers as follows:

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

3.2.4. Refurbishment

Refurbishment of Supply Regulators and associated components is usually undertaken as a project and where possible aligned with scheduled maintenance activities. As Supply Regulator components vary widely with regards to age, type, function and utilisation, refurbishment is determined on a case-by-case basis.

The primary drivers for refurbishment of Supply Regulators and associated components are:

- Failing to maintain lock-up and/or set pressure;
- Gas leakage – internal and/or external;
- Reduced operational capabilities;
- Improving maintenance efficiencies; and
- Availability of spare parts.

3.2.5. Replacement

The replacement of Supply Regulators and associated components is primarily driven by:

Availability of serviceable spare parts.

As critical equipment replacement parts become unavailable and the equipment can no longer be maintained to the satisfactory levels such equipment must be replaced with suitable commercially supportable units. The basis of regulator family replacement will be on the forecast availability of spares and the current level of regulator family exposure.

Each family of regulator requiring replacement has a detailed schedule for their replacement. This replacement considers the likelihood of future decommissioning within an acceptable period, and to maintain spare part volumes with respect to breakdowns.

Ability to meet demand requirements.

As gas load/volume changes occur within the distribution network so does the ability of the Supply Regulator to meet capacity requirements. As such, regulator upgrade or replacement is undertaken when a site's component(s) rated capacity is forecast to be exceeded and is likely to cause an increased risk in gas supply outage.

The forecast for capacity related station upgrades (considered Augmentations) is contained within Multinet Capital Growth Plan (MG-PL-0002).

Ability to meet operational, safety and regulatory requirements.

District Regulators installed prior to the formation of the Gas and Fuel Corporation have limited or no regulated by-pass facilities. These sites no longer meet Multinet Gas standards and require re-work/replacement in order to meet current operation requirements.

The Appendix (Section 5.6) contains a list of regulators with a non-standard bypass. Often these regulating stations use regulators that are no longer supported and hence the regulating station is scheduled for decommissioning or replacement.

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

3.3. Performance Measures

Supply regulator performance is measured during regulator performance trials, prior to acceptance and use by Multinet Gas. Individual regulator site performance is measured and recorded during scheduled and corrective maintenance works. These measures are analysed on a regular basis to ensure the correct strategies are being applied.

4. Capital Program – 2017 to 2022

4.1. Overview

Multinet Gas completes the following annual programs to maintain its alignment with Network Objectives (refer Section 3.1) and remain compliant with its regulatory obligations under the Gas Distribution System Code, AS 4645 and AS 2885.

- Hydraulic Regulator Replacement Program;
- Obsolete Supply Regulator Replacement Program;
- Sub-Standard Field Regulator Decommissioning Program[1];
- Sub-Standard District Regulator Decommissioning Program;
- Environmental Noise Improvement Investigation Program;
- Valve Actuator Replacement; and
- Supply Regulators - Miscellaneous Works.

Table 4-1 and Figure 4-1 provides a breakdown of capital expenditure from 2017 to 2022 by program. Total expenditure for Supply Regulators is driven by the Obsolete Supply Regulator Replacement Program which contributes approximately 80% of forecast expenditure. Average annual expenditure is $781k for the period.

Capex allocation is captured within the AER regulatory accounts 'Other' category (RJA sub-category).

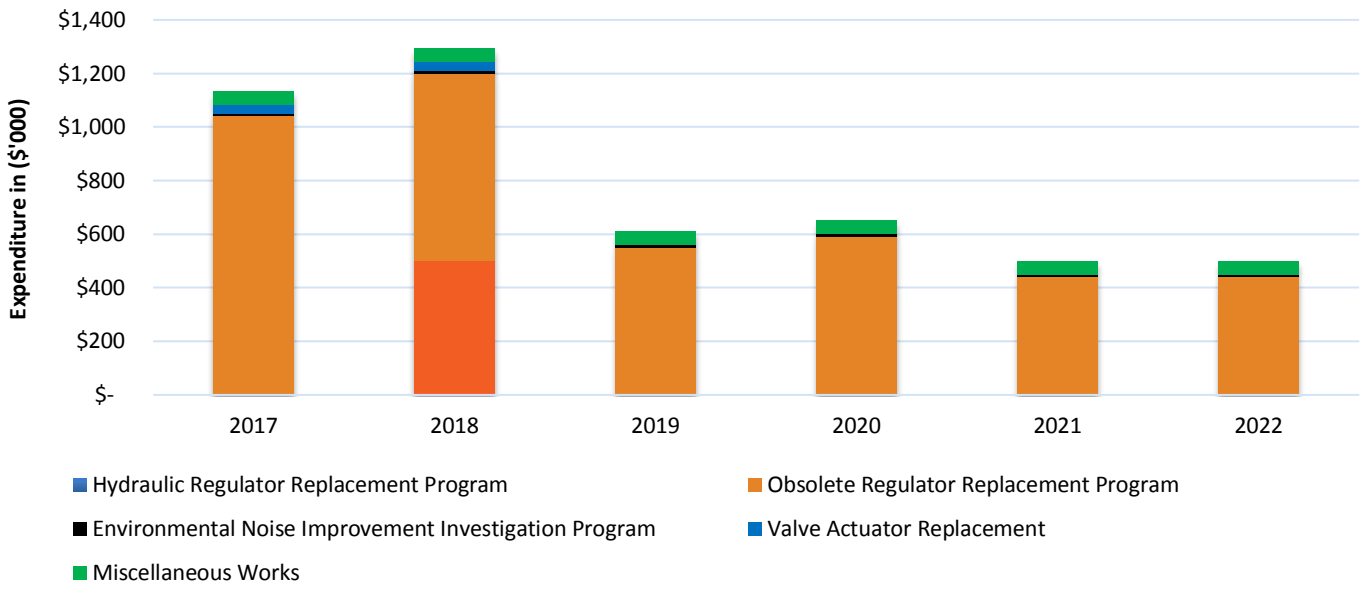
Table 4-1: Capital Program – Supply Regulators

Ref	Program Name	2017	2018	2019	2020	2021	2022
4.2	Hydraulic Regulator Replacement Program	-	$500	-	-	-	-
4.3	Obsolete Supply Regulator Replacement Program	$1,040	$700	$550	$590	$440	$440
4.4	Sub Standard Field Regulator Decommissioning	-	-	-	-	-	-
4.5	Sub Standard District Regulator Decommissioning	-	-	-	-	-	-
4.5	Environmental Noise Improvement Investigation Program	$10	$10	$10	$10	$10	$10
4.7	Valve Actuator Replacement	$33	$33	-	-	-	-
4.8	Supply Regulators - Miscellaneous Works	$50	$50	$50	$50	$50	$50
	Total Expenditure ($'000)	**$1,133**	**$1,293**	**$610**	**$650**	**$500**	**$500**

Unit costs used in forecasting future expenditure estimates for the above table have been based on the historical costs previously incurred in completing similar regulator replacement projects.

[1] The associated capital costs of decommissioning the Sub-Standard Field and District Regulators are expected to be included as part of the relevant mains replacement projects and hence costs are not forecast in this strategy. In the event the relevant mains replacement project does not proceed, then the estimated cost of decommissioning or replacing this field regulator is shown in section 5.6 and 4.5.

Figure 4-1: Supply Regulators Capital Works Program 2017 to 2022



4.2. Hydraulic Regulator Replacement Program

4.2.1. Introduction

The Welker Jet regulator is a complex system that provides good performance at high flows and low temperatures. This regulator (and a similar make known as Jetstream) had been selected for City Gate installations in the past.

Multinet has Welker Jet regulators installed on both legs of Vermont, DTS, Seville East, Korumburra and Gembrook City Gates[2].

The Jetstream regulator also utilises hydraulic fluid to control pressure. This fluid is susceptible to the ingress of gas and over time this changes its overall properties (it becomes more compressible). This creates poor control and reduces the pressure regulation functionality. This is the primary reason why all hydraulic regulators are overhauled every three years instead of a reactive overhaul as with most other regulators.

In addition, both regulator types rely on Bristol Controllers for control. These controllers are on an open loop control system which vents gas to atmosphere as part of the control process. As a result, the use of these regulators contributes a relatively small component of network emissions and Unaccounted for Gas (UAFG).

4.2.2. Scope

The Hydraulic Regulator Replacement program targets the replacement of Welker Jet and Jetstream Regulators at Multinet's City Gate facilities.

4.2.3. Business Drivers and Strategic Alignment

The primary drivers of the Hydraulic Regulator Replacement program are:

- Improve reliability and maintain security of supply;
- Maintain alignment with network objectives of safety, compliance and efficiency;
- To replace aging assets with new and better technology. (The Welker Jet regulators were introduced into the network in 1960's);

[2] Seville East, Korumburra and Gembrook City Gate are currently active 2016 projects.

- Availability of spare parts and suppliers to hold the necessary emergency spare parts in case of a failure;
- Significantly reduce the strip down maintenance intervals with the new regulators and hence reduce opex costs; and
- Removal of an open control loop that bleeds gas to the atmosphere and hence reduce UAfG component of the network.

4.2.4. Works Program

The capital expenditure forecast for the Hydraulic Regulator Replacement program is provided in Table 4-2, where three sites containing Welker Jet / Jetstream regulators are forecast for replacement to 2018.

Table 4-2: Capital Forecast - Hydraulic Regulator Replacement Program

Network Regulator	Reg #	2017	2018	2019	2020	2021	2022
[redacted]	P4-294	[redacted]	-	-	-	-	-
[redacted]	P3-002	-	[redacted]	-	-	-	-
[redacted]	P6-002	-	[redacted]	-	-	-	-
Program Expenditure		**-**	**$500**	**-**	**-**	**-**	**-**

The costs associated with the replacement of regulators at [redacted] (identified as "Augmentation" in Table 4-2) are included in Multinet's forecast of Augmentation capex. Refer to Multinet's Capital Growth Plan (MG-PL-0002) for further details.

4.3. Obsolete Regulator Replacement Program

4.3.1. Introduction

The Obsolete Regulator Replacement Program targets the replacement of Fisher 298, Grove and Reynolds regulators.

Each regulator is targeted for replacement due to the Original Equipment Manufacturer (OEM) no longer supporting the items. This has resulted in a scarcity in certain soft spares used to maintain each regulator, resulting in increased repair cost and network risk. By proactively replacing these obsolete regulators, Multinet can install the current manufacturer supported models of regulators in a cost efficient manner and build up a suitable level of strategic spares for the remaining population of the obsolete regulator models still operating in the network.

Additional background of each regulator types is provided below.

(a) Fisher 298 Regulator

The 298T-ET regulator was installed during the time of the Gas and Fuel Corporation. Operation of this regulator has identified it to be susceptible to poor lock-up (Internal leakage). Lock-up relies on a small rubber seal located directly in the gas flow-path which is susceptible to damage. This regulator is also susceptible to cage erosion. An alternative regulator design with seals placed out of the gas flow-path rectifies this problem.

The production of the Fisher 298 regulator model was ceased many years ago and getting spare parts is proving difficult. The current lead time on orders exceeds 12 weeks and manufacturers are not providing assurances regarding spare part availability over the next 5–10 years. This poses a risk of supply interruption to the customer in the event of a regulator breakdown as the spare parts to repair the regulator are not readily available.

The Fisher 298 family of regulators is to be replaced with suitably sized Norval regulators (for the HP and MP system) and with Axial regulators for the 840 kPa HP2 systems.

The installed population of Fisher 298T-ET regulators are shown in Table 4-3.

Table 4-3: Fisher 298T-ET Regulators

Location	Installed on Leg	Regulator Model Nominal Diameter (mm)	Replacement Regulator	Replacement Year
[redacted]	A Leg Secondary	100	Norval	2017
[redacted]	B Leg Secondary	100	Norval	2017
[redacted]	A Leg Secondary	50	Norval	2017
[redacted]	B Leg Secondary	50	Norval	2017
[redacted]	B Leg Secondary	50	Norval	2017
[redacted]	A Leg Primary	100	Axial	2016
[redacted]	A Leg Secondary	100	Axial	2016
[redacted]	A Leg Secondary	80	Axial	2016
[redacted]	B Leg Secondary	80	Axial	2016

(b) Grove Regulators

There are Grove Regulators currently operating in the distribution system which are installed with sleeve “201-03029-814”. As these sleeves are no longer in production, Grove has recommended sleeve “201-03024-814” as a replacement. The availability of sleeves and their poor fitting of the alternative sleeve has led to a replacement program being initiated to methodically replace the grove regulator.

As part of this program, only TP-TP, TP-HP, TP-MP sites have been shortlisted for replacement based on their risk profile. Refer to the Appendix (Section 5.7) for sites included in this program.

(c) Reynolds regulators

The Reynolds 670, 688 and 678 regulators are no longer in production and spare parts have been unavailable for 15 years (since 2001). Regulators which are currently kept in the ‘graveyard’ stores are being stripped of soft spares and useful hardware to maintain spares for the remainder of in-service regulators on the network. This is not sustainable.

The number of Reynolds Regulators that require replacement are summarised in Section 5.7. Some Reynolds Regulators will be decommissioned as part of the Sub-Standard District Regulator Decommissioning Program (which is dependent on the Mains Replacement Program). These regulators have been excluded from the Obsolete Regulator Replacement Program. Refer to the Appendix (Section 5.6) for sites included in this program.

Table 4-4: Total Installed Population of Reynolds 678/688/680 Regulators

Size (mm)	Regulator Model	Number to Replace
100	Reynolds 678	3
150	Reynolds 678	15
150	Reynolds 670	2
200	Reynolds 688	1[3]
200	Reynolds 680	1
300	Reynolds 678	2

4.3.2. Scope

The Obsolete Regulator Replacement Program targets the replacement of Fisher 298, Grove and Reynolds (models 670, 678, 688 and 680) regulators installed at Supply regulating stations.

The program does not target regulators earmarked for decommissioning as part of the Mains Replacement Program over the next 6 years (to 2022). Refer to Multinet's Distribution Mains Strategy (MG-SP-0009).

4.3.3. Business Drivers and Strategic Alignment

The primary drivers of the Obsolete Regulator Replacement program are:

- Lack of available spare parts and suppliers to hold the necessary emergency spare parts in case of a failure;
- Reduced maintenance frequency;
- Reduce the burden on staff training;
- Improved stock holding capability; and
- To achieve alignment with gas network objectives of safety, regulatory compliance, customer satisfaction and efficiency.

4.3.4. Works Program

The capital expenditure forecast for the Obsolete Regulator Replacement program is provided in Table 4-5. Refer to the Appendix (Section 5.7) for a detailed list of sites targeted for replacement under this program.

[3] This regulator will be replaced as part of 2019 Mains Replacement Program.

Table 4-5: Capital Forecast – Obsolete Regulator Replacement Program

Regulator Type		2017	2018	2019	2020	2021	2022
Grove Regulators	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Reynolds 678, 688 & 680 Regulators	Units	-	[redacted]	-	[redacted]	-	-
	Exp	-	[redacted]	-	[redacted]	-	-
Fisher 298T-ET Regulators	Units	[redacted]	-	-	-	-	-
	Exp	[redacted]	-	-	-	-	-
Program Expenditure		**$1,040**	**$700**	**$550**	**$590**	**$440**	**$440**

4.4. Sub Standard Field Regulator Decommissioning Program

4.4.1. Introduction

Certain Field Regulator sites commissioned in the early years of the former Gas and Fuel Corporation were installed with a bypass valve (not regulated), or with limited bypass facilities. These sites do not meet current Engineering Standards, operational expectations or in some cases system capacity requirements.

Over time, these sites have been rectified as part of Multinet's Mains Replacement Program.

4.4.2. Scope

The Sub Standard Field Regulator Decommissioning Program targets regulating sites with non-compliant bypass facilities.

4.4.3. Business Drivers and Strategic Alignment

Safety, regulatory compliance and network efficiency are the primary drivers of the Sub Standard Field Regulator Decommissioning program.

4.4.4. Works Program

A single supply regulating station requires replacement under the Sub Standard Field Regulator Decommissioning Program as shown in Table 4-6. This site is to be decommissioned as part of Mains Replacement Program.

The associated capital cost of decommissioning this Field Regulator is included as part of the Mains Replacement Program, and hence, not duplicated in the Supply Regulator Strategy.

In the event that the relevant mains replacement project does not proceed, the estimated cost of decommissioning or replacing this field regulator is estimated to be $250k.

Table 4-6: Capital Forecast - Sub-Standard Field Regulators Decommissioning Program

Regulator Number	Regulator Name	Equipment Number	Reasons for Sub Standard Status	Year
[redacted]	P2-066	21000064	Single Run with valve separating H.P. & M.P.	2020 (As part of Mains Replacement Program)

Note: This site will continue to receive a scheduled six monthly operational check to ensure it is fully operational. However, the six-yearly Full Strip-Down maintenance would not be carried out if it is planned to be decommissioned in the near future.

4.5. Sub Standard District Regulators Decommissioning Program

4.5.1. Introduction

District Regulator sites commissioned before the formation of the Gas and Fuel Corporation were built with either no or limited bypass facilities. Maintenance activities were usually carried out during periods of lower demand with surrounding regulator stations used to support the site being maintained. These sites no longer meet Engineering Standards, operational expectations or in most cases bypass system capacity.

4.5.2. Scope

The Sub Standard District Regulator Decommissioning Program targets regulating sites with either no or limited bypass facilities.

4.5.3. Business Drivers and Strategic Alignment

Safety, Regulatory compliance and network efficiency are the primary drivers of the Sub Standard District Regulator Decommissioning program.

4.5.4. Works Program

[redacted] sites have been identified as part of this program. Refer to the Appendix (Section 5.6) for a list of Sub-Standard District Regulators and their intended year of decommissioning. Most of the sites have the Reynolds 678 / 680 regulators installed with limited or no bypass facilities.

Multinet Gas has taken the approach of decommissioning these district regulators through alignment with the Mains Replacement Program (Low Pressure to High pressure). This is considered the most efficient and economical method of program delivery, as costs are absorbed within the Mains Replacement Program.

In the event that the relevant Mains Replacement program / project does not proceed, Table 4-7 provides the "standalone" capital cost of delivering the Sub Standard District Regulator Decommissioning Program.

Table 4-7: Capital Forecast - Sub-Standard District Regulator Decommissioning Program

		2017	2018	2019	2020	2021	2022
Sub Standard District Regulator Decommissioning Program	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Standalone Program Expenditure ($'000)		**$150**	**$600**	**$1,500**	**$300**	**$300**	**$450**
Forecast Expenditure ($'000)		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Note: Sites earmarked to be decommissioned in the next 6 years will continue to receive a 12 month operational check to ensure they are fully operational. However, the six-yearly Full Strip-Down maintenance would not be carried out on these sites as they are planned to be decommissioned in the near future.

4.6. Environmental Noise Improvement Investigation Program

4.6.1. Introduction

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

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

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

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

An annual budget allocation is maintained to address ad-hoc noise related issues and to continue development of noise abatement solutions.

4.6.2. Scope

Supply Regulator sites exhibiting excess noise characteristics. Works program to address high exceedance sites a priority and progressively coordinate noise mitigation works with augmentation projects.

4.6.3. Business Drivers and Strategic Alignment

The primary drivers of the Environmental Noise Improvement Investigation Program are:

- *Customer satisfaction:* Multinet Gas is obliged to implement mitigation works if a consumer complains. However, the Multinet Gas strategy is to manage the process utilising an Environmental Improvement Plan to pro-actively and progressively address this risk.
- *Regulatory Compliance:* There is a regulatory requirement for Multinet Gas to maintain acceptable noise levels as per the State Environment Protection Policy (SEPP) N-1 Control of Noise from Commerce, Industry and Trade. If noise levels exceed those set down in the SEPP and a customer complaint is received, Multinet Gas is required to reduce the noise level below set limits. By proactively targeting the high noise exceedance sites, Multinet aims to reduce noise levels and also meet the regulatory requirements.

4.6.4. Works Program

An ongoing capex budget allocation exists to address consumer complaints and fund pro-active investigation works to maintain regulatory compliance and customer satisfaction. This is summarised in Table 4-8 below.

Table 4-8: Capital Forecast - Environmental Noise Improvement Works

Program	2017	2018	2019	2020	2021	2022
Environmental Noise Improvement Works	$10	$10	$10	$10	$10	$10

4.7. Valve Actuator Replacement Program

4.7.1. Introduction

Audco valves (Model HW) have been installed in conjunction with newer style valve actuators. This has resulted in the valve being greased inadequately, resulting in the need for more frequent inspection and maintenance to ensure correct operation.

4.7.2. Scope

The scope is limited to the two sites mentioned in Table 4-9 which have Audco valves (Model HW) installed in conjunction with newer style valve actuators.

Table 4-9: Valve Actuator Replacement Sites

Regulator Number	Regulator Name	Inlet Valve Type	Inlet Valve Size	Actuator Numbers	Actuator Type
P4-168	[redacted]	GG33	200	2	Norbro 45-A-40
P6-003	[redacted]	GG33	200	2	Norbro 45-FKA-400

4.7.3. Business Drivers and Strategic Alignment

Safety and efficiency are the primary drivers of the Valve Actuator Replacement Program.

Replacing the existing valve actuator(s) with an appropriate unit gives an increased over pressure protection operation and also reduces maintenance activities. Rectification works for the remaining sites will be undertaken during annual refurbishment works.

4.7.4. Works Program

Table 4-10 shows the direct capital expenditure forecast for valve actuator replacements at two locations on Multinet's network.

Table 4-10: Capital Forecast – Valve Actuator Replacement Program

Network Regulator	Reg #	2017	2018	2019	2020	2021	2022
[redacted]	P4-168	$33	-	-	-	-	-
[redacted]	P6-003	-	$33	-	-	-	-
Program Expenditure		**$33**	**$33**	**-**	**-**	**-**	**-**

4.8. Supply Regulators - Miscellaneous Works

4.8.1. Introduction

Multinet's miscellaneous works program for Supply Regulators covers the refurbishment or replacement of supply regulators and their associated components e.g. valves, thermowells, filters, strainers, monolithic insulation joints etc. Works are undertaken as a project and where possible aligned with scheduled maintenance activities. As Supply Regulator components vary with age, type, function and utilisation, these works are determined on a case-by-case basis.

These works are carried out to achieve alignment with network objectives and maintain security of supply to the network.

4.8.2. Scope

The scope of this program includes refurbishment or replacement of supply regulators and their associated components e.g. valves, thermowells, filters, strainers, monolithic insulation joints etc.

The miscellaneous works program also includes:

(a) Hazardous Area Dossiers

Supply regulators with SCADA or electrical equipment are considered Hazardous Areas under Australian Standards. These standards demand a dossier with full description of the hazards and potential ignition sources. Maintaining these dossiers with the latest standards and changes to individual sites is an ongoing project.

(b) District Regulator Sense Lines

The level of District Regulator capacity utilisation has led to the need to relocate regulator sense lines to outside of the enclosure, allowing more accurate pressure control during high/low conditions. This modification is performed on an 'as required' basis.

(c) Huber Yale Insulation Unions

Insulation unions are installed in supply regulator stations together with insulating flanges to ensure the electrical separation of structures. The Huber Yale insulation unions were installed over a number of years and have been found to fail under moderate fault conditions. This is due to a relatively small external spark gap that is susceptible to dirt and moisture accumulation. These insulation unions will be replaced as part of any capital programs pertaining to that site as it would be the most efficient way to replace them.

(d) Slam Shut Panels

The increased utilisation and reliance on SCADA control at Field Regulators & City Gates has uncovered a hidden failure mode. The use of SCADA control on both regulator runs has masked the traditional drop in outlet pressure when a regulator run reaches maximum capacity. If the older style Slam Shut Panel closes the "B" Leg Actuator, then the station is forced to run only on the "A" Leg unless it is manually reset. Therefore, it is planned to replace the older style Slam Shut Panels with the newer versions and thus eliminating the failure mode mentioned above.

4.8.3. Business Drivers and Strategic Alignment

Safety and efficiency (through efficient works delivery) are the primary drivers of the funding allocation for the miscellaneous works program for Supply Regulators.

4.8.4. Works Program

Table 4-11 shows the direct capital expenditure associated with Multinet's miscellaneous works program for supply regulators.

Table 4-11: Capital Forecast– Supply Regulators Miscellaneous Works

Program	2017	2018	2019	2020	2021	2022
Supply Regulators - Miscellaneous Works	$50	$50	$50	$50	$50	$50
Program Expenditure	**$50**	**$50**	**$50**	**$50**	**$50**	**$50**

5. Appendix

5.1. Glossary & Definitions

Term	Meaning
AER	Australian Energy Regulator
AMP	Asset Management Plan
AMS	Asset Management Strategy
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
GFC	Gas and Fuel Corporation
HP	High Pressure (Pressure Range: 140 to 515 kPa)
HP2	High Pressure 2 (Pressure Range: 600 to 1050 kPa)
I&C	Industrial and Commercial connections
LP	Low Pressure (Pressure Range: Upto 7 kPa)
MG	Multinet Gas
MP	Medium Pressure (Pressure Range: 35 to 210 kPa)
OEM	Original Equipment Manufacturer
RTU	Remote Terminal Units
SAP	Systems Applications and Products is an Enterprise Resource Planning tool which used at Multinet Gas for recording asset data and maintenance management.
SCADA	Supervisory Control And Data Acquisition
SEPP	State Environment Protection Policy
SMS	Safety Management Study
TP	Transmission Pressure (Pressure Range: Above 1050 kPa)

5.2. Installations by Year

Supply Regulator installations by year (Data Source: SAP, as of 13/06/2016)

Year	Units Installed	Year	Units Installed	Year	Units Installed	Year	Units Installed
1958	4	1974	4	1990	2	2006	0
1959	2	1975	9	1991	2	2007	1
1960	1	1976	22	1992	6	2008	2
1961	4	1977	23	1993	2	2009	0
1962	2	1978	9	1994	4	2010	3
1963	0	1979	10	1995	1	2011	0
1964	8	1980	6	1996	1	2012	1
1965	4	1981	19	1997	4	2013	0
1966	1	1982	5	1998	2	2014	1
1967	0	1983	7	1999	1	2015	1
1968	5	1984	6	2000	1	2016	0
1969	12	1985	5	2001	1		
1970	8	1986	8	2002	3		
1971	3	1987	9	2003	2		
1972	5	1988	4	2004	1		
1973	6	1989	3	2005	2		

5.3. Regulator Types – Model by Quantity

Quantity as of 13/05/2016:

Regulator Model	Installation years	Regulator Units
Cocon 26	1998-Ongoing	3
Fisher S201/ S202	1969	1
Fisher 298	1968-still	55
Fisher 166	1958-1959	2
Fisher 66	1964-1990	38
Reliance 3000	1958-1969	11
Grove Model 80	1962-1972	178
Grove Model 81	1970-1983	
Grove Model 83	1993-1994	
AMC Axial Flow Valve	1961-Ongoing	384
Jetstream	1966-1980	16
Welker jet	1989-Ongoing	6
Reynolds 670 / 678	1958-1986	24
Reynolds 688	1978-1984	1
Reynolds 680	1994-Ongoing	1
Reynolds 682 series	2002-Ongoing	50
Apperval	2003-Ongoing	7
Reval	2003-Ongoing	3
GFC Butterfly	1958-Ongoing	59
Gorter R100(S)	2008-Ongoing	8
Pietro Fiorentini – Reval 182	2014-Ongoing	4

5.4. Scheduled Maintenance Activities for District Regulators

Scheduled Operational Check

A district regulator operational check consists of:

1. All regulators are to be externally inspected for signs of wear, damage and corrosion;
2. Lockup test to be carried out with results recorded;
3. All regulators are to be checked for correct operation and setting;
4. All time clocks where fitted are to be checked for correct operation and on/off settings;
5. All gas cocks where fitted are to be checked for correct operation;
6. The pressure card is to be checked for accuracy and updated if necessary;
7. All valves are to be checked for correct operation and lubricated;
8. All strainers/filters/screens are to be removed and cleaned;
9. All pipework and joints are to be checked for leaks with the site being leak free on exit;
10. Chart recorders where fitted are to be checked for correct calibration and adjusted if necessary;
11. Site alarms are to be verified with the Control Room before leaving site; and
12. Bare pipework and damaged coatings are to be repaired and primed.

Scheduled Full Maintenance

This activity consists of the same activities as an Operational Check as well as replacing all ‘soft-spares’.

5.5. Scheduled Operational Check Activities for Field & City Gate Regulators

City Gate & Field Regulator operational check is carried out on the following basis:

1. Test operation and check settings of primary, monitor and secondary regulators;
2. Test operation and check settings of all overpressure protection devices;
3. Fully maintain and partially operate all valves including isolation valves;
4. All regulators are to be externally inspected for signs of wear, damage and corrosion and checked for correct operation;
5. Lockup tests are to be carried out with results recorded;
6. Regulator runs and auxiliary equipment to be checked for correct identification;
7. Pressure Card to be checked for accuracy and updated if necessary;
8. All strainer baskets/screens are to be removed, inspected and cleaned;
9. All pipework and joints are to be checked for leaks with the site being leak free on exit. All leaks found are to be recorded on the Operational Check Sheet;
10. Chart recorders and gauges are to be checked for correct calibration and adjusted if necessary;
11. Site alarms (if fitted) are to be verified with the Control Room before leaving site;
12. Bare pipework and damaged coatings are to be repaired and primed; and
13. Results of all inspection are to be recorded on the Operational Check Sheet.

A more detailed summary of expectations and standards for supply regulator work can be found in the System Operations Manual.

5.6. Sub-Standard District Regulator Decommissioning Program

Regulator Name	Regulator Number	Installed Regulator	Equipment Number	2017	2018	2019	2020	2021	2022
[redacted]	P1-153	150 Reynolds 678/680	21000191	MR* [redacted]					
[redacted]	P1-094	150 Reynolds 678/680	21000328		MR [redacted]				
[redacted]	P1-133	150 Reynolds 678	21000183		MR [redacted]				
[redacted]	P1-168	100 Reliance 3010	21000198		MR [redacted]				
[redacted]	P1-185	100 Reynolds 682	21000204		MR [redacted]				
[redacted]	P1-874	200 Reynolds 688	21008009			MR [redacted]			
[redacted]	P1-136	150 Reynolds 678/680	21000184			MR [redacted]			
[redacted]	P1-096	150 Reynolds 678/680	21000167			MR [redacted]			
[redacted]	P1-156	150 Reynolds 678/680	21000193			MR [redacted]			
[redacted]	P1-129	150 Reynolds 682 EVA	21000180			MR [redacted]			
[redacted]	P1-068	150 Reynolds 682 EVA	21000159			MR [redacted]			
[redacted]	P1-186	150 Reynolds 678	21000205			MR [redacted]			
[redacted]	P1-505	100 Reynolds 682 EVA	21000283			MR [redacted]			
[redacted]	P1-807	150 Reynolds 682 EVA	21000307			MR [redacted]			
[redacted]	P1-849	80 Reynolds 682	21000312			MR [redacted]			
[redacted]	P1-169	150 Reynolds 682	21000199				MR [redacted]		
[redacted]	P1-075	150 Reynolds 678/680	21000160				MR [redacted]		
[redacted]	P1-163	300 Reynolds	21000330				MR [redacted]		
[redacted]	P1-090	150 Reynolds 678/680	21000166					MR [redacted]	
[redacted]	P1-052	150 Reynolds 678/680	21000153					MR [redacted]	
[redacted]	P1-141	100 Reynolds 682	21000187						MR [redacted]
[redacted]	P1-154	150 Reynolds 678/680	21000192						MR [redacted]
[redacted]	P1-158	150 Reynolds 678/680	21000194						MR [redacted]
[redacted]	P1-174	100 Reynolds 678/680	21000203						
[redacted]	P1-139	150 Reynolds 678/680	21000185						
		Total $ (in '000)		$150	$600	$1500	$300	$300	$450
		Total (if completed as part of MR)		$0	$0	$0	$0	$0	$0

* MR – Mains Replacement

** Post 2022

5.7. Obsolete Regulator Replacement Program

Regulator Name	Regulator Number	Installed Regulator	Equipment Number	2017	2018	2019	2020	2021	2022
[redacted]	P1-173	150 Reynolds 678	21000202	[redacted]					
[redacted]	P1-110	150 Reynolds 678	21000172		[redacted]				
[redacted]	P1-270	100 Reynolds 678	21000219			[redacted]			
[redacted]	P1-289	150 Reynolds 678	21000229				[redacted]		
[redacted]	P1-336	150 Reynolds 678	21000238					[redacted]	
[redacted]	P2-122	50 Fisher 298T-EG	21000089	[redacted]					
[redacted]	P2-235	50 Fisher 298T-ET	21002848	[redacted]					
[redacted]	P2-032	100 Fisher 298T-ET	21000051	[redacted]					
[redacted]	P3-004	80 Grove 11473	21000092		[redacted]				
[redacted]	P3-008	50 Grove 11473	21000095			[redacted]			
[redacted]	P4-007	80 Grove 110371	21000097	[redacted]					
[redacted]	P4-010	80 Grove 11135	21000100	[redacted]					
[redacted]	P4-011	80 Grove 11540	21000101	[redacted]					
[redacted]	P4-039	50 Grove 11474	21000105	[redacted]					
[redacted]	P4-056	50 Grove 11135	21000016		[redacted]				
[redacted]	P4-058	80 Grove 11135	21000017		[redacted]				
[redacted]	P4-060	50 Grove 11135	21000019		[redacted]				
[redacted]	P4-067	80 Grove 110371	21000020		[redacted]				
[redacted]	P4-092	80 Grove 11135	21000025			[redacted]			
[redacted]	P4-119	80 Grove 110371	21000111			[redacted]			
[redacted]	P4-160	80 Grove 110371	21000120			[redacted]			
[redacted]	P4-250	80 Grove 11135	21000132			[redacted]			
[redacted]	P2-006	50 Grove 11474	21000040				[redacted]		
[redacted]	P2-077	50 Grove 11473	21003614				[redacted]		
[redacted]	P2-010	80 Grove 11135	21000044				[redacted]		
[redacted]	P4-173	50 Grove 110371	21000124				[redacted]		
[redacted]	P6-002	150 Grove 11351	21000142					[redacted]	
[redacted]	P5-005	80 Grove 110371	21000141					[redacted]	
[redacted]	P4-078	80 Grove 11135	21000022					[redacted]	
[redacted]	P2-110	100 Grove 11351	21000083					[redacted]	
[redacted]	P4-141	100 Grove 11351	21000116						[redacted]
[redacted]	P4-154	80 Grove 11476	21000118						[redacted]
[redacted]	P4-178	100 Grove 11351	21000125						[redacted]
[redacted]	P4-239	100 Grove 11476	21000130						[redacted]
			Total $ (in '000)	**$1,190**	**$700**	**$700**	**$590**	**$590**	**$440**

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