Multinet Gas
Asset Management Plan
CY2017- CY2022

PUBLIC VERSION

Issued	19/12/2016
Document. No.	MG-PL-0005
Version	4.1
Owner	*Multinet Gas*
	Gas Network – Asset Management

Asset Management Plan

CY2017 – CY2022

Document No: MG-PL-0005

Preparation Record

Controlled Copy Register

Issue:	Version 4.1
Operative Date:	19/12/2016
Document Number:	MG-PL-0005

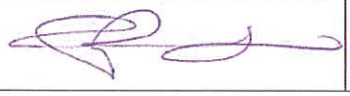
Amendment Record

Version	Date	Amended by	Description of Change
4	7/12/2016	Daryl Lee	Supersedes version 3.14: Multinet Gas Network AMP 2013/14-2017/18
4.1	19/12/2016	Troy Praag	Minor update to charts and figures

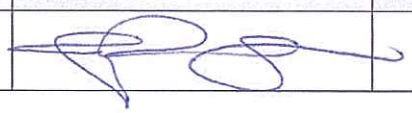
Originated By

Title	Name	Signature	Date
Asset Performance Engineer	Daryl Lee		19/12/2016

Reviewed By

Title	Name	Signature	Date
Gas Asset Manager	Mark Cooper		19/12/2016
Head of Gas Networks Strategy and Performance	Troy Praag		19/12/2016

Approved By

Title	Name	Signature	Date
GM Gas Networks	Mark Beech		19/12/2016

Executive Summary

Multinet Gas (MG) is the largest distributor (by connection base) of natural gas in Victoria, supplying safe and reliably energy to more than 690,000 customers throughout Melbourne's inner, outer-eastern and south-eastern suburbs; the Yarra Valley and South Gippsland.

The network comprises 175km of licenced Transmission Pipelines, 9,959km of distribution mains (operating at high, medium and low pressures), 7 City Gates, 118 Field Regulators and 133 District Regulators.

The Asset Management Plan (AMP) outlines the capital investment required to meet the following network objectives:

- Safety – Achieve Zero Harm, while maintaining current levels of network safety.
- Customer – Effortless Customer Experience
- Efficiency – Sustainable and prudent network investment
- Compliance – Maintain regulatory and technical compliance
- Growth – Seek opportunities for new growth

The AMP draws on information contained within the network specific strategies that define the strategies employed to meet the above network objectives and ensure the network is operated safely and sustainably.

This version of the AMP has been structured to align with the expenditure categories defined by the Australian Energy Regulator (AER) to support Multinet Gas' submission for the forthcoming (2018-22) Gas Access Arrangement Review (GAAR) submission.

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

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

Ref	Expenditure Category	2017	2018	2019	2020	2021	2022
4.1	Mains Replacement	$42,464	$53,626	$48,255	$49,588	$52,742	$45,503
4.2	Residential Connections	$18,146	$18,659	$17,695	$16,792	$17,100	$17,687
4.3	Industrial & Commercial Connections	$3,911	$3,958	$3,944	$4,049	$4,151	$4,090
4.4	Meters	$809	$3,627	$1,363	$2,654	$1,251	$1,049
4.5	Augmentation	$4,511	$4,090	$5,754	$3,503	$1,648	$1,210
4.6	SCADA	$1,664	$1,803	$1,585	$1,123	$1,100	$1,031
4.7	Other	$9,175	$9,910	$8,511	$9,250	$7,844	$9,225
	Total Direct Expenditure	**$80,680**	**$95,674**	**$87,106**	**$86,960**	**$85,835**	**$79,795**
	Overhead	$4,841	$5,740	$5,226	$5,218	$5,150	$4,788
	Subtotal	**$85,520**	**$101,414**	**$92,332**	**$92,178**	**$90,985**	**$84,583**
	Real cost escalation	-	$597	$487	$686	$987	$1,049
	Total Expenditure	**$85,520**	**$102,011**	**$92,819**	**$92,863**	**$91,972**	**$85,632**

Table of Contents

1. Document Overview

1.1. Objectives

The Gas Asset Management Plan (AMP) is central to the delivery of network services to Multinet customers.

It has the following key objectives:

- It provides a high level summary of projects and programs defined within Multinet's suite of asset & network strategies / plans;
- It outlines Multinet's planned capital expenditure profile for the forecast period (2017–2022); and
- It defines the linkage between the overarching Asset Management Strategy and the underpinning asset specific strategies.

The document is intended for use by:

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

1.2. Scope

This AMP covers network expenditure for Multinet's gas distribution and transmission assets operating throughout Melbourne's inner, outer-eastern and south-eastern suburbs; the Yarra Valley and South Gippsland.

It includes:

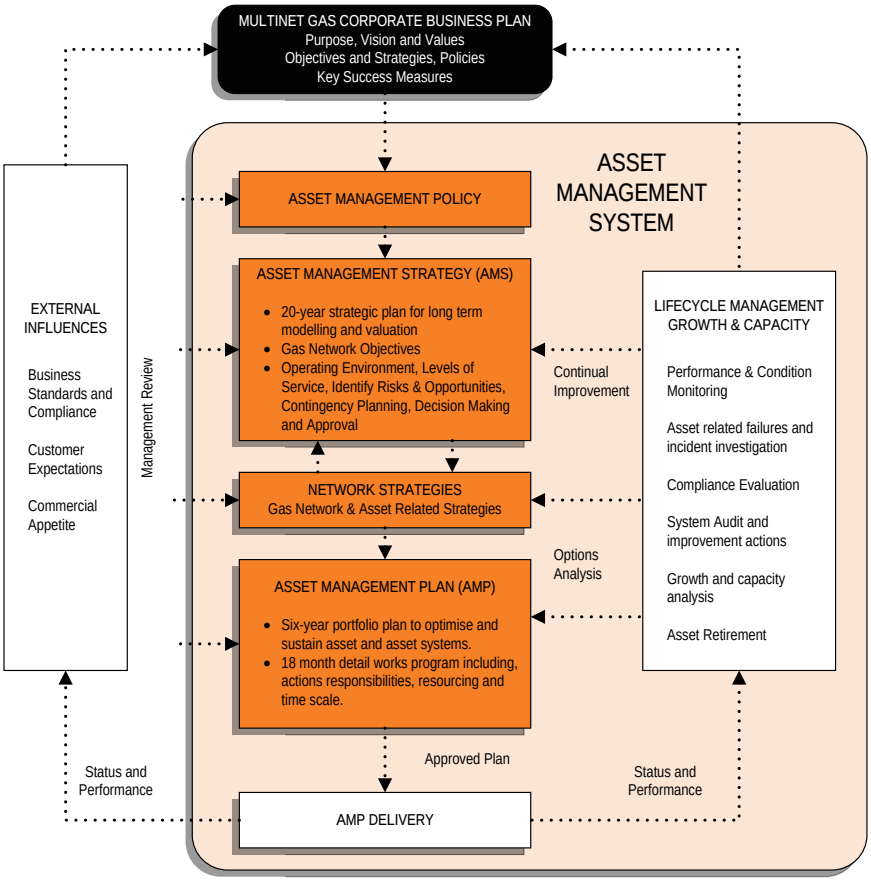
- Transmission pipelines, distribution mains, distribution services and associated easements and access tracks,
- Consumer regulators and supply regulating stations, valves, heaters, filters, vents, syphons and auxiliary assets used in the operation of the distribution and transmission networks,
- Corrosion protection, control, metering, enclosures and communications equipment, and
- Asset management processes and systems such as Supervisory Control and Data Acquisition (SCADA).

The AMP should be read in conjunction with Multinet's IT Strategy (which provides capital expenditure forecasts for IT related program) to gain a network wide appreciation of capital expenditure at Multinet Gas.

1.3. Relationship with other Key Asset Management Documents

The Asset Management Plan (AMP) is one of a number of key asset management documents developed and published by Multinet Gas in relation to its gas network. As indicated in Figure 1-1, detailed asset strategies inform 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 programs defined within the Asset Management Plan 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 Asset Management Plan draws on the capital forecasts outlined in Multinet's detailed asset and network strategies. Table 1-2 provides a summarised alignment of the AMP against network and asset strategies.

Table 1-2: Asset Management Plan alignment with Network and Asset Strategies

		AER Category						
Document #	Strategy	Mains Replacement	Residential Connections	I&C Connections	Meters	Augmentation	SCADA	Other
MG-PL-0002	Capital Growth Plan	-	✓	✓	-	✓	-	✓
MG-SP-0001	Transmission Pipelines	-	-	-	-	-	-	✓
MG-SP-0002	SCADA	-	-	-	-	-	✓	-
MG-SP-0003	Supply Regulator	-	-	-	-	-	-	✓
MG-SP-0005	Large Consumer Regulator	-	-	-	-	-	-	✓
MG-SP-0006	Small Consumer Regulator[1]	-	-	-	-	-	-	✓
MG-SP-0007	Small Meter	-	-	-	✓	-	-	-
MG-SP-0008	Large Meter	-	-	-	✓	-	-	-
MG-SP-0009	Distribution Mains	✓	-	-	-	-	-	-
MG-SP-0010	Distribution Services	✓	-	-	-	-	-	✓
MG-SP-0011	Distribution Valves	-	-	-	-	-	-	✓
MG-SP-0013	Corrosion Protection	-	-	-	-	-	-	✓
MG-SP-0014	Equipment Enclosures	-	-	-	-	-	-	✓
MG-SP-0015	Gas Heater	-	-	-	-	-	-	✓

Refer to the individual strategies highlighted in Table 1-2 for data sources drawn on in the development of each strategy and ultimately the Asset Management Plan.

[1]Small Consumer Regulator Strategy does not contain any capital expenditure within forecast period

1.6. References

- Gas Safety Case
- Gas Distribution System Code Ver. 11.0
- Retail Market Procedures (Victoria)
- National Gas Rules: Part 19 - Declared Wholesale Gas Market Rules
- AS/NZS 4944:2006 In-service Compliance testing of Diaphragm Meters
- National Gas Law
- Gas Safety Act 1997
- Distribution Licence
- Gas Pipelines Act 2005

1.7. Document Review

The Asset Management Plan is to be reviewed and approved annually for inclusion in Multinet Gas' annual budget setting process.

2. Network Overview

2.1. Introduction

Multinet Gas (MG) is the largest distributor (by connection base) of natural gas in Victoria, distributing to over 690,000 customers throughout Melbourne's inner, outer-eastern and south-eastern suburbs. Multinet also has two rural based networks that currently cover nine townships in the Yarra Valley located in outer eastern metropolitan Melbourne and five townships in South Gippsland Victoria.

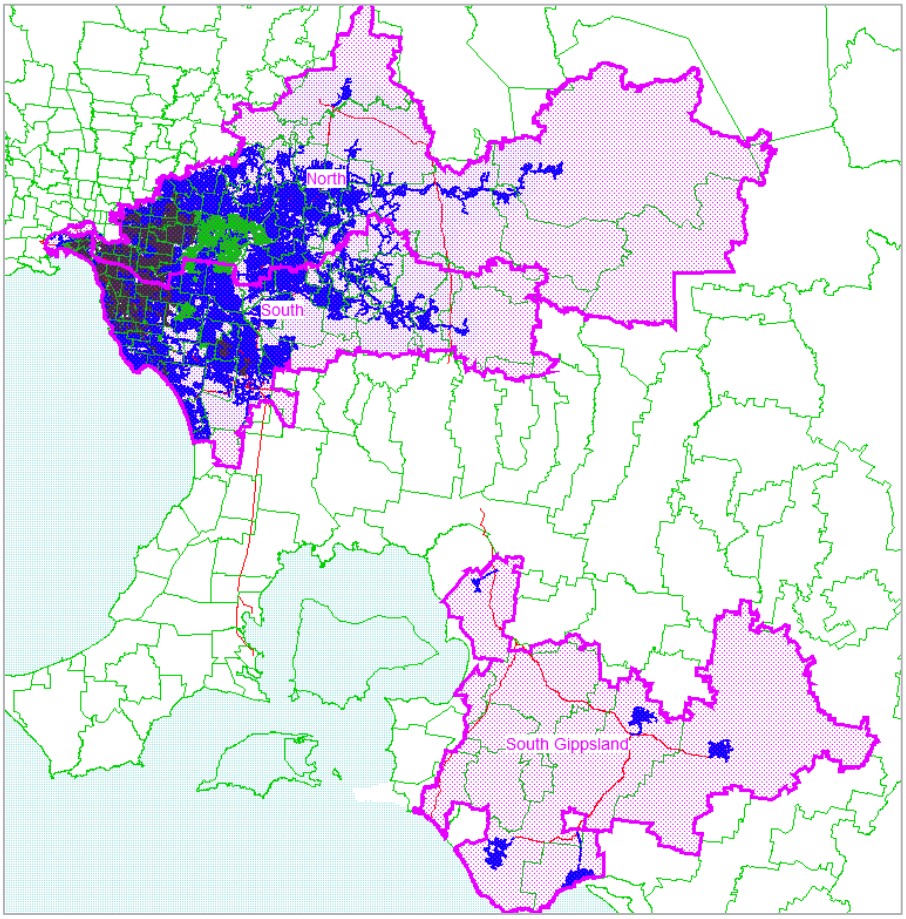
Multinet owns 175 kilometres of licensed transmission pressure pipelines and 9,959 kilometres of distribution mains used to transport gas from the high-pressure transmission network (owned by APA GasNet and BassGas) to residential, commercial and industrial gas users..

Figure 2-1: Multinet Gas' Distribution Area

Multinet's geographic footprint is surrounded by established regions of supply by other distribution businesses. As a result, Multinet's main corridors of geographic growth are from the greenfield regions in South Gippsland and Yarra Ranges through the expansion of high pressure distribution mains in each area.

The network experiences stable demand growth from the perspective of additional load from new customers. Demand growth, from new customers, comes in the form of development of infill regions. Customer connection activity is strongly correlated with the level of economic activity and, in particular, building and infrastructure developments. Increasing numbers of high rise developments increase the number of new customers (and load) within a certain areas. As such, for capacity reasons, this promotes the growth of high pressure regions of the network in order to cope with this demand. Figure 2-2 shows the current distribution of high pressure (Blue), medium pressure (Green), and low pressure (Black) systems in the network. It can be seen that the high pressure system dominates the network footprint which caters for the increase in demand over the years.

Figure 2-2: Multinet's Gas Distribution Network



Demand growth may also take the form of increased usage of natural gas by existing customers. Multinet's network primarily caters to residential customers which has a declining, per capita usage profile. However, there is enough evidence showing that peak demand on the network has been stable, if not increasing which can have many influences.

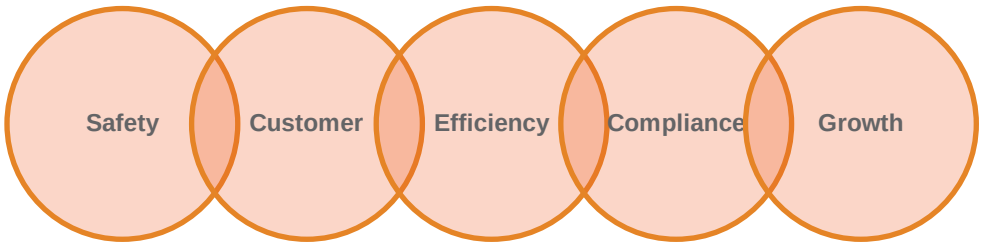
Industrial and commercial (I&C) sites are typically high usage customers, but due to the minor proportion of them on the Multinet network, they do not contribute very significantly to demand growth via increased usage.

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



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

This AMP aims to provide a safe and reliable supply natural gas as its core objective. In delivering this, Multinet strives to achieve zero harm in all network operations. The capital programs below are designed to reduce risk to the public and to personnel on the network and at the same time provide an above average level of service.

3.1.2. Customer – Effortless Customer Experience

This AMP aims to reduce the duration and frequency of interruptions to customers and minimise customer inconvenience from new connections and meter replacements. The work programs outlined in this document are designed to promote overall customer satisfaction and at the same time promote the uptake of natural gas as an efficient source of energy.

3.1.3. Efficiency – Sustainable and prudent network investment

This AMP aims to deliver the capital programs below as economically as possible with the intention of providing the most benefit to the customer and to shareholders. Multinet intends to ensure natural gas remains a competitive, value-for-money fuel option in line with customer interests and expectations.

3.1.4. Compliance – Maintain regulatory and technical compliance

This AMP seeks to ensure Multinet is compliant with legislative and regulatory obligations which underpin network operations and work practices.

3.1.5. Growth – Seek opportunities for new growth

This AMP aims to encourage growth of the network via in-fill development and through the introduction of gas into regional areas. Multinet's Mains Replacement program provides high pressure natural gas to high density inner urban areas currently supported by medium and low pressure networks, in turn providing potential to increase gas consumption.

4. Expenditure Summary

The AMP has been written to align with the Regulatory Expenditure categories as defined by the Australian Energy Regulator (AER) to support Multinet Gas' submission for the 2018-22 Gas Access Arrangement Review (GAAR).

Expenditure categories are defined in each corresponding section of the AMP (Sections 4.1 to 4.7) and summarised in the Appendix (Section 5.2).

Table 4-1 summarises (at the highest level) the network capital expenditure forecast for Multinet's gas distribution network from calendar year 2017 to 2022 (inclusive). Table 4-1 includes a breakdown of direct, overheads and labour escalators for the purpose of reconciliation with that of the overview documentations which support Multinet's forthcoming Access Arrangement submission.

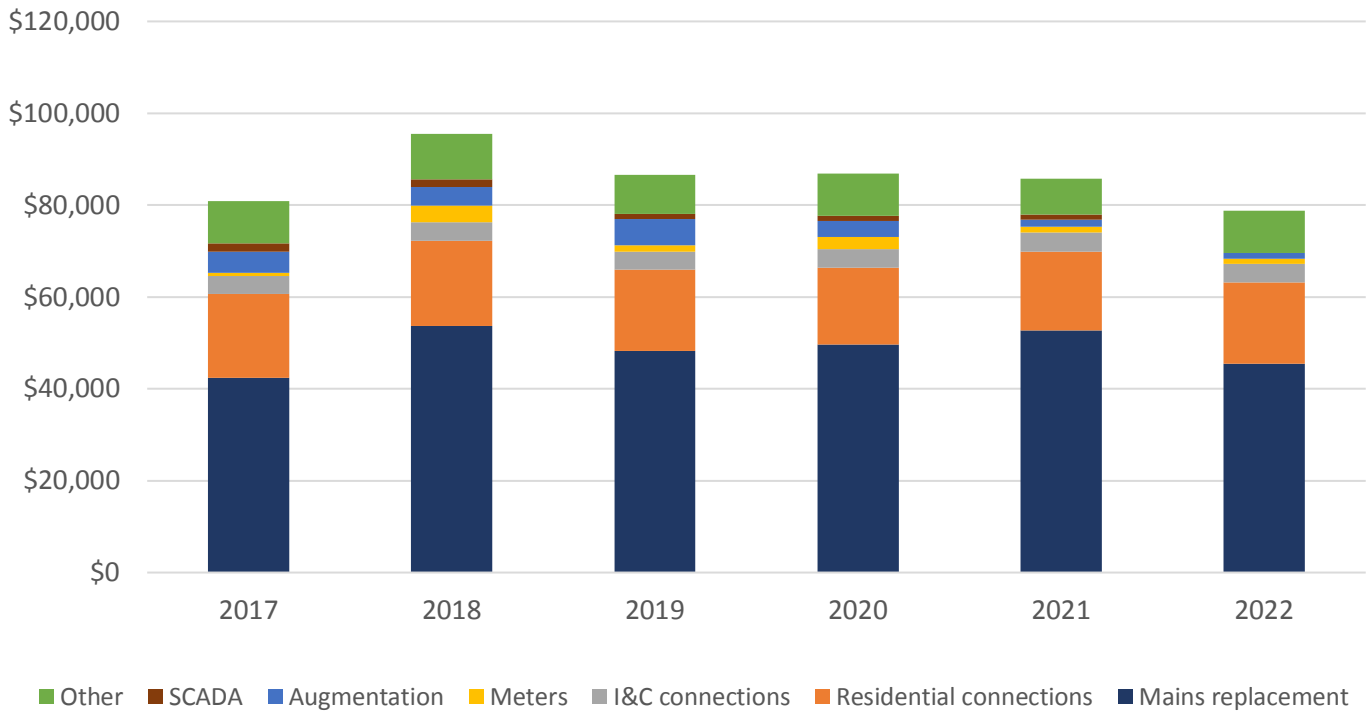
Table 4-1: Summary Capital Expenditure Forecast

Ref	Expenditure Category	2017	2018	2019	2020	2021	2022
4.1	Mains Replacement	$42,464	$53,626	$48,255	$49,588	$52,742	$45,503
4.2	Residential Connections	$18,146	$18,659	$17,695	$16,792	$17,100	$17,687
4.3	Industrial & Commercial Connections	$3,911	$3,958	$3,944	$4,049	$4,151	$4,090
4.4	Meters	$809	$3,627	$1,363	$2,654	$1,251	$1,049
4.5	Augmentation	$4,511	$4,090	$5,754	$3,503	$1,648	$1,210
4.6	SCADA	$1,664	$1,803	$1,585	$1,123	$1,100	$1,031
4.7	Other	$9,175	$9,910	$8,511	$9,250	$7,844	$9,225
	Total Direct Expenditure	**$80,702**	**$95,679**	**$87,256**	**$86,966**	**$85,841**	**$79,801**
	Overhead	$4,818	$5,735	$5,076	$5,212	$5,144	$4,782
	Subtotal	**$85,520**	**$101,414**	**$92,332**	**$92,178**	**$90,985**	**$84,583**
	Real cost escalation	-	$597	$487	$686	$987	$1,049
	Total Expenditure	**$85,520**	**$102,011**	**$92,819**	**$92,863**	**$91,972**	**$85,632**

During the forecast period, total network capital expenditure averages $92M per annum. Annual variations is driven by program phasing in the Mains Replacement Program and forecast economic activity influencing Multinet's forecast for customer connections.

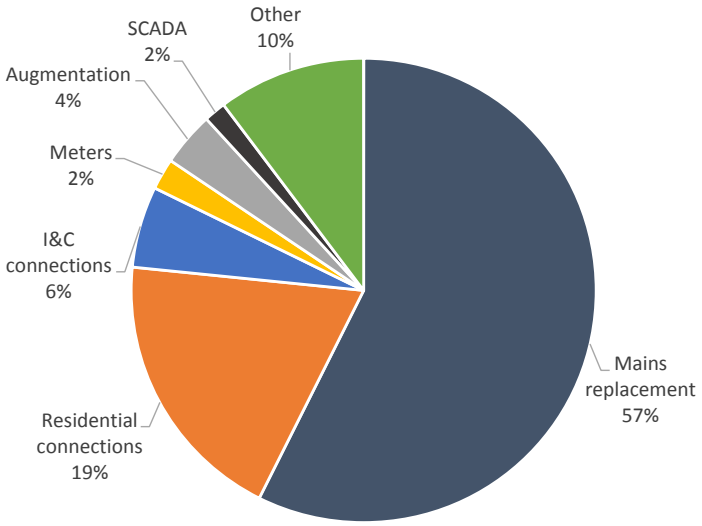
Figure 4-1 profiles Multinet's annual expenditure from 2017 to 2022.

Figure 4-1: Capital Expenditure Forecast



Mains Replacement (57%) and Network Connections (25%) contribute more than 80% of the capital forecast to 2022. This is characterised by steady network growth (in terms of gross network connections) and a mains replacement program targeting an average of 125 km a year of LP replacement. See Figure 4-2 for the average contribution of each expenditure category in the capital program.

Figure 4-2: Breakdown of Capital Forecast - 2018-22



4.1. Mains Replacement

The Multinet's distribution network dates back to the late 1880's and consequently consists of a variety of pipe materials which at the time of installation was deem fit for purpose. Cast iron (CI) and steel was predominantly used until the introduction of polyvinyl chloride (PVC) for a low pressure (LP) like-for-like replacement program and polyethylene for high pressure (HP) networks in the 1970's. The use of PVC was phased out in the early 1990's and while coated steel is still utilised polyethylene is the dominant pipe material.

The type of material has a major bearing on the maximum operating pressure of the network. Since cast iron can only be operated at medium and low pressures compared to polyethylene, the continual replacement of cast iron mains due to its obsolescence with polyethylene pipe means that the capacity and integrity of the network is managed.

Mains replacement is defined by the AER to be capital expenditure incurred for the replacement of mains and services operating in the network due to the condition of the mains and services[2]. Multinet Gas has five (5) programs which fall under the definition of mains replacement as per the AER guidelines. Table 4-2 shows the expenditure forecast for each program.

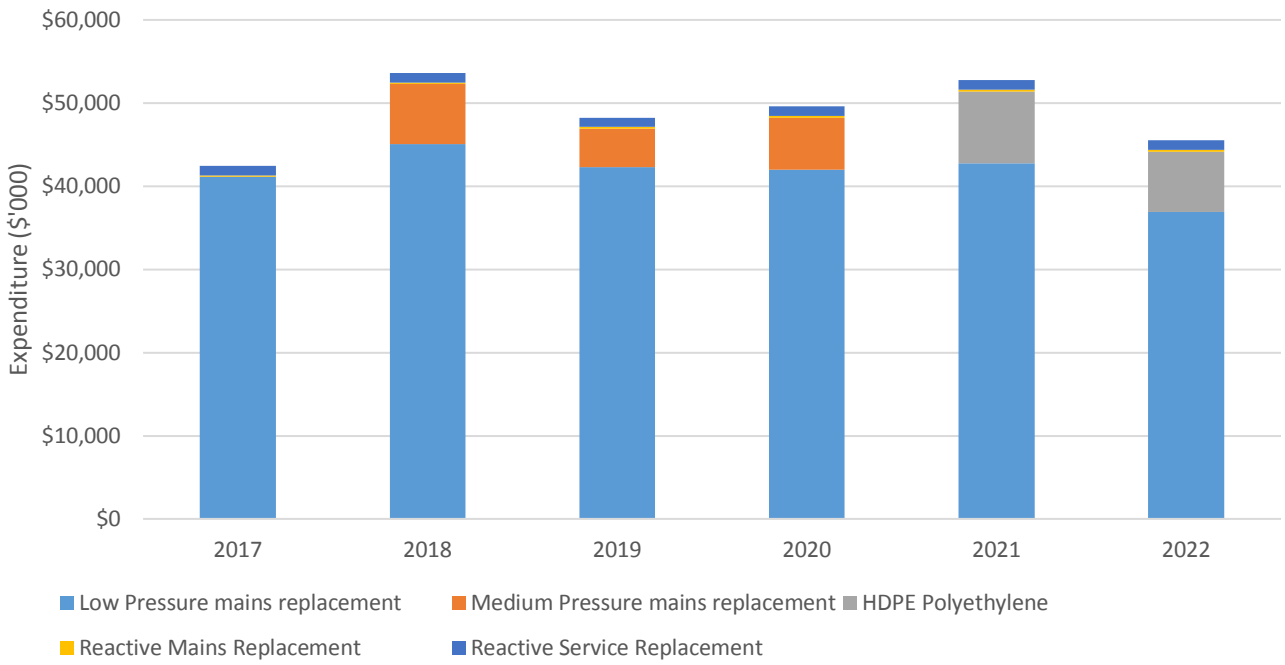
[2] 2018-22 GAAR RIN template – Definitions

Figure 4-3 profiles forecast expenditure to 2022.

Table 4-2: Mains Replacement Expenditure Summary

Ref	Program	Strategy #	2017	2018	2019	2020	2021	2022
4.1.1	Low Pressure Mains Replacement	MG-SP-0009	$41,120	$45,035	$42,305	$41,969	$42,746	$36,934
4.1.2	Medium Pressure CI Mains Replacement		-	$7,247	$4,606	$6,275	-	-
4.1.3	HDPE Polyethylene Replacement		-	-	-	-	$8,652	$7,225
4.1.4	Reactive Mains Replacement		$200	$200	$200	$200	$200	$200
4.1.5	Reactive Services Replacement	MG-SP-0010	$1,144	$1,144	$1,144	$1,144	$1,144	$1,144
	Total Direct Expenditure		**$42,464**	**$53,626**	**$48,254**	**$49,588**	**$52,742**	**$45,502**
	Overhead		$2,548	$3,218	$2,895	$2,975	$3,165	$2,730
	Subtotal		**$45,012**	**$56,844**	**$51,150**	**$52,563**	**$55,907**	**$48,233**
	Real cost escalation		-	$335	$270	$391	$607	$598
	Total Expenditure		**$45,012**	**$57,179**	**$51,420**	**$52,954**	**$56,513**	**$48,831**

Figure 4-3: Main Replacement Expenditure Summary



4.1.1. Low Pressure Mains Replacement

Multinet has an established history of replacing / renewing its low pressure mains and services to high pressure standard. The program is Multinet's largest, contributing 45% to 50% of capital expenditure in any given year. The focus of the renewal program is heavily deteriorated Cast Iron mains which have exceeded their service life. Polyethylene mains, installed through open cut or insertion methods are predominantly used to upgrade the low pressure networks to high pressure.

The principle driver for the low pressure replacement program is the 'societal risk' posed from the failure of cast iron mains and resulting risk of incidents leading to loss of life or significant property damage. The risk associated with cast iron is quantifiable and it is accepted by both UK and US safety regulators that cast iron is an obsolete material.

In relation the current status of cast iron replacement programs undertaken nationally, Multinet has the largest remaining volume of cast iron mains of all distribution networks. Analysing the option of adopting an average replacement rate based on a 2033 target results in an average annual replacement rate of 125 kilometres for the period from 2018 to 2033. The resulting volume of replacement for the period 2017 to 2022 is 753 kilometres.

Table 4-3 shows the direct capital expenditure forecast for Multinet's Low Pressure Mains Replacement program. For further information on how projects have been scheduled and their associated unit rates and volumes, refer to MG-SP-009 Distribution Mains Strategy.

Table 4-3: Mains Replacement – Low Pressure

Program		2017	2018	2019	2020	2021	2022
Low Pressure Mains Replacement	Length (km)	128.0	126.4	127.7	127.8	135.4	107.4
	Unit Rate ($/m)	$321	$356	$331	$328	$316	$344
Program Expenditure		**$41,120**	**$45,035**	**$42,305**	**$41,969**	**$42,746**	**$36,934**

4.1.2. Medium Pressure Cast Iron Mains Replacement

Medium Pressure (MP) Cast Iron Mains Replacement program shares the same drivers as Low Pressure mains replacement, in that the 'societal risk' posed from the failure of cast iron mains and resulting risk of incidents leading to loss of life or significant property damage. The risk associated with cast iron is quantifiable and it is accepted by both UK and US safety regulators that cast iron is an obsolete material.

In comparison to the low pressure cast iron network, the medium pressure cast iron network consists of a higher proportion of larger diameter mains. However, in spite of the lower probability of failure from fracture of these larger mains, they have been deemed as critical supply mains and are all located within the inner urban areas of metropolitan Melbourne. This combination of higher operating pressures, critical supply and high density geographic location places these assets as high risk from a consequence perspective in comparison to that of the overall low pressure cast iron program.

Table 4-4 shows the direct capital expenditure forecast for Multinet's Medium Pressure Mains Replacement program. The program will deliver the replacement/abandonment of the remaining 33 kilometres of medium pressure cast iron, proportioned between low pressure mains replacement program and the medium pressure mains replacement program.

Table 4-4: Mains Replacement – Medium Pressure

Program / Project		2017	2018	2019	2020	2021	2022
Clayton South (MP CI Block Renewal)	Length (km)	-	[redacted]	-	-	-	-
	Exp	-	[redacted]	-	-	-	-
Like for Like Replacement	Length (km)	-	-	-	[redacted]	-	-
	Exp	-	-	-	[redacted]	-	-
Graham Street, Port Melbourne	Length (km)	-	[redacted]	-	-	-	-
	Exp	-	[redacted]	-	-	-	-
Aughtie Drive, Albert Park	Length (km)	-	-	[redacted]	-	-	-
	Exp	-	-	[redacted]	-	-	-
Program Expenditure		**-**	**$7,247**	**$4,606**	**$6,275**	**-**	**-**

4.1.3. High Density Polyethylene Replacement

The High Density Polyethylene (HDPE) Replacement Program specifically targets early or first generation HDPE introduced onto the Multinet network. These first generation polyethylene mains were classified as Class 250 and Class 575 for operation at medium and high pressure respectively. The main difference between the class ratings is the variation in wall thickness with Class 250 having a thinner wall thickness than that of the Class 575 of the same nominal bore size. It is typically these early or first generation polyethylene mains whose properties offer limited resistance against severe environmental and operating conditions as they have substandard material properties relative to newer polyethylene mains.

Table 4-5 shows the direct capital expenditure forecast for Multinet's HDPE Mains Replacement program. The polyethylene mains replacement program targets the replacement of the earliest 31 kilometres of early generation high density medium pressure polyethylene, prioritised by breakage and leak incident rates.

Table 4-5: Mains Replacement – High Density Polyethylene Replacement

Project		2017	2018	2019	2020	2021	2022
King Arthur Drive, Glen Waverly, 3150	Length (km)	-	-	-	-	[redacted]	-
	Exp	-	-	-	-	[redacted]	-
Weeden Drive, Vermont, 3133	Length (km)	-	-	-	-	-	[redacted]
	Exp	-	-	-	-	-	[redacted]
Program Expenditure		**-**	**-**	**-**	**-**	**$8,652**	**$7,225**

4.1.4. Reactive Mains Replacement

Reactive mains replacement provides for an allocation of capital expenditure to allow for the piecemeal renewal of minor sections of mains outside the planned mains replacement program. These minor works result when reactive maintenance (i.e. repairing a mains leak) is deemed unsafe and inefficient considering the deteriorated condition of the asset which limits the effectiveness to repair the fault.

Table 4-6 shows the direct capital expenditure forecast for Reactive Mains Replacement.

Table 4-6: Mains Replacement – Reactive Mains Replacement

Program	2017	2018	2019	2020	2021	2022
Reactive Mains Replacement	$200	$200	$200	$200	$200	$200
Program Expenditure	**$200**	**$200**	**$200**	**$200**	**$200**	**$200**

4.1.5. Reactive Service Replacement

Reactive services replacement provides for an allocation of capital expenditure to allow for the piecemeal renewal of services outside the planned mains replacement program. These minor works result when reactive maintenance (i.e. repairing a leak) is deemed unsafe and inefficient considering the deteriorated condition of the asset which limits the effectiveness to repair the fault.

Table 4-7 shows the direct capital expenditure forecast for Reactive Services Replacement. For further information refer to Multinet's Distribution Services Strategy (MG-SP-0010)

Table 4-7: Mains Replacement – Reactive Services Replacement

Program		2017	2018	2019	2020	2021	2022
Reactive Services Replacement	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$1,144**	**$1,144**	**$1,144**	**$1,144**	**$1,144**	**$1,144**

4.2. Residential Connections

Residential customers are defined as those "who use gas primarily for domestic purposes"[3]. As of 31 December 2015 Mutlinet had 675,018 residential connections, contributing 97.7% of the total customer base by.

Customer connections, both residential and non-residential, are driven by network growth. Customer Connection Capex is required to establish new connections to the distribution network. This capital work typically includes the installation of new mains, the gas service pipe from the main to the meter, and the meter itself. Residential Connections contribute between 80% - 90% of customer connection capex in any one year.

Multinet forecast connection capex with reference to network Tariffs. Tariff V - Residential applies to customers using less than 10,000 GJ a year and use gas for domestic purposes.

Table 4-8 shows the direct capital expenditure associated with Tariff V – Residential connections to 2022. A separate forecast has been provided for the expected impact of the Marketing Subsidy to be introduced from 2018. Refer to Section 4.2.2 for further details.

Table 4-8: Residential Connections Expenditure Summary

Ref	Program	Strategy #	2017	2018	2019	2020	2021	2022
4.2.1	Residential Connections – Tariff V	MG-PL-0002	$18,146	$18,071	$17,106	$6,204	$6,511	$17,099
4.2.2	Residential Connections – Marketing Impact		-	$588	$588	$588	$588	$588
	Total Direct Expenditure		**$18,146**	**$18,659**	**$17,695**	**$16,792**	**$17,100**	**$17,687**
	Overhead		$1,089	$1,120	$1,062	$1,008	$1,026	$1,061
	Subtotal		**$19,234**	**$19,779**	**$18,756**	**$17,800**	**$18,126**	**$18,748**
	Real cost escalation		-	$116	$99	$132	$197	$232
	Total Expenditure		**$19,234**	**$19,895**	**$18,855**	**$17,932**	**$18,322**	**$18,981**

4.2.1. Residential Connections – Tariff V

The connection of Tariff V customers is done through a series of "unitised jobs", rather than by delivering a single consolidated project. Each customer connection therefore comprises a series of unitised jobs.

The forecast of Tariff V connection is derived by forecasting the volume of unitised jobs (Activity Codes) over the forecast period with reference to growth indices. Contracted unit rates are applied to forecast volumes to derive total expenditure forecasts. Growth is applied to each Activity Code based on indices that are prepared annually by the

[3] Definition from Gas Distribution System Code.

Australian Construction Industry Forum (ACIF) which have a high correlation to actual customer connection expenditure. Refer to Multinet Capital Growth Plan (MG-PL-0002) for further details on forecasting methodology.

Table 4-9 shows the direct capital expenditure associated with Tariff V Residential connections.

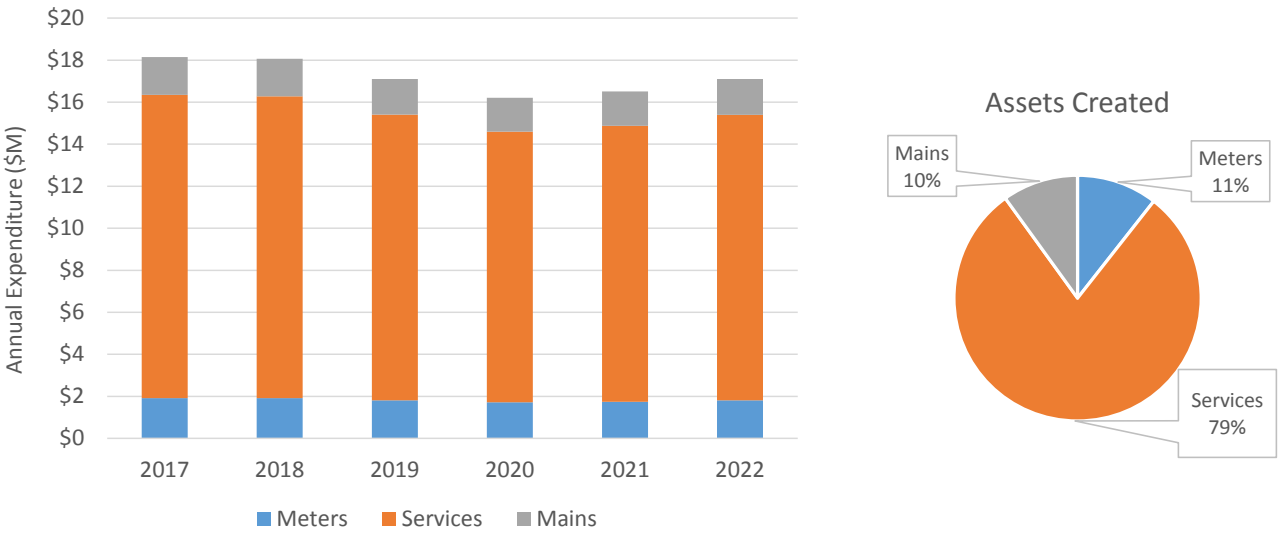
Table 4-9: Residential Connections – Tariff V

Program		2017	2018	2019	2020	2021	2022
Tariff V – Residential Connections	Gross Connections	8,669	8,633	8,173	7,741	7,888	8,169
	Unit Rate	$2.093	$2.093	$2.093	$2.093	$2.093	$2.093
Total Direct Expenditure		**$18,146**	**$18,071**	**$17,106**	**$16,204**	**$16,511**	**$17,099**

The consolidated unit rate for per residential connection is approx. $2,093 (Direct, no escalation) with almost 80% of this cost driven by the installation of a new service (dedicated asset), with the remaining split equally between meter costs (dedicated asset, 11%) and a per connection share cost of the distribution main (10%) in the street.

Figure 4-4 profiles annual expenditure to 2022 and the breakdown of expenditure by asset type.

Figure 4-4: Residential Connections –Tariff V - Annual Expenditure Profile and Asset Breakdown.



4.2.2. Residential Connections – Tariff V - Marketing Subsidy Impact

From 2018, Multinet is proposing to introduce a Marketing Subsidy to encourage the uptake and use of natural gas by new and existing customers. This is expected to generate 281 additional residential connections (per annum) but have no impact of I&C connections.

Table 4-10 shows the direct capital expenditure forecast associated with the additional 281 residential connections expected from the marketing program. The forecast has been calculated by applying the average unit rate of $2,093 per connection derived for residential connections.

For further details refer to Multinet's Capital Growth Plan (MG-PL-0002).

Table 4-10: Residential Connections – Tariff V – Marketing Subsidy Impact

		2017	2018	2019	2020	2021	2022
Tariff V – Residential Connections Marketing Subsidy	Connections	-	281	281	281	281	281
	Unit Rate	-	$2.093	$2.093	$2.093	$2.093	$2.093
Total Direct Expenditure		**-**	**$588**	**$588**	**$588**	**$588**	**$588**

4.3. Industrial and Commercial Connections

Industrial and Commercial (I&C) Connections are those "who use gas primarily for non-domestic purposes"[4]. As of 31 December 2015 Mutlinet had 15,957 I&C connections, contributing 2.3% of the total customer base.

Multinet forecast connection capex with reference to network Tariffs. Three network tariff are associated with I&C connections Tariff V, Tariff L and Tariff D.

Industrial & Commercial Connections contribute between 10% - 20% of customer connection capex in any one year. Table 4-11 shows the direct capital expenditure associated with Industrial & Commercial connections to 2022.

Table 4-11: I&C Connections Expenditure Summary

Ref	Program	Strategy #	2017	2018	2019	2020	2021	2022
4.3.1	I&C Connections - Tariff V	MG-PL-002	$3,409	$3,455	$3,442	$3,547	$3,648	$3,587
4.3.2	I&C Connections - Tariff L		-	-	-	-	-	-
4.3.3	I&C Connections - Tariff D		$502	$502	$502	$502	$502	$502
	Total Direct Expenditure		**$3,911**	**$3,958**	**$3,944**	**$4,049**	**$4,151**	**$4,090**
	Overhead		$235	$237	$237	$243	$249	$245
	Subtotal		**$4,146**	**$4,195**	**$4,181**	**$4,292**	**$4,400**	**$4,335**
	Real cost escalation		$-	$25	$22	$32	$48	$54
	Total Expenditure		**$4,146**	**$4,220**	**$4,203**	**$4,324**	**$4,448**	**$4,389**

4.3.1. Industrial & Commercial Connections - Tariff V

Tariff V I&C connections contribute, on average, 16% of Multinet Gas' forecast for connection capex over the period. The tariff V – I&C applies to customers using less than 10,000 GJ a year and use gas for non-domestic purposes. As with residential connections, the connection of I&C (Tariff V) customers is done through a series of "unitised jobs", rather than by delivering a single consolidated project. Similarly, the forecast approach for Tariff V connections is derived through forecasting the volume of applicable unitised jobs over the period (with reference to the ACIF growth forecast) multiplied by constricted unit rates. Refer to Section 4.2 (above) and Multinet's Capital Growth Plan (MG-PL-0002) for further details.

Table 4-12 shows the direct capital expenditure associated with Tariff V – Industrial & Commercial connections.

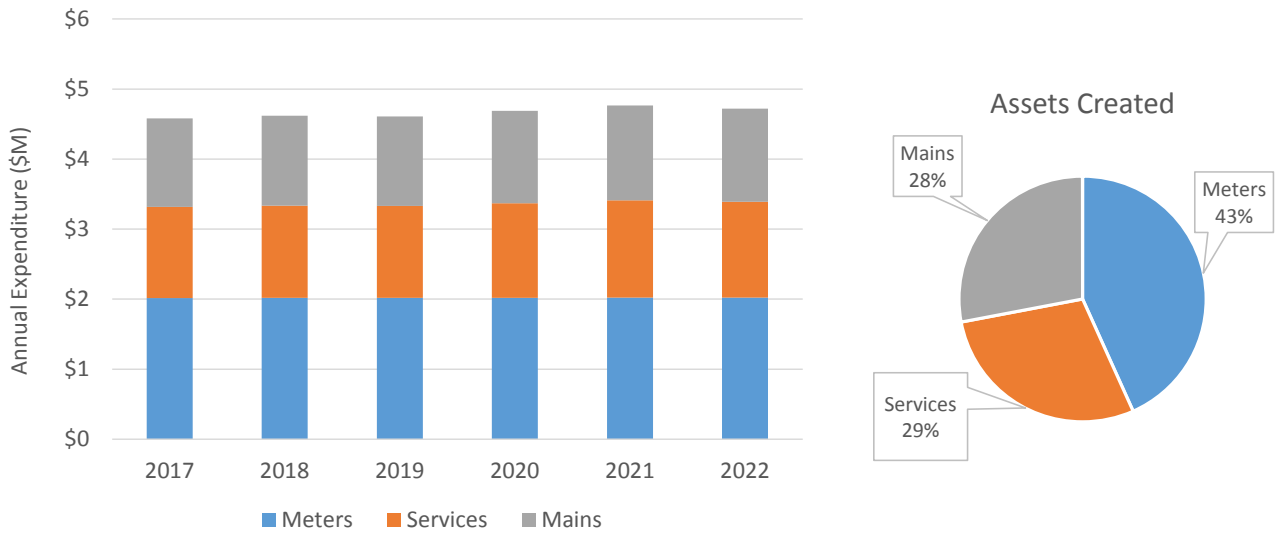
[4] Definition from Gas Distribution System Code.

Table 4-12: I&C Connections - Tariff V

Program		2017	2018	2019	2020	2021	2022
Tariff V – Industrial & Commercial Connections	Gross Connections	414	420	418	431	443	436
	Unit Rate	$8.23	$8.23	$8.23	$8.23	$8.24	$8.23
Total Direct Expenditure		**$3,409**	**$3,455**	**$3,442**	**$3,547**	**$3,648**	**$3,587**

The expenditure profile and asset segregation (Mains, Services & Meters) for Tariff V – Industrial & Commercial connections is summaries in Figure 4-5. Unlike Residential connections (where 80% of the unit rate is driven by Service costs), the unit rate for I&C connections is spread more equally across the three asset classes with Meters contributing – on average - 43% of the unit rate.

Figure 4-5: I&C Connections – Tariff V – Annual Expenditure Profile and Asset Breakdown.



4.3.2. Industrial & Commercial Connections - Tariff L

Tariff L is a mixture of the Tariff V and D tariff structures. Tariff L is charged to customers who consume more than 1 Terra Jules (TJ) per annum or less than 10TJ per annum and have a Maximum Hourly Quantity (MHQ) demand of less than 10 Giga Joules (GJ) per hour.

Given the low volume and sporadic nature of Tariff V connections, Multinet does not forecast any connections for this connection type.

4.3.3. Industrial & Commercial Connections - Tariff D

Tariff D is reserved for the largest connections on the network. Tariff D applies to customers using greater than 10,000 GJ a year or more than 10 GJ MHQ. Customers are charged based on their MHQ measured in GJ per hour applied across two usage blocks.

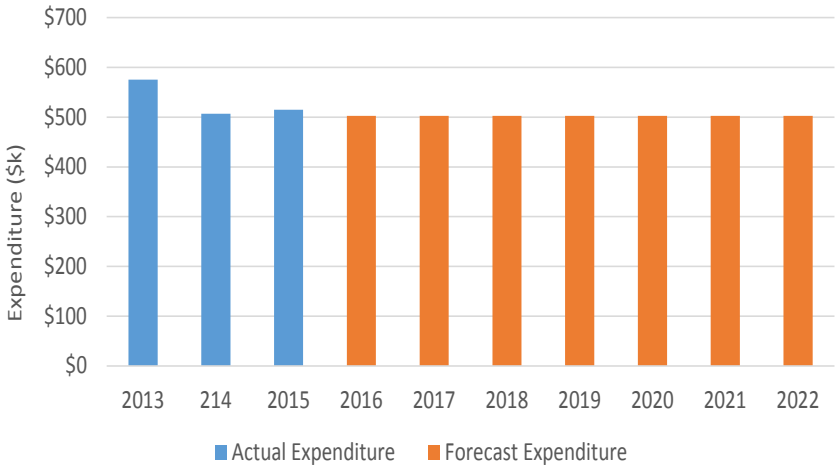
Table 4-13 shows the direct capital expenditure associated with Tariff D connections. Tariff D connection expenditure is forecast with reference to historical spend as there is typically a low volume of Tariff D connections and their unique individual nature.

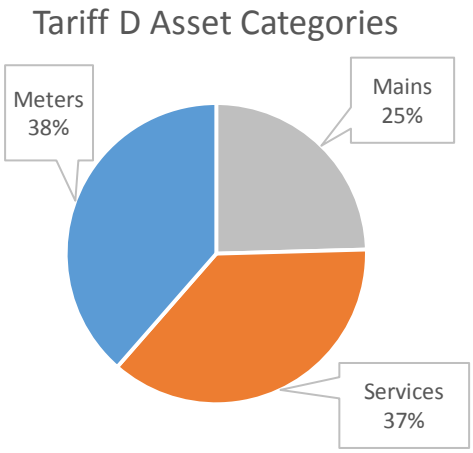
Table 4-13: I&C Connections - Tariff D

Program	2017	2018	2019	2020	2021	2022
Tariff D – Industrial Connections	$502	$502	$502	$502	$502	$502
Total Direct Expenditure	**$502**	**$502**	**$502**	**$502**	**$502**	**$502**

The expenditure profile and asset segregation (Mains, Services & Meters) Tariff D connections is summaries in Figure 4-6.

Figure 4-6: I&C Connections – Tariff D – Annual Expenditure Profile and Asset Breakdown.





4.4. Meters

A meter according to the natural gas rules is a device that measures and records quantities of gas by reference to volume, mass or energy content. Multinet Gas has divided its strategy concerning into meters into two strategies namely

- MG-SP-0007 – Small Metering Strategy
- MG-SP-0008 – Large Metering Strategy

Small meters are defined as having a capacity less than 10 Sm^3/hr whereas large meters are defines as having a capacity greater than 10 Sm^3/hr.

The capital expenditure outlined in the sections below aim to achieve the following objectives:

- Articulate the key areas of focus in relation to asset management, risk, investment, cost and service standard outcomes for the "Meters" asset group.
- Minimise the cost of meters to the end use customer by repairing and or purchasing new meters in line with regulatory, safety and reliability requirements.
- Show alignment of asset management practices with Gas Network Objectives.

Table 4-14 is a summary of the expenditure for this asset group for the period 2017-2022.

Table 4-14: Meters Expenditure Summary

Ref	Program	Strategy #	2017	2018	2019	2020	2021	2022
4.4.1	Time Expired Replacement – Small Meters	MG-SP-0007	$138	$2,363	$86	$1,355	$526	$416
4.4.2	FLE Testing – Small Meters		$14	$25	$58	$47	$53	$64
4.4.3	Defective Meters – Small Meters		$102	$103	$103	$104	$105	$105
4.4.4	Hand Held Meter Reading Devices		$70	$70	$70	$70	$70	$70
4.4.6	Digital Metering Program		$250	$623	$623	$623	$208	-
4.4.1	Time Expired Replacement – Large Meters	MG-SP-0008	$38	$244	$219	$262	$93	$183
4.4.2	FLE Testing – Large Meters		$38	$38	$41	$27	$26	$38
4.4.3	Defective Meters – Large Meters		$63	$67	$69	$72	$76	$79
4.4.5	Daily Metering – Flow Correctors		$94	$94	$94	$94	$94	$94
	Total Direct Expenditure		**$809**	**$3,627**	**$1,363**	**$2,654**	**$1,251**	**$1,049**
	Overhead		$49	$218	$82	$159	$75	$63
	Subtotal		**$857**	**$3,844**	**$1,445**	**$2,814**	**$1,326**	**$1,112**
	Real cost escalation		-	$23	$8	$21	$14	$14
	Total Expenditure		**$857**	**$3,867**	**$1,452**	**$2,835**	**$1,340**	**$1,126**

4.4.1. Time Expired Meter Replacement

The Time expired meter replacement program is conducted to ensure Mutlinet remains compliant with its obligations under the Gas Distribution System Code by replacing meters at the end of their in-service compliance periods. The program is made up of the following elements:

- Meter families within the final year of their in-service compliance period; and
- Non-compliant meters outstanding from previous meter replacement programs.

Only the cost of new meter purchases are included in Multinet's capital forecast for meter replacement.

Table 4-15 shows the direct capital expenditure associated with Time Expired Meter Replacement of Small meters. For further details refer to Multinet's Small Meter Strategy (MG-SP-0007).

Table 4-15: Meters – Time Expired Replacement – Small Meters

Time Expired Replacement		2017	2018	2019	2020	2021	2022
Forecast Replacement	Meters	15,320	59,613	953	26,879	43,419	18,147
Repairable Meters ([redacted]% New Meters)	*Meters*	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Non-repairable Meters ([redacted]% New Meters)	*Meters*	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
New Meters Required	Meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit Rate	$/Meter	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$138**	**$2,363**	**$86**	**$1,355**	**$526**	**$416**

Table 4-16 shows the direct capital expenditure associated with Time Expired Meter Replacement of Large meters. For further details refer to Multinet's Large Meter Strategy (MG-SP-0008).

Table 4-16: Meters – Time Expired Replacement – Large Meters

Program		2017	2018	2019	2020	2021	2022
Forecast Replacement	Meters	140	909	1,085	1,003	462	1,260
Repairable Meters ([redacted]% New Meters)	*Meters*	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairable Meters ([redacted]% New Meters)	*Meters*	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Non-repairable Meters ([redacted]% New Meters)	*Meters*	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
New Meters Required	Meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit Rate	$/Meter	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$38**	**$244**	**$219**	**$262**	**$93**	**$183**

The combined expenditure forecast for Time Expired Meter Replacement of small and large meter types is summarised in Table 4-17.

Table 4-17: Meters – Time Expired Replacement

	2017	2018	2019	2020	2021	2022
Small Meters (<10 Sm^3/hr)	$138	$2,363	$86	$1,355	$526	$416
Large Meters (>10 Sm^3/hr)	$38	$244	$219	$262	$93	$183
Total Program Expenditure	**$176**	**$2,607**	**$305**	**$1,617**	**$619**	**$1,015**

4.4.2. Field Life Extension Testing

Multinet Gas undertakes Field Life Extension (FLE) testing on selected diaphragm meter families for both small and large meters nearing the end of their service lives. The program is also known as in-service compliance testing.

FLE testing is undertaken in accordance with the requirements of AS/NZS 4944:2006 and is required to extend the in-service compliance period of a qualifying meter family. FLE testing applies to all diaphragm meters with capacity of <30 Sm^3/hr. Results of annual testing and Multinet's intentions to extend a meter family beyond their initial life are communicated annually to the AER by 30 September.

All of Multinet's small meter fleet (circa 680,000 meters) qualify for FLE testing at the end of their initial in-service compliance periods.

Table 4-18 shows the direct capital expenditure associated with annual FLE testing of Small meter types. For further details refer to Multinet's Small Meter Strategy (MG-SP-0007).

Table 4-18: Meters – Field Life Extension Program – Small Meters

Field Life Extension		2017	2018	2019	2020	2021	2022
Forecast Replacement	Meters	1,604	755	2,102	2,053	1,477	1,601
Repairable Meters ([redacted]% New Meters)	*Meters*	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Non-repairable Meters ([redacted]% New Meters)	*Meters*	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
New Meters Required	Meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit Rate	$/Meter	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$14**	**$25**	**$58**	**$47**	**$53**	**$64**

The AL425 and AL1000 "Large" meter families have sufficient annual meter populations to justify statistical sampling and are tested using AS/NZS 4944:2006. From 2019, Multinet Gas will also begin testing the AL800.

Table 4-19 shows the direct capital expenditure associated with annual FLE testing of Large meter types. For further details refer to Multinet's Large Meter Strategy (MG-SP-0008).

Table 4-19: Meters – Field Life Extension Program – Large Meters

		2017	2018	2019	2020	2021	2022
Forecast Replacement	Meters	327	325	332	275	335	451
Repairable Meters ([redacted]% New Meters)	*Meters*	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Non-repairable Meters ([redacted]% New Meters)	*Meters*	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
New Meters Required	Meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit Rate	$/Meter	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$38**	**$38**	**$41**	**$27**	**$26**	**$38**

Although outlined in different strategies, the annual FLE program is delivered as a single program. Total annual direct expenditure is summarised in Table 4-20.

Table 4-20: Meters – Field Life Extension Program

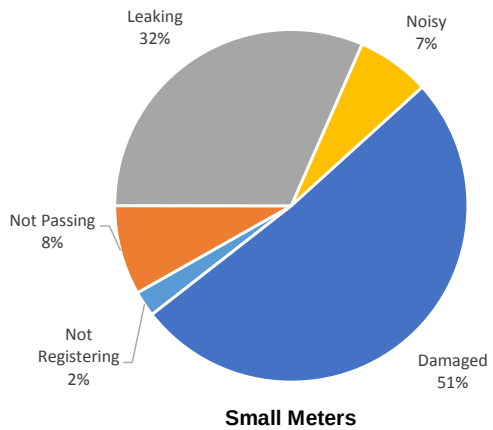
	2017	2018	2019	2020	2021	2022
Small Meters (<10 Sm^3/hr)	$14	$25	$58	$47	$53	$64
Large Meters (>10 Sm^3/hr)	$38	$38	$41	$27	$26	$38
Program Expenditure	**$52**	**$63**	**$99**	**$74**	**$79**	**$102**

4.4.3. Defective Meters / Failures

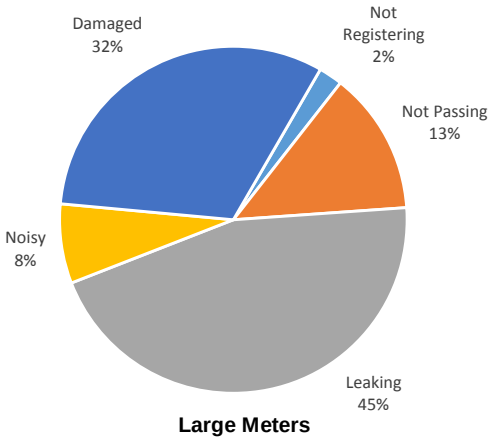
Leakage, inaccuracy, damage, excess noise and seizure are all failure methods for gas meters. Meter faults are predominantly identified by the public with meters replaced following an investigation by Multinet Gas' primary service provider.

Meter failure, especially those resulting in a leak increases the risk to public safety as a potentially explosive atmosphere could develop in the area surrounding the meter.

Figure 4-7: Meter Failure Modes



Small Meters



Large Meters

As a whole, Multinet's metering population is considered reliable with stable failure rates of close to 0.36% for Large and 0.32% for Small meter types of the metering population each year.

Leaking meters and third party damage are the two leading causes of defective meter removals for both small and large meter types.

Table 4-21 shows the direct capital expenditure associated with small meter failures per annum. For further details refer to Multinet's Small Meter Strategy (MG-SP-0007).

Table 4-21: Meters – Defective Meter / Failures – Small Meters

		2017	2018	2019	2020	2021	2022
Forecast Replacement (0.32% of fleet)	Meters	2,178	2,189	2,200	2,212	2,223	2,234
New Meters Required ([redacted] % of faults)	Meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit Rate	$/Meter	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$102**	**$103**	**$103**	**$104**	**$105**	**$105**

Table 4-22 shows the direct capital expenditure associated with large meter failures per annum. For further details refer to Multinet's Large Meter Strategy (MG-SP-0008).

Table 4-22: Meters – Defective Meter / Failures – Large Meters

		2017	2018	2019	2020	2021	2022
Forecast Replacement (0.36% of fleet)	Meters	94	99	103	108	113	118
New Meters Required ([redacted]% of faults)	Meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit Rate	$/Meter	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$63**	**$67**	**$69**	**$72**	**$76**	**$79**

The combined expenditure forecast for small and large meter failures is summarised in Table 4-23.

Table 4-23: Meters – Defective Meters / Failures

	2017	2018	2019	2020	2021	2022
Small Meters (<10 Sm^3/hr)	$102	$103	$103	$104	$105	$105
Large Meters (>10 Sm^3/hr)	$63	$67	$69	$72	$76	$79
Total Program Expenditure	**$165**	**$169**	**$172**	**$176**	**$181**	**$184**

4.4.4. Hand Held Meter Reading Devices

Multinet Gas maintains on average 65 functional Itron FC300 HHU meter reading devices used to read meters in the field. Of these approximately [redacted] hand held devices require replacement each year due to the continued high use and exposure to the elements.

In addition to periodic replacement, a new solution is needed to replace the MVRS (Multi-Vendor Reading Software) database which is no longer supported by Itron and is to be investigated in the near future. New HHU units are to be compatible with the new solution (one finalised) allowing for a smooth transition from current to new systems.

Table 4-24: Meters – Hand Held Meter Reading Devices

Program	2017	2018	2019	2020	2021	2022
Hand Held Meter Reading Devices	70	70	70	70	70	70
Program Expenditure	**$70**	**$70**	**$70**	**$70**	**$70**	**$70**

4.4.5. Daily Metering

Data Loggers and Flow Correctors are known more commonly as interval metering equipment. These electronic devices count meter pulse outputs from a physical meter index which directly relate to the flow of metered gas. This flow is then corrected to energy usage for billing purposes. Multinet has circa 315 interval metering sites.

The obligation for energy correction is outlined by the Gas Distribution System Code[5] with a detailed basis of calculation outlined in AEMO's publication "Declared Wholesale Market Energy Calculation Procedure (Victoria)".

There are two types of interval metering installations:

- Data Loggers are used to record hourly gas flow and converted to energy using only fixed temperature and fixed pressure values.
- Flow Correctors are used to correct gas flow with either fixed / live temperature and live pressure readings on site. These temperature and pressure values are aggregated 6 times per hour, with the calculations utilising the average values over the hour.

Table 4-25 shows the direct capital expenditure associated with Daily Metering per annum. The program is considered:

- Proactive when customers are applying for a new connection or an upgrade; and
- Reactive when rolling 12 month consumption figures dictate interval metering is required.

Table 4-25: Meters – Daily Metering

Program	2017	2018	2019	2020	2021	2022
Daily Metering / Flow Correctors	$94	$94	$94	$94	$94	$94
Program Expenditure	**$94**	**$94**	**$94**	**$94**	**$94**	**$94**

For further details refer to Multinet's Large Meter Strategy (MG-SP-0008).

4.4.6. Digital Metering Program

Multinet Gas (with United Energy) is uniquely placed to investigate and demonstrate the operation of digital gas metering that leverages the information and communications technology already in place following the successful rollout of smart meters in the electricity sector. This is because:

- Approximately 70% of Multinet Gas' customers are located in United Energy's geographic area; and
- Together, the companies have established a single shared point of network operational control.

[5] Gas Distribution System Code: Section 6.2 - Type of metering installation (p.10) and Section 7.4 - Correction (p.16)

Multinet will trial the Helios G6000 digital gas meter (certified by EDMI) as part of the study, installing 10,100 meters during the pilot. The sample size (<2% of the network) represents the minimum study size needed to gather sufficient information to enable a robust evaluation all costs, benefits and risks of a mass rollout.

The Pilot Study is to be completed over 5 years, beginning with the low scale proof of concept in 2017 (Phase 1 – 100 meters) and the larger rollout of meter from 2018 to 2021 (Phase 2 – 10,000 meters).

Program costs are shared between Network (i.e. Meter purchase & installation costs) and ICT Expenditure. Only the Network expenditure component of the program is covered in the AMP[6].

To minimise the cost of the pilot study, Multinet proposes to install digital meters in parallel with Time Expired meter replacement and new customer connections. This results in a 39% reduction in program expenditure from "Standalone" costs if not done in parallel.

Table 4-26 shows the direct capital expenditure forecast for the Digital Gas Meter Pilot Study. For more information, including pilot benefits, refer the Multinet's Small Meter Strategy (MG-SP-0007).

Table 4-26: Meters – Digital Metering Program – Program Expenditure

Digital Metering Program		2017	2018	2019	2020	2021	2022
Meter – Network Expenditure	Exp	$250	$1,128	$1,128	$1,128	$376	-
Discount for BAU activities		-	*($505)*	*($505)*	*($505)*	*($168)*	-
Incremental Program Expenditure		**$250**	**$623**	**$623**	**$623**	**$208**	-

4.5. Augmentation

Multinet has an obligation to manage the supply of natural gas to its customers in accordance with the Gas Safety Case (which complies with the Gas Safety Act 1997 and the Gas Safety Regulations 2008) and the Gas Distribution System Code.

At the highest level, Multinet is required to use all reasonable efforts to maintain network pressures above targeted levels detailed in the Gas Distribution System Code[7] and repeated in Table 4-27.

Table 4-27: Minimum network pressures required under the Gas Distribution System Code

Network Pressure	Minimum Obligated Pressure (kPa)
Low Pressure	1.4
Medium Pressure	15
High Pressure	140
High Pressure 2	600

[6] Refer the Multinet's IT Strategy for further details.

[7] Gas Distribution System Code, Schedule 1, Part A.

The need for network augmentation is identified by Multinet's Network Planning department and is the outcome of extensive modelling activities which identifies the need and timing of each project.

Multinet's Augmentation capex comprises:

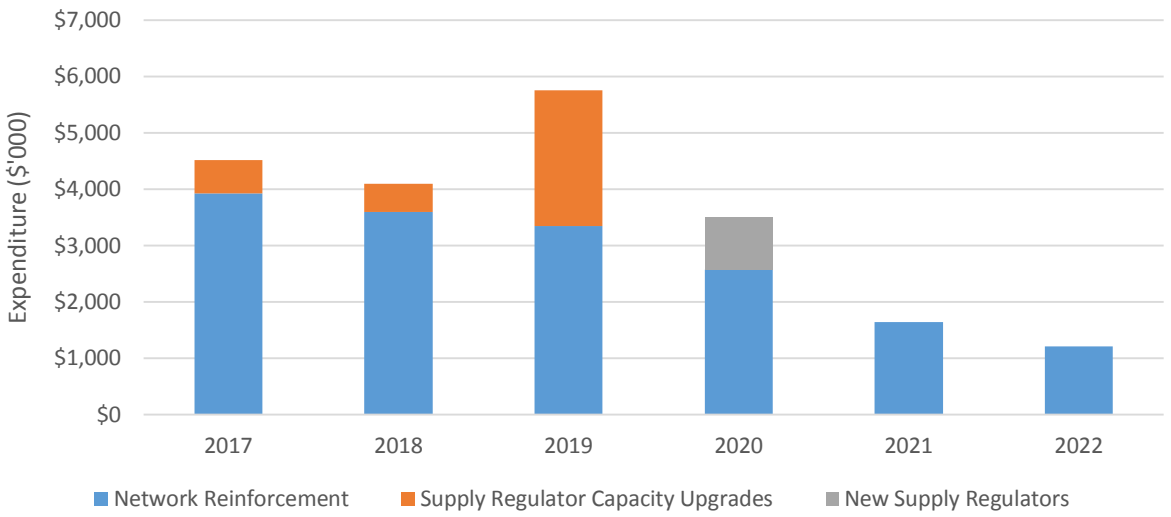
- **Network Reinforcement** – the installation of new gas mains to reinforce areas of poor supply.
- **Network Regulator capacity upgrades** – the upgrading of regulating stations to allow for increased throughput of a station.
- **New Network Regulating stations** – the construction of new network supply points to allow for additional feeds to our networks.

Table 4-28 shows the direct capital expenditure associated with Network Augmentation by program per annum. Each program is further detailed in the below sections. For further details refer to Multinet's Capital Growth Plan (MG-PL-0002).

Table 4-28: Augmentation Expenditure Summary

Ref	Program	Strategy #	2017	2018	2019	2020	2021	2022
3.5.1	Network Reinforcement	MG-PL-0002	$3,928	$3,590	$3,348	$2,580	$1,648	$1,210
4.5.2	Supply Regulator Capacity Upgrades		$583	$500	$2,406	-	-	-
4.5.3	New Supply Regulators		-	-	-	$923	-	-
	Total Direct Expenditure		**$4,511**	**$4,090**	**$5,754**	**$3,503**	**$1,648**	**$1,210**
	Overhead		$271	$245	$345	$210	$99	$73
	Subtotal		**$4,782**	**$4,336**	**$6,098**	**$3,713**	**$1,746**	**$1,283**
	Real cost escalation		-	$26	$36	$28	$19	$16
	Total Expenditure		**$4,782**	**$4,361**	**$6,134**	**$3,740**	**$1,765**	**$1,299**

Figure 4-8: Augmentation Expenditure Summary



4.5.1. Network Reinforcement

Network reinforcement involves the installation of new gas mains to reinforce or back-feed areas of poor supply.

Table 4-29 shows the direct capital expenditure forecast for the Network Reinforcement. Multinet's forecast is dominated by a single project in Oakleigh – scheduled to begin in 2017. The reinforcement will see 6.7 kilometres of 300NB Steel mains interconnecting a new field regulator (refer to Section 4.5.3) to the Oakleigh High Pressure network.

All network reinforcement projects were estimated via Advisian, Multinet's independent estimator.

Table 4-29: Augmentation – Network Reinforcement

Project Name	Network	Network ID	2017	2018	2019	2020	2021	2022
Glenview Road, Yarra Glen	Yarra Glen	H24	[redacted]	-	-	-	-	-
Lorimer Street, Dockland	Sth Melb	H07	-	-	-	-	-	[redacted]
Clancys Road, Korumburra	Korumburra	SGT	-	-	[redacted]	-	-	-
Sherbrooke Road, Sassafras	Olinda Sth	H48	-	-	-	-	[redacted]	-
Old Coach Road, Kalorama	Olinda Nth	H24	-	-	-	-	[redacted]	-
Selkirk Avenue, Knox	Knox HP	H02	-	[redacted]	-	-	-	-
Bedford Road, Ringwood	Ringwood	H01	-	[redacted]	-	-	-	-
Warrandyte / Ringwood Road, Warrandyte South	Ringwood	H01	-	[redacted]	-	-	-	-
Colman Road, Warrandyte South	Ringwood	H01	-	[redacted]	-	-	-	-
Braden Brae Dr, Warranwood	Ringwood	H01	-	[redacted]	-	-	-	-
Oakleigh Augmentation	Oakleigh	H29	[redacted]	[redacted]	[redacted]	[redacted]	-	-
		Program Expenditure	**$3,928**	**$3,590**	**$3,348**	**$2,580**	**$1,648**	**$1,210**

4.5.2. Supply Regulator Capacity Upgrades

Seven Field Regulators within the Eastern High Pressure system have reached their capacity and will require upgrading in the forecast period. Excessive gas flow rates through three stations[8] has increased the scope of these capacity upgrades to include new supply offtakes which increases the cost of each project.

Estimates for these projects were determined from the use of actual costs from historical projects as a benchmark where Multinet has previously undertaken comparable works.

Table 4-30 shows the direct capital expenditure forecast for Supply Regulator Capacity Upgrades.

[8] Modelled flow rates (above 80 m/s) are well in excess of 36m/s planning standard "MG Field Regulator Capacity Analysis" by OGP

Table 4-30: Augmentation – Supply Regulator Capacity Upgrades

Network Regulator	Reg #	2017	2018	2019	2020	2021	2022
Vermont (MP upgrade to HP - Stage 1) - original P2-064	P4-294	[redacted]	-	-	-	-	-
Vermont (HP upgrade - Stage 2)	P3-002	-	[redacted]	-	-	-	-
High Street (Knox)	P4-067	[redacted]	-	-	-	-	-
Lincoln Road (Olinda Nth)	P4-120	-	-	[redacted]	-	-	-
Blaxland Drive (Knox)	P4-250	-	-	[redacted]	-	-	-
Glenfern (Olinda South)	P4-182	-	-	[redacted]	-	-	-
Azalea Court (Ringwood)	P4-256	-	-	[redacted]	-	-	-
Program Expenditure		**$583**	**$500**	**$2,406**	**-**	**-**	**-**

4.5.3. New Supply Regulators

New Supply regulating stations are rare on the Multinet Gas network. A single new supply regulator is required in the forecast period (in 2020) to support the larger network reinforcement of the Oakleigh High Pressure network. Estimates for this project was determined from the use of actual costs from historical projects as a benchmark where Multinet has previously undertaken comparable works.

Table 4-31 shows the direct capital expenditure forecast for New Supply Regulators.

Table 4-31: Augmentation – New Supply Regulators

Program	Network ID	2017	2018	2019	2020	2021	2022
Princess Hwy, Oakleigh	H29	-	-	-	[redacted]	-	-
Program Expenditure		-	-	-	[redacted]	-	-

4.6. SCADA

SCADA (Supervisory Control and Data Acquisition) systems are used by Multinet for the effective and economical monitoring, recording and control of the network. The AER classifies SCADA projects under the term “Telemetry”.

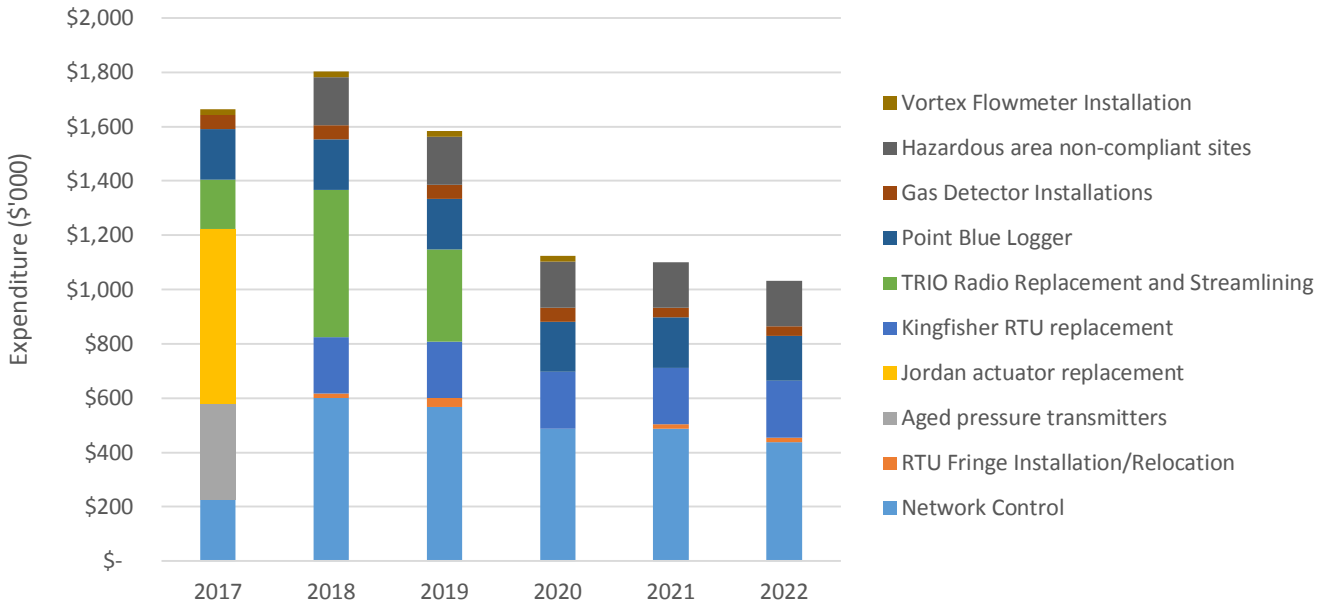
Multinet’s SCADA Strategy (MG-SP-0002) details the management of existing SCADA assets and their associated components. It details the lifecycle management of SCADA assets, including the replacement of existing and requirement for new installations to maintain and improve network monitoring and control.

Multinet’s forecast expenditure for SCADA is shown in the Table 4-32 and profiled in Figure 4-9. Further elaboration of each program is detailed in subsequent sections.

Table 4-32: SCADA Expenditure Summary

Ref	Program	Strategy #	2017	2018	2019	2020	2021	2022
4.6.1	Network Control	MG-SP-0002	$228	$601	$568	$488	$488	$439
4.6.2	RTU (Remote Telemetry Units)		-	$16	$32	-	$16	$16
4.6.3	Aged Pressure Transmitter Replacement		$354	-	-	-	-	-
4.6.4	Jordan Actuator Replacement		$641	-	-	-	-	-
4.6.5	Kingfisher RTU Replacement		-	$209	$209	$209	$209	$209
4.6.6	TRIO Radio Replacement & Streamlining		$182	$541	$340	-	-	-
4.6.7	Point Blue Logger Implementation		$186	$186	$186	$186	$186	$165
4.6.8	Gas Detector Installation		$52	$52	$52	$52	$35	$35
4.6.9	Vortex Flow meter Installation		$22	$22	$22	$22	-	-
4.6.10	Hazardous zone non-compliant site refurbishment		-	$177	$177	$167	$167	$167
	Total Direct Expenditure		**$1,669**	**$1,806**	**$1,587**	**$1,124**	**$1,101**	**$1,032**
	Overhead		$100	$108	$95	$67	$66	$62
	Subtotal		**$1,764**	**$1,911**	**$1,680**	**$1,191**	**$1,166**	**$1,093**
	Real cost escalation		-	$11	$8	$8	$12	$13
	Total Expenditure		**$1,764**	**$1,922**	**$1,688**	**$1,199**	**$1,178**	**$1,106**

Figure 4-9: SCADA Expenditure Summary



4.6.1. Network Control

Multinet has implement remote pressure SCADA control (of varying types) on many of its high, medium and low pressure networks. Sites classified as “SCADA Control” have monitoring equipment in addition to the capability of controlling pressure remotely. Control can be split into “step” control (i.e. predefined pressure set points) or “variable” control (i.e. continuous pressure set points).

Table 4-33 provides an overview of Multinet’s SCADA control program to 2022. In summary, Multinet intends to implement:

- Variable control of the High Pressure Network;
- Step control on Eastern Medium Pressure Network; and
- Step control on Low Pressure Networks

Refer to Multinet’s SCADA Strategy (MG-SP-0002) for further details.

Table 4-33: SCADA – Network Control

Program		2017	2018	2019	2020	2021	2022
Variable Network Control – High Pressure	Units	[redacted]	[redacted]	-	-	-	-
	Exp	[redacted]	[redacted]	-	-	-	-
Step Control – Medium Pressure (Not Monitored)	Units	-	[redacted]	[redacted]	-	-	-
	Exp	-	[redacted]	[redacted]	-	-	-
Step Control – Medium Pressure (Monitored)	Units	[redacted]	-	-	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	-	-	[redacted]	[redacted]	[redacted]
Step Control – Low Pressure	Units	-	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	-	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$228**	**$601**	**$568**	**$488**	**$488**	**$439**

4.6.2. Remote Telemetry Units

The installation of fringe Remote Telemetry Units (RTUs) is required to ensure Multinet maintains adequate pressure monitoring capability in areas of the network that are subject to new connection growth or load change. Fringe point locations are identified by Multinet’s Network Planning department via the annual winter testing program to indicate the lowest pressure on the network at times of peak demand.

Table 4-34 shows the direct capital expenditure forecast for [redacted] RTU fringe installations required to 2022.

Table 4-34: SCADA – Remote Telemetry Units

Program		2017	2018	2019	2020	2021	2022
RTU installation/relocation	Units	-	[redacted]	[redacted]	-	[redacted]	[redacted]
	Exp	-	[redacted]	[redacted]	-	[redacted]	[redacted]
Program Expenditure		**-**	**$16**	**$32**	**-**	**$16**	**$16**

4.6.3. Pressure Transmitter Replacement

Multinet is currently undertaking a time based replacement program of Rosemount pressure and temperature transmitters that are beyond their useful life and are no longer supported by industry.

2017 is the final year of the three year program where [redacted] sites ([redacted] transmitters) will be targeted for replacement. In conjunction with the program, additional site refurbishment works will be conducted if the site itself is found to be non-compliant with existing standards and regulations.

Table 4-35 shows the direct capital expenditure forecast for transmitter replacement. Refer to Multinet's SCADA Strategy (MG-SP-0002) for site details.

Table 4-35: SCADA – Pressure Transmitter Replacement

Program		2017	2018	2019	2020	2021	2022
Pressure Transmitter Replacement	Units	[redacted]	-	-	-	-	-
Program Expenditure		**$354**	**-**	**-**	**-**	**-**	**-**

4.6.4. Jordan Actuator Replacement

A number of Multinet's Field Regulators are currently being controlled using "Jordan Control" rotary actuators; installed in the network during the 1980's to 2000s. The actuators are not compliant with the current industry standard for IEC EX or AUS EX rated equipment in hazardous areas, hence are being systematically replaced.

2017 is the final year of the Jordan Actuator Replacement program with [redacted] sites being upgraded. In conjunction with the program, additional site refurbishment works will be conducted if the site itself is found to be non-compliant with existing standards and regulations.

Table 4-36 shows the direct capital expenditure forecast for Jordan Actuator Replacement program. Refer to Multinet's SCADA Strategy (MG-SP-0002) for site details.

Table 4-36: SCADA – Jordan Actuator Replacement

Program		2017	2018	2019	2020	2021	2022
Jordan Actuator Replacement	Units	[redacted]	-	-	-	-	-
Program Expenditure		**$641**	**-**	**-**	**-**	**-**	**-**

4.6.5. Kingfisher RTU Replacement

The Kingfisher PLUS+ (Previously Series II) RTUs is no longer in production, is unsupported and at end of life. Coupled with inaccurate legacy design drawings and non-standard/inaccurate RTU code, there is an increasing need for the replacement of these RTUs with a modern RTUs of standardised design.

Multinet has 241 Kingfisher RTU sites (21 sites considered complex, 220 non-complex) of which [redacted] units a year will be targeted for replacement from 2018.

Table 4-37 shows the direct capital expenditure forecast for Kingfisher RTU replacement. Refer to Multinet's SCADA Strategy (MG-SP-0002) for site details.

Table 4-37: SCADA – Kingfisher RTU Replacement

Program		2017	2018	2019	2020	2021	2022
Kingfisher RTU Replacement	Units	-	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**-**	**$209**	**$209**	**$209**	**$209**	**$209**

4.6.6. TRIO Radio Replacement & Streamlining

The previous E series radio equipment that was implemented during the current regulatory period is now outdated, and does not provide adequate protection from cyber security risks.

To ensure the prudent and efficient management of cyber security risks, Multinet plns to replace the TRIO radio network with new, more secure technology. To further strengthen security, we plan to separate and streamline the communication pathways which are currently shared by United Energy and Multinet. This will allow data to be transferred on separate and secure pathways, and will also reduce the number of base stations required for operation.

Table 4-38 shows the direct capital expenditure forecast for the TRIO Radio Replacement & Streaming Program. Refer to Multinet's SCADA Strategy (MG-SP-0002) for program details.

Table 4-38: SCADA - TRIO Upgrade

Program	2017	2018	2019	2020	2021	2022
TRIO Radio Replacement & Streaming Program	$182	$541	$340	-	-	-
Program Expenditure	**$182**	**$541**	**$340**	**-**	**-**	**-**

4.6.7. Point Blue Logger Implementation

Multinet's fleet of Cello dataloggers are used primarily for winter testing, outage management and pressure investigations. The loggers have reached end-of-life (having already undergone field life extension in January 2015) and continue to operate on a soon to be redundant 2G network with no 3G or 4G network capability.

Multinet plans to implement [redacted] data loggers. These data loggers will provide an efficient means of conducting crucial network planning activities such as winter testing and outage management. Additional benefits include the potential to conduct corrosion protection testing activities remotely (reducing safety risks to staff) and, in some cases, the new datalogger may also function as RTUs for large industrial and commercial sites.

Table 4-39 shows the direct capital expenditure forecast for the procurement and integration of [redacted] Loggers.

Table 4-39: SCADA – Point Blue Logger Implementation

Program		2017	2018	2019	2020	2021	2022
Cathodic Protection Data Loggers	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Network Pressure Loggers	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$186**	**$186**	**$186**	**$186**	**$186**	**$165**

4.6.8. Gas Detector Installation

Electronic gas detectors reduce the risk of a gas escape through early detection and improved network response. They represent an early warning device for potentially explosive atmospheres in pressure reducing stations (i.e. confined spaces where the potential for an explosive atmosphere may result from a gas escape).

Over the past 3 years Multinet has installed gas detectors in various pits across the network focusing on sites in proximity to public areas and thoroughfares.

Table 4-40 shows the direct expenditure forecast for the installation of Gas detectors to 2022.

Table 4-40: SCADA – Gas Detectors

Program		2017	2018	2019	2020	2021	2022
Gas Detector Installation	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$52**	**$52**	**$52**	**$52**	**$35**	**$35**

4.6.9. Vortex Flow Meter Installation

Understanding flow is essential in understanding how the network operates. Flow metering at sites that have a large throughput of gas will allow for more accurate modelling of networks used to identify the need for augmentation.

Table 4-41 shows the capital expenditure forecast for the installation of Vortex flow meters at Vermont and Korumburra Outstations, Leongatha, and Lilydale City Gates. Vortex (or wafer cone flowmeters) are ideal assets for flow monitoring as they require minimal upstream or downstream pipe runs and can be installed virtually anywhere in a piping system.

Table 4-41: SCADA – Vortex Flow Meters

Program		2017	2018	2019	2020	2021	2022
Vortex Flow Meter Installation	Units	1	1	1	1	-	-
Program Expenditure		**$22**	**$22**	**$22**	**$22**	**-**	**-**

4.6.10. Hazardous zone non-compliant site refurbishment

A number of SCADA installations on the network have been identified as not meeting the current hazardous zone regulations for electrical equipment located within a gas/air environment (Australian Standard AS 3000). Consequently, when significant modifications are made at these sites, necessary work is undertaken to ensure that the site is compliant with current standards. This refurbishment work ensures Multinet maintains a safe environment for the public and our personnel.

As shown in Table 4-42, modification works will be undertaken at [redacted] substandard installations to 2022 to ensure compliance with the current standard.

Table 4-42: SCADA – Hazardous Zone Non-compliant Site

Program		2017	2018	2019	2020	2021	2022
Hazardous zone non-compliant Installation	Sites	-	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**-**	**$177**	**$177**	**$167**	**$167**	**$167**

4.7. Other

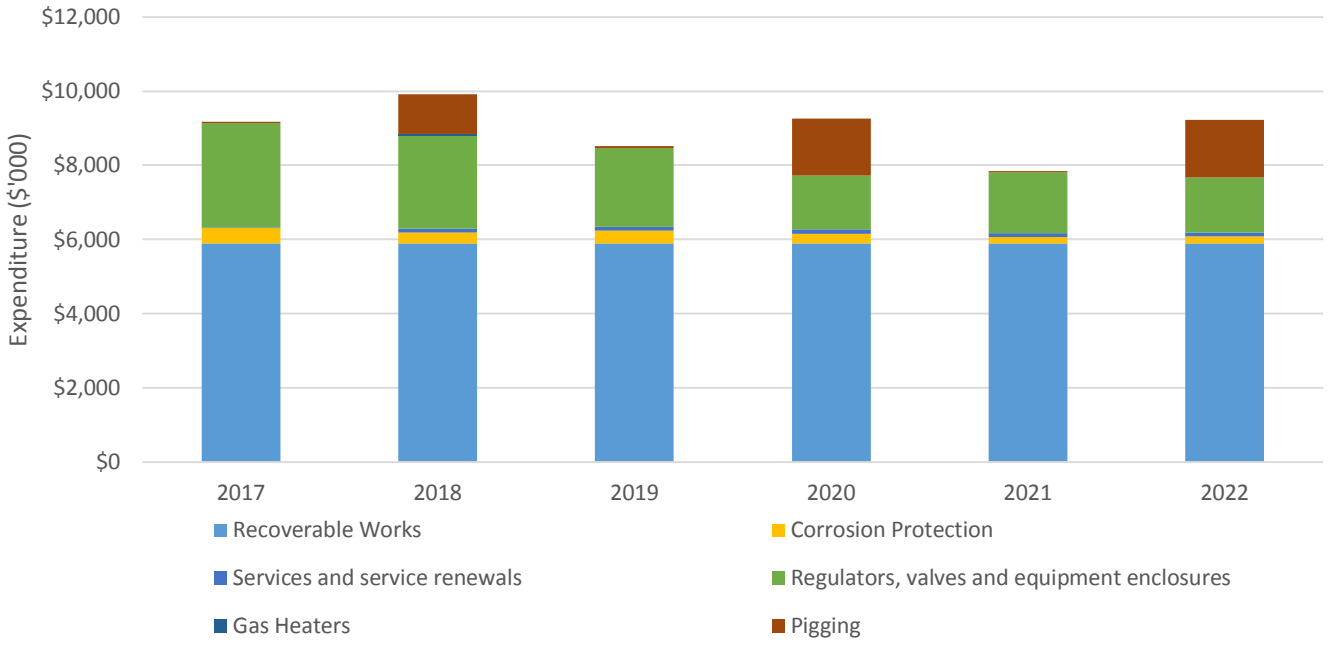
"Other" includes all capital expenditure not included in the subsequent expenditure categories.

For the purposes of internal reporting and expenditure forecasting, "Other" capex consists of six components or subcategories. Table 4-43 details the expenditure for "Other" capex. Further explanation of the subcategories provided form Sections 4.7.1 to 4.7.6.

Table 4-43: Other Expenditure Summary

Ref	Category	2017	2018	2019	2020	2021	2022
4.7.1	Recoverable Works	$5,901	$5,901	$5,901	$5,901	$5,901	$5,901
4.7.2	Corrosion Protection	$400	$278	$337	$253	$161	$175
4.7.3	Services – Thermal shut-off valves	$21	$111	$111	$111	$111	$111
0	Regulators, valves and equip enclosures	$2,816	$2,524	$2,124	$1,451	$1,633	$1,491
4.7.5	Gas Heaters	-	$30	-	-	-	-
4.7.6	Pigging & Marker Posts	$38	$1,066	$38	$1,534	$38	$1,547
	Total Direct Expenditure	**$9,175**	**$9,910**	**$8,511**	**$9,250**	**$7,844**	**$9,225**
	Overhead	$551	$595	$511	$555	$471	$553
	Subtotal	**$9,726**	**$10,505**	**$9,021**	**$9,805**	**$8,314**	**$9,778**
	Real cost escalation	-	$62	$48	$73	$90	$121
	Total Expenditure	**$9,726**	**$10,566**	**$9,069**	**$9,878**	**$8,405**	**$9,899**

Figure 4-10: Other Expenditure Summary



4.7.1. Recoverable Works

Recoverable works relate to the relocation or modification of assets undertaken at the request of a customer or some other third party. Recoverable work, broadly split between large (>$100k) and small (<$100k), typically have the objective of maintaining the existing level of service from the affected asset.

The costs of such works are recovered from the requesting third party.

Expenditure can vary significantly from year to year, as these works may arise from a variety of sources including government, developers, industrial, commercial and domestic customers and councils.

Table 4-44 shows the direct capital expenditure forecast for Recoverable Works to 2022. The forecast represents Mutlinet's average expenditure in this category over the past two years. For further details refer to Multinet's Capital Growth Plan (MG-PL-0002).

Table 4-44: Other – Recoverable Works

Program	Strategy #	2017	2018	2019	2020	2021	2022
Large Recoverable Works	MG-PL-0002	$5,901	$5,901	$5,901	$5,901	$5,901	$5,901
	Total Expenditure	**$5,901**	**$5,901**	**$5,901**	**$5,901**	**$5,901**	**$5,901**

4.7.2. Corrosion Protection

Multinet utilises Corrosion Protection (otherwise known as Cathodic Protection, or CP) and associated systems to actively defend against corrosion of buried steel assets within the network. CP prolongs the life of steel mains and fittings, effectively mitigating the risk of corrosion related gas escapes and resulting danger to field personnel and the surrounding public.

Multinet's Corrosion Protection program is determined by analysing the levels of protection administered by existing CP systems and installing/removing additional capacity where necessary.

Table 4-45 shows the direct capital expenditure associated with Corrosion Protection per annum, by program. Each program is detailed further in sections (a) to (e) below. For further details refer to Multinet's Corrosion Protection Strategy (MG-SP-0013).

Table 4-45: Other – Corrosion Protection

Ref	Program	Strategy #	2017	2018	2019	2020	2021	2022
(a)	CPU Installations	MG-SP-0013	$168	$109	$109	$89	$16	$11
(b)	Test Points Installations		$70	$79	$79	$75	$75	$75
(c)	Sacrificial Anodes		$39	$24	$24	$24	$24	$24
(d)	CPU Anode Beds		$122	$54	$113	$54	$35	$54
(e)	Surge Protection		-	$11	$11	$11	$11	$11
		Total Expenditure	**$400**	**$278**	**$337**	**$253**	**$161**	**$175**

(a) Cathodic Protection Unit Installations

Impressed current Cathodic Protection Units (CPUs) are required when sufficient corrosion protection cannot be maintained through connection to a magnesium anode. CPUs consist of a cabinet with electrical componentry (eg, power source, voltmeters/ampmeters) and silicone anodes.

New CPUs are installed when there is a need for additional CP in an area, identified as a result of potential surveys.

Replacement CPUs are installed to replace sites that are unable to provide adequate level of protection, if there is failure of componentry, or substandard condition of above ground equipment.

CPU relocations are driven by safety concerns of pole mounted CPUs presenting a safety hazard to field personal and are being relocated to ground locations for ease of access.

Table 4-46 shows the direct capital expenditure associated with CPU installations, replacements and relocations to 2022.

Table 4-46: Other – Corrosion Protection – Supply Regulator Capacity Upgrades

Program		2017	2018	2019	2020	2021	2022
New CPU Installations	Units	[redacted]	[redacted]	[redacted]	[redacted]	-	-
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	-	-
Replacement CPU – High Output	Units	-	[redacted]	[redacted]	[redacted]	-	-
	Exp	-	[redacted]	[redacted]	[redacted]	-	-
Replacement CPU – Low Output	Units	[redacted]	-	-	-	-	-
	Exp	[redacted]	-	-	-	-	-
CPU Relocations	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$168**	**$109**	**$109**	**$89**	**$16**	**$11**

(b) Test Points Installations

Test points are required to ensure Cathodic Protection can be monitored in smaller geographical footprints.

The installation of new test points is dependent on the detection of gaps in coverage. An allowance is also made for replacement of test points due to third party damage or construction activities.

Table 4-47 shows the direct capital expenditure associated with new and replacement test points.

Table 4-47: Other – Corrosion Protection – Test Point Installations

Program		2017	2018	2019	2020	2021	2022
New Testing Point Installations	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Replacement of existing Test Points	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$70**	**$79**	**$79**	**$75**	**$75**	**$75**

(c) Sacrificial Anodes

Sacrificial anodes (usually made of magnesium) are used as when impressed current systems (i.e. CPUs) are considered over engineered for the level of protection required; used where a smaller current and footprint is required to maintain protection levels. The need for new or replacement sacrificial anodes is dependent on gaps in CP coverage.

Table 4-48 shows the direct capital expenditure associated with new and replacement sacrificial anodes.

Table 4-48: Other – Corrosion Protection – Sacrificial Andes

Program		2017	2018	2019	2020	2021	2022
New Sacrificial Anodes	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Replacement of Existing Sacrificial Anodes	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$39**	**$24**	**$24**	**$24**	**$24**	**$24**

(d) CPU Anode Beds

Anode beds (typically made from silicon iron) are used with impressed current systems (i.e. CPUs) and can be split into two categories:

- High output systems produce >2 Amp output,
- Low output systems produce <2 Amp output.

The higher the output the more anodes required for the system to maintain it's potential. Low output beds consist of 1 - 2 anodes whereas the high output beds use around 10 anodes.

Anodes need replacing as they are consumed. Silicon iron anodes have a longer lifespan compared to the lower cost magnesium anodes. New anode beds are rarely installed, with most of the existing anode beds replaced as a result of continuous consumption to protect the pipe.

Table 4-49 shows the direct capital expenditure associated with replacement anode beds.

Table 4-49: Other – Corrosion Protection – Anode Beds

Program		2017	2018	2019	2020	2021	2022
High Output – Replacement	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Low Output - Repacement	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$122**	**$54**	**$113**	**$54**	**$35**	**$54**

(e) Surge Protection

Multinet's surge protection program consists of installing surge protection devised to identified below and above ground installations. This work mitigates the chances of electrical surges and hence the dangers of electrocution, equipment damage and ignition of fugitive emissions that are associated with them.

Table 4-50 shows the direct capital expenditure associated with Multinet's surge protection program.

Table 4-50: Other – Surge Protection

Program		2017	2018	2019	2020	2021	2022
Surge Protection	Exp	-	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**-**	**$11**	**$11**	**$11**	**$11**	**$11**

4.7.3. Services – Thermal activated shut-off devices

Multinet is introducing the use of thermal activated shut-off valves (i.e. bushfire valves) to be installed on new and existing services in bushfire prone areas. Bushfire valves operate by automatically turning off the gas supply in the event of a fire, preventing explosions and the further fuelling of the fire.

Multinet will target the use of "Bushfire valves" on connections within the Very High and Extreme risk areas as defined by the Department of Environment, Land, Water and Planning. (BRL Impact Risk levels). From this approach, Multinet has identified [redacted] customers in designated bushfire regions, with an average of [redacted] gas services retrofitted per year to 2022.

Table 4-51 shows the direct capital expenditure associated with Multinet's Bushfire Valve program.

Table 4-51: Other – Service & Service Renewals

Program	Strategy #	2017	2018	2019	2020	2021	2022
Service Valve replacement - Fire Valves	MG-SP-0010	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Expenditure		**$21**	**$111**	**$111**	**$111**	**$111**	**$111**

4.7.4. Regulators, Valves and Equipment enclosures

Multinet's capital works program for Regulating Stations (both network and consumer), network valves and enclosures is draw from a number of strategies, including:

- Supply Regulator Strategy (MG-SP-0003);
- Large Consumer Regulator Strategy (MG-SP-0005);
- Equipment Enclosures – Strategy (MG-SP-0014); and the
- Distribution Valves Strategy (MG-SP-0011)

Works include:

- Replacement of network / consumer regulators due to obsolescence or safety concerns;
- Replacement of network valves due to inoperability;
- Environmental noise improvement works;
- HP2 syphon removal works to increase network safety;
- Installation of network valves to increase network operatibility and safety;
- Structural engineering works at above ground regulating stations;
- Gas Meter room remediation works; and
- Other miscellaneous works.

It does not includes capacity driven station upgrades. Refer to Section 4.5 (p. 32) for Multinet's Augmentation forecast including the installation of new and the capacity upgrade of existing supply regulating stations.

Table 4-52: Other – Regs, Valves & Equipment Enclosure

Ref	Program	Strategy #	2017	2018	2019	2020	2021	2022
(a)	Hydraulic Regulator Replacement Program	MG-SP-0003	-	$500	-	-	-	-
(b)	Obsolete Supply Regulator Replacement		$1,040	$700	$550	$590	$440	$440
(c)	Valve Actuator Replacement		$33	$33	-	-	-	-
(d)	Supply Regulators - Misc. Program		$50	$50	$50	$50	$50	$50
(e)	Environmental Noise Improvement Works		$10	$10	$10	$10	$10	$10
(f)	Obsolete Consumer Regulator Replacement	MG-SP-0005	$908	$747	$1,084	$561	$833	$721
(g)	Gas Meter Room Remediation Program		$25	$25	-	-	-	-
(h)	Structural Engineering Rectification Program	MG-SP-0014	$360	$80	$50	$10	$70	$40
(i)	Equipment Enclosures - Miscellaneous works		$150	$150	$150	$150	$150	$150
(j)	HP2 Syphon Removal Program	MG-SP-0011	$60	$60	$60	$60	$60	$60
(k)	District Regulator Isolation Valves Program		-	$150	$150	-	-	-
(l)	Annual Program of Works - Misc. Allowance		$180	$20	$20	$20	$20	$20
	Total Expenditure		**$2,816**	**$2,524**	**$2,124**	**$1,451**	**$1,633**	**$1,491**

(a) Hydraulic Regulator Replacement Program

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

Three sites containing Welker Jet / Jetstream regulators have been forecast for replacement to 2018. As indicated in Table 4-53, two of these stations (Vermont MP and Vermont HP) are also earmarked for capacity upgrades as part of Multinet's Augmentation Program (Refer to Section 4.5, p. 32).

Hydraulic regulators are replaced due to:

- Poor performance resulting in a number of recent failures,
- Reduced functionality (i.e. pressure control),
- Reduced availability of spare parts, and
- UaFG contribution due to control processes.

Table 4-53: Other – Regs, Valves & Equipment Enclosure – 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**	**-**	**-**	**-**	**-**

Note: The costs associated with the replacement of regulators at [redacted] (identified as "Augmentation" in Table 4-53) are included in Multinet's forecast of Augmentation capex. Refer to Section 4.5.2, p.35.

(b) Obsolete Supply Regulator Replacement Program

The Obsolete Regulator Replacement Program targets the replacement of Fisher 298, Grove and Reynolds (models 670, 678, 688 and 680) 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.

Table 4-54 shows the direct capital forecast for the Obsolete Supply Regulator Replacement Program.

Table 4-54: Other – Regs, Valves & Equipment Enclosure – 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**

(c) Valve Actuator Replacement

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.

Replacing of the existing valve actuators with an appropriate unit will provide increased over-pressure protection operation, required to maintain network safety.

Table 4-55 shows the direct capital expenditure forecast for valve actuator replacements at two locations on Multinet's network.

Table 4-55: Other – Regs, Valves & Equipment Enclosure – Valve Actuator Replacement

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

(d) Supply Regs - Miscellaneous Works

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.

Table 4-56 shows the direct capital expenditure associated with Multinet's miscellaneous works program for supply regulators.

Table 4-56: Other – Regs, Valves & Equipment Enclosure – 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**

(e) Environmental Noise Improvement Works

Due to the nature of Multinet's operations, there is a continuing risk of non-compliance with the State Environment Protection Policy (SEPP) N-1 Control of Noise from Commerce, Industry and Trade.

There is 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.

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.

Table 4-57 shows the annual direct capital forecast for Environmental Noise improvement works required to address ad-hoc noise related issues and the continued development of noise abatement solutions.

Table 4-57: Other – Regs, Valves & Equipment Enclosure – Environmental Noise Improvement Works

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

(f) Obsolete Large Consumer Regulator Replacement Program

Multinet has been replacing obsolete regulator models and configurations (listed in Table 4-58) since 2012.

Each regulator type has been targeted due to the Original Equipment Manufacturer (OEM) no longer manufacturing or supporting the equipment. This has resulted in a scarcity in certain soft spares used for maintenance, resulting in increased repair costs and network risk.

By proactively replacing these regulators, Multinet can install the current manufacturer supported models in a cost efficient manner and build up a suitable level of strategic spares for the remaining population of obsolete regulators.

Table 4-58 shows the direct capital forecast for the Obsolete Large Consumer Regulator Replacement Program.

Table 4-58: Other – Regs, Valves & Equipment Enclosure – Obsolete Consumer Regulator Replacement

Regulator Type		2017	2018	2019	2020	2021	2022
Dival 250 – LBP	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dival 250 – LTR	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dival 100	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rockwell 243 RPC	Units	[redacted]	-	[redacted]	[redacted]	-	-
	Exp	[redacted]	-	[redacted]	[redacted]	-	-
Fisher 298	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Grove	Units	[redacted]	-	-	-	[redacted]	-
	Exp	[redacted]	-	-	-	[redacted]	-
Reliance 2002M	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$908**	**$747**	**$1,084**	**$561**	**$833**	**$721**

(g) Gas Meter Room Remediation Program

Gas Meter Room Remediation is an ongoing program forecast to continue to 2018 (inclusive). The program rectifies sub-standard meter rooms (built to Gas & Fuel standards) identified from internal audit activities.

Table 4-59 provides a forecast allowance for Meter room rectification works to 2018.

Table 4-59: Other – Regs, Valves & Equipment Enclosure – Gas Meter Room Remediation Program

Program	2017	2018	2019	2020	2021	2022
Gas Meter Room Remediation Program	$25	$25	-	-	-	-
Program Expenditure	**$25**	**$25**	**-**	**-**	**-**	**-**

(h) High Pressure 2 Syphon Removal Program

Multinet's High Pressure 2 (HP2) system has 104 installed syphons.

Historically, syphons were installed to extract liquids from the pipeline prior to the introduction of natural gas. These facilities are now redundant. In some cases, stress on the fitting increases if a road are built above the syphon, increasing the likelihood of leak.

Multinet has concerns regarding HP2 syphons arising from their likelihood of being damaged due to third party works, and the resulting lack of available repair methods. Refer to Multinet's Distribution Valve Strategy (MG-SP-0011) for further details.

A program has been initiated to proactively remove syphons from service; with prioritisation based on location risk factors, depth of cover, maintenance history and ability to obtain cost synergies from multiple removals at one time.

Table 4-60 shows the direct capital expenditure forecast for [redacted] HP2 syphon removals per annum to 2022.

Table 4-60: Other – Regs, Valves & Equipment Enclosure – HP2 Syphon Removal Program

Program		2017	2018	2019	2020	2021	2022
HP2 Syphon Removal	Sites	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$60**	**$60**	**$60**	**$60**	**$60**	**$60**

(i) District Regulator Isolation Valves Program

The primary function of the valves installed on the network is to provide the ability to isolate sections of the network in the event of a gas leak or a failure of pressure regulating equipment.

Two District Regulators have been identified as having a configuration which does not permit isolation of the supply regulator without losing supply to customers. This arrangement is not compliant with current Multinet Gas Engineering standards.

A rectification program has been initiated to address identified sites to ensure continuity of supply to customers in the event of regulator isolation, and modification of pipework to comply with current engineering standards.

Table 4-61: Other – Regs, Valves & Equipment Enclosure – District Regulator Insolation Valve Program

Network Regulator	Reg #	2017	2018	2019	2020	2021	2022
Spensor Road, Camberwell (L07)	P1-435	-	[redacted]	-	-	-	-
Bowen Crescent, Melbourne (L08)	P1-260	-	-	[redacted]	-	-	-
Program Expenditure		**-**	**$150**	**$150**	**-**	**-**	**-**

(j) Network Valves – Miscellaneous Works

Multinet's miscellaneous works program for network valves covers the refurbishment or replacement of distribution valves and associated pipework. As network valves vary with respect to age, type, function and utilisation, works are determined on a "case-by-case" basis; are usually undertaken as a project and, where possible, aligned with scheduled maintenance activities.

Table 4-62 shows the direct capital expenditure associated with Multinet's miscellaneous works program for Network Valves.

Table 4-62: Other – Regs, Valves & Equipment Enclosure – Valve Miscellaneous Works

Program	2017	2018	2019	2020	2021	2022
Network Valves Miscellaneous Works	$180	$20	$20	$20	$20	$20
Program Expenditure	**$180**	**$20**	**$20**	**$20**	**$20**	**$20**

(k) Structural Engineering Rectification Program

Above ground regulator kiosks / housings are susceptible to damage due to their exposure to the external environment. Brick walls, roof structures, door/window structures and guttering are susceptible to degradation due to corrosion, rot and water related breakdown issues.

A structural engineering review was conducted in 2014/15 (by T.D&C Consulting Engineers & Construction Managers) on all above ground supply regulator sites on Multinet's network.

Table 4-63 shows the direct capital expenditure associated with Multinet's Structural Engineering Rectification Program. The program implements the recommendations put forward by the structural engineering review.

Table 4-63: Other – Regs, Valves & Equipment Enclosure – Structural Engineering Program

Network Regulator / Site	2017	2018	2019	2020	2021	2022
[redacted]	-	-	[redacted]	-	-	-
[redacted]	[redacted]	-	-	-	-	-
[redacted]	-	[redacted]	-	-	-	-
[redacted]	-	-	[redacted]	-	-	-
[redacted]	[redacted]	-	-	-	-	-
[redacted]	-	-	-	-	[redacted]	-
[redacted]	-	[redacted]	-	-	-	-
[redacted]	-	-	[redacted]	-	-	-
[redacted]	-	-	-	[redacted]	-	-
[redacted]	-	-	-	-	[redacted]	-
[redacted]	-	-	-	-	-	[redacted]
Program Expenditure	**$360**	**$80**	**$50**	**$10**	**$70**	**$40**

(l) Equipment Enclosures - Miscellaneous works

This miscellaneous works program takes into account the replacement or refurbishment of equipment enclosures and its associated components, such as pit lids, concrete pit walls, ladders and foot-plates etc. These components are replaced or refurbished on a “case-by-case” basis to rectify any safety related issues.

Table 4-64 shows the direct capital expenditure associated with the miscellaneous works program for equipment enclosures.

Table 4-64: Other – Regs, Valves & Equipment Enclosure – Equipment Enclosures Miscellaneous Works

Program	2017	2018	2019	2020	2021	2022
Equipment Enclosure - Miscellaneous Works	$150	$150	$150	$150	$150	$150
Program Expenditure	**$150**	**$150**	**$150**	**$150**	**$150**	**$150**

4.7.5. Gas Heaters

Small Vortex heaters have replaced catalytic heaters at a number of Multinet’s supply regulating stations where inlet temperatures (during winter) result in poor operation of the regulator’s control loop; particularly pilot regulators.

Vortex heaters operate by reducing gas pressure through a vortex nozzle creating high velocity gas that is dumped into the downstream (lower pressure) network. The vortex warms the outer casing of the heater which is used to heat small volumes of gas. Vortex heaters are ideal for heating pilots and require no maintenance as there are no moving components.

Table 4-65 shows the capital forecast for [redacted] Vortex heater installations on the network in 2018. Refer to Multinet’s Gas Heater Strategy (MG-SP-0015) for further details.

Table 4-65: Other – Gas Heaters

Program	Strategy #	2017	2018	2019	2020	2021	2022
Vortex Heaters	MG-SP-0015	-	$30	-	-	-	-
	Total Expenditure	**-**	**$30**	**-**	**-**	**-**	**-**

4.7.6. Transmission Pipelines

The programs below are integral to maintaining the integrity of Multinet's 175km of Transmission Pipelines in addition to maintaining compliance with AS2885. They ensure the safety of the public through clear visualisation of transmission main locations and the ability to analyse their integrity through in-line inspection.

Table 4-66 shows Multinet's forecast direct capital expenditure relating to Transmission Pipelines.

Table 4-66: Other – Pigging & Marker Posts

Ref	Program	Strategy #	2017	2018	2019	2020	2021	2022
(a)	Non-Piggable Pipeline Alteration Program	MG-SP-0001	-	$1,028	-	$1,496	-	$1,509
(b)	Marker Post Replacement		$38	$38	$38	$38	$38	$38
		Total Expenditure	**$38**	**$1,066**	**$38**	**$1,534**	**$38**	**$1,547**

(a) Non-Piggable Pipeline Alteration Program

Multinet owns and operates 175km of Transmission Pipelines in its metropolitan Melbourne territory and in the non-contiguous South Gippsland network. Transmission pipelines are licensed by the Department of Environment, Land, Water and Planning (DELWP) and Energy Safe Victoria (ESV), and require a permit in accordance with the Pipelines Act 2005 for their operation.

Transmission pipelines are designed and constructed to Australian Standard (AS) 2885.1 using high-grade steel and maintained and operated to the latest version of AS 2885.3.

Multinet has an obligation to periodically demonstrate the integrity of its licenced pipelines. This is documented in Multinet's Pipeline Integrity Management Plan (PIMP).

Intelligent pigging (in-line inspection) is an essential condition assessment tool for pipelines. The purpose of intelligent pigging is to:

- Ensure the structural integrity of the pipelines is maintained;
- Provide evidence of pipeline condition;
- Identify corrosion, dents, gouges and other anomalies that may be present; and
- Inform remaining life reviews and Safety Management Studies (SMS).

Multinet has a number of pipelines targeted for in-line inspection but were designed and constructed such that they cannot be pigged without alterations. Such alterations include (at a minimum):

- The replacement of tight radius bends to swept bends to permit a pig to pass;
- The removal of reduced bore valves; and
- A valve configuration at each end of the pipeline to allow a pig launcher and receiver.

Table 4-67 shows the forecast cost required for alterations on three pipelines. The forecast has been drawn from an engineering feasibility study on the requirements to rectify each pipeline completed by OSD (consultant) in 2015.

Refer to Multinet's Transmission Pipelines Strategy (MG-SP-0001) for further details on the Non-piggable pipeline alteration program.

Table 4-67: Other – Pigging – Non-Piggable Pipeline Alteration Program

Transmission Pipeline	Licence #	2017	2018	2019	2020	2021	2022
Rowville - Ferntree Gully	T76	-	$1,028	-	-	-	-
Dandenong-Edithvale	T21	-	-	-	$1,496	-	-
Murrumbeena – Highett	T07	-	-	-	-	-	$1,509
Program Expenditure		-	**$1,028**	-	**$1,496**	-	**$1,509**

(b) Marker Post Replacement

Pipe Marker Posts are used on both transmission and distribution assets to warn the public that a supply main is buried in the vicinity. The installation, maintenance and replacement of pipe marker posts is an ongoing program for Multinet Gas.

Table 4-68 shows the direct capital expenditure associated with Multinet's marker post replacement program.

Table 4-68: Other – Pigging – Marker Post Replacement

Program		2017	2018	2019	2020	2021	2022
Marker Post – Plate Replacement	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Marker Post – Total Replacement / New	Units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Exp	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program Expenditure		**$38**	**$38**	**$38**	**$38**	**$38**	**$38**

5. APPENDIX

5.1. Glossary

Term / Abbreviation	Definition
ACIF	Australian Construction Industry Forum
AER	Australian Energy Regulator
AMP	Asset Management Plan
Augmentation Expenditure	AER defined expenditure category
Commercial & Industrial Connection Expenditure	AER defined expenditure category
CP	Cathodic Protection
CPU	Cathodic Protection Unit
DELWP	Department of Environment, Land, Water and Planning
DTS	Dandenong Terminal Station
EDD	Effective Degree Day
EDMI	Company suppling metering equipment and supplies
ESC	Essential Services Commission of Victoria
ESV	Energy Safe Victoria
FLE	Field Life Extension
GAAR	Gas Access Arrangement Review
GDSC	Gas Distribution System Code
GJ	Giga Joule 1 GJ = 1000 MJ
I&C	Industrial and Commercial
kPa	Kilopascals
LP	Low Pressure
HDPE	High DensityPolyethylene
HP	High Pressure
HP	High Pressure 2

Term / Abbreviation	Definition
Mains Replacement Expenditure	AER defined expenditure category including all proactive and reactive mains and service replacement.
MDQ	Maximum Daily Quantity
MHQ	Maximum Hourly Quantity
MP	Medium Pressure
Meters Expenditure	AER defined expenditure category including
MVRS	Multi-Vendor Reading Software
NGR	National Gas Rules
NIEIR	National Institute for Economic and Industrial Research
OEM	Original Equipment Manufacturer
Other Expenditure	AER defined expenditure category including
OPEX	Operating expenditure
PE	Polyethylene
PVC	Polyvinyl Chloride
Residential Connection Expenditure	AER defined expenditure category including
RTU	Remote Telemetry Unit
SCADA	Supervisory Control and Data Acquisition
Sm^3/hr	Standard cubic meters per hour
Telemetry	AER defined expenditure category including SCADA
TJ	Tera Joules, 1 TJ = 1000GJ

5.2. Mutlinet Gas Strategy Overview

Table 5-1: Capital Summary by Multinet Gas Strategy

Document #	Strategy	2017	2018	2019	2020	2021	2022
MG-PL-002	Capital Growth Strategy	$32,469	$32,608	$33,293	$30,245	$28,799	$28,888
MG-SP-0001	TP Integrity Management Plan	$38	$1,066	$38	$1,534	$38	$1,547
MG-SP-0002	SCADA Strategy	$1,664	$1,803	$1,585	$1,123	$1,100	$1,031
MG-SP-0003	Supply Regulator Strategy	$1,133	$1,293	$610	$650	$500	$500
MG-SP-0005	Large Consumer Regulator Strategy	$933	$772	$1,084	$561	$833	$721
MG-SP-0006	Small Consumer Regulator Strategy	-	-	-	-	-	-
MG-SP-0007	Small Meter Strategy	$575	$3,184	$939	$2,198	$962	$655
MG-SP-0008	Large Meter Strategy	$234	$443	$424	$456	$289	$394
MG-SP-0009	Distribution Mains Strategy	$41,320	$52,482	$47,110	$48,444	$51,598	$44,358
MG-SP-0010	Distribution Services Strategy	$1,165	$1,255	$1,255	$1,255	$1,255	$1,255
MG-SP-0011	Distribution Valve Strategy	$240	$230	$230	$80	$80	$80
MG-SP-0013	Corrosion Protection Strategy	$400	$278	$337	$253	$161	$175
MG-SP-0014	Equipment Enclosure - Strategy	$510	$230	$200	$160	$220	$190
MG-SP-0015	Gas Heater Strategy	-	$30	-	-	-	-
	Total Direct Expenditure	**$80,680**	**$95,674**	**$87,106**	**$86,960**	**$85,835**	**$79,795**
	Overhead	$4,841	$5,740	$5,226	$5,218	$5,150	$4,788
	Subtotal	**$85,520**	**$101,414**	**$92,332**	**$92,178**	**$90,985**	**$84,583**
	Real cost escalation	-	$597	$487	$686	$987	$1,049
	Total Expenditure	**$85,520**	**$102,011**	**$92,819**	**$92,863**	**$91,972**	**$85,632**

5.3. List of Tables

5.4. List of Figures