AusNet Gas Services Pty Ltd

Gas Access Arrangement Review 2018–2022

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Consumer Regulators Strategy

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Table of Contents

Consumer Regulators Strategy

Executive Summary

A Consumer Regulator is defined as a regulator that reduces the gas pressure from network pressure to a pressure acceptable for entry into a Domestic or Industrial & Commercial (I&C) customers' premise. Such pressure regulating units extend from the consumer's service isolation valve up to the fitting line entry point to the consumer's meter after the regulator. The scope of assets that fit this description includes Domestic, I&C, Metering Room, and Black Box installations.

This document outlines AusNet Services' strategy from the 2017/18 to 2021/22 financial periods with regards to managing Consumer Regulator assets in alignment with the network objectives:

- ***Maintaining network safety in accordance with the Gas Safety Case*** by removing leakages on defective consumer regulators to avoid hazardous situations and improve consumer safety;
- ***Maintaining top quartile operating efficiency*** by undertaking commercially driven regulator replacement in order to reduce maintenance costs;
- ***Undertaking prudent and sustainable network investment*** through identifying reactive and proactive asset replacement programs as fit-for-purpose;
- ***Delivering services valued by our customers*** through the reliability benefits of identified capital programs.

To achieve these objectives and ensure AusNet Services' external obligations are maintained, the following capital programs will be undertaken over the next 5 years:

Program FY:	2017/18	2018/19	2019/20	2020/21	2021/22	Total
I&C '298' Type Regulator Replacement	$325	$250	$175	$375	$250	$1,375
Domestic Regulator Replacement[1]	$1,050	$1,050	$1,050	$1,050	$1,050	$5,250
Miscellaneous I&C Works Program[2]	$200	$200	$200	$200	$200	$1,000
TOTAL Expenditure ('000)	**$1,575**	**$1,500**	**$1,425**	**$1,625**	**$1,500**	**$7,625**

Regular maintenance cycles of 6-monthly Operational checks and 6- or 10-yearly Full Maintenance Overhaul on large[3] I&C metering sites will be maintained in the strategy period to ensure they are operating safely and reliably. The remainder of metering sites are maintained under fault response, with response times being monitored as part of the KPI framework.

The combined Opex and Capex programs that make up this strategy contribute to the safe management of AusNet Services' metering assets.

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1 Actual volumes will align with the Domestic Meter Replacement Program which is based on the annual Time-Expired Meter Testing outcomes (reference: Meter Management Strategy).

2 Includes allowance for reactive regulator replacement i.e. replacement upon regulator failure.

3 Those stations with a metering pressure of >4 kPa.

1 Introduction

1.1 Purpose

The Consumer Regulating Station Strategy is one of several plant strategies developed and maintained for the management of AusNet Services' Gas Distribution Network. This document provides background on Consumer Regulators and describes the approach used to manage the assets.

1.2 Scope

Consumer regulator stations are facilities that provide natural gas at a reduced pressure directly to the consumer. This strategy covers the regulators used to maintain pressure at residential, industrial and commercial customer sites. It does not cover City Gate, Field Regulator and District Regulator facilities that supply gas to distribution networks as these are covered in AMS 30-51 Regulating Facilities.

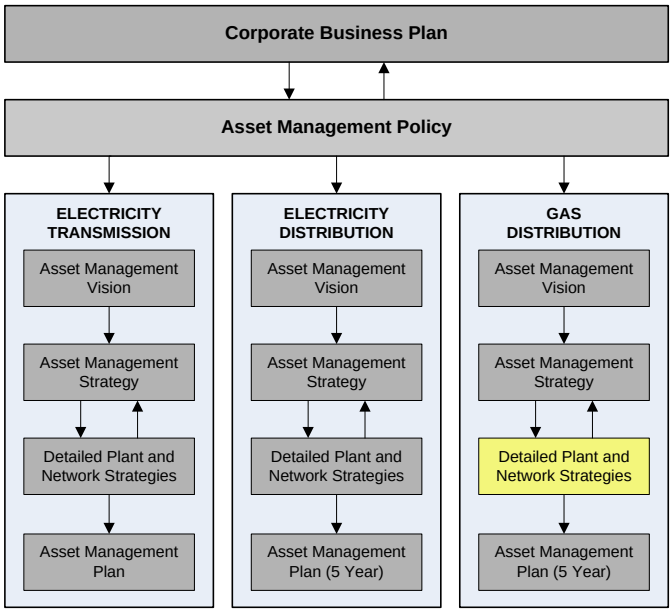
1.3 Definitions

- **Commercial Meters** are larger metering installations (> 10m^3/hr) operating at pressures less than 4kPa.
- **Domestic Meters** or residential meters are small capacity meters (< 10m^3/hr) operating at pressure less than 4kPa and typically located at the front of domestic properties.
- **Energy Safe Victoria (ESV)** is a government body responsible for the safety and technical regulation of AusNet Services' energy networks, including the gas distribution network.
- **Gas Meter** is mechanical device (usually) used to measure the volumetric flow rate of gas that passes the device. The volume of energy that passes through the meter is dependent on both gas pressure and temperature when the volume is measured.
- **Industrial Meters** are large capacity metering installations (> 10m^3/hr) operating at pressures greater than 4kPa. Industrial meters can only be maintained by System Operations trained personal.
- **Installation type** refers to the classification of domestic, commercial or industrial meters.
- The **Gas Distribution System Code (GDSC)** underpins specific regulatory requirements for gas distribution networks.
- **SAP** is the asset management IT systems that stores asset records, project work flow and notifications.

1.4 Relationship with Other Management Documents

This Plant Strategy is one of a number of asset management related documents developed and published by AusNet Services in relation to its gas distribution network. As indicated in the figure below informs both the Asset Management Strategy (AMS) and Asset Management Plan (AMP) of the required capital programs needed to achieve the long-term objectives of the gas distribution network.

Figure 1: Asset Management System document interdependencies



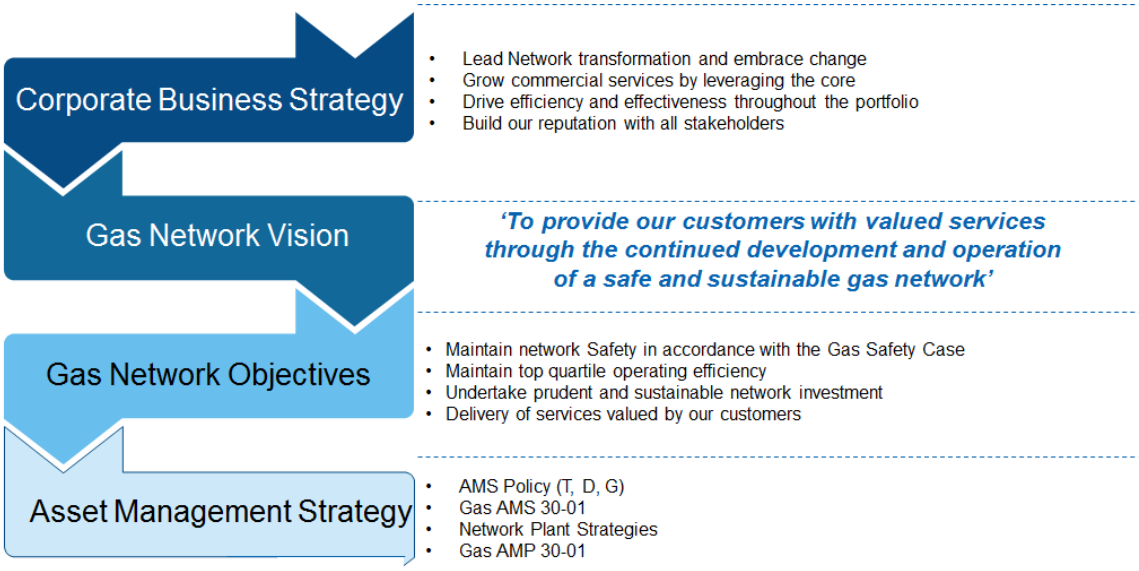
1.5 References

- *Gas Safety Act 1997*
- Gas Distribution System Code (Version 11)
- Gas Safety Case
- TS4356 Metering Room

1.6 Alignment of AusNet Services' Business Drivers and Objectives

AusNet Services' purpose statement is to "Empower communities and their energy future". This statement places the customer (as individuals and communities) at the forefront as a business driver and acknowledges the critical relationship with their energy supply and usage, and is a key theme throughout the Corporate Business Strategy. The following diagram provides the linkage between AusNet Services' corporate strategy, and the gas network vision consistent with providing valued customer service' and sustainable network investment. The gas network objectives, which stems network vision drives the development of the programs for each of the asset strategies.

Figure 2: Alignment of Corporate, Business and Network objectives



The gas network objectives alignment with the business, regulators, and the delivery of plant strategies are detailed below:

1. Maintain network safety in accordance with the Gas Safety Case

Maintains the alignment to AusNet Services' commitment to 'Mission Zero'. The objective to maintain network safety is in recognition of AusNet Gas Services current safety performance and design of the network.

2. Maintain top quartile operating efficiency

Aligns to the Corporate Business Plan with AusNet Services' aspiration to operate "all three core networks in the top quartile of efficiency benchmarks".

3. Undertake prudent and sustainable network investment

Alignment to AusNet Services' obligation to undertake prudent and sustainable network investment, as defined in the National Gas Rules and Gas Distribution System Code.

4. Delivery of valued services to our customers

Establishes the need to better understand our customers (their needs and behaviours) and deliver services they value.

2 Asset Overview

2.1 Introduction

Each customer supply point across the distribution network features a regulator that reduces the gas to a usable pressure as per the customer demand. AusNet Services has approximately 663,500 connection points (646,500 domestic & 17,000 Industrial and Commercial), each with a dedicated regulating facility.

Each connection point also contains a metering unit accompanying the regulator unit to allow the volume of gas consumed by the consumer to be measured.[4]

There are two categories of a Consumer Regulator station based on the demand profile and type of premise it supplies:

- Industrial and Commercial Regulator station; and
- Domestic Regulator.

2.1.1 Industrial / Commercial Regulator Stations

Industrial and Commercial (I&C) regulators supply varying outlet pressure ranges from 1.1kPa up to 100kPa depending on the customers' requirements and system pressure capacity. An I&C installation can be either single run or dual run depending on the customers' reliance on a continuous gas supply and the impact an outage will have on their process.

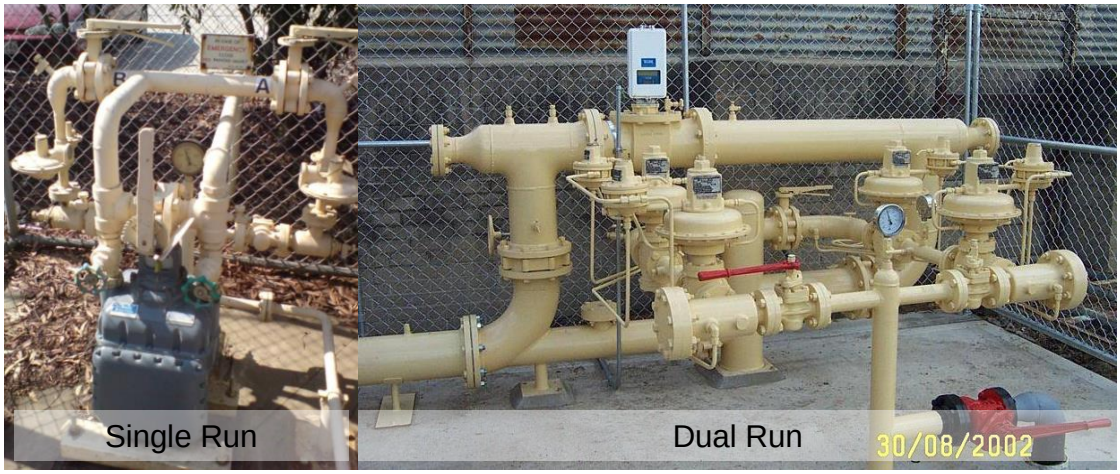
Single Run I&C Stations

Single run consumer regulator stations consist of the meter and regulator unit installed along one run. There is also the option to design a single run station so that one run is metered and one is manually operated called a "single run with bypass".

Dual Run I&C Stations

Dual Run meter/regulator units consist of two automatically operated pressure reducing legs with a regulated bypass and are typically used where continuity of supply is required.

Figure 3: I&C Type Consumer Regulator Station



[4] Refer document AMS 30-54 *Meter Management Strategy*.

2.1.2 Domestic Regulators

Domestic regulating stations supply residential customers (Tariff V). The standard metering pressure for a domestic customer is 1.1 kPa for low or medium pressure residential services, and 2.75 kPa for high pressure residential services. Domestic regulator stations installation can range between single regulator-meter installations existing at the side of a house to multiple regulator-meters installed in a stack, as typically seen in the Meter Rooms that supply multiple apartment units.

Figure 4: Domestic Regulator Station

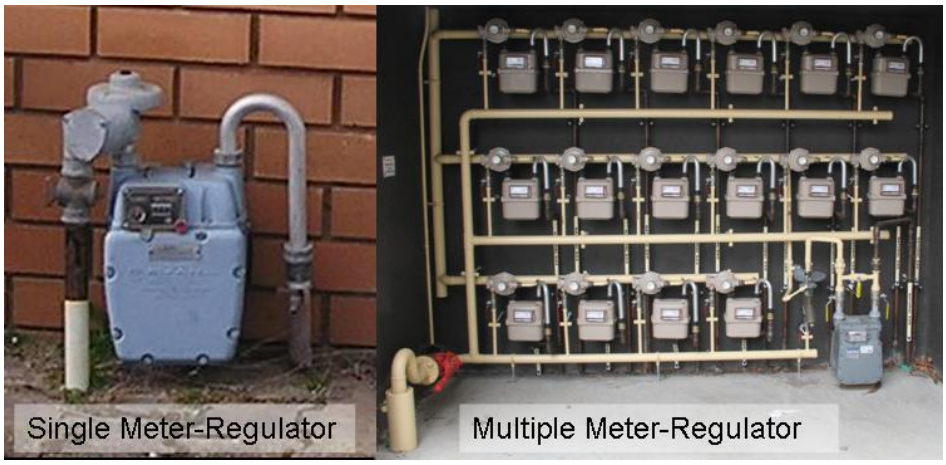
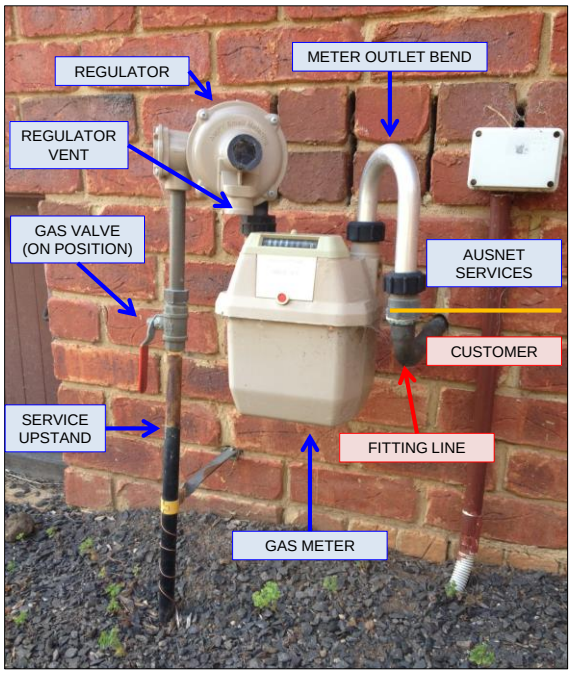


Figure 5: Typical Domestic Gas Meter Setup



2.1.3 Other Consumer Regulator Stations

Black Box

A "Black Box" type regulator facility can be distinguished from regular domestic and I&C regulators as these are installed inside a pre-fabricated enclosed pit assembly. Black boxes are used to avoid high pressure gas entering commercial or occupied buildings and usually regulate the pressure down to 3 kPa outlet.

Figure 6: Black Box

Metering Room

A room specifically constructed for the housing of gas metering infrastructure and comprising of a minimum of 2 walls, ceiling and a means of entry/exit for a person.

Enclosures

Enclosures typically consist of a wire cage protecting the meter regulator installation from damage.

Figure 7: Metering Room and Enclosures

2.2 Asset Profile

Regulators are classified as *system operations* and *non-system operations* units.

All domestic and black box consumer regulators are non-system operations units and these assets are not individually recorded in the asset management database. System operations ('system ops') units are captured in the SAP database. Approximately 13% of I&C regulators are systems ops units.

Unlike meters in the network, AusNet Services does not record domestic regulator data. These units are therefore treated as meter-regulator units. The age profile of domestic regulators is not known as this asset class is not captured in the asset database and installation dates are not readily available.

The age profile of 'systems ops' classed I&C regulator sites is depicted in Figure 8.

Figure 8: Age profile of I & C Regulator Sites

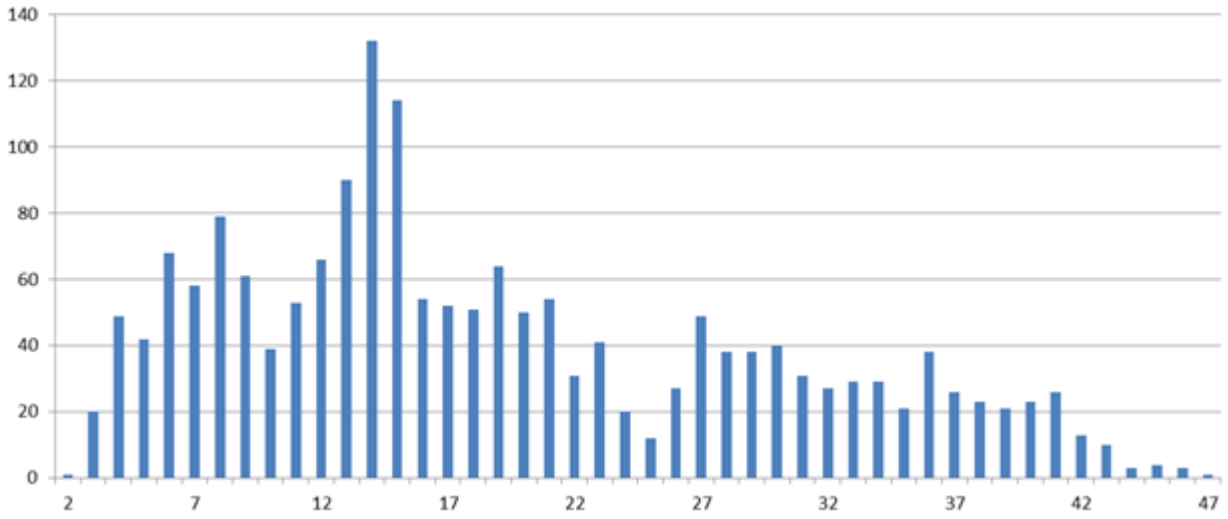


Figure 8 depicts a relatively young profile for I&C 'system operations' sites, with approximately 70% of these assets having an age of 25 years or less.

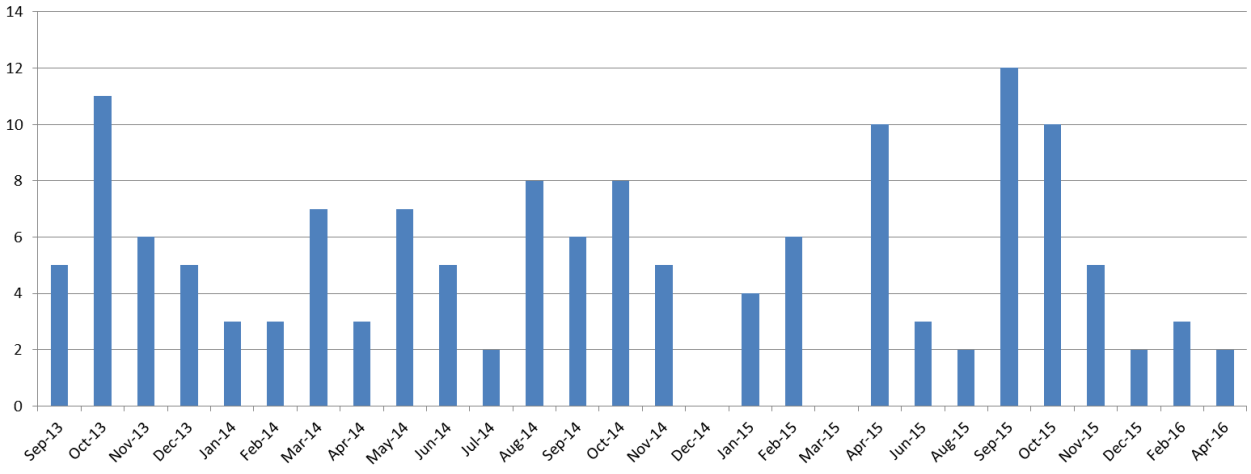
2.3 Asset Performance

2.3.1 Industrial & Commercial Regulator Stations

Faults over the period September 2013-April 2016 were analysed. The fault information is gathered from Systems Ops' fault reports that cover identified faults and activities undertaken and are captured directly from the field.

A summary of fault callouts by month is depicted in Figure 9.

Figure 9: I&C site fault callouts by month[5] September 2013-April 2015



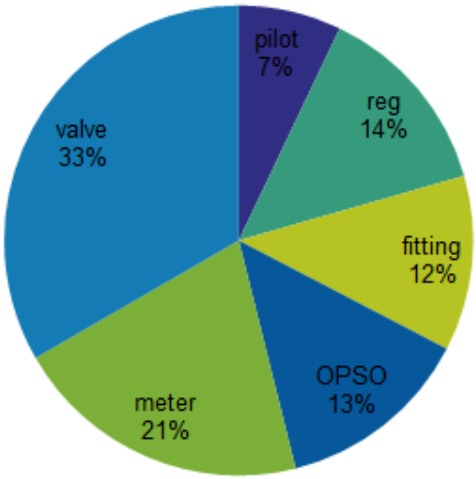
The average number of fault ('Trouble Order') callouts experienced on I&C sites within the network are 5 per month. However, there is no clear trend in the nature of faults and the type of equipment on which they occur.

[5] Systems Operations Report (Downer).

Out of the 150 fault callouts to I&C sites analysed, only 19 were attributed to breakdown of a regulator unit with a relatively even divide of non-specific sleeve and diaphragm-type regulators.

Figure 10 shows the proportion of I&C faults attributable to each piece of equipment.

Figure 10: I&C faults by equipment



Valves and meters[6] together account for more than half of faults at these regulating stations. The nature of the fault in 70% of cases is attributed to a leak.

Regulator-specific faults account for just 13% of breakdowns suggesting that regulators are generally reliable asset units.

2.3.2 Domestic Consumer Meter-Regulator Units

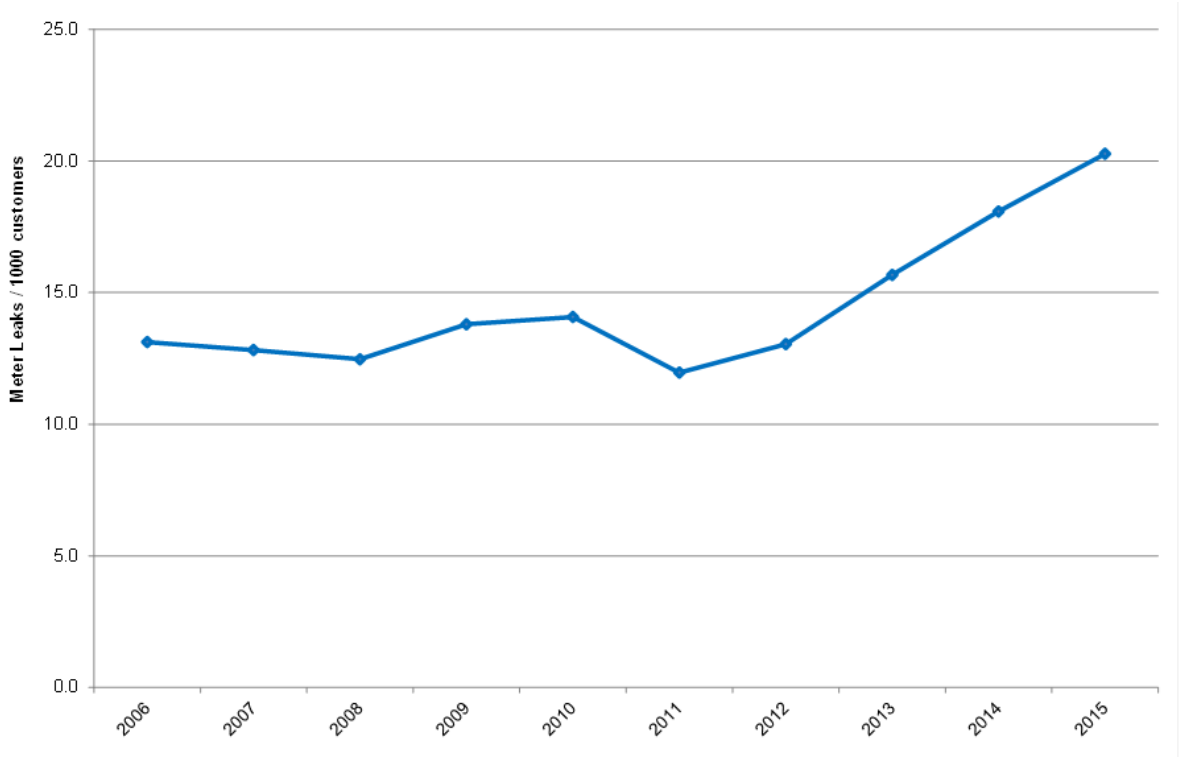
A meter leak is classified as a leak on a gas meter, valve, regulator or meter inlet and these leaks account for an average of 75% of all leaks on the gas network, with the remaining 25% attributed to mains and service leaks.

A measure of the performance of these assets is the number of recorded Domestic Meter Leaks per 1,000 Customers. However, this measure does not differentiate between leaks that occurred on the meter or the attached regulator unit.

The trend of domestic meter leaks is shown in Figure 11.

[6] The meter units at I&C regulator stations are replaced cyclically at the end of their useful life as part of the I&C Meter Replacement Program (refer *Meter Management Strategy* document AMS 30-54).

Figure 11: Domestic Meter Leaks / 1,000 customers



A rising trend for leaks on meters ('meters' includes the regulator) has heavily influenced the network leakage rate which attributes 75% of those leaks as occurring at meters. At the end of 2015, the rate of meter leaks stood at >20 leaks / 1,000 customer connections, translating to an overall fault rate of 1.9% for existing meter installations.

The increase in recorded meter leaks correlates with the increasing failure rates of domestic regulators. The trend seen in Figure 11 can be attributed to the rise in domestic regulator leaks. Under the current practice of reactive replacement of domestic regulators (i.e. upon failure), the field fault rate of domestic regulators could double by 205.[7]

Analysis[8] suggests that 91% of 'meter leaks' actually occur on a component of the regulator unit, and in 60% of those cases the regulator had to be replaced.[9]

7 NCS Meter Leaks Report 2015.

8 NSC Meter Leaks Report 2015.

9 The remaining 40% of regulator leakage cases were due to a leaking joint.

3 Risks

The following describes the risks associated with the operation of both domestic and I& C regulators within the gas network.

3.1 Domestic Regulator Risk

The following are consequence associated with Domestic regulator failure:

- Gas leak from a residential regulator results in a gas escape. The leak in conjunction with an ignition source has the potential to ignite and may cause damage to property or public.
- The regulator fails in the closed position resulting in poor supply pressure to customer or outage.
- The regulator failing in the open position can result in over pressure through the downstream fitting line and internal appliances. The material and equipment are not equipped to deal with higher pressure and may result in failure.

A consequence of leaking regulators is failure to maintain network safety. The *Gas Safety Act 1997* prescribes a maximum penalty of 1,500 penalty units for non-compliance with Clause 32. Clause 32 relates to the general duties of gas companies in ensuring that facilities are maintained and operated to as far as practicable minimise any hazards and risks to the safety of the public and to customers.

Under the GDSC, AusNet Services is required to provide a compliant metering installation at each supply point off the distribution network; it is critical that the operation of domestic regulator is maintained and operates safely.

3.2 Large Industrial and Commercial Regulator Risk

Industrial and Commercial regulators provide gas to AusNet Services' largest customers. Failure at the point of the regulator can result in detrimental effects and is a substantial risk considering the volume release of gas. The following are potential risks associated with failure:

- Regulator fails in open position resulting in inlet pressures seen on downstream pipework.
- Gas leak from an I&C regulator results in a gas escape. The leak in conjunction with an ignition source has the potential to ignite and may cause damage to property or public, with the associated risk of fatality.
- The regulator failing in the closed position resulting in poor on no supply to the customer. This can severely impact manufacturing processes, and may result in loss of business to our customers.

It is critical that all sites are maintained adequately for safe operation, to minimise any hazards and risk to the safety of the public and customers.

4 Strategies

4.1 Domestic and small I&C regulators

Historically, domestic regulators have not been subject to planned maintenance and have only been replaced when they are faulty. The main driver for maintenance on these units is a customer reporting weak or no gas supply or smelling/hearing gas escape through the regulator. Where a fault is confirmed on the regulator (rather than on the adjacent meter or pipework), the regulator is replaced.

The historical strategy is leading to increasing risk due to the volumes of leaking regulators. Due to this increasing risk, a strategy involving the proactive replacement of regulators has been evaluated. This strategy involves the replacement of a regulator replacement concurrently with the Meter Replacement Program where certain meter families are proactively 'retired'.

If the regulator was replaced at the same time as the meter (i.e. during the Meter Replacement Program), this would significantly decrease the labour component of the regulator change as only a small incremental labour cost would be incurred. The opportunity to proactively replace domestic regulators is 55% cheaper than reactive replacement.

A comparison of the costs associated with reactive and proactive replacement is shown in Table 1.

Table 1: Modelled Variables

	Reactive Replacement	Proactive Replacement Program
Manufacturer	Landis & Gyr	Landis & Gyr
Model Regulator	300 Series	300 Series
Unit Cost – Initial ($2014)	C-I-C	C-I-C
Installation Cost	C-I-C	C-I-C
Design Life	15 years	15 years
Regulator Replacement	Model Outcome	15 years
Replacement Costs ($2014)	C-I-C	C-I-C

Figure 12: Modelled operational cost comparison of reactive and proactive regulator replacement

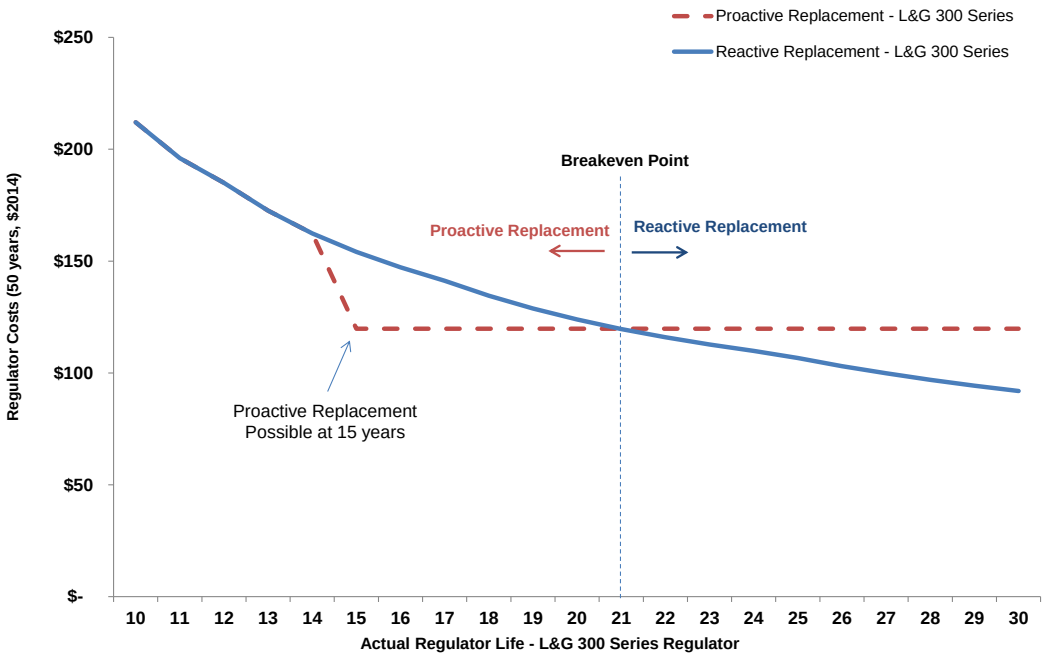


Figure 12 shows a comparison between the operational costs of implementing a regulator replacement program (in conjunction with the Meter Replacement Program) and continuing with reactive replacement.

If the regulator lasts for more than 21 years, then the reactive replacement approach is the most economic option. If the regulator is found to be defective between 15-21 years, then modelling indicates that implementation of a proactive replacement program (if conducted in conjunction with the Meter Replacement Program) would be the most economic option. If the regulator lasts for less than 15 years it would be replaced before the meter and proactive replacement of the regulator with the meter would not be an economic option.

Both meters and regulators have a design life of 15 years. Meter end-of-life is primarily determined by meter accuracy. Meter groups are subject to an accuracy test and when a group fails the test; all the meters in the group are replaced.

A program involving replacement of meters at the time the meter is replaced will result in economic replacement of most regulators. The program should result in most regulators meeting or exceeding their 15-year design life, will reduce the number of gas leaks and should arrest the increasing gas leak trend.

Strategies

- Replace domestic regulators at the time the meter is replaced; and
- Continue with no scheduled maintenance on domestic regulators.

4.2 Large I&C Regulators

4.2.1 Maintenance

All large (systems operations) I&C regulators[10] are recorded in the asset database and are subject to the following maintenance regime:

- Operational Check – 6 monthly; and
- Full Operational Check – 12 monthly.

This maintenance schedule allows the integrity of these assets to be maintained.

A full overhaul/upgrade is completed every 6 year or 10 years (depending on the type of asset) to maintain safety and integrity of the asset through upgrading degraded components, undertaking performance tests, recalibrating set points, and touching up paintwork where required.

Figure 13: I &C undergoing Full Overhaul

This maintenance and overhaul program is critical in maintaining the effectiveness and safety of the regulators provided spare parts are available. The program ensures that fault and leak levels are maintained at acceptable levels.

Metering Rooms contain multiple gas meters typically for the purpose of supplying apartment blocks, shopping centres, or sporting arenas (where there are multiple consumers populating a premise). There are approximately 300 metering rooms installed within the gas network. Metering Room assessments are performed in accordance with AusNet Services' Technical Standard (TS 4356). The priority of works is based on identified sites that require:

- improved and compliant venting systems;
- signage, security locks and update emergency contact details; and
- intrinsically safe electrical installations.

The outcome of Metering Room assessments leads to the identification of rectification works required to ensure compliance with TS 4356 which is in turn compliant with current Australian building code requirements.

The primary driver behind carrying out such assessments is safety. Metering rooms are typically located near high density residential houses. Natural gas is highly flammable and in the event that gas leaks into a confined

[10] i.e. those I&C regulators that have a metering pressure of 4 kPa or greater with an automatic overpressure protective shut-off device installed.

space (e.g. within the metering room) and a source of ignition exists, the resultant explosion has the capacity to demolish the property, and cause injury to the public. The repair and upgrade to "out of specification" metering rooms ensures that those installations are safe and do not pose as a hazard to the public.

4.2.2 I&C '298' Type Regulator Replacement

The Fisher 298 regulators are a higher capacity gas regulator typically installed on Industrial and Commercial type installations. These regulators are now obsolete, with spare parts required for 6-yearly maintenance increasingly more difficult and expensive to source. As such, their replacement with a modern equivalent, the Pietro Fiorentini 'Norval' regulator, has been identified as a project to prevent operational costs increasing over the long term.

The Pietro Fiorentini 'Norval' regulator is a direct bolt-on replacement for the Fisher 298 regulator.

The sites to be replaced are to be selected based on the schedule of sites planned for full maintenance. In this way cost efficiencies will be realised through alignment of the replacement with planned preventative maintenance activities.

There is commercial benefit for installing the nominated replacement regulator as it is far cheaper to maintain than the '298' type regulator (approx. $452 pa compared with $2,467 pa) and is a suitable alternative.

4.2.3 Miscellaneous I&C Works

I&C regulators occasionally experience failures which necessitates replacement of low value capital items at consumer regulating stations that have either failed in operation or have been identified through risk assessment (safety or network risk) as requiring urgent replacement.

An ongoing program is necessary to reduce (eliminate) identified network safety risks and to maintain network compliance and / or performance.

All items must meet each of the following criteria:

1. ***Replacement*:** Replacement of an existing asset only.
2. ***Low capital value*** (~ <$20k).
3. ***Reactive in nature*:** Expenditure is to be reactive in nature through failure of the existing asset or identified as requiring urgent replacement through risk assessment.

Example projects may include the replacement of:

- mechanical protection bollards within regulating compounds;
- enclosures;
- pipe supports, valves, etc;
- actuators; and / or
- auxiliary equipment.

Strategies

- Continue with routine scheduled maintenance of I&C regulators and inspection of metering rooms;
- Implement a program to replace Fisher 298 regulators with a modern equivalent; and
- Continue to replace items and regulators at consumer regulating stations that have failed in operation or identified through risk assessment as requiring urgent replacement.

5 Alignment with Network Objectives

This section provides an overview of the alignment of the programs proposed in the Consumer Regulator Strategy with the gas network objectives which govern how the network is operated and maintained.

Consumer Regulator Strategies	Gas Network Objective			
	Maintain network Safety	Maintain operating efficiency	Undertake prudent & sustainable investment	Deliver valued services to customers
Replace Domestic regulators in line with meter replacement	•		•	•
No scheduled maintenance on domestic regulators		•	•	
Routine maintenance of I&C and Meter Rooms	•	•		•
Replace Fisher 298 regulators with a modern equivalent	•		•	•
Miscellaneous I&C works	•		•	

Table 2: Alignment of Consumer Regulator Strategy Programs with Gas Network Objectives

Gas Network Objectives
Maintain network safety in accordance with the Gas Safety Case; • The proactive replacement of domestic regulators will slow the trend of regulator leaks, reducing the risk of a leak to the public. • Maintenance activity on I&C meter rooms sites, ensure that hazards identified are treated in line with the safe operation of the gas network. *Maintain top quartile operating efficiency;* • Due to the low cost of domestic regulators it is not feasible to have a regular maintenance program. • Maintenance of I&C meter rooms will ensure integrity of reliability of each of the sites, and extends the life of larger regulators. *Undertake prudent and sustainable network investment;* • The replacement of the identified sites ensure the integrity and reliability of the network is maintained. *Deliver valued services to customers;* • Provides a safe and reliable network, through the replacement and maintenance of each of the programs.

6 Detailed CAPEX Requirements

6.1 Phasing and Financial Disclosure

All programs are defined in financial years, aligning to AusNet Services' annual capital period between April to March in the ensuring year.

All financial figures quoted within this document, including all historic and forecasted expenditure – unless otherwise specifically stated – have the following characteristics:

- Real Expenditure / Cost (reference year = 2016);
- Direct Expenditure only (i.e. excludes overheads and corporate finance costs); and
- In units of $1,000 (i.e. '000).

6.2 Summary of Programs

Table 3: Financial Year Capital Expenditure to FY2022

Program FY:	2017/18	2018/19	2019/20	2020/21	2021/22	Total
I&C '298' Type Regulator Replacement	$325	$250	$175	$375	$250	$1,375
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[12] Includes allowance for reactive regulator replacement i.e. replacement upon regulator failure.