Asset Management Strategy – Appendix 5A

Gas Distribution Network

SP AusNet
A member of Singapore Power Group

ISSUE/AMENDMENT STATUS

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Contact

This document is the responsibility of the Network Strategy & Development Division, SP AusNet. Please contact the officer below with any inquiries.

Elias Raffoul
Manager Gas Networks
SP AusNet
Level 30, 2 Southbank Boulevard
Melbourne Victoria 3006
Ph: (03) 9695 6000

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1 Executive Summary

SP AusNet is a multi-utility company that owns and operates $6.3 Billion of electricity and natural gas assets in Victoria, Australia.

SP AusNet's gas transmission and distribution business services approximately 605,000 customers across the west of Victoria, including the outer northern and north-west metropolitan area of Melbourne. The network consists of approximately 10,000km of mains operating at different pressures and pressure regulating facilities (e.g. City Gates, Field regulators etc) spanning a geographical diverse region of approximately 60,000km^2.

At present, SP AusNet's network contains three of Victoria's six fastest expanding urban growth areas[1]. Specifically, growth rates exceeding 5% p.a. have been seen and are expected to continue (in the short term) in the Melton, Wyndham, and Hume growth areas. This is compared to total forecast network growth of approximately 1.2% p.a. (demand) and 2.4% p.a. (gross connections) to 2017.

The gas demand profile of the network is winter peaking, with a pronounced spike arising from the increased customer take-up of domestic heating. Management of the gas peak demand is accordingly an important consideration for the Asset Management Strategy (AMS).

SP AusNet is one of three natural gas distribution business within Victoria; each considered a natural monopoly operating under a licence from the Department of Primary Industries (DPI). The Australian Energy Regulator (AER) is responsible for regulation of networks under the National Gas Law and the National Gas Rules, with Energy Safe Victoria (ESV) responsible for the technical regulation, overseeing the safety of employees, contractors, consumers and the general public.

SP AusNet's asset management mission is to:

"Deliver energy and associated services, safely, reliably, and to enhance the lives of our customers and employees in a sustainable manner"

This mission encompasses SP AusNet's underlying purpose and its non-negotiable commitment to safety as captured within the "missionZero" initiative.

To deliver on its mission, SP AusNet has established four (4) key network objectives that govern how the gas network is operated and maintained. A suit of key performance indicators (KPIs) exist to track ongoing performance of these objectives.

1. Maintain and Improve Safety in accordance with the Gas Safety Case
2. Maintain Integrity of the network
3. Maintain Capacity of the network, and
4. Maintain Customer Satisfaction levels

In aligning with these objectives, SP AusNet is committed to the provision of safe and reliable network services by investing in the upgrade and maintenance of the network. A total lifecycle approach is adopted, with SP AusNet's Asset Management System being accredited to the requirements of PAS55 (Publically Available Specification # 55), a British Standard for the optimised management of physical infrastructure assets. Accreditation is recognised as an indicator of best practice in asset management.

The Gas AMS documents SP AusNet's holistic approach to management of the network assets, and establishes the linkages with and between the underpinning detailed strategies, processes and plans. This approach seeks to deliver optimal distribution network performance at efficient cost and by ensuring network objectives are considered at all times.

SP AusNet welcomes feedback from stakeholders on this document.

[1] Source: State Government Victoria, Growth Areas Authority, www.gaa.vic.gov.au.

2 Document Overview

2.1 Purpose

The Gas Asset Management Strategy is central to SP AusNet's processes for the delivery of safe and reliable network services to customers in accordance with SP AusNet's Asset Management Policy (see Figure 1 below).

This strategy has the following objectives:

- It outlines SP AusNet's overarching approach to the management of the network assets;
- It defines the linkage between the asset management strategy and the underpinning detailed asset specific management strategies;
- It outlines the:
    - Demand for network services,
    - The condition of network assets, and
    - Expected trends into the future.
- It articulates the key areas of focus in relation to asset management, key risks, key programs, and key cost and service standard outcomes.

The Gas Asset Management Strategy is written for both internal (e.g. SP AusNet staff and representatives) and external stakeholders (e.g. Regulators – both economic and technical).

It is SP AusNet's belief that the Gas Asset Management Strategy (and all the documents underpinning it) complies with all legal obligations imposed on SP AusNet for operation of its gas distribution and transmission assets, including but not limited to the National Gas Law, the National Gas Rules, the Gas Safety Act, Gas Safety regulations, the Victorian Gas Distribution System Code and relevant Australian Standards.

Figure 1: Asset Management Policy

2.2 Scope

The asset management strategy covers SP AusNet's natural gas distribution and transmission assets operating in the western region of metropolitan and rural Victoria, including all:

- Transmission pipelines, distribution mains and associated easements and access tracks,
- Regulators and regulating stations (including building and civil infrastructure), valves, heaters, filters, vents, syphons and auxiliary assets used in the operation of the distribution and transmission networks from the primary transmission system (PTS) to end consumers,
- Corrosion protection, control, metering and communications equipment,
- Related functions and facilities such as spares, maintenance and test equipment,
- Asset management processes and systems such as System Control and Data Acquisition (SCADA) and asset management information systems (including asset repositories).

Section 3.3 (page 11) of the AMS provides further details of gas network assets.

2.3 AMS Structure

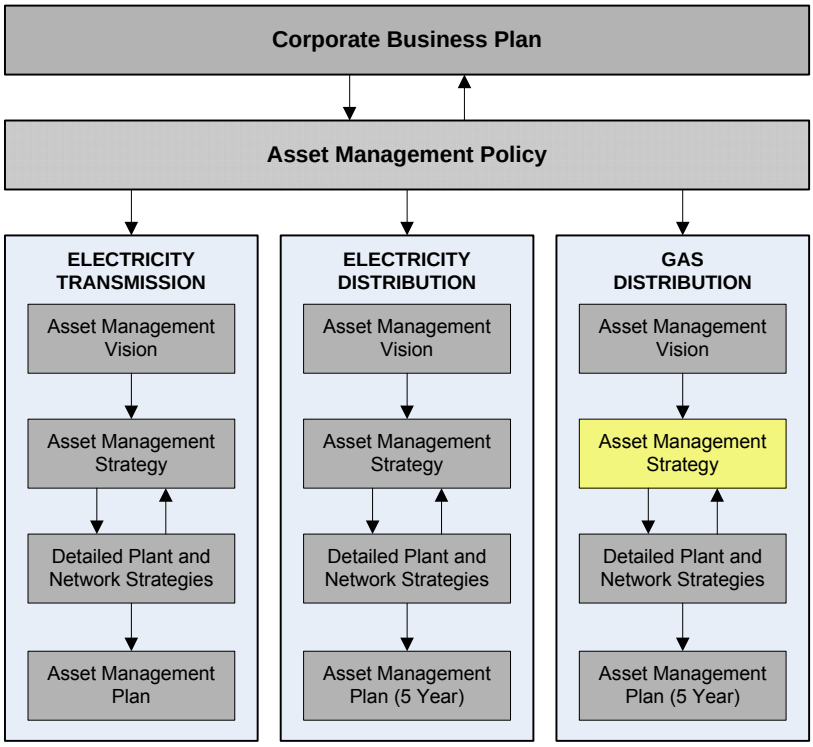
The remainder of this document is structured as follows:

- **Introduction** – Defines SP AusNet's asset management methodology and approach when managing the gas distribution network. Provides a network and industry overview, defines the relationship with other management documents including SP AusNet's STEM (Strengthen, Transform, Extend and Modernise) business model.
- **Asset Management Drivers** – Outlines the drivers influencing asset management decisions and network performance.
- **Network Objectives and Current Performance** – Summarises gas network objectives and historic performance against key metrics.
- **Process and System Strategies** – Overview of major 'system wide' strategies required to manage the distribution network as a whole.
- **Plant Strategies** – Overview of detailed plant specific asset management strategies including current and future capital and operational requirements.

2.4 Relationship to Other Management Documents

The Gas Asset Management Strategy is one of a number of asset management related documents developed and published by SP AusNet in relation to its gas distribution network. As indicated in Figure 2 (below), the asset management strategy presents an all-encompassing strategy for the gas distribution network, with this overarching strategy being supported by numerous, more detailed, asset specific strategies.

Figure 2: AMS Document Interdependencies



3 Introduction

This section:

- Introduces and discusses SP AusNet's strategic objectives;
- Provides a network and industry overview; and
- Outlines the objective of 'Asset Management', and defines and discusses SP AusNet's asset management methodology, processes and approach.

3.1 SP AusNet

SP AusNet is a leading energy infrastructure company operating a diversified portfolio of both gas and electricity assets throughout Victoria, helping to meet the energy needs of approximately 1.2 million customers. SP AusNet's core assets include:

- **Gas Distribution Network**
  Transportation of natural gas to approximately 605,000 customers across central and western Victoria. Network spans approximately 10,000km of buried pipelines.
- **Electricity Distribution Network**
  Consists of approximately 46,000km of conductors that carry electricity from the high voltage transmission grid to approximately 640,000 customers across eastern Victoria.
- **Electricity Transmission Network**
  Consist of approximately 12,800 high voltage towers and 6,500km of transmission lines that carry high voltage electricity from power stations to electricity distributors across Victoria.
- **Select Solutions**
  SP AusNet's commercial arm provides commercial services to help customers manage their energy, water and environmental needs.

SP AusNet is a publically listed company listed on both the Australian Stock Exchange (ASX) and the Singapore Exchange (SGX-ST). SP AusNet's securities are 51% owned by Singapore Power Limited and 49% owned by ASX stock market investors.

3.1.1 SP AusNet's Purpose

SP AusNet's overarching purpose statement is:

"To provide our customers with superior network and energy solutions"

This purpose has been formulated against an expectation that the nature of the energy sector will change fundamentally over the next five to ten years, responding to climatic forces and policies, community expectations of reliability and safety, and rapid technological change.

The key outcome from achieving the purpose over the next five years will be to grow earnings to create and maintain sustainable value to security holders, customers, employees and the community.

SP AusNet's Corporate Business Plan focuses on four strategic themes:

Figure 3: SP AusNet's STEM Model

STRENGTHEN	TRANSFORM	EXTEND	MODERNISE
Strengthening the existing business and improve service delivery	Transforming our business, people and commercial mindset to achieve operational excellence and enhance the company's ability to deliver on objectives	Developing a diversified portfolio of utility businesses (regulated and unregulated)	Modernising the business to provide customers with superior, innovative and sustainable solutions

It is the aim of the Asset Management Strategy to execute the corporate purpose by carrying out asset management activities that will Strengthen, Transform, Extend and Modernise SP AusNet's gas networks.

Due to the nature of gas distribution being a regulated energy network, initiatives closely align with the Strengthen, Transform and Modernise portions of SP AusNet's growth STEM model. Support is provided to extend SP AusNet's diversified portfolio of utility business but this is not the primary focus when maintaining the existing gas network infrastructure.

The relationship between SP AusNet's growth STEM and key capital programs are summarised within Figure 4.

Figure 4: Alignment between the Gas AMS and SP AusNet's Growth STEM*

		Strengthen		Transform		Extend	Modernise
		Resilience & Reliability	Compliance	Customer & Community	Sustainability	New Business	New Technologies
Example Program	**Customer Initiated Capital** - Organic growth of existing networks.	-	Extreme	Extreme	-	Low	-
	Meter Replacement - Reactive and proactive replacement of metering assets	Extreme	Extreme	Low	-	-	-
	Augmentation / Reinforcement - Network reinforcement to ensure security of supply	Extreme	Extreme	Extreme	-	-	-
	Mains Replacement - Reactive and proactive replacement of mains and services.	Extreme	Extreme	Extreme	Moderate	-	Low
	SCADA - Telemetry & pressure control	Extreme	Extreme	Moderate	Low	-	Moderate

* Refer to SP AusNet's business driver selection checklist (SOP 14-02) for impact definitions (i.e. low, moderate, strong and extreme) indicated above.

3.1.2 SP AusNet Corporate Values

Safety	Passion	Teamwork	Integrity	Excellence
				
Safety is our way of life Protect and respect our people and our community	Bring energy and excitement to what we do Be innovative by continually applying creative solutions to problems	Support, respect and trust each other Continually learn and share ideas and knowledge	Act with honesty Practise the highest ethical standards	Take pride and ownership in what we do Deliver results and continually strive for the highest quality

3.1.3 SP AusNet Safety Vision

mission zero

Our safety vision is symbolised by the simple expression "missionZero". When it comes to the safety of our people, contractors and visitors, Zero injuries is the only acceptable target. We will not compromise on safety and we will not tolerate unsafe acts and behaviours. It is this mindset that drives us to ensure there are no negative impacts on our families and communities as a result of our business operations. To achieve our safety vision, our mission must be to work together to implement a common strategy with unified purpose and consistency of attitude.

missionZero and the strategy that underpins it will set clear expectations about what is acceptable safety behaviour in our workplaces. It will provide the necessary training, tools and information to ensure everyone at SP AusNet successfully fulfils their responsibilities as a safety leader. missionZero and everything it stands for is a challenge – it's a mission that never ends. Safety will always be our number one priority and will be critical to our future.

3.2 Asset Management Mission

SP AusNet's common asset management mission must be viewed in the company's purpose statement and SP AusNet's non-negotiable commitment to safety, which is captured by the expression "mission Zero".

SP AusNet's asset management mission is to:

"Deliver energy and associated services, safely, reliably, and to enhance the lives of our customers and employees in a sustainable manner"

SP AusNet balances the cost of increased expenditure against network performance and customer satisfaction in both the short and long term. However, SP AusNet must also meet its regulatory obligations set out in its Gas Safety Case (consistent with the Gas Safety Act and Gas Safety Regulations) and the Gas Distribution System Code.

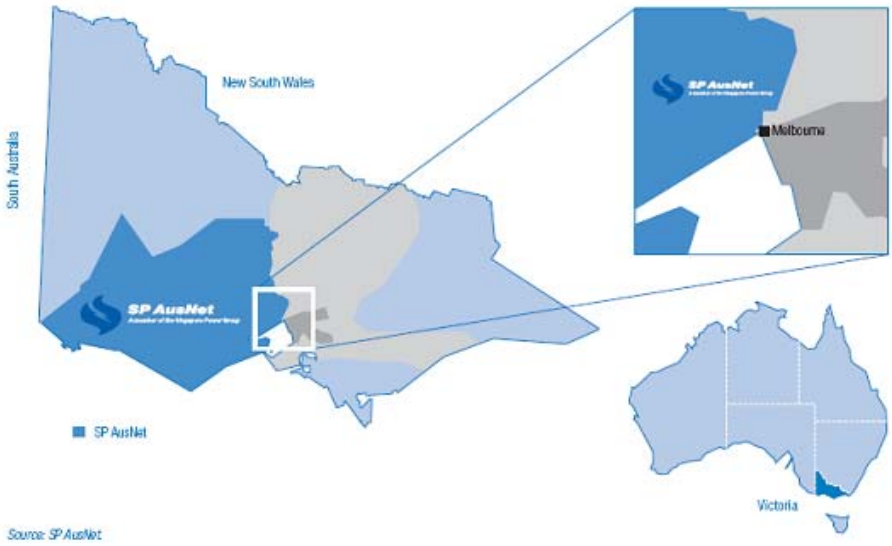
SP AusNet's four primary objectives for the Gas networks, used to deliver the mission are outlined within section 5.1 of the AMS (p. 28)

3.3 Gas Network Overview, Locality & Geography

SP AusNet owns an extensive natural gas transmission and distribution network throughout western metropolitan Melbourne and South-West and West regional Victoria. The network distributes natural gas from the principal gas transmission system to individual gas meters, which supply customers' appliances. In total, SP AusNet delivers gas to approximately 605,000 customers across a geographical diverse region spanning 60,000km^2. The gas transmission and distribution network includes mains, mainline valves, pressure regulating facilities (including city gates, field and district regulators), service pipes, meters and ancillary equipment.

Figure 5 (below) highlights SP AusNet's geographical footprint that extends from the Hume Highway to the South Australian boarder, and North of Bendigo and Horsham. SP AusNet also owns an LPG vapour reticulation network at Mt Baw Baw.

Figure 5: SP AusNet's Supply Area



The gas distribution network consists of 183km of licensed transmission pipelines operating at a minimum pressure of 1,050kPa to a maximum allowable operating pressure (MAOP) of 2,800kPa and approximately 10,000km of distribution mains and services operating at high, medium and low pressures.

The majority of the distribution system operates at high pressure with a minimum allowable pressure of 140kPa to a maximum of 515kPa. Pressures are regulated through major facilities known as 'City Gates' that regulate supply from the principal transmission system (owned and operated by APA Group) to SP AusNet's distribution network.

The medium pressure distribution systems operate between 15kPa to 140kPa, with Field regulators regulating gas supply from SP AusNet's high pressure networks.

The low pressure distribution systems operate up to 7kPa with District Regulators regulating gas supply for SP AusNet's high and medium pressure networks.

Meter and regulator assemblies, varying from large industrial or commercial units to small domestic units, supply gas to consumers. A meter and regulator setup is provided for each supply point (i.e. customer connection) from the distribution network.

The network has been constructed over a period of more than 100 years and consequently consists of a variety of pipe materials. Cast iron and steel was predominantly used until the introduction of polyvinyl chloride (PVC) for low pressure like-for-like replacement and polyethylene for high pressure networks in the late 1970's. Today, PVC is no longer installed in the network leaving polyethylene as the dominant pipe material.

The type of material dictates 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 with polyethylene pipe means that the capacity and integrity of the network is managed, helping to offset some of the natural deterioration of the network.

Table 1: Network Composition by Pipe Pressure and Material (December 2011)

Material	Low Pressure	Medium Pressure	High Pressure	Transmission Pressure	Total
Cast Iron	559km	21km	-	-	580km
Polyethylene	22km	254km	5,583km	-	5,859km
PVC	535km	-	-	-	535km
Unprotected Steel	120km	269km	-	-	389km
Protected Steel	36km	213km	2,250km	183km	2,681km
Other	<1km	-	-	-	<1km

Table 2: Gas Distribution Network Asset Summary

Asset	Number / Length	Mean Service Life (Average Years)	Expected Service Life
Transmission Pipelines	183km[2]	38 years[4]	80 years
Distribution Mains	9,863km[2]	23.9 years[5]	
– High Pressure (HP)	– 7,883km[2]	– 19.4 years[5]	– 60 years
– Medium Pressure (MP)	– 757km[2]	– 36.5 years[5]	– 60 years
– Low Pressure (LP)	– 1,273km[2]	– 43.2 years[5]	– 60 years
Domestic Meters Types	547,686 units[3]	9.9 years[3]	22 years
Industrial & Commercial Meters Types	48,114 units[3]	5.4 years[3]	10-15 years
City Gates	37 units[4]	24 years[4]	50 (est.) years
Field Regulators	104 units[4]	28 years[4]	50 (est.) years
District Regulators	114 units[4]	25 years[4]	50 (est.) years
SCADA (remote terminal units)	183 units[5]	14.0 years[5]	15 years
Cathodic Protection Units (CPU)	164 units[2]		
– Transmission	– 13 units[2]	– Various	– 30 years
– Distribution	– 151 units[2]	– Various	– 30 years

[2] Accurate as of 31 December 2011.
[3] Accurate as of 30 June 2011.
[4] Accurate as of 31 December 2010.
[5] Accurate as of 31 March 2011.

3.3.1 Characteristics of the SP AusNet Gas Network

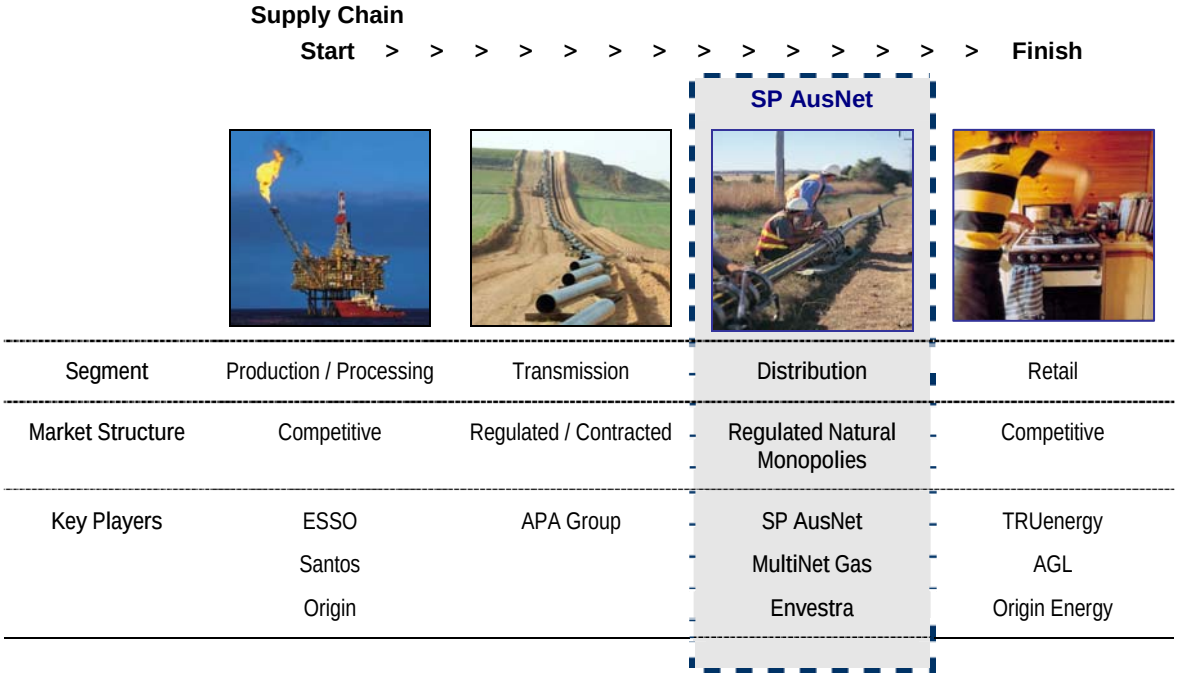
There are a number of characteristics of SP AusNet's gas network which add complexity and cost to operating the network:

- **Geography:** remoteness increases the need for remote control of core infrastructure and increases repair and inspection costs.
- **Weather:** a wide range of climatic conditions drives a need to increase current capacity margin. The rapid expansion / contraction of ground conditions caused by water saturation / drought increases the incidents of main failures, especially on the brittle cast iron network,
- **Ground Conditions:** existence of rock and clay-based soils increases pipe laying costs and frequency of failures due to ground movement.
- **Demographics:** SP AusNet contains urban growth corridors (areas) within its gas network, placing increasing demand on the existing network
- **Holiday Resorts:** seasonal demand and identification of faults results in additional costs to cater for uneven requirements on SP AusNet resources.
- **Network Configuration:** much of the current growth is away from transmission pipelines, requiring large infrastructure to meet reliability requirements.

3.4 Industry Overview

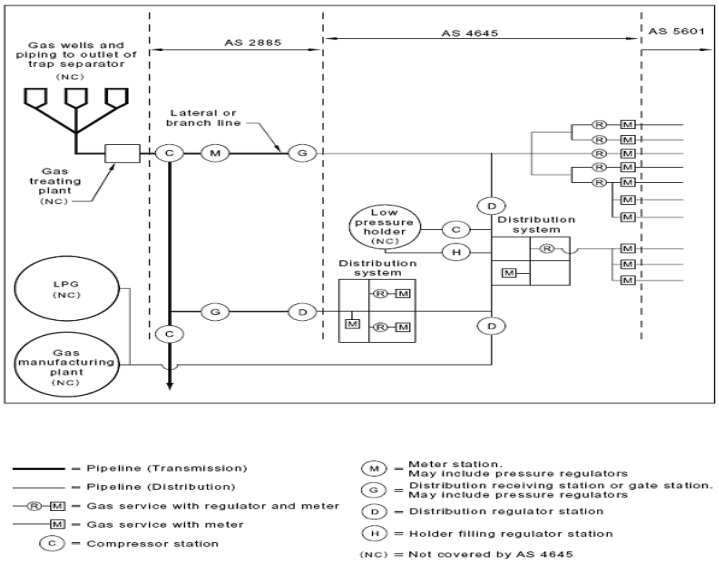
The Victorian gas industry was restructured from a State-owned monopoly to a competitive industry during the privatisation in the late 90's. The structure of Victoria's gas distribution system (as it operates today) is represented in Figure 6 below. The distribution asset in which SP AusNet operates has been highlighted.

Figure 6: Gas Distribution Industry Structure



The gas network configuration can also be shown in relation to the various Australian Standards that are applicable to the gas distribution business, as shown in Figure 7 below.

Figure 7: The Role of Australian Standards in the Gas Supply Chain



3.4.1 Regulatory Framework

On 1 July 2008, responsibility for the regulation of Victorian gas distributors became the responsibility of the Australian Energy Regulator (AER) under the National Gas Law and the National Gas Rules. Previously, the Essential Services Commission (ESC) regulated gas distribution and retailing in Victoria pursuant to the Gas Industry Act 2001, the Essential Services Commission Act 2001, and the National Third Party Access Code for Natural Gas Pipeline Systems (the Code).

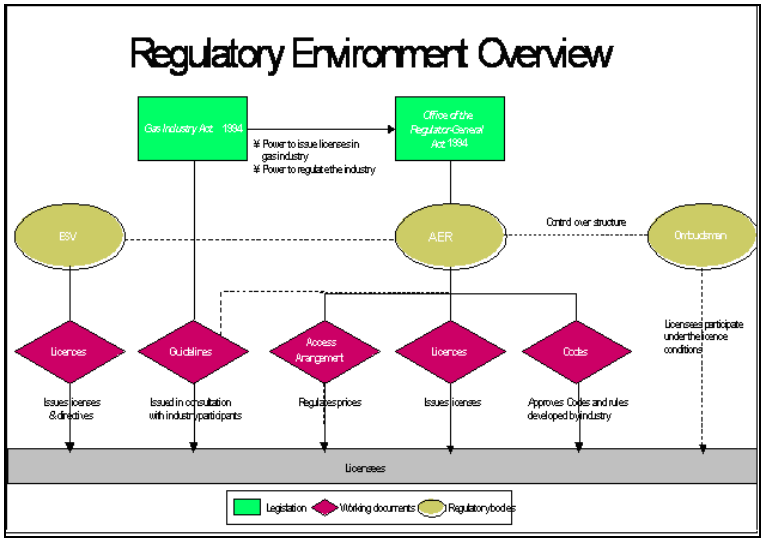
The AER (a constituent part of ACCC) regulates natural gas transmission pipelines and distribution networks in all Australian states and territories (except WA). Energy Safe Victoria (ESV) continues to act as the technical regulator and oversees the safety of employees, contractors, consumers and the general public.

SP AusNet is one of three gas distribution businesses (DBs) in Victoria operating under a license from the Department of Primary Industries (DPI). The role of the DBs is to manage their distribution networks to provide consumers with a safe, efficient and reliable supply of natural gas.

Under transitional arrangement of the National Gas Law, SP AusNet is subject to licences, codes and guidelines issued by the ESC. The ESC also sets minimum technical performance standards with which all distributors must comply.

Gas is not currently distributed throughout all of Victoria. The regulatory framework provides scope for extensions of the gas network.

Figure 8: Regulatory Environment Overview



The ESV employs a 'safety case' regime. All participants in the Victorian gas industry are required to have a Gas Safety Case document detailing how gas will be conveyed safely to its customers. Each company must submit their safety case to ESV every five years, or as significant changes occur. A summarised version of SP AusNet's approved safety case is publically available from SP AusNet's website (SP AusNet - Codes & Guidelines.)

3.4.2 Stakeholder Expectations

In managing its assets, SP AusNet seeks to meet the valid expectations of all stakeholders. These stakeholders and their drivers are summarised in Table 3 below.

Table 3: Stakeholders

Stakeholder	Driver
Customers	Quality and reliability of supply and a level of service at an acceptable price
Community	Public safety and protection of the environment
Regulators	Accountability, compliance, transparency and audit-ability
Shareholders	Return on investment, value-adding with growth potential
Employees	Safety, rewarding work and skill development
Suppliers and service providers	Fairness, risk sharing and commitment
Other gas related businesses: • Retailers • Distributors • Transmission pipelines • Industry associations • Energy Networks Association • Institute of Engineers • Australian Standards	Growth, reliability, gas quality Mutual aid, sharing of information, standards development Connection agreements, reliability, gas quality
Other utilities	Safety, asset protection, growth, mutual aid/support
Statutory Bodies (State government, AER, DPI/ESV, Police, Fire)	Fairness, regulatory compliance, safety, asset protection, system capacity, coordination of works, road reserve reinstatement
Transportation (Vic Roads)	Asset protection, safety, coordination of works

3.5 Asset Management Process and Approach

3.5.1 Objective of Asset Management

Asset Management involves the development of a plan for the management of one or more infrastructure assets that combines technical, financial and other drivers over the life cycle of the asset in the most cost effective manner to provide a specific level of service.

The British Standards Institution, within PAS55:2008, provides a formal definition of asset management as:

"Systematic and coordinated activities and practices through which an organisation optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organisational strategic plan".

The key underlying principles of asset management involves a detailed and dynamic assessment of the benefits and costs of an asset, or group of assets. As such, there are two overarching requirements:

- **Benefits:** The asset must be clearly identified, having regard to either the mandated (by law) or imputed (by monetising) value placed on the outputs of the asset by the community;
- **Costs:** The costs of an asset, or group of assets, should be assessed across their full lifecycle. This will include:
    - Provision of the asset;
    - Ongoing maintenance and rehabilitation of assets;
    - Operation of the asset; and
    - Disposal of the asset.

It is acknowledged that in most cases, the provision of a particular output may be delivered in a multitude of different ways, each with their own costs and benefits. Therefore, asset management involves the assessment of different feasible options such that the ratio of benefits to costs is maximised, or alternatively, where benefits are mandated (by the statutory requirement to deliver that service to the community) to minimise the cost to society of delivering that outcome.

3.5.2 Asset Management Methodology

SP AusNet is focused on delivering optimal distribution network performance at efficient costs. Except in the case where outputs are mandated, this requires an explicit cost benefit analysis to be undertaken in order to assess whether the overall economic value of capital expenditure is positive. In doing this, SP AusNet assesses the incremental costs of delivering an incremental change in network performance to customers, relative to the incremental benefits accruing to customers from the delivery of that enhanced network performance.

As per s79 (3) of the NGRs, in deciding whether the overall "economic value of capital expenditure is positive", consideration is to be given only to economic value directly accruing to the service provider, gas producers, users and end users". Consistent with this, SP AusNet, in assessing the incremental costs has regard to:

- Direct costs to SP AusNet; PLUS
- Allocation of SP AusNet's capitalised overheads; PLUS
- Imposed costs stemming from the program, which accrue to gas producers, users and end users.

The latter – incremental benefits – has regard to the full societal benefits, which includes:

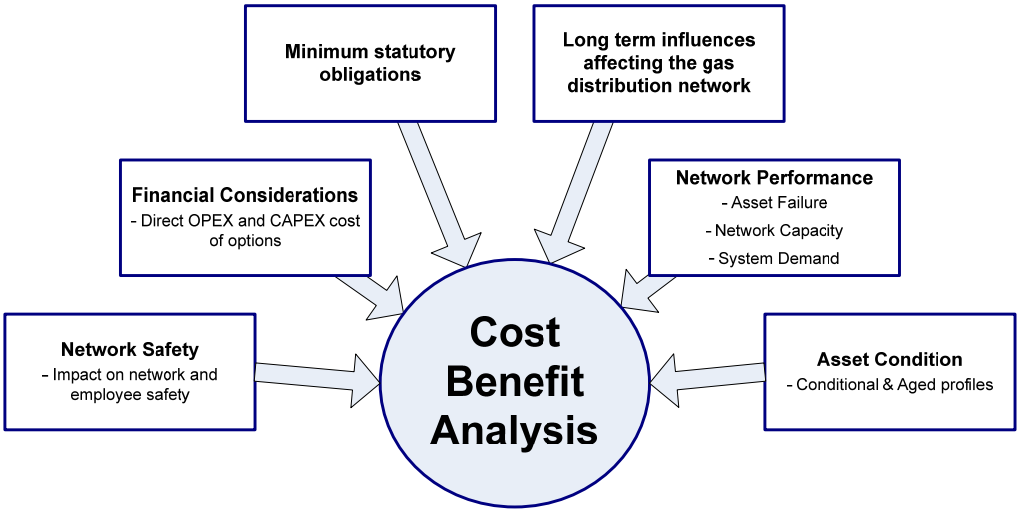
- Direct benefits to SP AusNet's customers; PLUS
- Additional benefits stemming from the program, which accrue to gas producers, users and end users.

Where the delivery of certain outputs is a function of the external obligations placed upon the business (e.g.: legislation stipulating network safety requirements), a different approach is undertaken. More specifically, SP AusNet adopts a cost effectiveness (least cost) analysis to ensure that the output is delivered at least cost.

The asset strategy therefore ensures that all decisions to augment replace or maintain network assets are justified on economic grounds – with the benefits being a function of the explicit customer value proposition, or proxy via the adoption of minimum performance standards stipulated in legislation or other statutory or regulatory instruments.

The various drivers that are brought to bear when undertaking SP AusNet's Cost Benefit Analysis are summarised in Figure 9 below.

Figure 9: Cost Benefit Analysis Drivers

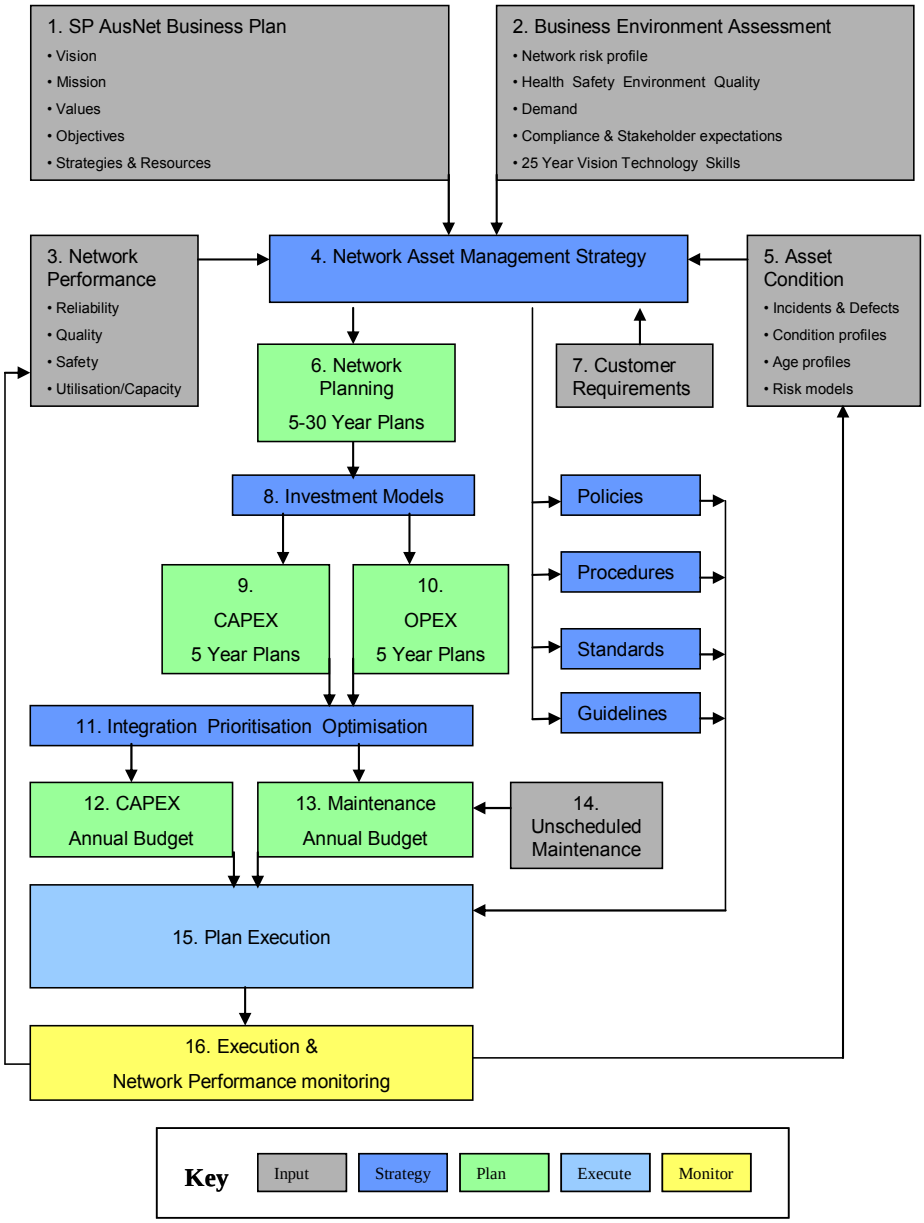


An assessment of the above drivers – both individually and collectively – are fundamental to the cost benefit analysis that underpins SP AusNet's approach to managing its gas distribution network.

3.5.3 SP AusNet's Asset Management Process

The overall asset management process is illustrated in Figure 10 below. It is an important guide when establishing work programs focused on enhancing performance and efficiency. It brings together the external influences, investment drivers, business values, asset management directions and the selected strategies to deliver sustained performance for the benefit of stakeholders.

Figure 10: Asset Management Process



3.5.4 PAS 55 Compliance

To demonstrate the effectiveness of SP AusNet's Asset Management System, SP AusNet gained accreditation to British Standards Institution's (BSI) PAS 55 requirements in March 2011.

PAS (Publicly Available Specification) 55 is a UK standard for the optimised management of physical infrastructure assets to achieve a desired and sustainable outcome. It is applied where physical assets are a critical factor in achieving business objectives and effective service delivery, and permits organisations to assess their asset management systems in a similar manner to other management systems such as ISO 9000 and ISO 14001. PAS 55 implements a risk management focussed approach to asset management.

Accreditation requires the demonstration of robust and transparent asset management policies, processes, procedures, practices and a sustainable performance framework.

Accreditation is recognised as an indicator of best practice in asset management.

4 Asset Management Drivers

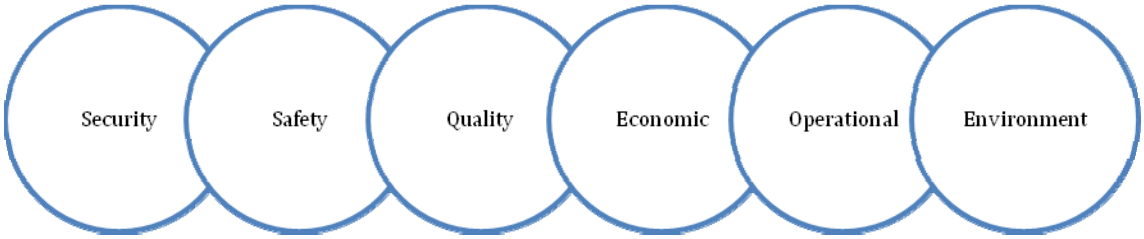
The objective of this section is to outline the major drivers influencing asset management decisions, including:

1. Legislative and regulatory obligations affecting SP AusNet's gas distribution network;
2. The lifecycle costs (CAPEX and OPEX) associated with different options for delivering outputs to consumers; and
3. Longer term issues influencing SP AusNet's gas distribution network.

4.1 Legislative and Regulatory Requirements

Legislative and regulatory requirements impact a number of areas of SP AusNet's gas distribution business. These are outlined in Figure 11 (below) and discussed in the following sections.

Figure 11: Legislative and Legal Influences on SP AusNet's Gas Distribution Network



4.1.1 Asset Security

Legislation has been enacted to counteract the threat of terrorism or sabotage to critical infrastructure. Industry standards for security have also been established to reduce the risk of injury to the public, or asset damage caused by vandals, following unauthorized access to SP AusNet assets. These instruments reflect the increasing physical priority of security as a critical component of asset management.

4.1.2 Safety

Energy Safe Victoria (ESV) is an independent Victorian statutory authority responsible for the safety and technical regulation of electricity, gas and pipelines in Victoria. The Energy Safety Victoria Act 2005 specifies the role and functions of the ESV. The responsibilities of ESV relevant to gas networks include:

- Safety of gas supply including transmission and distribution systems;
- Safety of gas installations in industrial, commercial and domestic premises;
- Safety of gas workers by the registration of contractors and the licensing of gas workers on the attainment of an appropriate level of gas safety competency;
- Safety of gas equipment by ensuring it meets minimum required gas safety standards before sale;
- The education of the community and the gas industry on the safe use of gas through a strong and focused awareness campaign;
- Issuing of guidelines for the preparation of gas safety cases and the compliance of gas companies with accepted safety cases;
- Assessing and auditing pipeline safety management plans and environmental plans to determine their adequacy and effectiveness;
- Investigation and analysis of incidents and accidents to identify trends and develop preventative measures; and
- Monitoring and enforcing compliance with the Act and the regulations including (but not limited to) the Gas Safety Act 1997 and the Gas Safety (Safety Case) Regulations 2008.

Victorian safety legislation requires network businesses to lodge a Gas Safety Case (GSC) Management System, with ESV. Refer to section 6.2: Gas Safety Case (page 38) of the AMS for further details.

4.1.3 Quality of Supply Requirements

Quality of supply strategies in the asset management strategy are focused on managing gas network pressures and the continuity of supply to SP AusNet's domestic and Industrial/Commercial customer base with reference to the Gas Distribution System Code, Version 9.

Customers are becoming aware of, and increasingly sensitive to, quality of supply issues through their use of gas appliances and the dependency on uninterrupted supply. In the 2008-12 regulatory control period the AER introduced Guaranteed Service Levels (GSLs), recognising this as an area requiring additional focus. GSL's are expected to continue for the 2013-17 regulatory period.

Broad planning and investment strategies, individual project economic evaluations, and network performance monitoring alike, must be cognisant of the quality of supply standards, including the Gas Safety (Gas Quality) Regulations 2007 and Australian Standard No. 4564.

4.1.4 Economic

The AER assumed responsibility for regulation of SP AusNet's network on 1 January 2009. The AER presently administers the price control set by the ESC for the 2008-2012 regulatory control periods, which expires on 31 December 2012. The AER will determine SP AusNet's distribution price control for the 2013-2017 regulatory control period in accordance with the National Gas Rules.

The AER's key gas related responsibilities include:

- Regulating the revenues of transmission and distribution network service providers;
- Monitoring the gas wholesale market;
- Monitoring compliance with the national gas law, national gas rules and national gas regulations;
- Investigating breaches or possible breaches of provisions of the national gas law, rules and regulations and initiate and conduct enforcement proceedings against relevant market participants;
- Establishing service standards for gas transmission and distribution network service providers; and
- Establishing ring-fencing guidelines for business operations with respect to regulated transmission and distribution services.

The economic regulation of the Gas Distribution industry is subject to a national regulatory framework. The framework is governed by the National Gas Law (NGL), and contained in the National Gas Rules (Rules).

In relation to the former, the key sections are:

Section 23 of the National Gas Law outlines the National Gas Objective:

> *"The objective of this Law is to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas."*

and…

The key rules underpinning the economic regulation of the Gas Distribution industry considered during development of this asset management strategy include:

Rule 79, which outlines the "New capital expenditure criteria", which in turn underpins the AER's assessment of SP AusNet's proposed capital expenditure requirements. Rule 79 states:

1. Conforming capital expenditure is capital expenditure that conforms with the following criteria:
   (a) the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services;
   (b) the capital expenditure must be justifiable on a ground stated in sub rule (2).
2. Capital expenditure is justifiable if:
   (a) the overall economic value of the expenditure is positive; or

(b) the present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure; or

(c) the capital expenditure is necessary:

i. to maintain and improve the safety of services; or

ii. to maintain the integrity of services; or

iii. to comply with a regulatory obligation or requirement; or

iv. to maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or

(d) the capital expenditure is an aggregate amount divisible into 2 parts, one referable to incremental services and the other referable to a purpose referred to in paragraph (c), and the former is justifiable under paragraph (b) and the latter under paragraph (c).

3. In deciding whether the overall economic value of capital expenditure is positive, consideration is to be given only to economic value directly accruing to the service provider, gas producers, users and end users.

4. In determining the present value of expected incremental revenue:

(a) a tariff will be assumed for incremental services based on (or extrapolated from) prevailing reference tariffs or an estimate of the reference tariffs that would have been set for comparable services if those services had been reference services; and

(b) incremental revenue will be taken to be the gross revenue to be derived from the incremental services less incremental operating expenditure for the incremental services; and

(c) a discount rate is to be used equal to the rate of return implicit in the reference tariff.

5. If capital expenditure made during an access arrangement period conforms, in part, with the criteria laid down in this rule, the capital expenditure is, to that extent, to be regarded as conforming capital expenditure.

6. The AER's discretion under this rule is limited.

Rule 91, which outlines the “Criteria governing operating expenditure”, which in turn underpins the AER’s assessment of SP AusNet’s proposed operating expenditure requirements. Rule 91 states:

1. Operating expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of delivering pipeline services.

2. The AER's discretion under this rule is limited.

SP AusNet's asset management and operational policies are designed to comply with the National Gas Law.

4.1.5 Operational

Various Acts, Codes, Regulations, Guides, Standards and Agreements define the expected operating standards for the distribution system. As a minimum, the network must be designed and managed to meet the requirements set out in current versions of the:

- Access Arrangement;
- Tariff Order;
- Distribution License;
- Gas Industry Act/Gas Safety Act;
- Gas Distribution System Code;
- Victorian Occupational Health and Safety Act 1985;
- Pipeline Regulations 2007; and
- Appropriate Australian and International Standards.

The expected level of service is expressed in terms of various key performance indicators (KPIs) that are used to monitor the performance of individual asset items and the distribution system as a whole. Asset and performance data is submitted on a quarterly and annual basis to the AER and ESV as per 'Information Specification – Performance Indicators Requirements for Reporting By Victorian Gas Distribution Companies; Essential Services Commission and Energy Safe Victoria – January 2009. Refer to section 5 of the asset management strategy for recent performance.

Further to the above, it is noted that planning for the Principal Gas Transmission assets in Victoria is coordinated through three Gas distributor companies and AEMO in its role as Victoria transmission network planner. Annually, each Gas distributor provides new connection details and forecast load information to assist in the development of the Victorian Annual Planning Report (VAPR). This is published and is available on the AEMO website.

4.1.6 Environment

The regulatory instruments (including the NGR and Distribution License) require SP AusNet to comply with all applicable regulatory obligations or requirements associated with the provision of network services. Environmental compliance, including the implementation of sustainable practices, is therefore a key objective for the Gas Asset Management Strategy.

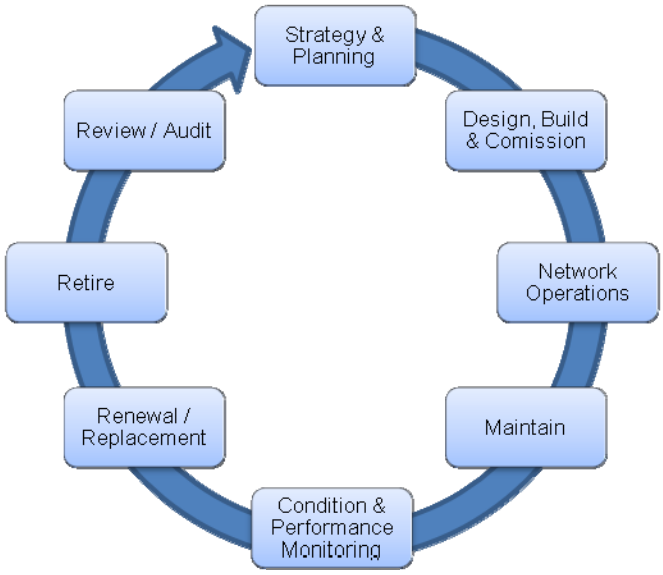
In addition to the above, SP AusNet focuses on the protection of the immediate environment through its AS/NZS ISO 14001 certified environmental management system[6]. The environmental management system is the principle tool through which SP AusNet identifies environmental risks, develops and implements solutions and monitors success in controlling such risks.

As part of its environmental program, SP AusNet continues to mitigate risks associated with asbestos containing materials, oil contaminations, greenhouse gas emissions and noise in order to address community and customer expectations. Unaccounted for Gas reduction (UAfG) and the capability of the gas distribution network to interconnect distributed generation are emerging expenditure drivers.

4.2 Asset Lifecycle

SP AusNet adopts the lifecycle approach to the management of its assets. This means the different phases of an assets lifecycle are considered when determining the optimal cost-benefit solutions to network issues, as shown in Figure 12: Asset Lifecycle.

Figure 12: Asset Lifecycle



[6] EMS 10-01 Environmental Manual, SP AusNet.

4.2.1 Strategy & Planning

SP AusNet has both short-term and long-term strategies that align with SP AusNet's corporate objectives. Strategies cover the operation and maintenance of existing assets, as well as network expansion, both organically and through new reticulation of regional towns.

4.2.2 Design, Build and Commission

The network design function is divided into three major categories:

- **Network / System Design** – incorporates the high-level, strategic design of the network and takes consideration of elements such as future load growth, asset capacity, major customer developments and overall network performance, including reliability and security.
- **Complex designs** – incorporates the design of complex facilities such as field regulator stations. It typically involves site-specific designs with references to Australian and international standards and focuses on the design considerations and risk assessments associated with the asset concerned.
- **Standard Designs** – involves the application of standard network designs, documented design standards, procedures and principles to a range of less complex assets. Such design work typically incorporate mains replacement and reticulation extensions work and are undertaken on an as-needs basis (i.e. for specific projects). The designs are carried out in accordance with design standards, procedures and principles developed and specified by SP AusNet.

Construction activities are divided into two following categories:

- **General Construction** – involve the application of SP AusNet standards, documented procedures, SP AusNet or industry-accepted equipment and materials for the construction of an asset to a standard design. Such works typically include mains and services reticulation work and are generally undertaken by a contractor on behalf of SP AusNet.
- **Complex Construction** – encompass installations of a unique nature and incorporate non-standard items of plant and/or equipment. Such installations typically include city gates, field regulators and transmission pipelines. Construction of such installations typically incorporates a range of different activities such as civil works, structural works, construction and commissioning, etc.

In addition to SP AusNet standard procedures and specification, specific procedures are developed (if required) in compliance with industry standards for commissioning of assets constructed under this category. Support from external experts is sought if not available in house.

4.2.3 Network Operations

Day-to-day management of the network is necessary to monitor and control network pressures to ensure reliability of supply, safety, and other operating requirements are maintained. Operations also include responding to faults and emergencies.

4.2.4 Maintain

SP AusNet categorises its maintenance into the following:

- **Unplanned Maintenance** – Work carried out in response to reported problems or defects (e.g. pipe failure causing leakage, mechanical failure), with the aim being to provide speedy, appropriate and effective response to unforeseen equipment or system breakdown; minimising interruption, inconvenience and risk to the customer.
- **Condition Maintenance** – Work carried out to a predetermined frequency (e.g. inspection of cathodic protection systems, leakage surveys). The aim is to ensure that plant and equipment operate reliably and economically as the first part of a preventive maintenance program.
- **Scheduled Maintenance** – Work carried out to a predetermined schedule (e.g. regulator overhaul for City Gates, Field and District Regulators, lubrication of valves, etc.). The aim of this maintenance is to perform routine major maintenance at preselected intervals to maximise equipment life and minimise the possibility of interruption of supply to the customer, whilst maintaining costs at an optimum level in accordance with best practice.

More specific details on asset maintenance can be obtained from SP AusNet has Gas Maintenance Plan (AMP 30-02).

4.2.5 Condition & Performance Monitoring

The expected level of service is expressed in terms of various key performance indicators (KPIs) that are used to monitor the performance of the individual asset items and the distribution system as a whole.

SP AusNet is benchmarked against the other Victorian distribution businesses by the AER in its Gas Industry Comparative performance report.

Further details on SP AusNet's current performance are contained within section 5.2 – Key Performance Indicators of the AMS.

4.2.6 Renewal / Replacement

SP AusNet undertakes asset renewals to restore, rehabilitate, replace or renew an existing asset to its original or improved capacity. Factors driving these activities are:

- the safety of the entire network,
- reliability of supply,
- compliance with performance requirements, and.
- efficiently manage maintenance costs.

The main activities in this area are the pipe renewal and meter replacement programs.

4.2.7 Retire

Retiring or de-commissioning of faulty, old or redundant assets. Strategic planning, Risk Assessment and Network Modelling determines and prioritises the assets to be decommissioned from the network.

De-commissioning of faulty or old assets helps in eliminating or reducing the associated risks associated with the outgoing asset and increases network safety. Retirement of fault prone assets also increases network performance and prevents inefficient increases in maintenance costs.

Disposal and/or decommissioning may occur for the following reasons:

- Obsolescence
- Failing to meet regulatory requirements
- Repairs exceed replacement costs
- Policy changes

4.2.8 Review / Audit

SP AusNet facilities are subject to regular reviews and audits to verify compliance with specified technical, operational and safety standards and legislative requirements. Reviews and audits are undertaken in accordance with specified procedures to ensure the requisite compliance is achieved in all aspects of the design, construction, installation, operation and maintenance of the SP AusNet network.

4.3 Longer term influences affecting the gas distribution business

4.3.1 Network Growth

SP AusNet's geographical footprint contains three of Melbourne's fastest developing urban growth areas[7]. Growth rates in excess of 5% per annum have been experienced and are expected to continue in the Melton, Wyndham and Hume growth areas. SP AusNet's footprint also includes the state's top three (3) regional

[7] Wyndham is Victoria's largest and fastest growth corridor to June 2010 increasing 12,600 people or 8.8% growth. Whittlesea (8,900 people), Casey (8,100 people), Melton (7,100 people), Cardinia (4,600 people) and Hume (4,350 people) made up the top six corridors. Source: Australian Bureau of Statistics.

development districts of Greater Geelong, Ballarat and Greater Bendigo[8]. This is compared to total forecast network growth of approximately 1.2% p.a. (demand) and 2.4% (gross connections) to 2017.

SP AusNet continues to invest in core infrastructure to meet the growing demand for natural gas within these and other small areas of development within the state. Notwithstanding ongoing investment in network augmentation, SP AusNet has managed to maintain high levels of network utilisation, which demonstrates efficient spend of capital while managing the risk to security of supply during times of peak demand (i.e. one in two winters peak).

There are a number of risks arising from high utilisation:

- Accelerated deterioration of gas assets, specifically pressure regulating assets, caused by elevated operating pressures;
- Risks to reliability of service caused by complex operating procedures to re-distribute peak loadings when raising and lowering network pressures;
- The need to establish sophisticated, case specific, contingency plans to minimise customer load-at-risk;
- A heightened reliance on frequent and sophisticated condition monitoring and maintenance to ensure loading conditions are not impacting design parameters or causing rapid deterioration of the plant;
- Reduced flexibility to access equipment for maintenance or repair;
- Compromised network reliability performance and subsequent GSL payment penalties; and
- Increased operating and capital cost associated with reduced flexibility to access network assets for maintenance; and the requirement for increased strategic spares, particularly high cost items such as regulators, to mitigate the risks of network failure.

SP AusNet's Gas Network Capacity Strategy (AMS 30-17) captures the required reinforcement required over the next decade to stabilise network utilisation at sustainable levels. Refer to section 6.13 – Network Capacity (page 50) for further details.

4.3.2 Advances in Technology

Advances in technology are enabling a broader range of solutions to network constraints to be considered by distributors. The consideration of demand side solutions, and smart network initiatives such as network pressure control are two areas where stakeholders can exploit new technology.

The current focus on energy efficiencies and climate change policy are fuelling advances in new gas fired generation (at a macro and micro level), gas fired air conditioning and more efficient co-generation and tri-generation solutions. The Australian Federal governments push to introduce a price on carbon, through an emissions trading scheme or carbon tax, will further accelerate advances in clean energy technologies.

Technological and social change may also trigger the expansion of Liquefied Natural Gas (LNG) and Compressed Natural Gas (CNG) for the road transport industry (although the current focus is heavily on electric powered vehicles). Again, a step change in demand for natural gas would result if LNG or CNG transport became mainstream.

Within the network, new technology often brings with it significant improvements in functionality and reduced maintenance costs, however asset management strategies must also consider the implications for older equipment that may become unsupported and hence obsolete before the end of their intended service lives.

The benefits of advances in technology in primary asset classes include:

- Increasing reliability through the use of fewer components and improved materials,
- Increasing availability of integrated condition monitoring equipment,
- Reducing need for intrusive maintenance, and
- Aggregation of previously discrete primary assets.

The dominant trend in secondary systems is toward the application of digital technology devices and systems with in-built intelligence and integrated functionality. These digital technology platforms add value by:

[8] Within regional Victoria, Greater Geelong had the largest increase in population (3,600 people) in the year to June 2010, followed by Ballarat (2,000 people) and Greater Bendigo (1,800 people). Source: Australian Burro of Statistics.

- Increasing functionality, reliability and availability through the use of microprocessors, solid-state devices, digital technology and optic fibre-based communication systems,
- Lowering per function costs whilst increasing performance capability,
- Embedding intelligent diagnostic software that optimises operation and improves asset management,
- Rationalising equipment via functional integration and multiple signal processing capability,
- Providing remote management facilities for network elements based on real-time data communications,

More specifically, SP AusNet faces a number of technology challenges. To address these issues, research and development is occurring in the following areas.

- Metering, in conjunction with meter manufacturers, SP AusNet is researching new types of meters to improve reliability, such as:
  - Ultrasonic metering
  - Remote metering
  - Smart metering
- Distribution Piping
  - The introduction of third-generation high-density polyethylene polymers PE100 and PE120 for pipes and fittings, which has enabled the use of poly pipe for higher pressures and equivalent strength fittings using thinner wall thickness.
  - Directional bore main laying technology which can substantially reduce the cost of main laying, damage to other assets and disruption to the public.
  - Pipe refurbishment systems such as swage lining
  - Leak repair systems
  - Developing a Victorian industry-wide approach to leakage management
  - Collaborating with a leading university on investigating geotechnical impacts on the gas pipes
- Regulating Stations
  - Improvements in SCADA monitoring and controlling,
  - Regulator and gas flow integrated systems that will enable more accurate flow data to be obtained, leading to optimisation of system pressure to meet demand while reducing outages and gas leaking from the network,
  - Investigating the use of Gas Turbo Expanders for Power Generation,
  - All City Gates and Field Regulating Units to be appropriately protected from spark or surge currents in accordance with CPS 2308 (Protection from Electrical Surges and Induced Voltages), and
  - Gas Detectors connected to SCADA to provide early warning of high-risk gas leaks.

4.3.3 Climate Change

Climate change has been identified as a key driver of change in SP AusNet's operating environment and the consumers demand for natural gas.

In July 2011, the federal government announced the details of Australia's proposed carbon pricing mechanism as part of its Clean Energy Future policy package. The Clean Future package establishes a carbon price and expands renewable energy, energy efficiency and land use policies and programmes. Legislation is expected to be passed by parliament in late 2011.

Under the proposed carbon policy, around 500 of Australia's biggest emitters (including SP AusNet) will need to buy and surrender to the government a permit for every tonne of carbon emissions they produce. Only firms that release over 25,000 tonnes of direct carbon emissions will be taxed. This mechanism, coupled with the green energy policies, aims to achieve a high level emissions reduction target of 5% below 2000 levels by 2020 and 80% below 2000 levels by 2050.

The policy (from 1 July 2012) will see the introduction of a carbon tax in which the price of carbon is fixed at $23 per tonne (raising 5% p.a. in nominal terms). From 1 July 2015, the carbon price will be set by the market (i.e. an emissions trading scheme) where the number of carbon permits available is restricted by the government to a level required to meet regulatory obligations. Federal Treasury has projected the nominal world carbon price, in the 2016 financial year, will commence at $29 per tonne.

Based on the proposed carbon policy summarised above, the following highlights SP AusNet's exposure under the scheme.

- SP AusNet is liable under the proposed Carbon Pricing legislation as it exceeds the emissions threshold of 25,000 tonnes CO2-e;
- The primary scope 1 emissions are from fugitive emissions on the gas distribution network, with cast iron assets representing SP AusNet's greatest source of direct gas emissions[9].

SP AusNet, as it has done in the past, actively pursues measures to reduce its carbon footprint where it is economical to do so.

In addition to SP AusNet becoming liable for direct emission of CO2-e gasses, the introduction of a price on carbon is expected to increase the procurement costs of core materials and componentry used to manage and extend the gas distribution network, as suppliers of such materials pass cost increases to SP AusNet.

4.3.4 Resourcing

Retaining and developing SP AusNet's long term established and inexperienced personal is critical to the successful future of the organisation. Knowledge sharing and skills transfer are critical objectives. Programs designed to promote behaviours and activities consistent with SP AusNet's values facilitate these objectives.

More immediately, the industry faces skill shortages through retirement of an aging workforce. The retirement profile, together with a projected increase in network expenditures, is driving the increasing demand for knowledge-management, skills-transfer, training and recruitment.

4.3.5 Commercial

SP AusNet relies heavily on external workforces for the delivery of capital and maintenance programs. As such, significant time and effort is taken to build and maintain relationships with external contractors, specifically the primary service providers who provide SP AusNet's emergency response and maintenance functions.

Approval of the National Broadband Network (NBN) has been identified as a significant threat to the availability and quality of contractors needed to deliver maintenance and capital programs.

4.3.6 Social

SP AusNet works toward building meaningful relationships and dialogue with community groups through initiatives such as the stakeholder consultative committee, regional forums, employee giving programs, sponsorships, community development funds, community safety programs and partnering with community organisations such as the Country Fire Authority and Landcare.

A practical initiative undertaken with the cooperation of 'Regional Development Victoria' was a project to reticulate Natural Gas to regional towns providing connection subsidies to domestic consumers and reducing carbon emissions from the usage of alternate fuels.

SP AusNet continues to explore the opportunities that exist for the reticulation of further regional towns within the distribution area. Refer to section 6.16 – New Towns – Regional Victoria (page 55) of the AMS for addition details.

[9] As per calculation "Method 2" of the National Greenhouse & Energy Reporting Scheme (NGERS) which takes pipe material into account.

5 Network Objectives & Performance

This section provides an overview of SP AusNet's:

- Network objectives; and
- Network Key Performance Indicators (KPIs) with current performance.

5.1 Network Objectives

SP AusNet has established four (4) key network objectives that govern how the gas distribution 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 sustainable and reliable operation of the gas distribution network.

The four objectives are:

- Maintain and improve safety in accordance with the Gas Safety Case,
- Maintain Integrity of the network,
- Maintain Capacity of the network, and
- Maintain Customer Service Levels.

These objectives align with SP AusNet's STEM business planning model as discussed in section 3.1.1

5.1.1 Maintain and Improve Safety in accordance with the Gas Safety Case

SP AusNet's approach to enhancing network safety is to establish strategies to continuously reduce safety risks.

SP AusNet's Gas Safety Case facilitates monitoring and quantification of network safety risks and implementation of key mitigation controls.

SP AusNet's safety framework is further discussed in Section 6.3 (page 38) of the AMS.

5.1.2 Maintain Capacity of the Network

Maintain adequate levels of network capacity to ensure reliability of supply is maintained to SP AusNet's existing and future customer base.

The Gas Distribution System Code, Version 9 outlines minimum pressure standards that SP AusNet are obligated to maintain on a one in two winters peak basis (i.e. 50% probability of exceeding capacity).

SP AusNet's Network Capacity strategy is further discussed in Section 6.13 (page 50) of the AMS.

5.1.3 Maintain the Integrity of the Network

Maintain network integrity by decreasing the volume and severity of network leaks caused by asset deterioration or mechanical damages.

Delivery of mains replacement programs and increased public awareness of buried assets are practical examples of SP AusNet's commitment to maintaining network integrity and subsequently network safety.

5.1.4 Maintain Customer Service Levels

SP AusNet is committed to providing its customers with best practice standards of service and performance of the gas distribution network. It is an expectation that customer satisfaction levels remain at 80% or greater while minimizing the frequency of customer complaints.

5.2 Key Performance Indicators

SP AusNet's Gas Distribution System is highly reliable; however these high reliability levels can only be sustained now and into the future with continual maintenance and investment in the replacement, augmentation and optimisation of distribution assets.

The following indices (Sections 5.2.1 to 5.2.4) represent SP AusNet's expectations of future service levels. These measurements are subject to significant variability determined by many uncontrollable factors including, but not limited to, the following:

- **Environment** – rapid changes in the environment can cause ground movement, leading to cracks in mains; these cracks can be the cause of gas leakage. In terms of the low pressure distribution system, water entry into the network can then occur through these cracks, and this is often the cause of outages;
- **Weather** – in particular, higher rainfall levels have a marked impact on outages caused by more water entering the distribution system (predominantly limited to the low pressure network)
- **Third Party Damage** – many outages are caused by a third party digging into gas mains. SP AusNet seeks to minimise these outages through the expansion of the *Dial Before You Dig* program, and the continuation of onsite location provings; and
- **High Activity** – restoration of supply times can also be affected by the number of outages experienced at any time, large number of outages at any one time will lead to longer response times.

SP AusNet's activities are designed to maintain or improve the following KPI's, however due to the above reasons, and as evident from historical performance, SP AusNet expects some degree of variability around its targeted Key Performance Indicators (KPI's).

5.2.1 Safety Indicators

Emergency Response

SP AusNet is required to respond efficiently and effectively in the event of an emergency on its gas distribution network. In particular, SP AusNet is required to meet or exceed minimum response time benchmarks set by Energy Safe Victoria (ESV), which require:

- Field response within 1 hour for 'A class' (major leaks / emergencies) emergencies; and
- Field response within 4 hours for 'B class' (minor) gas escape repairs.

SP AusNet tracks its performance against these benchmarks on a monthly basis, and provides quarterly performance reports to ESV and ESC for all 'A class' emergencies. Table 4 below shows SP AusNet's performance over the period from 2004 to 2011

Table 4: Emergency Response KPI

Priority A Response	Benchmark	2004	2005	2006	2007	2008	2009	2010	2011
Metro Business Hours	*95%*	97%	97%	98%	98%	98%	98%	98%	99%
Metro After Hours	*90%*	94%	96%	95%	97%	98%	98%	98%	98%
Non Metro All Hours	*90%*	95%	94%	96%	97%	98%	97%	97%	98%

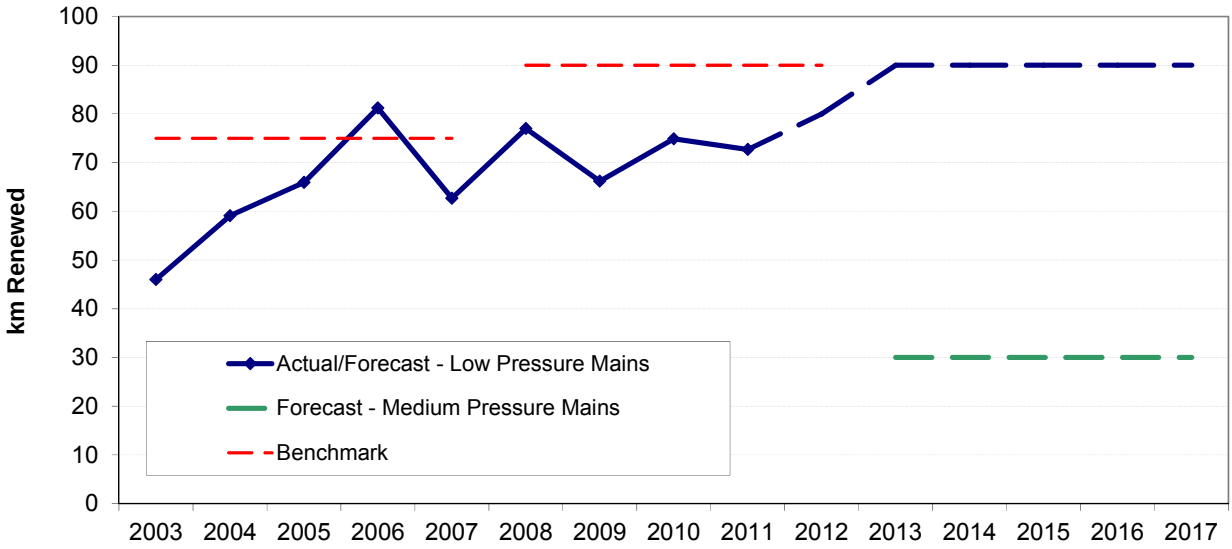
Source: SP AusNet annual reports

Mains Replacement

To improve the safety profile of the distribution network, SP AusNet conducts an annual mains replacement program to remove and replace mains to reduce the incidence of leaks on the network and thereby deliver public safety and reliability improvements. The volume of SP AusNet's recent actual and forecast distribution mains replacement work is shown in Figure 13 below.

The benchmark for mains replacement is set for each five year period as part of the GAAR process and reported annually with the Regulatory Accounts.

Figure 13: Distribution Mains Replacement



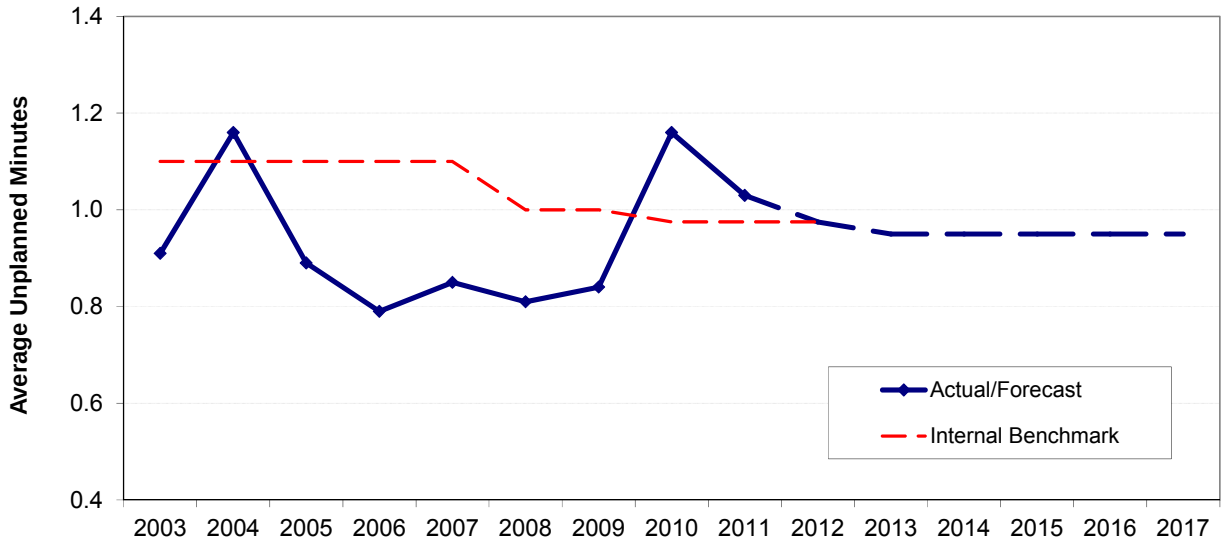
5.2.2 Reliability of Supply / Network Capacity Indicators

In consideration of SP AusNet's mains renewal program (2013 to 2017) and the current deterioration rates of assets, SP AusNet forecasts that current levels of reliability will be maintained within the current and following regulatory periods.

USAIDI – Unplanned Supply Average Interruption Duration Index

Unplanned System Average Interruption Duration Index (USAIDI) is an important indicator of network reliability. USAIDI represents the average outage duration for each customer. SP AusNet's current and predicted USAIDI performance is shown in Figure 14 below. SP AusNet's USAIDI has deteriorated over the last 2 years due to higher than average rainfall causing water ingress into the low pressure system. SP AusNet believes that with the safety based mains replacement program reducing the number of system leaks, USAIDI can be kept flat, even in a higher rainfall environment than experienced in the last decade.

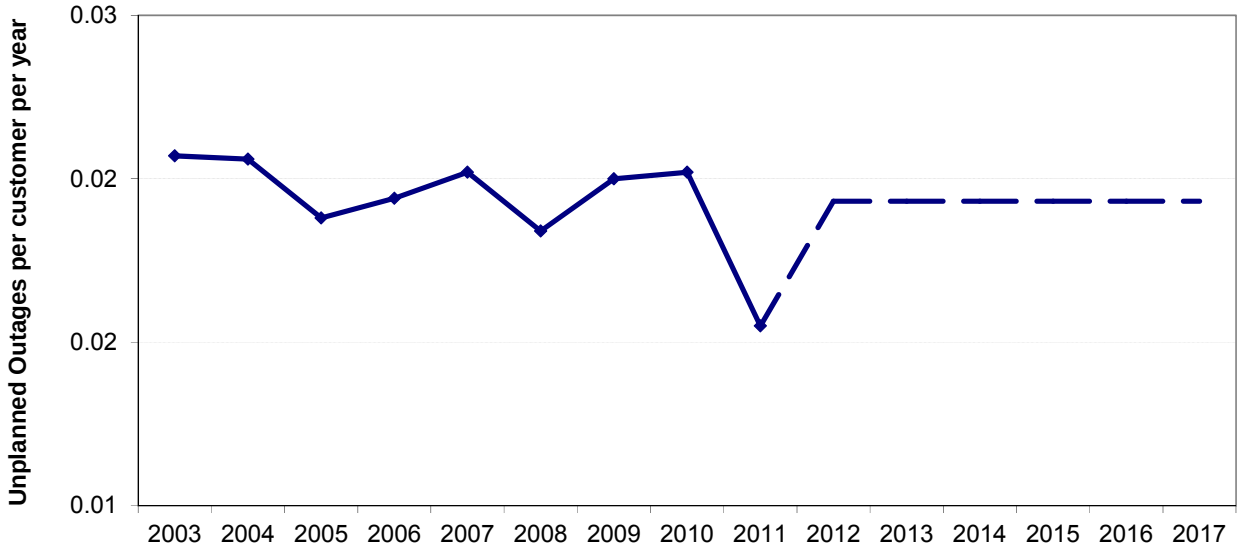
Figure 14: USAIDI



USAIFI – Unplanned System Average Interruption Frequency Index

USAIFI represents the number of occasions per year when each customer could, on average, expect to experience an unplanned interruption. SP AusNet's historic USAIFI performance is shown in Figure 15 below. The average USAIFI of 0.02 indicates that a gas customer can expect (on average) to experience an outage every 50 years. SP AusNet expects to maintain USAIFI at average historic levels into the future.

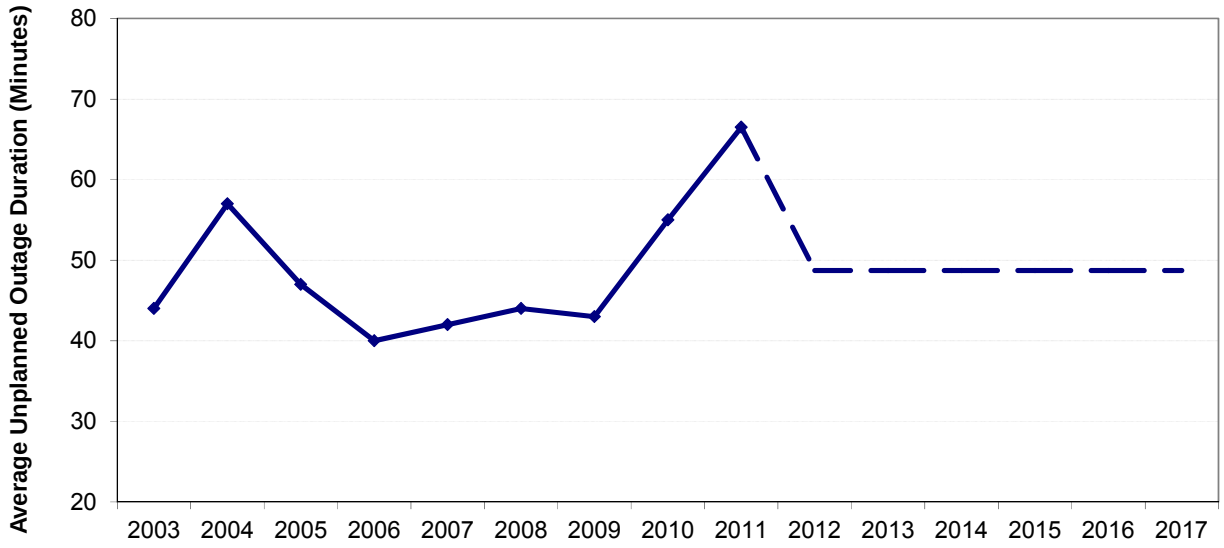
Figure 15: USAIFI



UCAIDI – Unplanned Customers Average Interruption Duration Index

UCAIDI represents the average time taken for supply to be restored to a customer when an unplanned interruption has occurred; it is defined as USAIDI / USAIFI. SP AusNet's current UCAIDI performance is shown in Figure 16 below. It follows from the USAIDI and USAIFI targets, that SP AusNet is also proposing a target for UCAIDI which reflects average historic levels.

Figure 16: UCAIDI



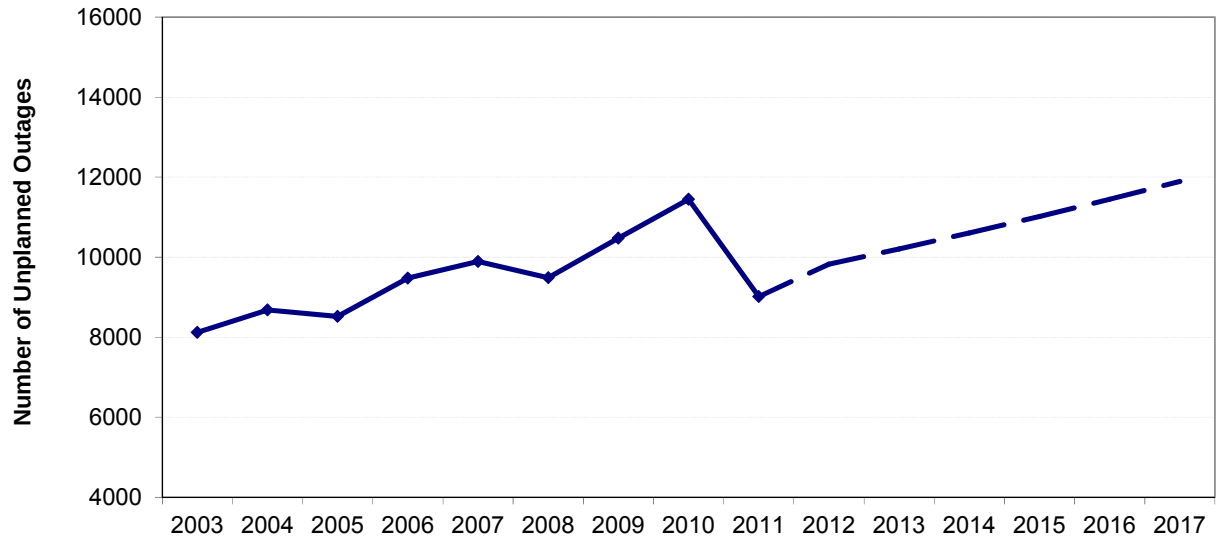
Higher than average rainfall in 2011 (and previous years) has resulted in saturated soil conditions and significant amounts of water ingress into SP AusNet's low pressure network. As a whole, waterlogged soil impedes escapes from the distribution network (as seen in SP AusNet's recent USAIFI performance) but increased levels of water ingress into the low pressure network, increasing average restoration times when compared to other network faults (as seen in SP AusNet's recent UCAIDI performance).

Number of Unplanned Outages

As more customers are connected to the network, there is a corresponding increase in network assets. Thus, the number of unplanned outages affecting less than five customers is expected to increase. Figure 17 (below) shows SP AusNet's recent actual and future target performance against this KPI. In contrast with other performance measures, the target performance is expected to show a trend increase into the future, which reflects the increasing numbers of customers served by SP AusNet's network.

The number of unplanned outages affecting less than 5 customers is reported externally to the ESV and ESC on a quarterly basis.

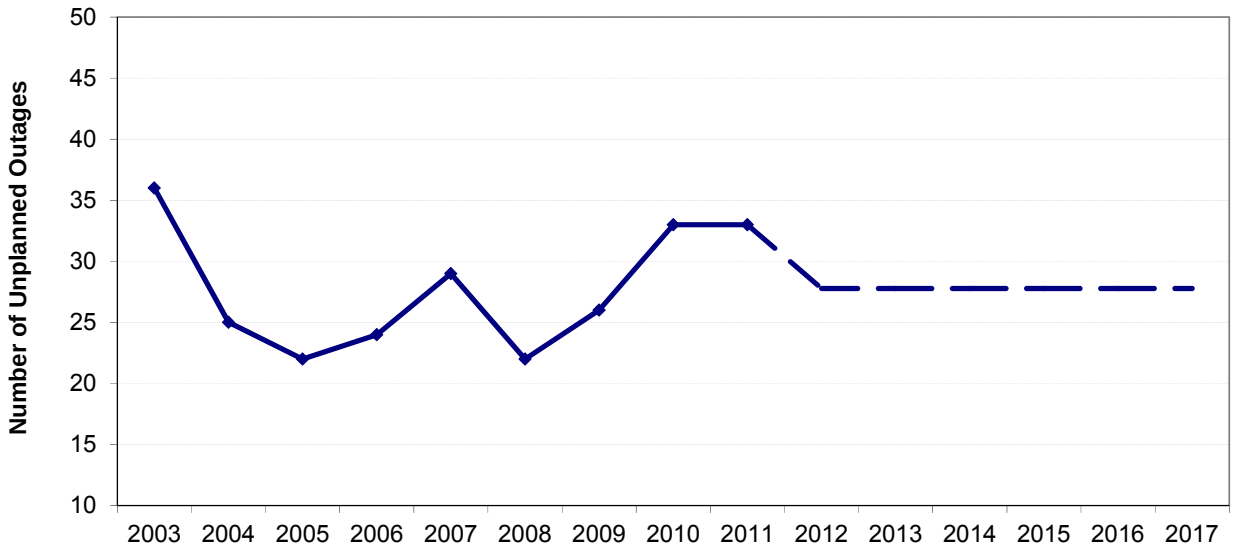
Figure 17: Number of unplanned outages affecting <u>less</u> than 5 customers



The number of unplanned outages affecting five or more customers indicates relatively major events. This performance measure is targeted to be maintained (which results in a per capita improvement) at average historic levels, as shown in Figure 18 (below).

The number of unplanned outages affecting more than 5 customers is reported externally to the ESV and ESC on a quarterly basis.

Figure 18: Number of unplanned outages affecting more than 5 customers

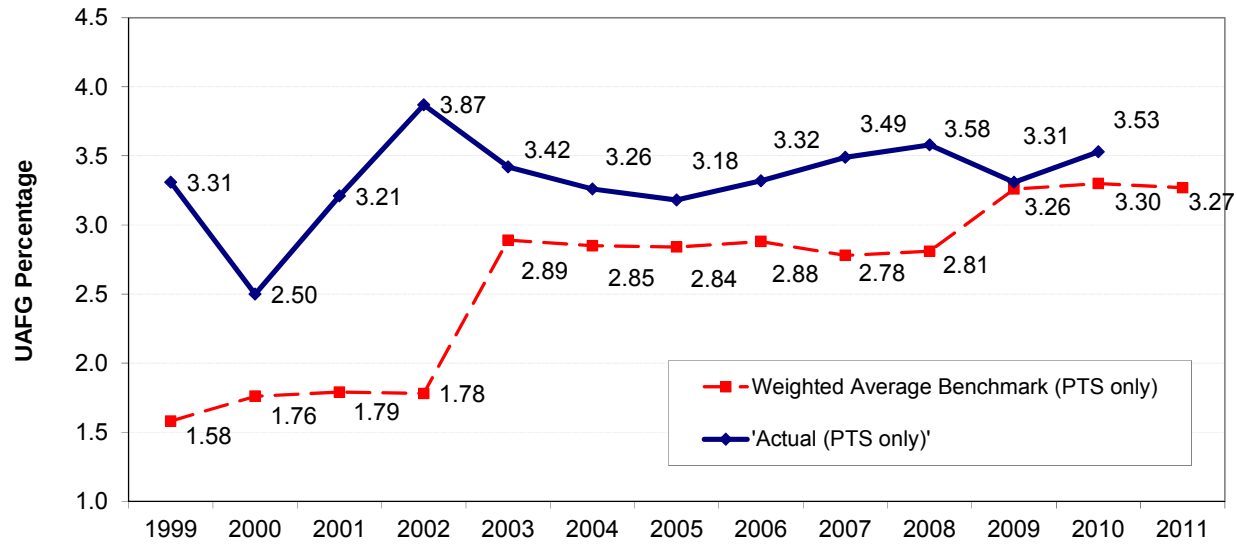


5.2.3 Asset Integrity Indicators

Unaccounted for Gas

Unaccounted for Gas (UAFG) is the difference between the amount of gas injected into the distribution system and the amount of gas withdrawn by consumers. Regulatory benchmarks are established by the regulator for each regulatory period. SP AusNet's performance against the current benchmark, which was set by the ESC, is shown in Figure 19 below. The UAFG benchmark for the fourth regulatory period is yet to be determined but expected to be consistent with 2010 weighted average UAFG performance at 3.53%.

Figure 19: Unaccounted for Gas (PTS Only)

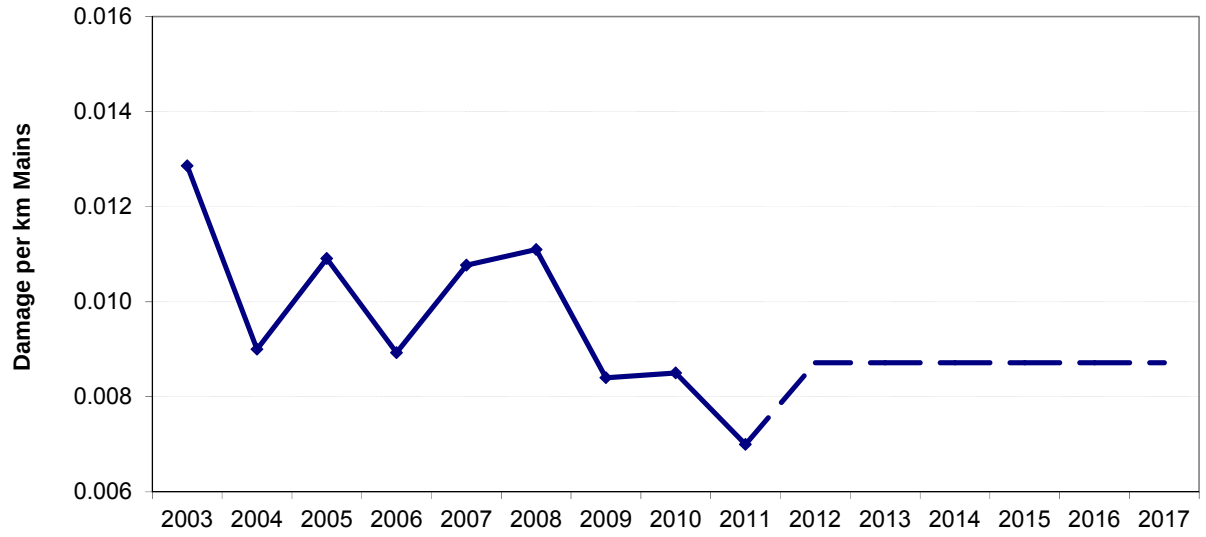


Mechanical Damage – Gas Mains

The target frequency of mechanical damage per kilometre of mains is expected to be slightly lower than the average historic level as shown in Figure 20 below, reflecting the traction of ongoing awareness program initiatives (e.g. Dial Before you dig and council presentations)

The number of distribution main damages is reported externally to the ESV and ESC on a quarterly basis.

Figure 20: Mechanical Damage per kilometre of Mains

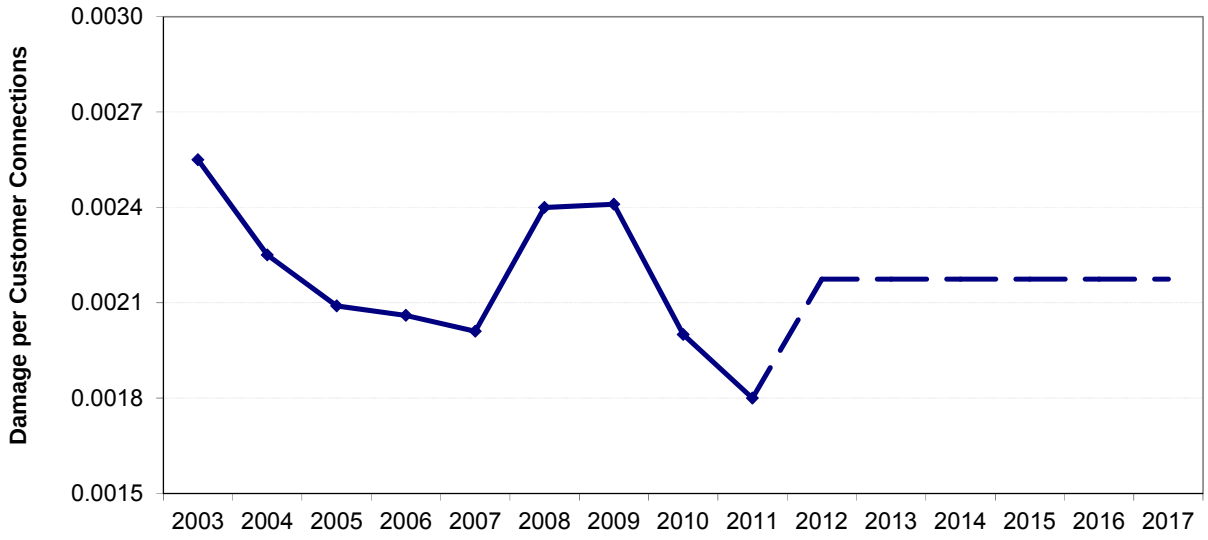


Mechanical Damage – Customer Connections

The target frequency of mechanical damage to services per customer connection reflects the average historic levels, as indicated in Figure 21 below.

The number of distribution service damages is reported externally to the ESV and ESC on a quarterly basis.

Figure 21: Mechanical Damage per Customer Connection



Network Leaks

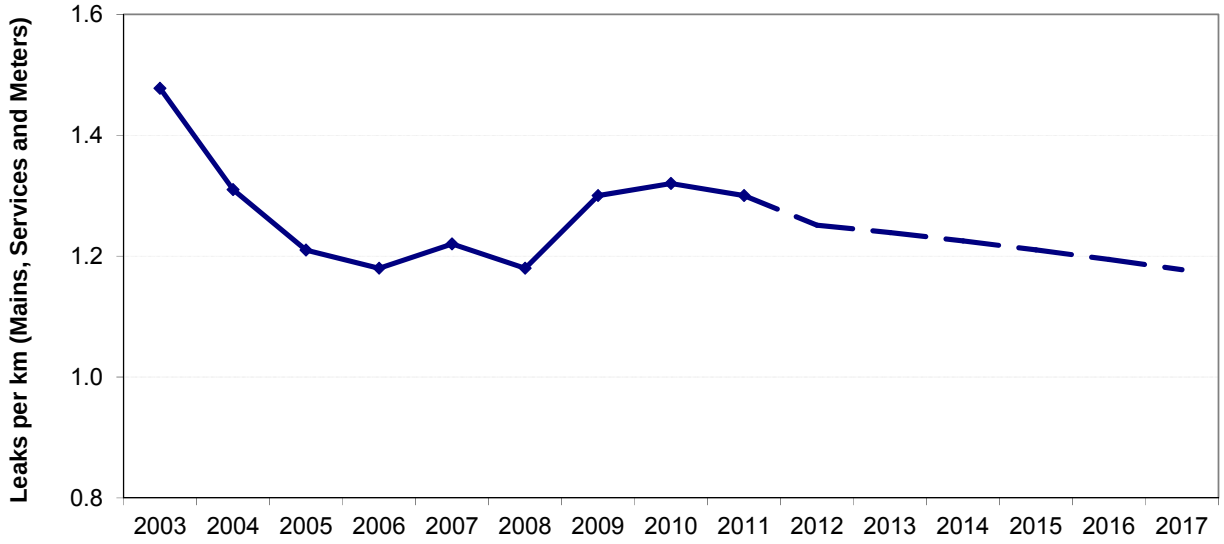
The number of leaks[10] per unit length of main is predicted to fall against historical averages due to an increase in capital expenditure to fund medium and low-pressure mains replacement programs. SP AusNet's recent actual and future forecast performance against this KPI is shown in Figure 22 below.

SP AusNet's favourable outcome for network leaks in 2011 (1.06 leaks/km) is again attributed to unseasonably higher than average rainfall during the calendar year. The waterlogged soil impedes escapes from the low pressure network resulting in fewer leaks identified / repaired.

The number of network leaks (split between meters, services and mains) is reported externally to the ESV and ESC on a quarterly basis.

[10] The combination of all leaks (i.e. Meter, Service and Mains) on the distribution system.

Figure 22: Network Leaks (Mains, Service & Meter) per kilometre of Mains



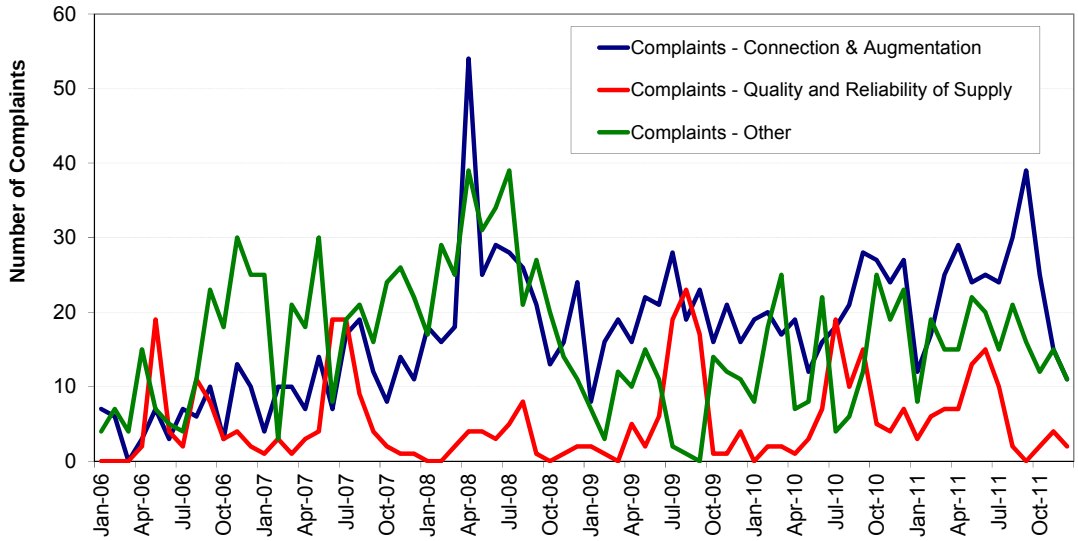
5.2.4 Customer Service Indicators

Customer Complaints

The volume of customer complaints (recorded on a monthly basis) over the current access arrangement period is shown in Figure 23 below. SP AusNet is expecting these volumes to remain at around their current levels for the next period.

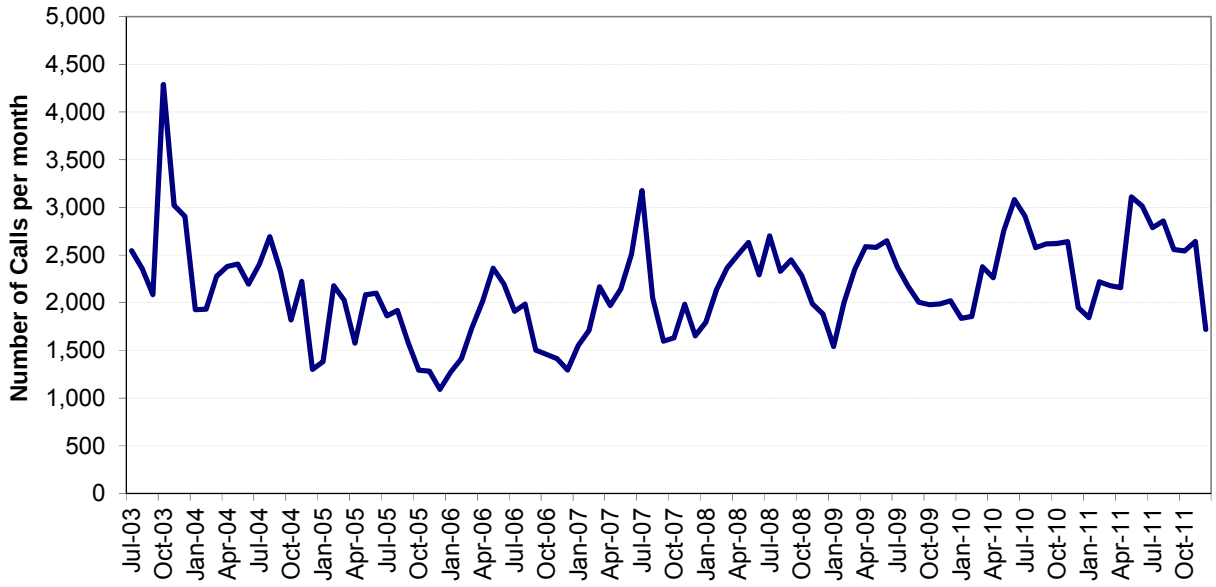
The spike in connection complaints witnessed in 2008 was due to process changes involving the interface between Retailers, SP AusNet and Tenix (SP AusNet's primary service provider) in respect to new customer connections during the mobilisation new Service Agreement (which became live in 1 April 2008). As is evidenced in Figure 23, internal process improvements have since streamlined and improved the customer experience of this process.

Figure 23: Number of Customer Complaints



The total number of calls received by SP AusNet's fault reporting line is shown in Figure 24 (below).

Figure 24: Total number of calls to SP AusNet's Call Centre Fault Line

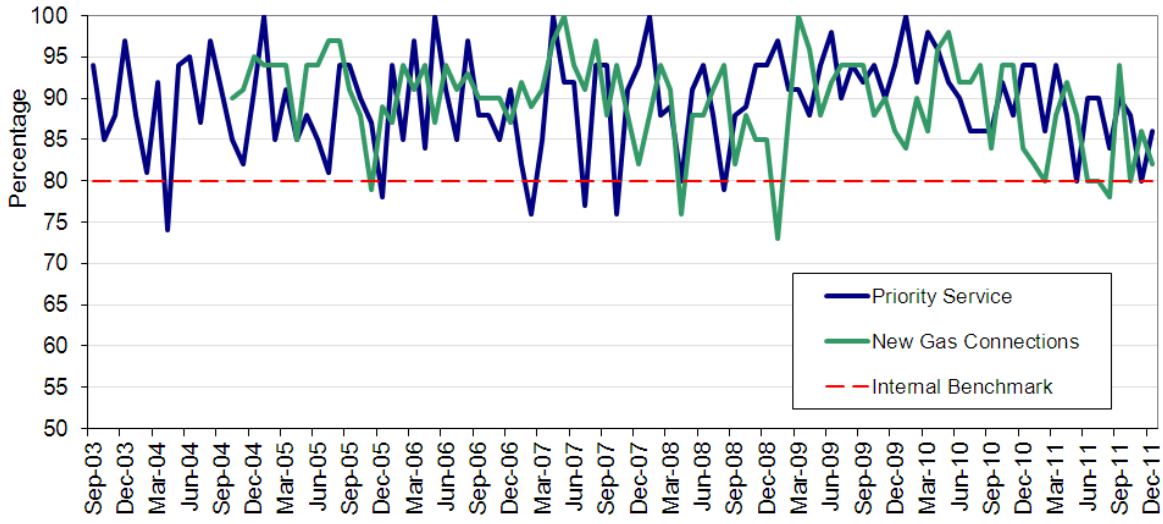


The number of calls to SP AusNet's call centre fault line and the volume of customer complaints are reported externally to the ESV and ESC on a quarterly basis.

Customer Satisfaction

Customer satisfaction levels are calculated independently by Wallis and Associates on a monthly basis. As shown in Figure 25 below, SP AusNet has consistently achieved satisfaction levels higher than the internal 80% benchmark. Satisfaction levels are expected to remain steady across all service offerings into the future.

Figure 25: Customer Satisfaction



The data relating to customer complaints and customer satisfaction demonstrates that SP AusNet is continuing to deliver high levels of service

6 Process and System Strategies

The objective of this section is to provide an overview of the major processes and system strategies required to manage SP AusNet's gas distribution network for the achievement of network objectives.

6.1 Risk Management Approach

SP AusNet operates a corporate Risk Management Framework[11] that utilises the principles of Australian Standard AS/NZ 4360:2004 and AS/NZ ISO 31000 "Risk management – Principles and Guidelines, 2009 to assess a range of business risks under the following categories:

- Financial;
- Regulatory;
- Safety;
- Environmental; and
- Corporate Image.

By adopting common metrics across the broad range of business risks and investment portfolios, SP AusNet can more effectively manage business risk and optimize network outcomes and objectives.

SP AusNet's Risk Management Framework (Document RM 001-2006) sets out the overarching philosophy, principles, requirements and responsibilities for a sound approach of risk oversight, management and ongoing internal control assurance required within SP AusNet. The Framework addresses the following:

- Governance and responsibilities;
- Risk management principles and methodology;
- How SP AusNet assesses and manages risk; and
- How SP AusNet monitors and reports on risk.

6.1.1 Risk Rankings for Each Element of the Gas Distribution Business

As part of the SP AusNet Gas Safety Case, a Formal Safety Assessment (FSA) has been carried out consistent with the Gas Safety Act 1997 and the Gas Safety (Safety Case) Regulations 2008 in order to assess risks associated with SP AusNet's gas distribution network, as defined within the Facilities Description and Safety Management System Overview (GSC 10-01) which forms part of the Safety Case documentation.

Risk assessments were completed in workshops involving personnel with a range of backgrounds in gas transmission and distribution. Resulting risk levels are based on current technologies, materials and controls relevant to the assets or processes. A change in any of these parameters may affect the determined risk level – their measurement being inherent in the monitoring of the asset base. FSA is reviewed on an annual basis or as required.

Refer to SP AusNet's Safety Case and FSA for complete list of identified risks.

Within the gas distribution network, all identified risks are contained within acceptable limits. However, action plans to further mitigate the greater risks are in place or planned over the next 5 years. An example being the risk associated with leakage from cast iron and unprotected steel mains, which have driven the need for annual mains renewal programs on SP AusNet's low, and medium pressure networks.

[11] RM 001-2006 Risk Management Framework, 2007, SP AusNet.

6.2 Gas Safety Case

Safety Legislation requires gas network businesses to lodge a Gas Safety Case (GSC) Management System with Energy Safe Victoria (ESV). SP AusNet's GSC for the forthcoming regulatory period was accepted by the ESV for approval in May 2010. The GSC meets the requirements of the Gas Safety Act 1997, Version No. 34, effective from 13 December 2009. A summarised version of SP AusNet's approved safety case is publically available from SP AusNet's website (SP AusNet - Codes & Guidelines.)

The GSC is represented in three sections:

1. Facility Description: overview of the SP AusNet transmission, distribution and alpine resort facilities and operations,
2. Formal Safety Assessment: risk identification, modelling and control measures, and
3. Safety Management System: mean by which SP AusNet manages risks identified in the Formal Safety Assessment.

The AMS has been prepared having regard to the latest GSC requirements, and is intended to facilitate SP AusNet's compliance with those requirements.

6.3 Health and Safety Management

Figure 26: Mission Zero

SP AusNet's health and safety management system complies with the requirements of AS/NZS 4801 and describes our approach and implements a framework managing health and safety across our business. The primary aim of the health and safety management system is to establish an integrated, sustained and systematic approach to safety management in all areas of our activities.

SP AusNet's safety vision is symbolised by the simple expression missionZero. missionZero is founded on the indisputable fact that workplace injuries are unacceptable and avoidable. The strategy has four goals:

- Zero inquiries to our people, contractors and visitors
- Zero compromise on safety
- Zero tolerance of unsafe acts & behaviours
- Zero impacts on our families & communities.

SP AusNet's journey to Zero is supported by a safety strategy with four key components:

1. Safety Leadership

Safety leadership means having a highly visible and passionate commitment to safety, led by all of us, based on clearly, and consistently stated expectations that are not compromised.

2. Safe Work Environment

Safe work environment means we will continually improve our approach to managing safety hazards so that we prevent workplace injuries. We will share ideas and learn from each other. We will implement effective injury-prevention solutions consistently across the business through our design, procurement and application processes.

3. Safe Behaviour

Safe behaviour means our people understand that 'everyone is responsible for leading safety' and that unsafe behaviour and acts will not be tolerated. We will recognise and reward excellent safety performance and outcomes.

4. Safety Systems & Measurement

Safety systems and measurement means we will implement, certify, and maintain a safety management system to provide a platform for achieving our safety milestones, goals, and objectives. We will consistently capture and represent our safety performance to ensure safety is always 'front of mind' for our people.

SP AusNet's journey to Zero will be measured by the achievement of the following key milestones:

- Preventing workplace injuries, measured by moving our Recoverable Injury Frequency Rate (RIFR) to less than 1 within five years (before end of financial year 2016):
- 100% completion and attendance of safety-related training
- Being safety leaders in our industry and the community
- Achieving a Top Quartile Engagement Score
- Attaining a peer-based 'Buddy Culture'
- Living our safety value

Refer to Section 3.1.3 (p.10) of the AMS for more information on SP AusNet's safety vision and missionZero

6.4 Environmental Management

SP AusNet is committed to responsible environmental and resource management through its ISO 14001 accredited environmental management system.

6.4.1 Greenhouse Emissions

SP AusNet directly and indirectly emits greenhouse gases in its day-to-day activities. These emissions – principally methane and carbon dioxide, are associated with losses incurred in the transport of gas through our network, primarily as a result of leaking pipes.

SP AusNet has a number of action plans in place to reduce the level of greenhouse gas emissions. These include:

- Gas main replacement;
- Network augmentation programs; and
- Electronic pressure control on major regulating stations.

SP AusNet's mains replacement strategy is detailed in the Gas Mains and Services Strategy (AMS 30-52) and further summarised in section 7.4 (page 66) of the AMS.

The introduction of the proposed carbon pricing mechanism in June 2012 will result in a financial liability for each tonne of CO2-e equivalent gas released into the atmosphere for general operation of the gas distribution network. Refer to section 4.3.3 (page 26) for further details on the federal governments Clean Energy future policy package.

6.4.2 Pipelines and the Environment

Before the construction and commissioning of pipelines, SP AusNet conducts a range of environmental studies along the pipeline route and adjacent areas to:

- Establish characteristics, values and level of significance of the area,
- Identify key environmental issues and potential impacts on the area, and
- Devise methods and management practices to mitigate potential impacts on the area.

6.4.3 Asbestos

The Occupational Health and Safety (Asbestos) Regulations requires strict work methods for removal of asbestos from the workplace as well as stringent requirements when working with asbestos-containing materials. Environmental Protection Authority (EPA) guidelines detail transport and disposal requirements.

Asbestos has been identified at a number of the former TLPG and coal gas production sites. The asbestos is found in some wall and roof cladding. The material is deemed safe and has been labelled and recorded in the SP AusNet asbestos register. The demolition and land remediation will encompass the safe removal of the asbestos.

6.4.4 Land Contamination

Eight former gas works sites in western Victoria, from which only three remain, have been identified as having contaminated soil, arising from historical production of town gas from black coal prior to SP AusNet's purchase of the business.

During 2000, a consultant was engaged to undertake a review of the contaminated sites and report on the likely level of risk at each site. The consultant was also asked to provide recommendations on actions required for managing the sites. An environmental management plan was put in place in 2001 to monitor site conditions and manage the risks posed by each site. The status of each site is summarised in Table 5 below.

Table 5: Status of decontamination work at former gas works sites

Site	Status
Colac, Horsham	Sold - Site no longer owned by SP AusNet
Castlemaine, Stawell, Ararat	Remediation and clean-up work completed, waiting on EPA inspection / signoff
Portland, Warrnambool, Hamilton	Awaiting remediation

6.5 Condition Monitoring

6.5.1 Overview

SP AusNet manages the condition of its assets through:

- Real-time data acquisition and recording (via SCADA),
- Leakage surveys, leak reports, and UAFG monitoring,
- Asset inspection programs and corrosion surveys, and
- Gas quality monitoring, including management of oil-in-gas issues.

These various condition-monitoring activities are outlined below.

6.5.2 Real-time Data Acquisition and Recording (SCADA)

SP AusNet uses a SCADA (Supervisory Control and Data Acquisition) system to monitor and control assets across the network from the transmission system to the network fringe. The SCADA system provides data on the real-time performance of the assets, and data for long-term evaluation of gas demand and network performance to identify potential system deficiencies.

Section 7.7 - SCADA (p. 79) of the AMS provides an overview of SP AusNet's gas SCADA network, including the capital plans to extend network coverage to provide complete real-time visibility of all gas networks.

6.5.3 Leakage Surveys

SP AusNet has a risk based leakage survey methodology that focuses leakage survey efforts to the areas of highest risk. Currently, all mains in locations of high risk are surveyed on an annual basis. Transmission pipelines, internal services and high-risk special crossing (e.g. railway line crossing) are also surveyed on an annual basis. Cast iron mains are subject to spot surveys when monthly leakage rates within a postcode exceed pre-determined levels. Technical Standard TS-5201 Leakage Survey outlines SP AusNet's leakage survey methodology.

All leaks are assessed by field crews (Class 1 or Class 2) and if deemed hazardous are repaired before the next leakage survey cycle. Class 2 leaks on mains identified within a proposed (i.e. to be completed in the coming 18 months) mains replacement program are periodically monitored to ensure the leak does not deteriorate outside of acceptable limits.

All public reported leaks are considered class one and immediately attended to.

6.5.4 Publicly Reported Leaks

Publicly reported leaks are captured through the SP AusNet's emergency response system (i.e. PowerOn). A response team is sent out to assess the leak and leak information is then entered into the Q4 system in a similar manner to survey results. This means that important leaks are addressed immediately and also factored into SP AusNet’s pipe replacement and future leakage survey programs.

6.5.5 Unaccounted for Gas (UAFG)

UAFG is the difference between the amount of gas injected into the Distribution System and the amount of gas withdrawn by Consumers. The level of UAFG is influenced by network leakage, meter inaccuracies and theft.

Refer to Section 6.14 - Unaccounted for Gas (page 53) of the AMS for further details on SP AusNet's UAFG Strategy.

6.5.6 Regulator Inspections

SP AusNet has a number of different regulators for city gates, field, district and residential purposes. These are inspected regularly, and inspection information collected in the Q4 system. This data is analysed to identify any adverse performance trends to inform decisions about models purchased and maintenance/replacement programs. Pressure records from regulators with chart recorders (showing the inlet and outlet pressures of the unit) are also collated weekly.

Refer to Sections 7.2 – Regulating Facilities - Network (page 61) and 7.3 - Regulating Facilities – Consumer (p. 64) of the AMS for further information on SP AusNet's management of regulating facilities.

6.5.7 Corrosion Surveys

Electrical surge protection is placed on steel pipes to minimise the risk of electrical discharge through the steel pipe system. All surge protection devices are inspected annually and specialised devices have additional testing every five years.

Surveys are performed on protected steel pipes to assess corrosion protection levels every:

- Six months for high-risk areas (e.g. transmission pipe and stray current zones), and
- Twelve months for low risk areas.

The surveys measure the performance of the corrosion protection unit by checking the voltage resistance of the pipe through a test point, which are situated approximately every kilometre along the pipe route. This

information is collected by the corrosion investigator and used to develop a corrosion protection upgrade program targeting the worst affected areas first.

Refer to section 7.6 – Corrosion Protection (page 77) of the AMS for further information on SP AusNet's corrosion protection strategy.

6.5.8 Gas Quality Monitoring

SP AusNet's gas quality monitoring is primarily concerned with odorant checks to ensure enough odorant is present to allow leaks to be detected by the public. However, some areas of the network suffer from oil contamination originating from upstream plant passing into the system. This oil contaminates downstream assets including field/district regulators, commercial regulator/meter assemblies, gas/burner control trains, and safety equipment on Type B appliances (where excessive oil can cause 'flame-outs'). Some major customers are affected, particularly high use Tariff D consumers at end points in Ballarat and Geelong.

A Liquids in Gas Strategy (30-2507) has been developed to:

- Address specific safety issues identified pertaining to oil contamination,
- Monitor the causes of gas contamination to identify safety issues and areas for improvement,
- Obtain more accurate information from parties suspected of causing the contamination as to the amount of oil currently in the system and how much is continuing to be released into the system, and
- Maintain consumer and other stakeholder confidence in the integrity of the gas distribution system, including provision of technical expertise to major customers with identified problems.

The long-term strategy for liquids in gas includes the following:

- Chemical analysis of oil found in the distribution system to identify source, and mapping of networks to identify known problem areas,
- Installation of Coalescers to affected major consumers and city gates; drainage of oil from siphon points (including affected meter regulator sets) and recording the volumes of oil drained,
- Revising the frequency at which affected meter regulators are monitored (for example reducing intervals from 12 months to three months for severely affected equipment),
- Liaising with APA GasNet re pigging schedules, and undertaking combined risk assessment and contingency planning before pigging is undertaken,
- Conducting regular, detailed briefing sessions with major consumers and retailers, and
- Develop gas flow velocity profiles of the network, and continuing research into oil flow characteristics and suitability of various entrapment methods and devices.

6.6 Contingency Planning

SP AusNet has developed a Gas System Contingency Plan (30-2507-17) to support the recovery from incidents adversely affecting the performance of SP AusNet's gas system. Such incidents may result from plant failure, natural events or deliberate actions by individuals or groups.

Effects from isolated intentional attacks on physical facilities are only marginally different from those of natural events. This analogy applies to the nature of the damage inflicted and to the ability to begin repair operations.

As each emergency may be different in size, duration and impact, the systems contingency plan provides an initial response, and is aimed at bringing the emergency under control by:

- Managing the immediate cause of the emergency,
- Identifying the parts of the system affected by the emergency, and
- Identifying and allocating appropriate resources to ensure the continued operation of the system assets.

6.7 Operations Management

The operation of the overall system and of individual assets is a key part of asset management to ensure that system performance targets are achieved, the integrity of the assets is not compromised, and safety and environmental requirements are met.

SP AusNet determines its operational requirements by reference to industry best practice, and by introducing incremental refinements to established programs as a result of accumulated knowledge of the asset base. Network operating procedures are set out in document 33-2001 – Gas Network Control and Monitoring.

An over-riding principle is to ensure that operational staff has access to systems that can provide them with relevant information in a format that assists them to make timely and accurate decisions.

The following strategies will provide improved operation of the network:

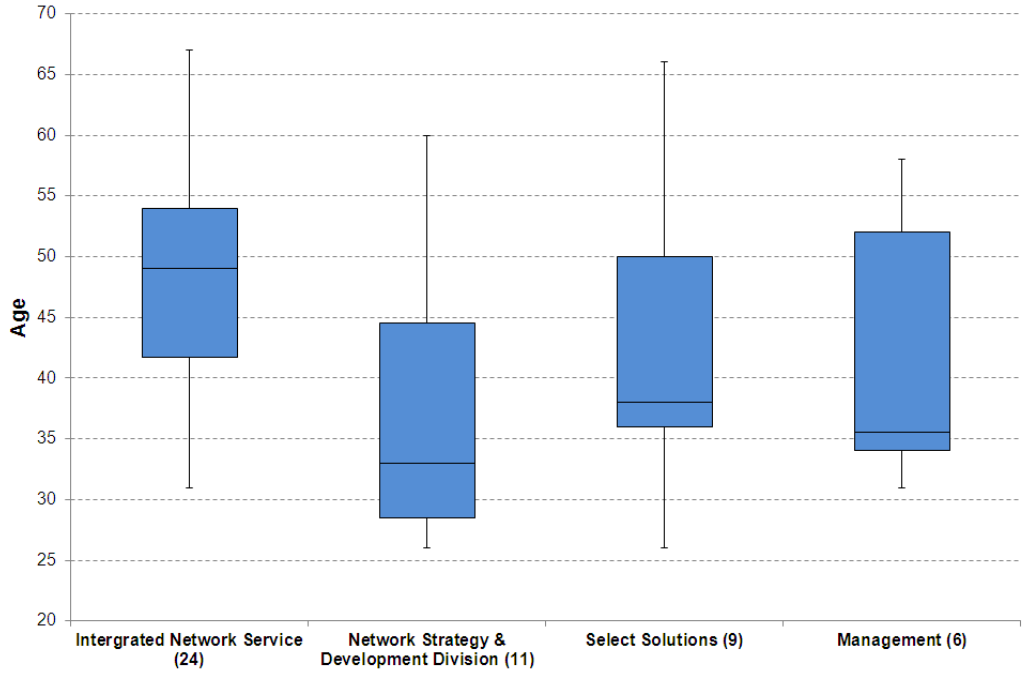
- Implement key SCADA system improvements including:
    - Continue to develop enhanced pressure management systems to better protect and respond to energy and network; and
    - Implement Distribution Management systems that provide real time monitoring, management and optimisation tools such that network components can be more effectively monitored for failure and better predictive actions;
- Maintain and enhance plant operating thresholds and schedules to assist network controllers;
- Outage management system to be integrated with asset management systems and GIS;
- Field personnel equipped with PDAs (Personal digital Assistant);
- Continue to optimise the timing of the planned outages of assets using the maintenance management and network management systems;
- Further development of 'SMART network and metering' techniques;
- Continue to enhance and develop the direct contacting of customers during pressure issues;
- Regular review of all current operational procedures to ensure they remain relevant with the introduction of new technologies; and
- Continue to enhance and ensure that the backup Control Room (i.e. the Customer & Energy Operations Team) and back up Data Management Centre are regularly tested.

6.8 Skills and Human Resources Management

Maintaining adequate numbers of skilled employees in the future is an important aspect of maintaining the knowledge that underpins SP AusNet's asset management activities.

Previous business plans and their associated analysis of human resources revealed an aging workforce with a shortfall in available younger employees to replace them come retirement. Recent staff recruitment efforts have seen improvements to the age profile of gas workers; this can be seen in Figure 27 below.

Figure 27: Gas Employee Age Profile (August 2011)



Overall, the data shows a more evenly distributed age profile than previous years, highlighting the success of previous recruitment plans.

To maintain the availability of relevant skills for business operations, a steady effort of recruitment and training is required. As such, SP AusNet is planning to recruit a number of professional and technical trainees over the coming years. The current plan is summarised in Table 6 below.

Table 6: Planned Employment of Technical Trainees & Graduates

Year	2011	2012	2013	2014	2015	2016	2017	2018
Graduate Engineer	-	1	1	1	1	1	1	1
Gas Technical Trainee	1	1	1	1	1	1	1	1

SP AusNet recognises the strategic importance of the development and maintenance of gas-related competencies by both staff and contractors so as to mitigate risks and ensure continuing safety and infrastructure integrity of the gas distribution network. To achieve this, SP AusNet actively facilitates the training and subsequent compliance auditing of relevant competencies across the industry's workforce. This activity also ensures compliance with SP AusNet's obligations as set out in the Gas Safety Case.

A broad set of national gas industry competencies have been established. These are set out in the 'Gas Industry Training Package – Competency Standards Index' (also referenced in the Victorian Natural Gas Construction and Maintenance Competency Guidelines).

SP AusNet has a close relationship with the EE-Oz training board and is a financial member and active contributor to the national gas industry training regime.

SP AusNet utilises these nationally recognized competences and requires its contractors to do likewise, also to comply with SP AusNet-specific requirements when working on SP AusNet assets. Staff and contractors are trained by a registered training organisation in these competencies. Personal Development Plans (which reference these competences where relevant) are formulated for each SP AusNet employee on an annual basis, and are reviewed and updated every six months.

6.9 Contractor Management

6.9.1 Operations & Maintenance Contract

Operations and Maintenance and minor capital works are currently outsourced under a 5 (3 year +2 year extension if targets are met) year contractual arrangement that will end on 31 March 2013. The works were originally competitively tendered in a two-step process (a non-price and price assessment) with the contract awarded to the best compliant and commercial offering.

The agreement is a unit rate contract where the contractor is paid monthly for units completed. These units would include such activities as searching for escapes (subsequent to a public report of smell of gas) conducting the leakage survey, repairing mains and other standard maintenance activities. Within this contract SP AusNet's primary service provider also provides the majority of customer connections works, these are standard connections in terms of laying mains and services, for larger developments the connection work is generally referred to the capital works tender panel.

Ongoing contract performance is monitored and controlled via Key Performance Indicators (KPIs), which are regularly reviewed to ensure the contractors' performance continues to be consistent with SP AusNet's businesses objectives.

6.9.2 Major Capital Works

Major capital works projects typically have a value over $100,000 and are awarded to successful applicants pursuant to the Installation Service Provider (ISP) or capital works agreement. The ISP Panel consists of 5 panel members appointed for a 5 year period (3 + 1 + 1) ending on 31 March 2016. Panel members have been selected based on an assessment process where their safety, competiveness, quality, delivery record and financial viability are assessed, there performance against these variables determine whether their term on the panel is extended.

Individual projects are periodically released to the panel members, who are invited to bid competitively. Following an appraisal and approval process, the works are awarded to the successful panel member. Projects are typically negotiated to be delivered within a set timeframe and are subject to fixed price agreements to transfer price risk to the service provider. SP AusNet's internal resources focus on the core functions of project planning, overall project delivery and contract management.

SP AusNet's contracting approach benefits SP AusNet and our customers by:

- appropriately balancing the use of internal and external resources;
- utilising market expertise and intellectual property;
- securing lower prices by requiring panel members to compete for work;
- obtaining economies of scale by ensuring that panel members expect to deliver appropriate volumes of work; and
- ensuring high quality and timely project delivery through effective monitoring of performance.

6.10 Infrastructure Security

Commonwealth and state governments have imposed legal responsibility on both the owners and operators of critical Gas infrastructure and to take all necessary preventative security measures to ensure continuity of supply.

The four main security threats to the gas distribution network are:

- **Safety** – of untrained persons in the vicinity of energy-containing equipment;
- **Malicious** – motivated by revenge, fame, association or challenge;
- **Criminal** – profit driven; includes theft, fraud, sabotage or extortion; and
- **Terrorism** – threat or use of force to influence government or public through fear or intimidation.[12]

[12] A 'terrorist act' is an act or threat intended to advance a political, ideological or religious cause by coercing or intimidating an Australian or foreign government or the public; causing serious harm to people or property, creating a serious risk of health and safety to the public, disrupting trade, critical infrastructure or electronic systems - Criminal Code Act 1995 [Commonwealth].

The Infrastructure Security Risk Assessment Tool (ISRAT) is used to assess physical security risks and control measures in SP AusNet's installations. The Infrastructure Security Strategy is informed by more than 50 individual assessments, of major sites, and 20 generic assessments for the multiplicity of less significant installations.

SP AusNet's physical security control measures are founded on the following principles:

- Consistent risk identification and quantification;
- Defence in depth – increasing the number and sophistication of control measures commensurate with the degree of intrusion risk;
- Deterrence – measures to deflect would-be intruders towards other targets;
- Delay – measures to increase the time and effort required to successfully intrude;
- Detection – measures to promptly and reliably detect intrusion;
- Response – measures to promptly and appropriately deal with intruders and associated consequences; and
- Contingency planning – measures to promptly recover service and minimise societal impact.

SP AusNet's Infrastructure Security Policy covers all high risk installations across SP AusNet's three energy networks, inclusive of City Gate regulating facilities.

6.11 Capital Expenditure (CAPEX) Prioritisation

SP AusNet operates an overall capital governance process designed to ensure the objectives of customers, regulators, owners, and other stakeholders are met as efficiently as possible. This process includes the following steps:

- Network managers, planning engineers, and other officers identify current and emerging needs where CAPEX (or non-recurrent OPEX) may be required to meet the legitimate needs of customers or other stakeholders. This involves establishing formal outcome-oriented measures and targets in areas such as asset-related customer service, safety, statutory compliance, various aspects of risk, operating costs, etc. – then identifying how the business will perform against these metrics over time if capital is not spent.
- The potential contribution over time to these targets is quantified for each candidate capital project, via various network planning and analysis techniques, and (for major projects) consideration of alternative proposals to achieve the required outcomes.
- Selecting an optimal combination of candidate projects so that agreed targets are achieved each year at minimum sustainable cost then forms capital budgets. The selection of an optimal set of projects for commencement in the next 18 months is updated on a rolling basis, so that at the business is continually addressing the most efficient set of capital projects that will deliver required outcomes.
- Once an individual project is accepted into the optimal selection for commencement in the coming year, it is progressively detailed and costs are refined through the planning process. Approval to spend is granted only if the project continues to predict the budgeted benefits and the budgeted costs (within a tolerance) for which it was originally selected. If outside selection tolerance the project reverts to being a candidate for selection when the portfolio is next re-optimised, and will proceed only if it remains the most efficient option to achieving the desired outcomes.

This capital governance process ensures that the overall level of capital is adequate to achieve an appropriate set of outcomes for customers and other stakeholders, and that CAPEX is explicitly managed in the most efficient manner.

6.12 Asset Management Data & Information Systems

SP AusNet manages asset-related data in a series of specialist systems. Table 7 (below) provides a summary of such systems. Each system is operated by in-house specialists and supported by in-house software owners or expert contractors. Daily system backups to a remote site provide disaster recovery capability. All systems can be operated from a remote site.

Table 7: SP AusNet's Gas Business Systems

System	Function
Computer-Aided Maintenance Management System (Q4)	Asset maintenance management system. All network assets (except meters) are registered in Q4, together with their operations, inspection and maintenance records. Q4 produces programmed maintenance work instructions, based on age or condition, with scheduled due dates
Asset Mapping Facilities Management (AM/FM)	AM/FM is SP AusNet's vehicle for accessing and maintaining network system connectivity, and spatial asset location data. AMFM operates on the Smallworld GIS platform. No changes to AM/FM can be made without prior registration in Q4
AMFM Web	General use, view-only version of AM/FM
AutoCAD	Drawing application used for storing detailed information on assets
Stoner	Network planning model used for design of network capacity
EzyEst Pro	Project initiator, generates project number and expenditure authority documentation
PET	Project tracking database (Scoping, Business Case, Approval, Delivery and In Service data and key dates)
Oracle	Financial management system
PowerOn	Connection point management system used to manage and store supply fault information and outage management
PowerOn Web	Connection point management system used to manage all service order work and to log fault calls
Hansen Hub	Customer data management system used to track and record meter information
PV2	SP AusNet's meter reading and DUoS billing system
Gas Master Station	Hub for SCADA, a system which talks to RTUs located at various regulating stations, large industrial and commercial regulator sets and fringe points
PI	Transmission and distribution information repository for SCADA history
GRR	Gas Regulatory Reporting, automated KPI reporting
SCADA Web	Real Time SCADA desktop monitoring
Spatial	GIS based asset reliability modelling tool.
AREVA	Monitoring and Remote operation of gas facilities

6.12.1 Information and Communication Technology (ICT) Strategy

SP AusNet recognises that business systems are essential for effective management and operation of the gas distribution network.

The ICT strategy is focussed on establishing a future state ICT environment that supports the gas network objectives and is aligned with SP AusNet's corporate business plan to Strengthen, Transform, Extend and Modernise (STEM) our business and provides the roadmap to achieving this environment.

In developing the ICT strategy, the following three principals were formulated with a focus on both continuous improvement from the current state and providing an operating phase which support SP AusNet business strategy and network objectives.

- ***Reduce application complexity – Less is More***

The current ICT environment is comprised of solutions from an array of vendors, across applications, and infrastructure.

Consistent with good industry practise, the 'less is more' principle introduces a focus on strategic relationships with core solution providers to establish "platforms" that address multiple business and / or technical requirements. This enables common platforms to be deployed across SP AusNet's three network businesses, lowering the cost for each business.

Over time, the 'less is more' principle leads to a consolidation of application, information and infrastructure solutions onto strategic platforms.

- ***Best fit solutions rather than best of breed***

This objective closely aligns with the "less is more" objective. This aims at solutions that meet the business requirements with a focus on best overall fit to the company rather than adopting best of breed.

This principle means ICT capital expenditure is targeted to meeting business requirements and also puts a focus on the best overall outcome for the business where as best of breed may lead to better outcomes in one area of the business, but an overall reduced position for SP AusNet.

- ***Capture data once***

The principle of capture data once is focussed on minimising the multiple handling of data related to a business event or business object. When a business event takes place (for example, a field service is performed), data about the event should be captured at the point where and when it occurred, and information about a business object (for example an asset) should be captured at the same point. The data for both events and objects does not need to be re-captured and/or re-entered.

The implication of this principle is that there must be tight integration between the business systems that support interrelated business processes, and that the appropriate devices and systems need to be deployed where events are taking place, whether they are in the office, in the field, or in the network itself.

Capture data once leads to increased business efficiency through reduced data handling and by placing the right information in the right person's hands at the right time. It also supports improved data integrity through a consistent view of data about a business object or event. This ensures safety and integrity of networks.

ICT Capital Works Program

Key components of the ICT capital works program is summarised below.

Asset & Works Management

The Asset and Works Management Program is focused delivering improved safety, maintaining network integrity and capacity and maintaining customer service by improving data quality, consolidation and modernising of ICT systems, and assurance of compliance and regulatory obligations through repeatable, transparent and auditable processes. The projects set out in this program will:

- Consolidate and integrate the enterprise asset and works management platform to drive efficiencies across end-to-end asset and works management processes. In accordance with the ICT objective of "less is more" this will consolidate the disparate asset management systems to a strategic common platform and reduce the number of vendors.
- Enhancement of spatial capabilities that will enable geographical visualisation of assets and work activities maintaining the safety of the asset.
- Functional upgrades to the Enterprise Project management and drawings management systems to ensure vendor support.

Customer and Meter Management

Customer and meter management program will focus on providing facilities to maintain the level of customer service with an increasing number of customer interactions over the next five years. The projects set out in this program will:

- Enable a consolidated single view of customer through migration and upgrades to the Customer Information System;
- Enable customer self-serve to maintain efficiency with increasing customer interactions.
- Enable system changes to comply with NECF related changes

Workforce Collaboration

Provide workforce mobility capabilities, including scheduling and vehicle location management that will enable SP AusNet to effectively manage an increase work load associated with our increasing customer base. The project will enable the effective scheduling, dispatching and execution of work, and enable timelier, accurate data to and from the field.

Back Office Management

The Back Office management program is focused on consolidation of core business systems including Billing, Financial, Payroll, HR, Corporate Learning, Risk Management, and Health and Safety. This will enable the organisation to effectively support the volume of activity anticipated in the next five years, driven by the level of asset replacement and maintenance works as set out in the Asset Management Strategy. The projects set out in this program will:

- Standardise and consolidate back office operations to enable the support functions to be delivered more efficiently;
- Increase capacity and capability to manage the corporate financials and activity-based costs in a more coordinated and efficient manner; and
- Support risk management for identified health, safety and environmental hazards, and enable a broader platform to more effectively manage human resources and workplace relations.

Analytics and Reporting

The key drivers for this program are poor data quality; lack of actionable intelligent analytical data; increasing data volumes through major business activities like asset replacement and obsolete reporting platforms and systems. In response to the above, SP AusNet has developed an Information Management strategy that revolves around management of information, data standards, reporting and information capture across all activities in the organisation. The projects set out in this program will:

- Upgrade existing reporting, integration and analytics infrastructure to a modern, integrated and consolidated platform;
- Enable more accurate, timely and relevant report generation for internal and external stakeholders. Provide flexible reporting capabilities to address specific organisational, regulatory and compliance reporting requirements;
- Implement an Enterprise Content Management platform that will manage content presentation and delivery from various sources in the organisation to all users including the field workforce; and
- Define and implement data standards and processes (i.e. common data model, authoritative data sources, and data governance) to improve data integrity, which will enable more effective and efficient reporting and analytics capabilities.

IT Infrastructure and Operations

SP AusNet has IT infrastructure assets that are or near end of life, at a point where they are no longer supported by vendors, or operating beyond their economical asset life. The projects in this program aim to ensure that the IT infrastructure is up to date, robust, scalable, and agile to support the changing business needs and ongoing initiatives. The IT Infrastructure and Operations program will:

- Upgrade existing Richmond and Rowville data centres and storage infrastructure;
- Replace end of life server infrastructure and implement server virtualisation to drive efficiencies and lower cost;
- Replace end of life desktop equipment to maintain staff efficiency;
- Implement robust security and intrusion prevention and Identity and access management capabilities; and
- Upgrade and improve the network and communications infrastructure including a fully integrated VoIP (Voice over internet protocol), secure wireless and net meeting to maintain.

Network Management

Network management systems are critical to maintaining network integrity and customer service. The projects in this program are focused on ensuring these critical systems continue to meet the business needs:

- Upgrade the SCADA system to minimise the risk of failure by ensuring the system and its components remain in vendor support.

6.13 Network Capacity

SP AusNet has an obligation to its various regulatory authorities to maintain and manage the supply of natural gas to its customers in accordance with its Gas Safety Case (this being compliant with the Gas Safety Act and Gas Safety Regulations) and the Gas Distribution System Code.

SP AusNet's annual augmentation program, which includes network reinforcements resulting from expectations of both customer numbers and throughput, is required to create new assets, or upgrade the capacity or functionality of existing assets to achieve appropriate outcomes for customers and other stakeholders.

Network augmentation includes:

- Installation of new supply and reticulation mains;
- Upgrade of existing regulating and metering facilities, including auxiliary equipment;
- Installation of new regulating and metering facilities, including auxiliary equipment; and
- Installation of future supply mains as an enabler for network growth.

The Gas Network Capacity Strategy (AMS 30-17) outlines the augmentation required on SP AusNet's distribution and transmission assets required to meet its regulatory obligations.

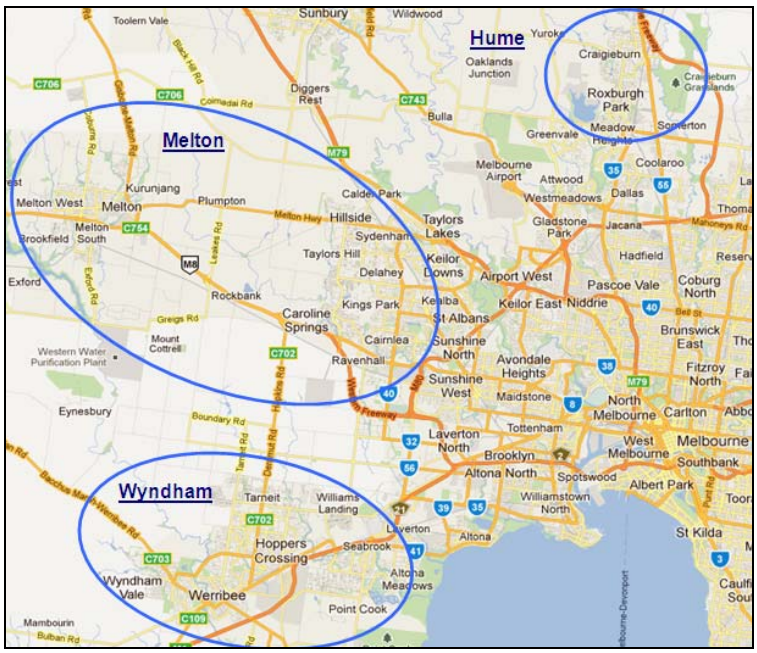
6.13.1 Drivers underpinning Network Augmentation

Demand loading (i.e. peak winter load) on SP AusNet's distribution networks has continued to grow at approximately 3.0% p.a. since winter 2008. This is primarily driven by continued strong residential development, the increasing penetration and reliance of natural gas appliances, and the steady uptake of natural gas in regional towns, an outcome of the natural gas extension program completed 2008.

At present, SP AusNet's network contains three of Victoria's six largest urban fringe growth areas. Specifically, growth rates exceeding 5%p.a have been seen and are expected to continue (in the short term) in the Melton, Wyndham and Craigieburn (Hume) growth areas (See Figure 28). This is compared to total forecast network growth of approximately 1.2% p.a. (demand) and 2.4% (gross connections) to 2017.

New developments are also expected to continue, including Armstrong Creek and Geelong South with an estimated 20,000 customer connections are to come online over a 20-year period.

Figure 28: Melbourne's Western Growth Areas



6.13.2 Historical Network Performance

SP AusNet has divided its gas asset base into approximately 90 separate networks, operating at a range of pressures. SP AusNet is required under the Gas Distribution System Code to maintain minimum network pressures (as outlined in the code), at network extremities, on a one-in-two winters peak day (i.e. an effective degree day of 14.60 with a 50% probability of exceeding this value in any given year). Where required, SP AusNet introduces local reinforcement to cater for specific growth in each network.

Utilisation of SP AusNet's gas networks is increasing, particularly in metropolitan areas. There is a higher utilisation of the metropolitan networks compared with regional networks, reflecting the more predictable nature of a concentrated multi-customer demand pattern. Utilised capacity in the regional networks is lower due to conversion from TLPG (Tempered Liquid Petroleum Gas); however these networks are sensitive to new loads.

6.13.3 Methodology used to identify Network Reinforcement

SP AusNet's distribution networks are continually expanding due to residential growth, and commercial and industrial development. To manage this, continued planning and management is undertaken with the aid of computer-calibrated models that predict the operation of the networks in the field. Models are based on 1-in-2 winters peak day (also known as a 14.60 Effective Degree Day). This standard is based on the system coincident peak day with a 50% probability of exceeding this value in any given year.

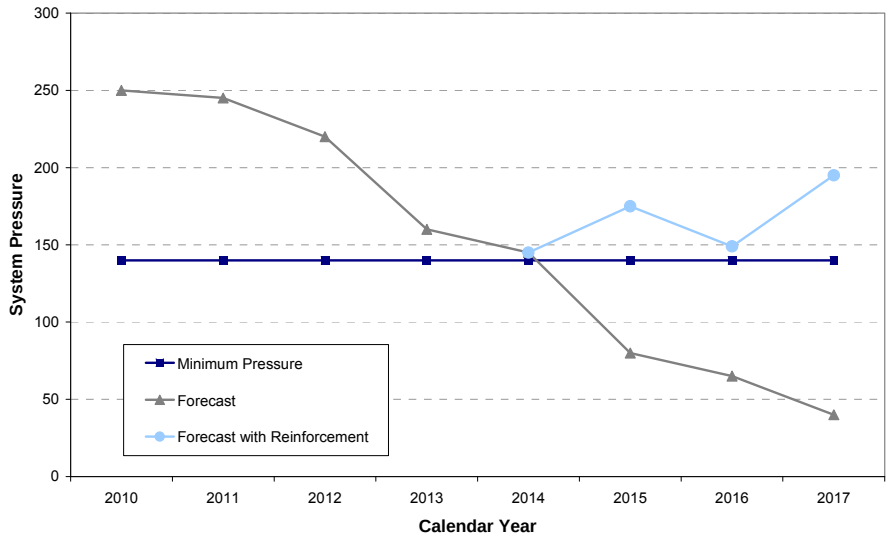
Modelling of forecast gas consumption often indicates the need for future augmentation to the networks to ensure the security of supply and maintenance of fringe pressures in accordance with the Gas Safety Case and the Gas Distribution System Code. SP AusNet's Network Planning group identifies necessary augmentation by simulating forecast growth and demand, which in turn determines the appropriate timing of individual projects.

A major input to augmentation planning is the winter testing program – i.e. a detailed pressure monitoring program conducted at selected locations across the network during peak load conditions. Winter testing data is analysed and used to ensure accuracy of network models and identify required reinforcements to maintain network fringe pressures remain above required minimum levels even in peak load conditions

Network models are validated on a periodic basis or as required (i.e. following a major augmentation project on a network). Document 30-2507-7 Gas Network Planning – Winter Testing Strategy defines the criteria for prioritising and selecting networks for winter testing.

An example of a typical network analysis highlighting the benefit of augmentation, in terms of minimum network pressures, is depicted in Figure 29 (below). The graph indicates the consequence of not following planned augmentation with network pressures falling below 140kPa, the required benchmark for high pressure networks as specified in the Gas Distribution System Code and SP AusNet's Gas Safety Case.

Figure 29: Example of resulting network pressures with and without identified augmentation



SP AusNet's obligation under the Gas Distribution System Code is to maintain network pressures above the minimum levels highlighted in Figure 11.

Table 8: Minimum Network Pressure – Gas Distribution System Code

Network Pressure	Minimum Obligated Pressure
High Pressure	140kPa
Medium Pressure	7kPa
Low Pressure	1.4kPa

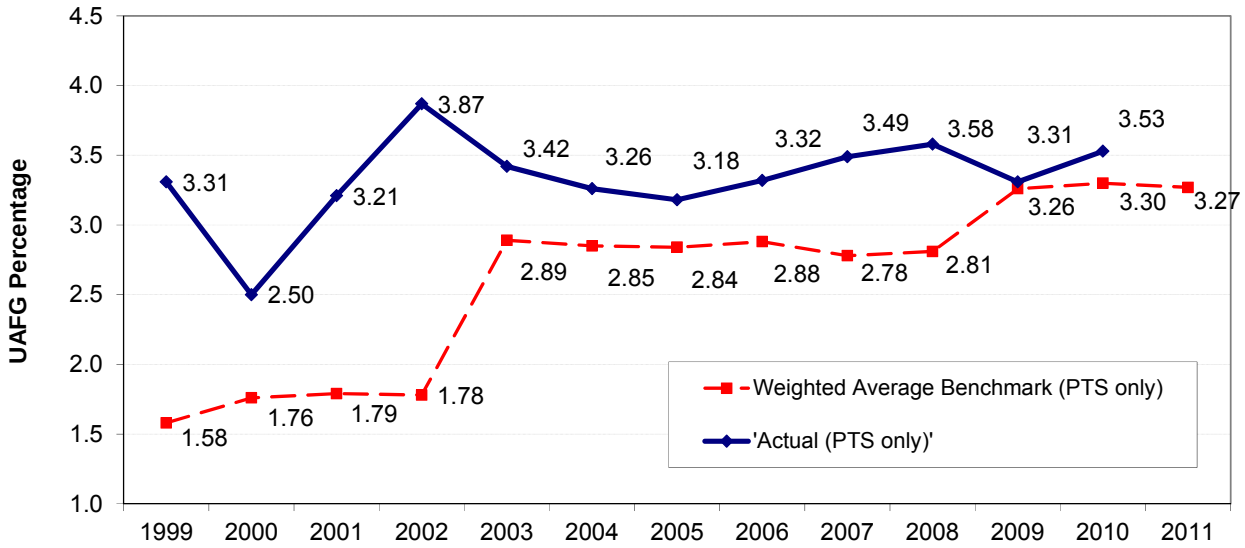
Source: Gas Distribution System Code, version 9, Schedule 1, Part A

6.14 Unaccounted for Gas

Unaccounted for Gas (UAfG) refers to the difference between the measured quantity of gas entering the gas distribution system and the amount of gas used by Consumers. UAfG can arise because of leakage from the system, metering errors, theft, inaccuracy in the conversion from quantity of gas measured to energy (reflecting discrepancies in temperature, pressure, heating value, altitude or the gas compressibility factor), and a number of other minor causes.

SP AusNet's Gas Distribution Network is subject to a UAfG incentive mechanism set by the AER. At the last review, a declining benchmark resulted which reflected an assumed 200GJ reduction in lost gas resulting from each km of low-pressure mains replaced. The following graph (Figure 30) shows SP AusNet UAFG over the past 10 years.

Figure 30: Unaccounted for Gas – 1999 to 2010 (Duplicate of Figure 19)



Retailers pay the difference of the metered consumption and the UAfG benchmark. As a result the Distributor carries the risk of meeting the UAfG Benchmark. If the benchmark is exceeded (i.e. unaccounted for gas is more than allowed), SP AusNet pays retailers for the excess volume of gas at prevailing market rates. The opposite occurs if UAfG is below benchmarks.

In recent times, SP AusNet commissioned an independent consultant to conduct an in-depth analysis to gain a better understanding of the drivers of UAfG to enable a focussed effort to out-perform the benchmark.

A key finding is that:

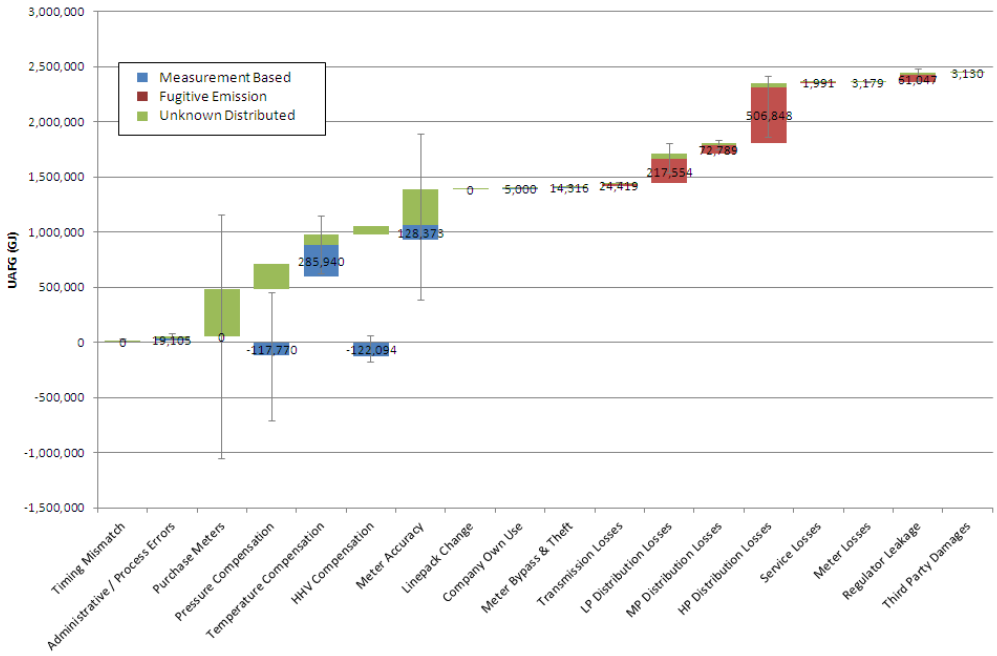
> *"The estimation of UAfG to each category results in 54% of actual UAfG not attributed to any category. This emphasizes the uncertainty associated with UAfG."*

Noting that fugitive emissions are often incorrectly referred to as UAfG (as UAfG also includes measurement based errors) the report grouped the components into two sub categories:

1. Measurement Based UAFG
2. Fugitive Emissions

Each component was then assessed for its expected UAFG contribution together with the uncertainty limits stemming from the assumptions used in each calculation. Each component of UAfG, together with its uncertainty (represented by error bars) is shown in Figure 31 below.

Figure 31: UAFG Components and Uncertainty



Moving forward SP AusNet plans to focus on the following components.

- **Purchase Meters (CTMs) Metering Accuracy.**
  Uncertainty of CTMs ranges from 1.5 to 3% of throughput. Small errors on large throughput can have a large impact on UAfG. For example a systemic 1.5% error in CTM readings would contribute to 45% of UAfG.
- **Large Tariff D Customer Uncertainty.**
  As with CTM accuracy, uncertainty in large Tariff D customers' consumption can have a large effect on total UAfG.
- **Temperature Compensation**.
  Temperature assumption for basic meter customers introduces an error that is estimated to increase UAfG and is more pronounced for customers on HP networks. The addition of customers to HP networks is increasing UAfG slowly on an annual basis.
- **Classification of Class A Meters**
  Movement of customers between the classifications can have a significant impact on UAfG both positive and negative to SP AusNet. As such greater clarification of the definition of Class A is required in order to establish rules for initial classification and any subsequent classification movement due to changes in consumption.

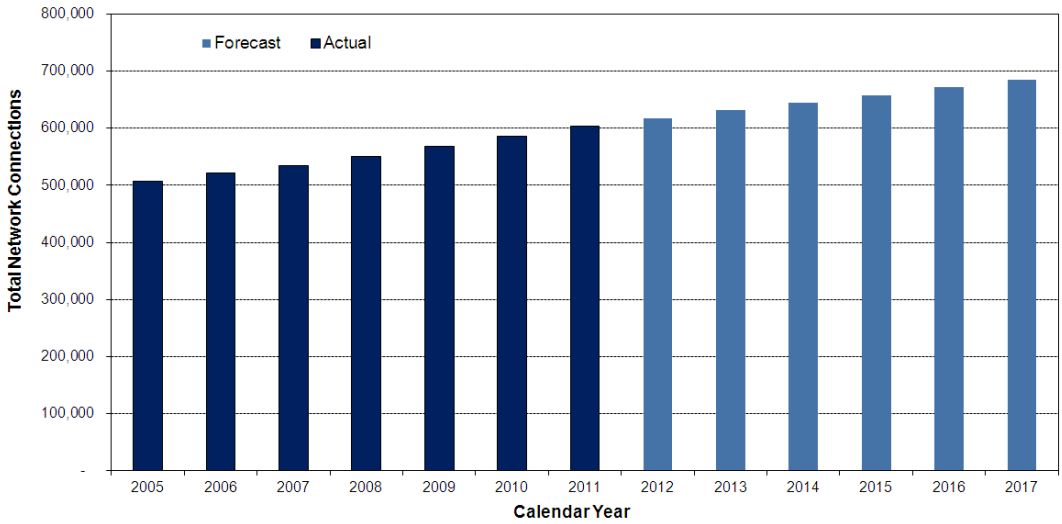
SP AusNet's strategy for maintaining UAFG is contained within document 30-2507-17

6.15 Customer

The Gas Distribution System Code specifies the minimum standards for connection and disconnection of customers to SP AusNet's distribution network. In summary, SP AusNet must, upon request and within specified time periods, connect a customer to the distribution network if it complies with regulatory requirements and on fair and reasonable terms. In essence, standard residential connections with existing infrastructure passing the property are connected without charge (from SP AusNet) to the customer. Connections that are not as straight forward are assessed utilising a 'customer contribution model' to calculate a connection charge based on the cost of augmentation relative to expected future revenues to SP AusNet.

Moving forward growth in SP AusNet's customer connections is expected to be approximately 2.1% (net connections) in the fourth regulatory period. Figure 32 forecasts SP AusNet's gas customer base to 2017.

Figure 32: Customer Base Forecast to 2017



Refer to section 6.13 – Network Capacity (page 50) for SP AusNet's strategy and requirement augmentation to cater for network growth.

6.16 New Towns – Regional Victoria

SP AusNet has worked closely with both state and local governments on the natural gas reticulation of regional towns throughout Victoria. Over the 2003 to 2010 period, SP AusNet successfully completed the reticulation and connection of 12 regional towns in Victoria's west. Moving forward, SP AusNet will continue to work with state and local government to further reticulate new towns where feasible. In general, the reticulation of new towns required with the establishment of significant gas demand, or additional external funding before natural gas distribution systems are viable.

The process for determining which towns are connected to natural gas involves tabling the estimates of cost and subsidy required to achieve an acceptable regulatory and commercial return. SP AusNet works with local governments and gas retailers to ensure awareness of potential demand for natural gas in and around each candidate regional town, and firm up estimates of demand. SP AusNet then works with the State Government and the AER to make reticulation estimates available to the relevant parties.

SP AusNet's summarised strategies for New Towns include:

- Continue to work closely with both State and Local Governments and the AER to resolve funding issues, with particular emphasis on the approval process, costs due to legislative requirements, the consultation process and compliance costs.
- Working on detailed costing of selected towns and making these available to the AER and other authorities to assist funding and subsequent facilitation of 'economically feasible' regional towns.
- Maintaining relationships with Local Governments and Retailers to ensure awareness of changes in and around each regional town to guarantee opportunities are captured as they arise.

6.17 Network Maintenance

6.17.1 General Overview

Routine maintenance is the regular day-to-day operations necessary to keep assets operating safely and reliably. SP AusNet categorises maintenance work in five areas:

- **Scheduled Maintenance:** preventive maintenance work carried out to a predetermined schedule (e.g. regular overhaul of city gates, field regulators and district regulators, lubrication of valves).
- **Condition Monitoring Maintenance:** work carried out a predetermined frequency (e.g. inspection of cathodic protection systems, leakage surveys, checking access to valves).
- **Unplanned Maintenance:** work carried out in response to reported problems or defects (e.g. pipe failure causing leakage, mechanical failure).
- **Site Management:** maintaining the site in a clean, functional, safe and visually acceptable condition.
- **Damages:** repairs to assets (i.e. services and mains) damaged by third parties.

Most plant is checked at fixed time intervals. For example operational checks are conducted biannually on all city gates and field regulators, and annually on district regulators and line valve installations on transmission pipelines. The Gas Maintenance Plan (Document AMP 30-02) details the unplanned, condition monitoring and scheduled maintenance activities for each asset class, referencing the particular SP AusNet Technical Specification or Australian Standard to which the work is to be performed.

6.17.2 Historical Performance

Substantial cost savings for years 2003—2010 have been achieved by applying a risk-managed approach to maintenance activities.

Over the 2002 - 2010 periods, Reliability Centered Maintenance (RCM) analysis has been applied to a number of the maintenance applications with the biggest impacts made in changes on maintenance frequencies. These have been applied on regulator station maintenance (i.e. city gates, field regulators, and industrial commercial installations), leakage survey methods, leak repair criteria and potential surveying of CP protected steel distribution pipelines.

Mains and services leak repairs amount to approximately 60% of the total maintenance expenditure. Older cast iron and bare steel pipes in the inner suburban low-pressure areas generate the majority of the leaks and subsequent expenditure. These pipes are the primary contributors to water and no-gas problems that occur on the network.

Small regulators passing up to 10 m^3/hr, have no preventative maintenance and are replaced on failure. Approximately 5,000 or less than 1% of small regulators fail each year. SP AusNet, at a high level, monitors the performance of regulator types and plans to implement a proactive replacement program (similar to that imposed on meters) to improve consumer safety and network integrity.

SP AusNet uses a number of strategies (post-commissioning) to reduce the occurrence of damage to assets:

- Daily patrol of pipelines (Transmission pipelines)
- No Go Zone
- ‘Dial Before You Dig’
- ‘Hot spot’ patrolling
- Work Permit system
- Use of inspectors when working within 3 metres of TP pipeline
- Marker-posts
- Installation of marker tape over pipeline
- Easement landowner visits

6.17.3 Methodology used to develop Maintenance Programs

SP AusNet determines its maintenance activities by reference to industry best practice, and by introducing incremental refinements to established programs as a result of accumulated knowledge of the asset base. From time to time these schedules are revised to cater for external changes (e.g. new legislation) or reviewed from a zero-base (e.g. application of Reliability Centered Maintenance to maintenance schedules).

Maintenance programs are established to minimise the total lifecycle cost of the asset, taking into account the risk and consequence of failure. RCM is one technique used by SP AusNet to optimise planned maintenance schedules.

6.17.4 Maintenance Forecast

Maintenance activity is forecast to reduce in the next 10 years because of the targeted capital investment planned for the network, particularly the mains replacement program. This investment will result in a reduced number of leaks that SP AusNet must action, and reducing the number of activities associated with visits to regulators.

As the network grows, so does the number of assets needing maintenance and repair from third party damages. Based on planned renewal rates, SP AusNet's low pressure network will be removed in 2025, which is also the expected turning point where network expansion maintenance will exceed the reduction in maintenance improvement programs. However, this increase is offset by the average cost of maintenance per customer, which is expected to decline as the network expands through contiguous growth.

6.17.5 Maintenance Strategies

The following long-term maintenance strategies are adopted for maintenance activities on SP AusNet's gas distribution networks.

- Continue to apply and further refine risk-based and Reliability Centred Maintenance (RCM) approach to maintenance
- Add minor assets (services, meters and regulators) to the Asset Management IT System and instigate RCM analysis to optimise Capex and Opex
- Further ease the possibility of asset damage, by:
    - Education sessions to construction industry associations.
    - Information brochures to councils.
    - Promoting Dial Before You Dig via plant and equipment hire companies.
    - Media advertisements.

7 Plant Strategies

The objective of this section is to provide an overview of SP AusNet's detailed plant strategies, with reference to future capital and operational requirements. Highlighted within each strategy will be:

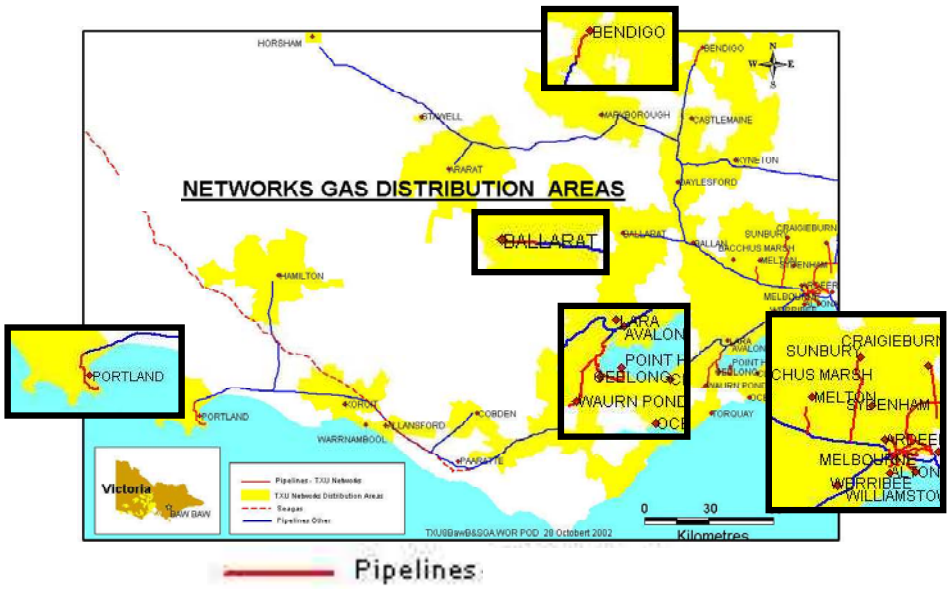
- Asset / plant overview;
- Historical and current performance;
- Capital requirements;
- Operational requirements; and
- Plant specific strategies.

7.1 Transmission Pipelines

7.1.1 Asset Overview

SP AusNet currently has 20 individually licensed transmission pipelines totalling 183km, operating at pressures up to 2,800kPa and ranging in diameters from 100mm to 500mm. Transmission pipelines operate at high pressure to efficiently convey large amounts of energy over large distances. Permits to operate licensed pipelines are issued by the Department of Primary Industries (DPI) with written consent from the Minister of DPI required for their operation.

Figure 33: SP AusNet's Gas Transmission Network



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 (2008). Corrosion protection and pipeline patrols are examples of proactive measures used to maintain the integrity of the transmission network.

The average age of SP AusNet's pipelines is 35 to 40 years, with the latest pipeline constructed in 1991 (Portland City Gate to Portland Smelter). The conservative engineering life of transmission pipelines is 80 years.

Table 9: Breakdown of SP AusNet's Pipeline Licence Details

License Number	Location and Route Description	Length (km)	Diameter (mm)	Year Commissioned
16	Altona to Derrimut	6.44	100	1961
17	Derrimut to West Melbourne	15.7	150	1962

License Number	Location and Route Description	Length (km)	Diameter (mm)	Year Commissioned
18	Footscray to Sunshine	12.03	400/300/200	1969
19	West Footscray to Williamstown	8.8	400/300/200	1969
54	Fawkner to Coburg	4.5	250/150	1972
57	Corio to Belmont to Point Henry	24.5	350/250/200	1973
64	Fawkner to Craigieburn	10.75	250/200/150	1971
76	Maidstone to Braybrook	4.1	300	1972
80	North Geelong to Fyansford	4.93	350	1972
82	Sunshine to Sunshine North	1.2	300	1973
84	Yarraville to Yarraville	2.8	200/150/100	1977
90	Exford to Melton	8	150	1974
97	Corio to Shell refinery	0.6	200	1974
99	Fyansford to Waurn Ponds	12.6	250	1975
113	Brooklyn to Altona	4.9	500/300/100	1977
184	Ararat, Stawell and Horsham City Gates	1.0	-	1998
188	Ballarat City Gate to Dana Street	7.1	200	1972
189	Bendigo City Gate to Able Street	9.2	200	1972
190	Derrimut, Bacchus Marsh, Ballan, Wallace, Daylesford	1.0	-	1993
191	Sydenham, Diggers Rest and Sunbury City Gates	1.0	-	1978
192	Kyneton City Gate	1.0	-	1980
193	Maryborough City Gate	1.0	-	1979
194	Allansford City Gate	1.0	-	1985
195	Koroit City Gate	1.0	-	1991
196	Portland City Gate to Portland Smelter Services	15.8	200	1991
197	Brooklyn Compressor Station to Somerville Road	1.7	400	1972
198	Snydes Road, Lock Avenue, Lara and Avalon City Gates	1.0	-	1972
199	Cobden City Gate	1.0	-	1993
200	Hamilton City Gate	1.0	-	1994
203	Keon Park West to North Melbourne	25	450	1970

License Number	Location and Route Description	Length (km)	Diameter (mm)	Year Commissioned
221	Craigieburn Field Regulator (Brick & Pipe)	1.0	-	1975
235	Colac City Gate	1.0	-	2001
	Total	**183km**		

7.1.2 Current Performance

The transmission system is in good condition due to original construction techniques and controls, and the ongoing maintenance management, particularly the cathodic protection program.

Network analysis indicates that the existing transmission system is adequate for the next 30 years, based on current load forecasts with sufficient supply from the Declared Transmission System (DTS), which is operated by Australian Energy Market Operator (AEMO).

Less than 10 near misses and no incidents have been recorded against SP AusNet's transmission assets over the past two years (2009 – 2010). Examples of near misses would include unauthorised operations being conducted within transmission easements. An incident may result in physical contact with a transmission pipeline or loss of supply.

7.1.3 Capital Requirements

The management of SP AusNet's existing transmission network is considered operationally intensive when compared to ongoing capital requirements.

Increased pipeline integrity, which leads to increased public safety and security of supply, are the primary drivers for proposed capital works in the short to medium term. The requirement for new pipelines or major alterations of existing pipelines is predominately customer driven and not discussed within this section. Refer to section 6.13: Network capacity for further details on pipeline alterations driven from capacity constraints.

Capital programs to 2017 are detailed within SP AusNet's Gas Transmission Pipeline Strategy (AMS 30-50) and are captured within the following overarching principles.

- **Relocation of Exposed Transmission Pipework**
  Relocate, preferably below ground, above ground or exposed transmission pipework that poses a significant risk to public safety or security of supply.

- **Removal of Redundant Pipework**
  Removal of redundant above ground pipework to eliminate the threat of failure or malicious damage and the consequent impact to public safety

- **Increased Pipeline Security**
  Installation of pipeline markers or protective barriers to provide additional protection identified sections of pipeline that may be susceptible to external interference.

7.1.4 Operational Requirements

Public safety and regulatory (license) compliance are the dominant drivers underpinning maintenance activities on licensed pipelines. Maintenance includes pipeline patrol, third party work inspections, leakage survey, corrosion (cathodic) protection, minor coating repairs, fault repairs, maintenance of pipeline markers and easements, pipeline integrity inspections and line valve/branch valve maintenance.

SP AusNet has developed and maintains an Integrity Management Plan (30-2507-1) which covers each of SP AusNet's licensed pipelines. A qualitative pipeline risk assessment has been used for the purposes of prioritising pipelines based on risk rankings.

Each pipeline is reviewed every 5 years and assessed in terms of:

- Historical data (Coating defects, pigging data, damage data, repair data, etc),
- Asset data (MAOP, wall thickness, design factors, %SMYS, operating pressure, etc), and

- Assessment data (Hot spots, over-pressure protection review, MAOP review, etc).

Utilising a risk based approach; strategies for further maintenance and/or inspections may be recommended following the assessment of individual pipelines.

Inspection strategies may include:

- Increase coating defect survey intervals,
- Intelligently Pigging of the pipeline,
- Non-invasive pipe inspection tools eg, Dig ups, No Pig Tool, etc, and
- Increase leakage survey frequency.

Proposed operating Strategies may include:

- Pressure downgrading of pipeline,
- Review of current protection measures, and
- Introduce automated control of line valves for instant pipeline isolation.

7.1.5 Plant Specific Strategies

The following plant specific strategies are employed for the management of SP AusNet's transmission pipelines. Refer to SP AusNet's Transmission Pipelines Strategy (AMS 30-50) and Integrity Management Plan (30-2507-1) for further details.

- Ongoing revision of maintenance practices (e.g. pipeline patrol). Implement changes based on "risk" rather than historical practices.
- Continuation of hot spot surveying, identifying and recording areas of high risk. Increase frequency of integrity dig-ups confirming the integrity of protective coatings.
- Investigate and implement improved methods of demonstrating pipeline integrity.
- Continue management of cathodic protection systems with the aim of maintaining levels above 98%.
- Relocate to below ground, for the purposes of safety and security of supply, identified sections of above ground transmission pipelines.

7.2 Regulating Facilities - Network

7.2.1 Asset Overview

Pressure Regulators

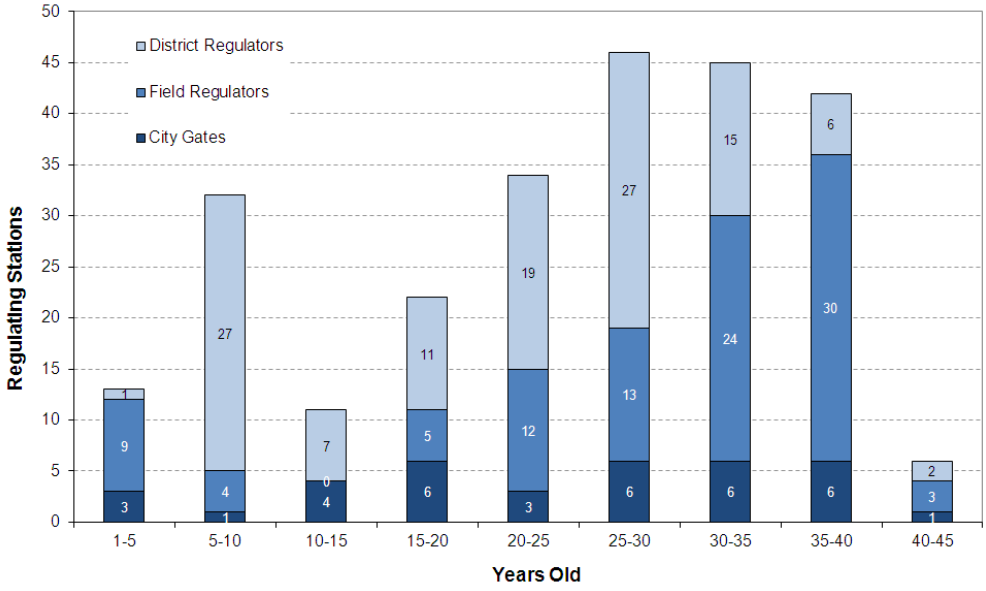
A pressure regulator is a valve that automatically opens or closes to match the flow of gas through the regulator to the demand for gas placed on the downstream network. The regulator does this by maintaining a predetermined set pressure downstream of the regulator. Pressure regulators are used throughout SP AusNet's network to maintain safe and useable pressures within its networks.

There are three (3) broad classifications of network pressure regulating stations:

- **City Gates** that regulate gas into SP AusNet's high-pressure and transmission pressure networks form the states Declared Transmission System (DTS).
- **Field Regulators** that feed gas into SP AusNet's high-pressure and medium-pressure distribution networks. The facility is either supplied by SP AusNet's transmission or high-pressure distribution network.
- **District Regulators** that control the pressure levels in the low-pressure reticulation system by the reduction of either high or medium pressure to low-pressure.

Each facility may include a host of auxiliary equipment namely valves, filters, SCADA, civil assets and cathodic protection. A city gate also includes highly accurate metering assets known as the custody transfer meters (CTM), which are owned and maintained by the DTS operator.

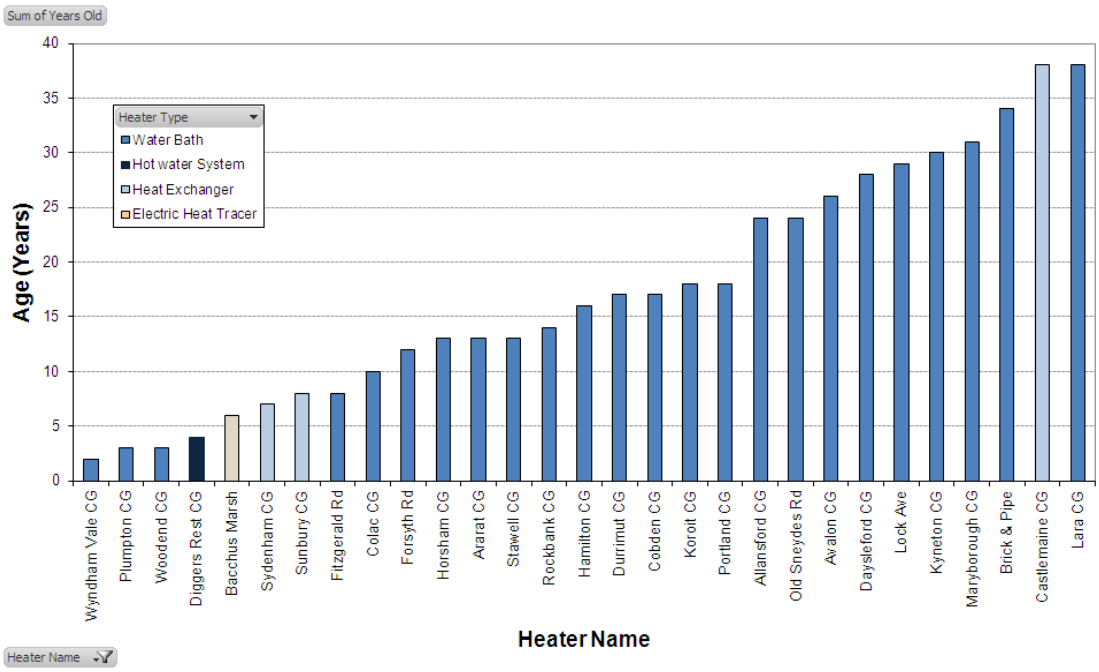
Figure 34: Age Profile of SP AusNet Regulating Stations (December 2010)



Heaters

Gas pre-heat is required at City Gates or Field Regulators where the pressure drop across the facility causes a significant drop in gas temperature resulting in icing of pipework. The phenomenon is known as the Joules-Thompson effect which equates to approximately a 5.6 degree temperature drop per 1,000kPa decrease in pressure. Icing of pipe work causes reliability and control problems with regulators and an inability to operate site valves.

Figure 35: Age Profile of Network Heaters (December 2010)



Liquid Contamination (Coalescers)

SP AusNet has been aware of issues related to liquids passing from the DTS into SP AusNet's distribution assets for some time. The most significant impact of liquid contamination has been identified with high use Tariff D consumers at end points in the Ballarat, Koroit and Geelong Networks, sustaining damage to plant and equipment.

To prevent liquids entering SP AusNet's networks a number of Coalescer filters have been installed at City Gates and consumer connection points over the 2008 to 2012 GAAR periods. Additionally, two portable skid mounted Coalescers have been built and are available for rapid installation within the network when signs of liquid contamination arise. Portable Coalescers have also been used to protect SP AusNet asset during pigging operations conducted by the DTS operator.

7.2.2 Current Performance

Pressure Regulators

The reliability of SP AusNet's regulating stations is critical to system integrity and continuity of supply. The reliability of each site type, since 2006 is summarised;

- **City Gates:** SP AusNet's 37 city gates, on average, have experienced approximately two breakdowns per site, per year since 2006. However, some sites are over represented in terms of failures, particularly Lock Ave City Gate, which experiences an average 6 failures per year and Diggers Rest City Gate which averages 5 per year.

- **Field Regulators:** SP AusNet's 104 field regulator sites have experienced an average 65 faults per year (total) over the last 5 year period, with a spike of 90 faults occurring in 2010. This spike is attributed to flooding problems as a majority of the sites are underground. As such, a program is being developed to install high water level alarms in flood prone pits.

- **District Regulators:** SP AusNet's 114 district regulators have experienced an average of 32 faults per year, with a spike of 47 faults in 2010, which was once again due to flooding of underground sites. Failure of the regulators to obtain 'lock up' has also been a common problem.

Due to high levels of redundancy within pressure regulator station design, (with three levels of protection on City Gates / Field Regulators and two levels on District regulators) no gas outages have been associated with the above failures.

Heaters

SP AusNet currently operates 28 gas pre heaters at various city gate sites. Between 2006 and 2010 each site has experienced a number of failures. However, some sites have proven far more reliable than others, with the number of faults ranging from 2 to 51 failures over the 5 year period. The majority of these failures have been the result of the heater systems pilot light failing.

Liquid Contamination (Coalescers)

SP AusNet's fleet of Coalescers are considered extremely reliable with no recorded faults since 2006.

7.2.3 Capital Requirements

Capital programs identified from maintenance or operational deficiencies are detailed within SP AusNet's Regulating Facilities (Network) Strategy (AMS 30-51). Capital requirements (upgrade or replacement) due to capacity constraints are captured within SP AusNet's Network Capacity Strategy (AMS 30-17) which is summarised in Section 6.13 (p. 50) of the AMS.

The following principles / strategies are followed during the definition of the capital program for network regulating facilities.

- **Asset Replacement:** Proactive replacement of aged and/or obsolete regulators operating at high, medium and low pressures where parts are no longer manufactured by the Original Equipment Manufacturer (OEM),
- **New Facilities:** Installation of new heaters to major regulating stations. Freezing of pipework creates a safety hazard, will adversely affect the performance of the regulating station and reduce the integrity of downstream assets;
- **Asset Safety:** Programs to increase public and/or employee safety. Examples included the installation of water bath heater platforms to reduce OH&S risks onsite and a program to relocate regulating stations to underground due to urban growth encroachment;
- **Asset Security:** Upgrade of security fencing at high risk sites to prevent unauthorised access.

7.2.4 Operational Requirements

Pressure Regulators

City Gates have full refurbishment schedules that vary from 'breakdown only' for low risk stations to 10 years for medium risk stations, 6 years for high risk stations and 3 years for very high risk stations.

Detailed analysis of historical fault data via RCM modelling, on the various types of city gate configurations and components as well as the impact of failure on the network has determined the best fit maintenance regime.

Field and district regulators are stripped and rebuilt every 6 or 10 years depending on whether they are deemed high or low risk. Operational checks are conducted at least every six to 12 months.

City gates, Field and District regulators have a useful life of 60 years with this type of major maintenance.

Heaters & Coalescers

Water bath heater maintenance and Coalescer maintenance is performed at the same time as the city gate regulators as they are part of the same city gate station facility.

Heater coil inspection / refurbishment are carried out every 8 years or as identified during full maintenance.

Filtering elements within Coalescers are replaced during the scheduled full maintenance of the regulating facility it operates.

Refer to SP AusNet's Regulating Facilities - Network Strategy (AMS 30-51) for additional details on current and future maintenance programs.

7.2.5 Plant Specific Strategies

The following plant specific strategies are employed for the management of SP AusNet's network regulating assets. Refer to SP AusNet's Regulating Facilities – Network Strategy (AMS 30-51) for further details.

- Replace aged and/or obsolete regulators where parts are no longer manufactured by OEM providers.
- Installation of heaters at City Gates to mitigate freezing of regulating facilities and downstream assets.
- Asset Safety & Security investment to mitigate and reduce hazards.
- Continual optimisation of maintenance frequencies (based on RCM principles) to improve or maintain network safety and reliability.
- Introduction of SMART network technology to automate network pressure control.
- Improved asset selection that minimises total lifecycle costs.

7.3 Regulating Facilities – Consumer

7.3.1 Asset Overview

As with network regulators, each supply point (i.e. connection) from the distribution network contains a regulator that matches the flow of gas through the regulator to the demand for gas by the consumer. In total SP AusNet has approximately 605,000 connection points, to the distribution network, each with a dedicated regulating facility.

Regulators are sized based on expected consumer demand which can range from 6m^3/hr for domestic loads to in excess of 2,500m^3/hr for large industrial and commercial customers, for which a purpose-designed regulator unit is installed. Regulator assemblies exist in a variety of designs (e.g. single run or duel run) and enclosures (e.g. black boxes, metering room, etc) which are dependent on the consumers demand profile and underlying site conditions.

The standard metering pressure for domestic customer is 1.1kPa (for low pressure networks) or 2.75kPa (for medium and high pressure networks). Industrial & Commercial consumers can have metering pressures up to 100kPa subject to SP AusNet approval.

Accompanying the pressure regulator, each supply point also contains a gas meter used to measure the volume of gas flowing to the consumer. Refer to Section 7.5 (p.73) of the AMS for SP AusNet's management of metering assets.

7.3.2 Current Performance

SP AusNet's asset management database (Q4) does not record the location and detail of domestic regulators commissioned within the network, therefore, the age profile of domestic regulators can be estimated but is essentially unknown.

Reactive replacement of domestic regulators occurs when the unit fails in operation and is replaced with a new asset of similar capacity. As demonstrated in Figure 36 below, leaking regulators contribute to almost 80% of all domestic regulator failures.

Figure 36: Domestic Regulator Fault Breakdown (Calendar Year 2010)

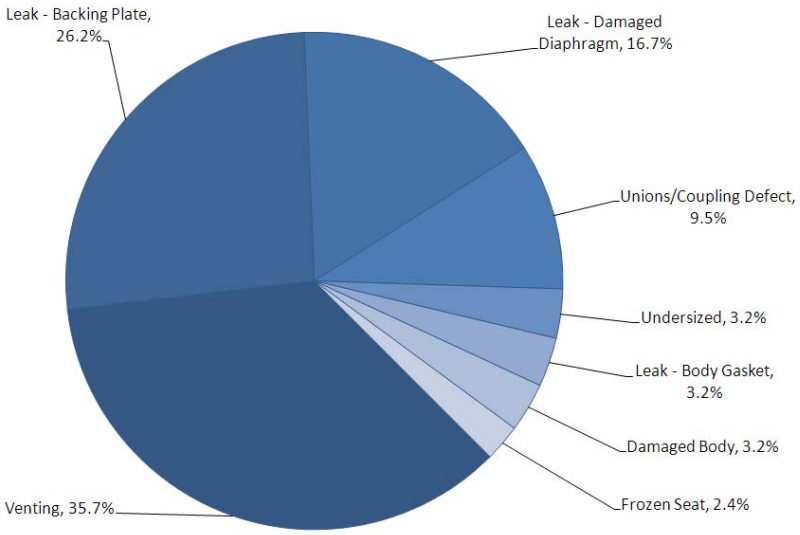
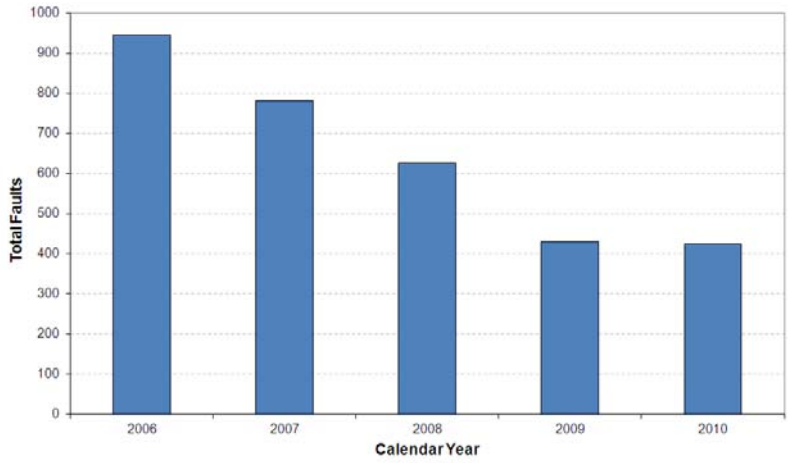


Figure 37 (below) shows the trend of faults for all Industrial & Commercial (I&C) sites. It can be seen that the total number of faults has decreased over the past few years indicating an improvement to the current state of I&C site assets.

Figure 37: Historic Volume of Industrial & Commercial Regulator Faults



7.3.3 Capital Requirements

Capital requirements for consumer regulators are identified proactively during maintenance activities and reactively if a regulator was to fail. Security of supply, public safety, spare part availability and financial efficiencies are all drivers for capital works on consumer regulators.

An overview of capital programs delivered for consumer regulators is provided. Refer to SP AusNet's Regulating Facilities – Consumer Strategy (AMS 30-53) for further details.

- **Replacement of Obsolete Industrial & Commercial Regulators:** SP AusNet actively replaces industrial and commercial regulators that have become obsolete with spares no longer manufactured by the OEM providers. Proactive replacement promotes network integrity and security of supply.

- **Miscellaneous Works:** Capital expenditure is regularly incurred on minor as hoc work at industrial and commercial sites. This work is required due to a combination of OH&S, risk mitigation, regulatory compliance, asset integrity and/or operational requirements.

7.3.4 Operational Requirements

Domestic regulators are operated to failure with no scheduled maintenance conducted. When failure does occur, it is replaced with a new regulator of similar capacity. Domestic regulators are not refurbished as it is not economical to do so.

Industrial and Commercial installation with outlet pressures ≥ 4kPa are classified as system operations units and undergo 6 or 12 monthly operational checks. In addition, the same regulating installations are periodically refurbished (soft rubber components are replaced) as part of the preventative maintenance regime. The interval between refurbishment, 6 year or 10 years, is based upon the RCM principles and the criticality of the regulating station.

7.3.5 Plant Specific Strategies

The following plant specific strategies are employed for the management of SP AusNet's consumer regulator assets. Refer to SP AusNet's Regulator Facilities – Consumer Strategy (AMS 30-53) for further details.

- Improve the safety, security and accessibility of legacy installations.
- Replace obsolete regulating assets on commercial and industrial stations (before in-service failure) where the consequence of failure is significant.
- Improved asset selection that minimises total lifecycle costs.
- Implement IT system to record the location and asset details of domestic regulators.

7.4 Distribution Mains & Services

7.4.1 Asset Overview

The gas mains distribution network is comprised of 9,863 kilometres (km) of mains that operates up to 1050kPa maximum operating pressure. The distribution system transports gas from the transmission network (>1050 kPa) via three main pressure tiers to consumer service lines. The pressure tiers are referred to as low, medium, and high with a fourth minority pressure tier known as ‘High Pressure 2’. This pressure tier accounts for less than <1% of the total distribution network. In relation to material types, four dominate material types exist (cast iron, poly vinyl chloride, polyethylene and steel).

Table 10: Length of mains by pressure classification

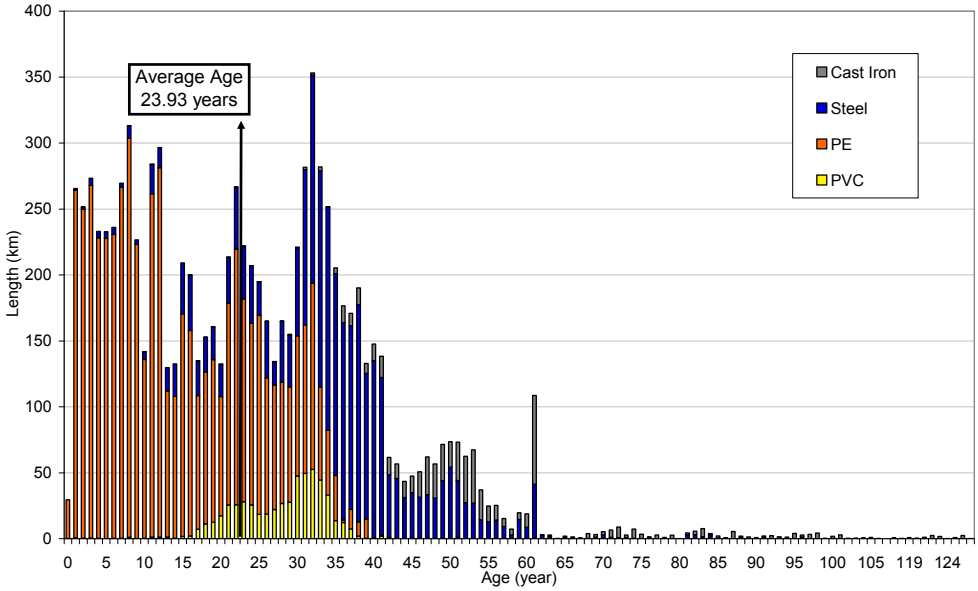
Pressure Tier	Operating Pressure (kPa)	Length (km)	% Allocation
Low (LP)	Up to 3 kPa	1,273	13%
Medium (MP)	15 kPa - 140 kPa	757	8%
High (HP1)	140 kPa - 515 kPa	7,801	79%
High (HP2)	515 kPa - 1050 kPa	82	<1%
	Total	**9,863km**	**100%**

Asset Management Strategy – Gas Distribution

Gas services operate at pressures up 515kPa. They are predominately constructed from polyethylene with a small percentage constructed in steel, aged wrought iron and poly vinyl chloride.

The age profile of SP AusNet's distribution mains are displayed in the Figure 38 below. The age profile of the network ranges from 124 years old with an average network age of around 23.9 years.

Figure 38 - Network Age Profile (2011)



Material types utilised within SP AusNet's distribution network is captured in Table 11 (below).

Table 11: Pipe Material Summary

Material Type	Description	Network
Cast Iron	Cast irons generally contain more than 2% carbon. There are two main types; lead jointed and mechanical jointed.	6%
Polyethylene	Polyethylene mains were introduced in the 1970's accounts for more than 50% of the total distribution mains in the network. It can operate at high pressure and is not susceptible to corrosion.	58%
Unprotected Steel	This piping system is based on bare steel and galvanised iron pipes that have been joined by having threads cut into the ends and screwed into joining couplings. It is considered that the galvanising will be of considerably reduced effectiveness in reducing corrosion when buried	4%
Protected Steel	Coated steel in both screwed and welded are dependent on the corrosion protection coating. The coatings are regarded as having an effectively indefinite life. The effective life of this piping system is determined by the faults in the corrosion protection coating	27%
PVC	Poly Vinyl Chloride (PVC) was used extensively from 1970 to 1997 in the replacement of cast iron mains in "like" for "like" mains replacement program adopted by the Gas & Fuel at the time. PVC is only rated for operation at low pressure	5%

Refer to Table 1, Section 3.3 - Gas Network Overview, Locality & Geography (page 12) of the AMS for network composition by pipe pressure and material.

7.4.2 Current Performance

Figure 39 (mains) and Figure 40 (services) shows the leakage rate (leaks per km of mains) for mains and services over the past 9 years by network pressure classification.

Figure 39 - Mains leakage rate of whole network by pressure classification

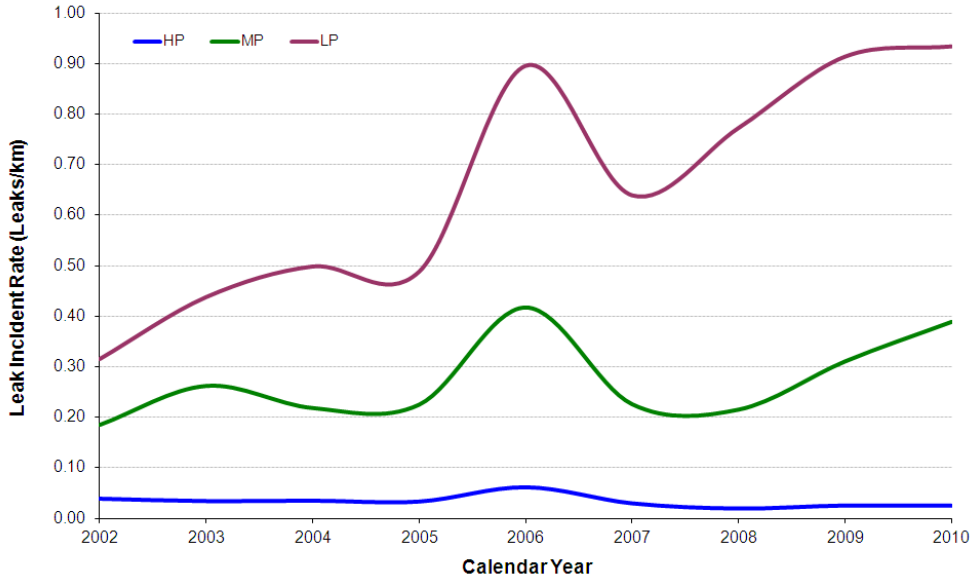
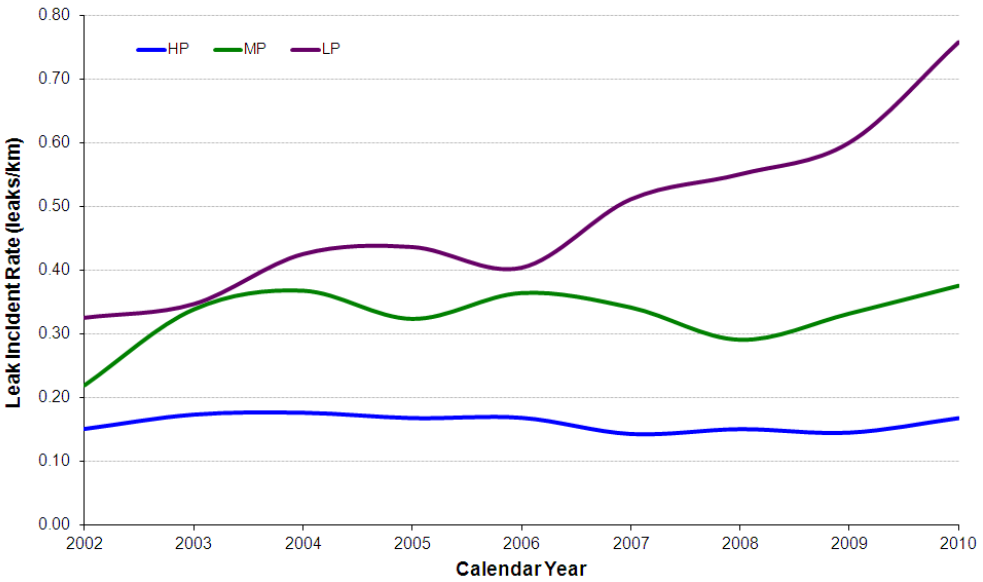


Figure 40 - Service leakage rate of whole network by pressure classification



SP AusNet periodically reviews failure data to monitor the relative performance of material types and pressure tiers. Cast iron mains contribute most in terms of volume and leakage rates within the network. As cast iron is predominately found within the low pressure system, the low pressure network also contributes the majority to network failures.

Refer to SP AusNet's Mains and Service Strategy (AMS 30-52) for detailed breakdowns of asset performance by material type and pressure tiers.

7.4.3 Capital Requirements

Mains Replacement

SP AusNet has an established history of replacing its low pressure mains and services to high pressure standard. The focus of SP AusNet's current replacement program is to target heavily deteriorated low pressure cast iron mains; as inferred by high incidence of leaks. Modern polyethylene mains, installed through open cut or insertion methods are predominantly used to upgrade the low pressure networks to high pressure allowing the network to operate at higher pressures, reducing leakage and improving safety. The responsible replacement of aging mains, on a safety risk prioritisation basis, is a key mitigation control set out in SP AusNet's Gas Safety Case.

In summary, SP AusNet's mains replacement program has the following drivers:

- Reduction in the safety risks created by gas leaks;`
- Improved system capacity and reliability;
- Continued compliance with regulatory benchmarks, the Gas Safety Case (GSC) and Gas Distribution System Code;
- Reduction in carbon emissions and environmental impact;
- Long-term reduction in network maintenance; and
- Move towards a uniform high pressure gas network.

The rationale for undertaking the low pressure replacement program is based on a risk assessment of the network by material type. This risk assessment also applies to medium pressure mains, which demonstrates that certain material types within that asset group also represent a significant safety risk. SP AusNet's research indicates that although the risk of a medium pressure asset failure occurring is low; the associated consequence (in any populated area) could be significant.

The analysis in Table 12 (below) shows the relative risk associated with different main material types at different pressures. Failure modelling has indicated that replacing the low pressure network and additionally targeting some medium pressure mains of specific material types will improve safety and reliability by reducing incidence of leaks and, resultantly, outages.

Table 12: Length of Mains by Pressure Classification

	Material	Average Leak Incidence (leaks / km) (A)	Gas Flow Ratio[13] (B)	Risk Weighting (AxB)
High Pressure	PE	0.02	11.95	0.24
	Steel (Protected)	0.03	11.95	0.36
Medium Pressure	PE	0.04	4.01	0.16
	Steel (Protected)	0.19	4.01	0.76
	Steel (Unprotected)	0.36	4.01	**1.44**
	PE CL250	0.95	4.01	**3.81**
	Cast Iron	1.28	4.01	**5.13**
Low Pressure	PVC	0.16	1.00	0.16
	Steel (Protected)	0.54	1.00	0.54
	Steel (Unprotected)	0.68	1.00	0.68

[13] Refer to SP AusNet's detailed Mains and Service Strategy (AMS 30-53) for the underlying calculations.

Cast Iron	1.47	1.00	**1.47**

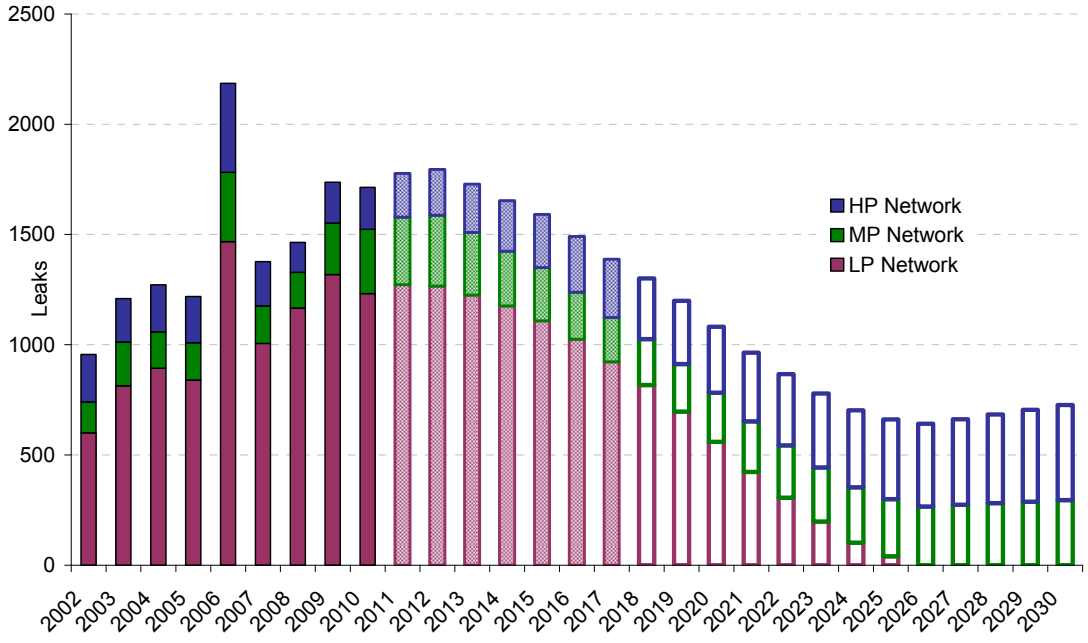
Medium pressure asset failure is most likely to occur on cast iron, CL250 PE or unprotected steel mains; other asset materials do not demonstrate high leak incidence, which is a strong indicator of significant deterioration.

A programme to replace approximately 150km of medium pressure mains will remove all the cast iron medium pressure assets (highest failure risk) and the worst performing CL250 PE and unprotected steel mains for the network. SP AusNet proposes to implement this programme from 2013 within the fourth access arrangement period to reduce the current leak incidence per km profile of the medium pressure network and maintain and improve overall network safety. In doing so, not only is overall public safety risk managed but occupational health and safety for SP AusNet employees and contractors is improved; by avoiding increased need to undertake reactive shut offs and repairs, which on medium pressure assets can be extremely challenging.

SP AusNet maintains that the gradual replacement of the entire low pressure network is required and intends to continue to replace 90km of main per annum. If unchecked, the expected deterioration of the remaining cast iron and unprotected steel mains on the low pressure network is forecast to lead to rapid increases in leak incidences. SP AusNet's modelling indicates that 160 km of low pressure pipelines would need to be replaced each year in order to stabilise leakage incidence per km of main. However, the replacement rate of 90km per annum provides a sustainable approach to managing the risk profile of the low pressure system, as demonstrated in SP AusNet's Mains and Services Strategy (AMS 30-53), at reasonable cost. SP AusNet maintains that the low pressure mains replacement program should continue until all low pressure assets are replaced, this is targeted to occur during, or around, 2025 at 90km per annum.

Based on SP AusNet's proposed overall 120 km of annual replacement during the fourth access arrangement period, and an assumed return to replacing only low pressure mains thereafter (a policy for future evaluation), the number of leaks on mains is forecast to decrease within the fourth regulatory period as indicated in Figure below.

Figure 40: Cumulative forecast of network leaks by pressure tier



Conversely, the incidence of leaks on the high pressure network is expected to increase simply as a result of network growth; as all growth assets are constructed to high pressure standard. This is consistent with the forecast in Figure 41 as high pressure network leak incidence per km is expected to remain broadly constant, but as SP AusNet moves closer to a uniform high pressure network the length of high pressure mains increases.

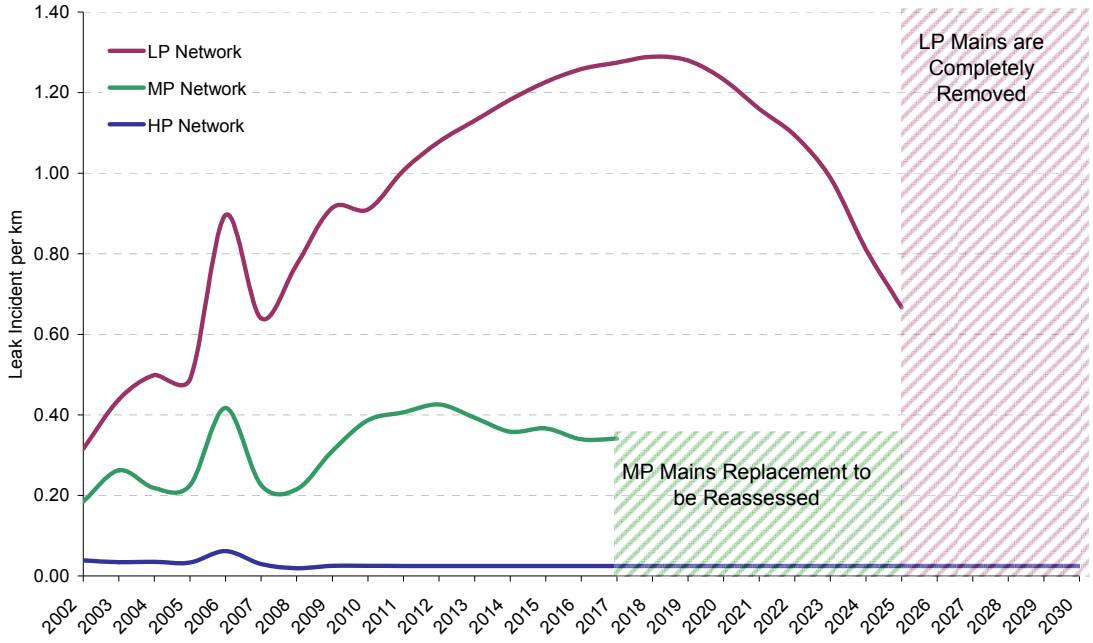
When leak incidence is considered per km of main, 30 km of medium pressure mains replacement per annum is sufficient to reduce the leak incidence per km. This improves both the current risk profile of the remaining medium pressure network and overall network risk. As the length of the medium pressure network is reduced

by replacing the worst performing sections, the remaining assets operated by SP AusNet represent an improved safety risk outcome.

However, this is not the case for the low pressure distribution network which is deteriorating at a rate that indicates maintaining the current number of leak incidence per km is not realistic or sustainable[14]. The renewal rate of 90 km per annum provides a reduction in the total volume of leaks but an increase in leak incidence per km, peaking at approximately 1.3 leak incidents per km in 2019 as indicated in Figure 41 (page 72). Past 2019, the fastest deteriorating assets have been replaced and at that stage the leak reduction impacts of removing mains exceed the rate of deterioration and improvements are visible. As shown below, in 2025 the last section of low pressure main is expected to have an average leak incidence per km of approximately 1 when it is replaced.

[14] Over 400 km of renewal is required in 2012 to maintain leak rates at the current level.

Figure 41: Leak incidence per km of mains by pressure tier



With an expected increase in leak incidence per km for the low pressure network, identification of highest risk areas for mains replacement becomes essential to limiting the risk to which customers, public and employees are exposed.

Miscellaneous Mains Replacement

Any mains under 20 meters in length identified by maintenance that is beyond repair and require urgent/emergency replacement is capitalised under minor asset replacement (010). This excludes mains replacement associated with mains replacement program and third party damages
Two counteracting factors influence the reactive mains replacement requirements:

- Mains deterioration with age and reduction in top ground cover increases the number of mains failing that require replacement.
- Mains upgrades associated with LP and MP mains replacement program will decrease the total aged cast iron mains that have a higher risk of failure.

Therefore it is predicted that reactive replacement due to Mains failure is to remain constant and the current reactive mains replacement rate is to be maintained.

Service Replacement

Service replacement is driven by two mains mechanisms:

- **Service Upgrade**: This involves service replacement as part of the mains replacement program. Services associated to mains that are being replaced are tested to HP standard. Failure of the pressure test will result in the service being replaced.

  This service replacement is incorporated as part of the mains replacement program and is dependent on the ratio of number of services per length of mains replaced.

- **Miscellaneous Service Replacement (reactive):** Any services identified by maintenance that fails a pressure test and/or is beyond repair are replaced under a reactive mechanism and capitalised under minor asset replacement (010). This excludes service replacement associated with mains replacement program and third party damages.

Two counteracting factors influence the reactive service replacement requirements:

- Services deterioration with age and reduction in top ground cover increases the number of services failing that require replacement
- Service upgrades associated with mains replacement program will decrease the number of reactive service replacement required. This is because the mains replacement program targets aged cast iron mains that typically have aged services connected to it.

Therefore it is predicted that reactive replacement due to service failure is to remain constant and the current service replacement rate is to be maintained.

7.4.4 Operational Requirements

Both proactive and reactive maintenance is conducted on SP AusNet's distribution mains and services to ensure their ongoing integrity, and to minimise public risk and lifecycle costs.

Proactive maintenance includes SP AusNet's leakage survey program which employs a risk based survey methodology by targeting areas of highest risk. Cathodic protection techniques are also applied to steel mains to extend their useful life by limiting the incidence of corrosion.

The predominant form of reactive maintenance is the repair of both mains and service leaks identified through pubic reports and leakage survey activities.

7.4.5 Plant Specific Strategies

The following plant specific strategies are employed for the management of SP AusNet's distribution mains and services. Refer to SP AusNet's Mains and Services Strategy (AMS 30-52) for further details.

- Continuation of the current low pressure mains renewal methodology, with 90km of mains removed from the network each year. Renewal of the low pressure network to high pressure is expected by 2025.
- Introduction of a medium pressure mains replacement (30km p.a.) to address concerns with cast iron, unprotected steel and first generation polyethylene mains (CL250). Renewal of the medium pressure network to high pressure is expected by 2035.
- Introduction of the next generation high density polyethylene pipe (PE100) to increase network capacity and integrity
- Ongoing review of SP AusNet's leakage management policies to find the correct balance between reactive and proactive maintenance activities.
- Improve asset data quality on mains and services, with particular attention on leak data, pipe characteristics and risk profiles, which are key inputs to SP AusNet's mains renewal and leakage management programs.

7.5 Meter Management

7.5.1 Overview

Gas meters are used to measure the volumetric flow rate of gas passing through the device. The volume of energy that passes through the meter is dependent on both gas pressure and temperature at the time of measurement.

SP AusNet is required by the Gas Distribution System Code to provide an appropriate metering installation at each supply point (i.e. connection) off the distribution network. SP AusNet is required to periodically maintain these installations, replace meters when their field life has expired, and provide periodic metering information to retailers for billing purposes.

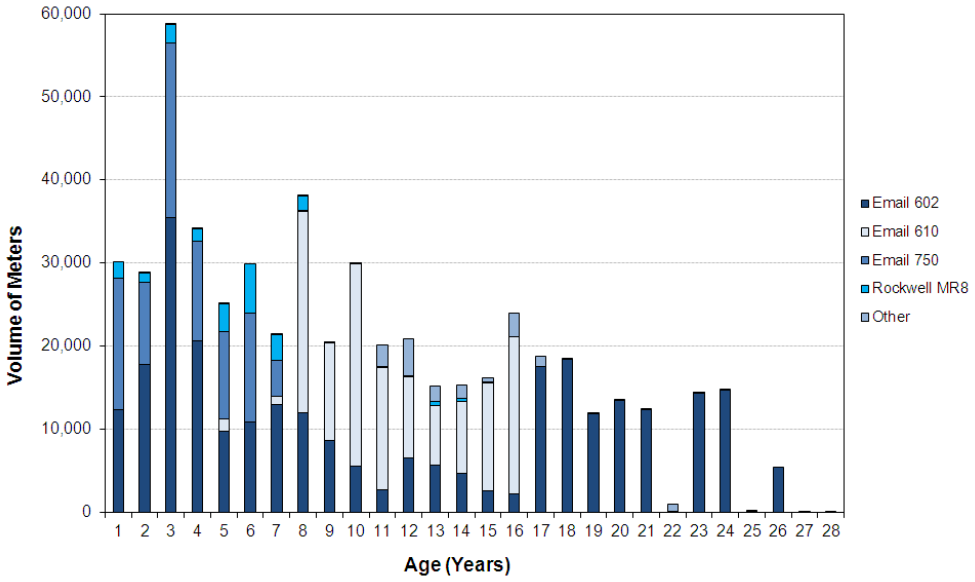
Overall SP AusNet has a fleet of 595,800 [15] meters installed of which 547,686 are classed as residential type meters and 48,114 are Industrial and Commercial (I&C) meters.

[15] Accurate as of 30 June 2011.

Residential Meters

Residential meters are small capacity meters (<10m^3/hr) typically found at the front of domestic properties. All of SP AusNet's domestic meters are diaphragm type gas meters.

Figure 42: Domestic meter age profile (June 2011)



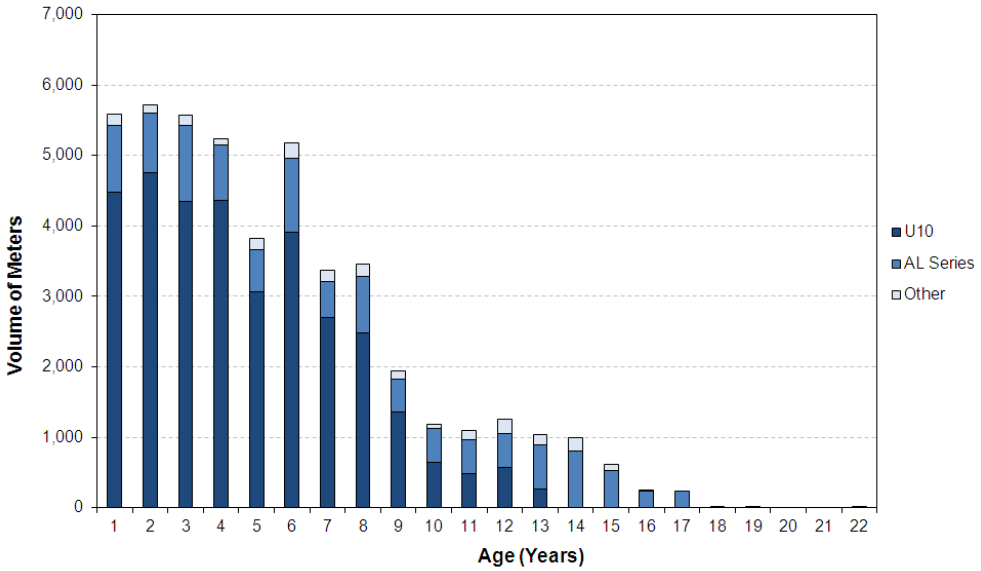
Industrial and Commercial Meters

Industrial and commercial sites are high users of gas, usually greater than 25m^3/hr. A combination of three (3) higher flow meter types; rotary, diaphragm or turbine gas meters is commonly used at I&C installations.

Table 13: Breakdown of industrial & commercial meter types

Meter Type	Maximum Flow rate	Number of Meters
Diaphragm	500 m^3/hr	47,301
Rotary	1,500 m^3/hr	359
Turbine	9,000 m^3/hr	353

Figure 43: Industrial & Commercial meter age profile (June 2011)



7.5.2 Current Performance

The recent performance of SP AusNet's metering fleet (i.e. faults) and the results of key works programs are summarised in Table 14 below.

Historically, meter failure rates have averaged 0.3% of the meter population each year, with most failures resulting from third-party damage. Annual time expired replacement programs consistently achieve a replacement rates of >95% per program, with the exception of the 2010 industrial & commercial program which was hampered by resourcing issues with both labour and material (i.e. replacement meters).

Table 14: Historical performance of domestic and I&C meter types

Year	Meter Class	Meter Faults	In-service Compliance Testing - Meters Tested (Failed[16])	Time Expired Replacement Program Size (% Completed)
2008	Domestic	1,488	144,484 (9.2%)	47,938 (96.2%)
	I&C	79	-	459 (98.9%)
2009	Domestic	1,631	88,437 (13.5%)	14,478 (97.6%)
	I&C	131	-	295 (96.3%)
2010	Domestic	1,620	25,437 (35.7%)	11,699 (97.3%)
	I&C	147	-	277 (75.8%)
2011	Domestic	1,761	34,368 (34.4%)	14,930 (97.1%)
	I&C	191		572 (99.0%)

7.5.3 Capital Requirements

SP AusNet undertakes a range of annual meter testing and replacement programs to ensure ongoing compliance with the Gas Distribution System Code, Version 9. An overview of each program is provided. Refer to SP AusNet's Meter Management Strategy (AMS 30-54) for further details.

[16] Failed meters are to be replaced within the preceding years meter replacement program.

- **In-service compliance testing program:** Annual in-service compliance testing is completed on small capacity (<25m^3/hr) diaphragm meter families nearing the end of their in-service compliance periods. Testing follows the requirements of AS/NSZ 4944:2006 where meters are tested through either the 'variables' or 'attributes' sampling methods. Outcomes of compliance testing leads to a field life extension (5, 3, or 1 year) or the meter family being removed from the field.

  The in-service compliance testing program does not extend to I&C meters which are automatically removed from the field at the end of their in-service compliance periods.

- **Time expired meter replacement program:** Meters at the end of their in-service compliance periods (i.e. useful life) are removed from the field and replaced with new or refurbished assets of similar capacity.

  The domestic replacement program includes meters that are at the end of their in-service compliance periods, meters outstanding from previous replacement programs, and meter families being prematurely retired to avoid extreme volatility in replacement program sizes. Typically, SP AusNet aims to remove 25,000 to 30,000 meters per annum within the domestic meter replacement program.

  The I&C meter replacement program includes meters at the end of their in-service compliance periods and those outstanding from pervious programs. Typical program sizes vary from 300 to 500 meters per annum.

- **Non-compliant meter:** Dedicated programs are established to target and replace meters that remain in the field beyond their in-service compliance periods. An inability to gain access to the meter during the time expired replacement program (due to locked gates, guard dogs, refused entry, etc.) is the primary reason for non-compliant meters within SP AusNet's network. In total, non-compliant meters equate to approximately 0.15% of all commissioned meters.

- **Meter Faults:** SP AusNet reactively replaces meters that fail within operation. Typical, SP AusNet replaces approximately 1,500 to 1,800 meters annually, equating to 0.3% of the metering fleet.

Meter replacement and sampling volumes for the aforementioned programs, to 2017, are defined within SP AusNet's Meter Management Strategy (AMS 30-54).

7.5.4 Operational Requirements

I&C regulator units, in which the meter forms a vital component, are maintained on either a 6 monthly or annual basis. Maintenance of the physical meter is limited with the exception of rotary meters which require oiling of componentry.

Domestic meters are not periodically maintained outside the in-service compliance-testing program.

7.5.5 Plant Specific Strategies

The following plant specific strategies are employed for the management of SP AusNet's Metering assets. Refer to SP AusNet's Gas Meter Management Strategy (AMS 30-54) for further details

- Continuations of in-service compliance testing programs to ensure meter lifecycle costs are minimised.
- Extend in-service compliance testing to other meter families that meet program criteria (i.e. diaphragm > 10m^3/hr).
- Continue to maximise the number of meter refurbishments, as opposed to the purchase of new meters, to minimise the capital costs of maintaining SP AusNet's metering fleet.
- Implement a 'smoothing' strategy to replace an average of 25,000 to 30,000 meters per year to prevent extreme volatility within replacement programs, which inflates per unit replacement costs.
- Embrace any SMART meter developments as appropriate.

7.6 Corrosion Protection

7.6.1 Asset Overview

SP AusNet utilises Cathodic Protection, and associated systems, to actively defend against corrosion of its buried steel assets within its gas transmission and distribution networks.

The SP AusNet gas transmission and distribution system features 161 active cathodic protection units of various current outputs that protect 2,683km of steel pipeline and mains from corrosion. All 183 km of SP AusNet's transmission network is fully cathodically protected. The steel mains of the distribution systems are also largely shielded; however, 398 km of isolated steel main is dispersed within the distribution network that cannot be effectively protected. Protection is also aided by approximately 800 magnesium sacrificial anode bed sites which provide low levels of cathodic protection current. Earthing and stray current drainage sites, which remove unwanted electrical interferences, are also integral to the cathodic protection system operations.

A necessary adjunct to the cathodic protection systems, are the numerous electrical isolation and surge protection devices used throughout the network. These assets provide electrical isolation of the steel assets to allow for targeted cathodic protection. The systems also aid in providing field personnel with protection from electrical surges.

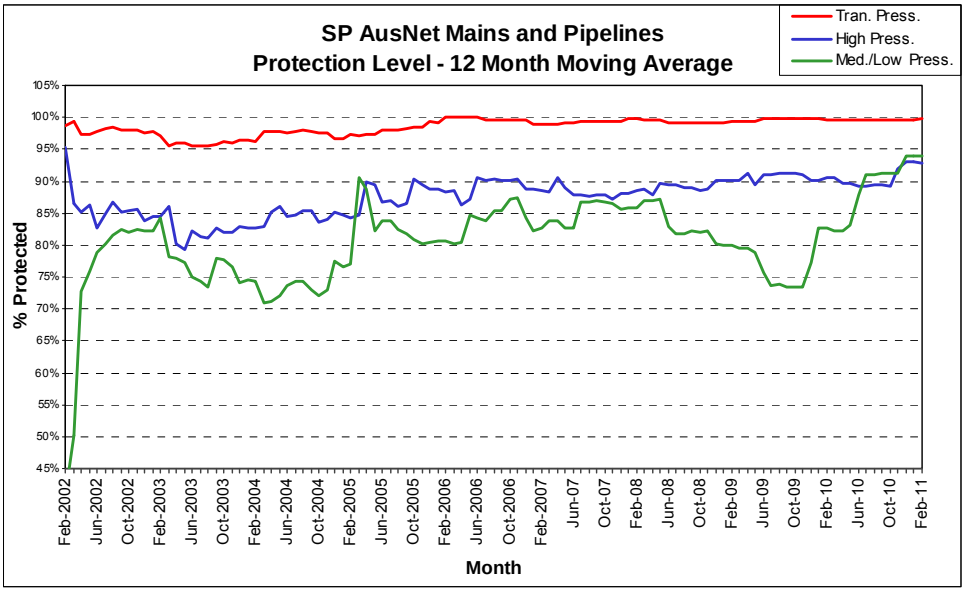
7.6.2 Current Performance

The cathodic protection system is monitored via direct measurements of electrical potential (cathodic protection level). This is performed through test points directly wired to the steel assets throughout the network. SP AusNet aims to achieve the following percentages of its protected assets within the optimal range of cathodic protection (-850mV to -1100mV):

Table 15: Target CP Protection Levels

Pressure	Target Protection Level
Licensed (Transmission) Pipelines	98%
High Pressure Areas	90%
Medium Pressure Areas	85%
Low Pressure Areas	80%

Figure 44: Historical Cathodic Protection Performance (February 2011)



Through SP AusNet's capital investments in cathodic protection, these levels have steadily increased, as evidenced in Figure 44 (above). The drop in cathodic protection of the medium pressure network over the 2008/2009 period is attributed to drier ground conditions over this time, which inhibits cathodic protection currents.

7.6.3 Capital Requirements

Cathodic protection capital requirements are primarily driven by the potential survey program used to monitor network performance. If an areas protection level is found to be below the desired level, and operation of the local cathodic protection unit is confirmed, then rectification work will result.

Cathodic protection systems have a variable useful life that is dependent on factors such as the environment in which they are located, the condition of the main they are shielding, and other environmental factors. As such, the existing systems require routine capital investment to ensure their correct function.

Capital programs to 2017 are detailed within SP AusNet's Cathodic Protection Strategy (AMS 30-56) and follow the following principles:

- **Corrosion Protection:** The corrosion protection work program Includes the installation of additional corrosion protections units (CPUs), upgrading of existing systems, installation of sacrificial anodes and replacing those that have been depleted. This program ensures cathodic protection levels are maintained in accordance with SP AusNet's Gas Safety Case, reducing corrosion rates and hence the safety risk of corrosion induced leakage.

- **Surge Protection:** The surge protection programs consist of installing surge protection to the SP AusNet's below 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.

7.6.4 Operational Requirements

Operational requirements for the cathodic protection system are aimed at maintaining the systems to ensure current levels of performance and coverage are maintained. This involves 6 monthly potential level surveys of both the transmission and distribution systems, coating defect surveys of transmission pipelines, coiling (interference) testing and stray current electrolysis testing conducted by the VEC. These works also allow capital works to be effectively targeted at areas requiring improved cathodic protection levels.

7.6.5 Plant Specific Strategies

The following plant specific strategies are employed for the management of SP AusNet's Corrosion Protection assets. Refer to SP AusNet's Gas Corrosion Protection Strategy (AMS 30-56) for further details

- Medium and Low pressure networks will progressively be upgraded to High Pressure with subsequent corrosion protection becoming redundant.
- Corrosion Protection Units for the Transmission Pipelines to be fully owned and operated by SP AusNet by 2017, eliminating the current 'shared sites' arrangement
- All City Gates and Field Regulating units to be appropriately protected from spark or surge currents in accordance with CPS 2308 (protection from Electrical Surges and Induced Voltages).
- Introduction of SCADA technology to monitor and control Cathodic Protection systems.

7.7 SCADA

7.7.1 Asset Overview

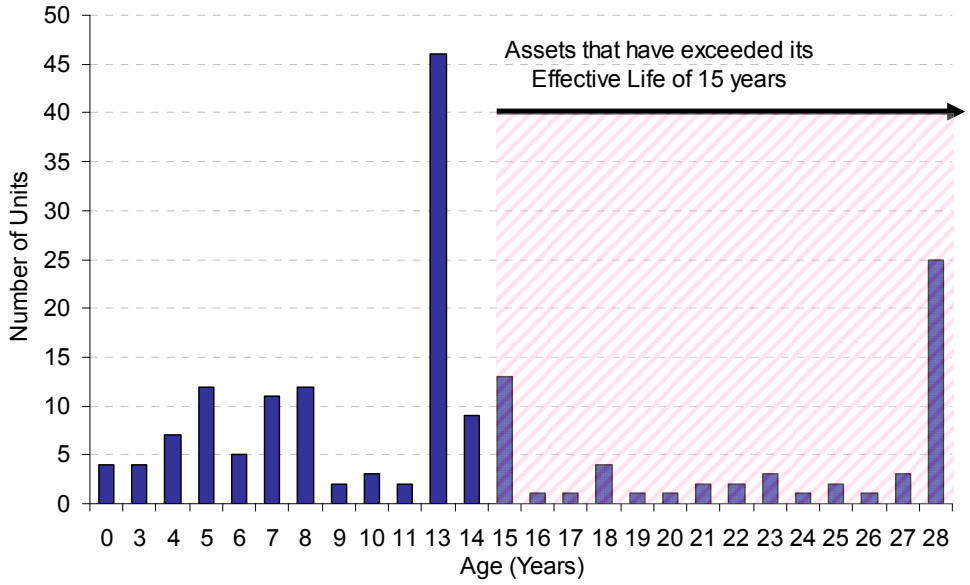
SP AusNet uses a SCADA (Supervisory Control and Data Acquisition) system to monitor and control assets across the network from the transmission system to the network fringe. The SCADA system provides data on the real-time performance of the assets, and data for long-term evaluation of gas demand and network performance to identify potential system deficiencies.

The SCADA system is made up of Remote Telemetry Units (RTUs), a radio and telephone communications system, and a host computer system supporting the Network Operations Centre, which operates 24 hours a day, 365 days a year. Three classes of site are covered by the SCADA system:

- Controlled regulator sites where the SCADA system maintains a set fringe pressure by altering gas outlet pressures, either automatically or via remote manual control from the control room
- Monitored regulator sites where outlet pressures are adjusted by field personnel and SCADA is used to alert the control room operators if pre-determined pressure alarm limits are breached
- Fringe sites where SCADA is used to monitor the pressure at the lowest-pressure extremity of the system, again allowing control room operators to react to pre-determined alarm limits.

Alarm limits and conditions have been set on the SCADA system which, when triggered, indicate abnormal conditions within the network. The limits, conditions and required responses are reviewed annually following each winter peak.

Figure 45: Age Profile of SP AusNet's RTUs (March 2011)



7.7.2 Current Performance

Currently, approximately 25% of all high-pressure networks are operating under automatic control, with the remaining networks only being monitored installations. There are also 12 low-pressure systems operating under solenoid control to vary the outlet pressure of district regulators via pre-determined time settings. This dynamic control of pressure is used to minimize leaks and unaccounted for gas (UAfG) in accordance with SP AusNet's quality management document (30-2509: Network Pressures Management).

7.7.3 Capital Requirements

The SP AusNet Gas SCADA strategy (AMS 30-57) provides details on plans to expand the current SCADA coverage and implement further controlled installations to ensure and maintain levels of service as the network grows. Asset replacements are also planned when existing equipment reliability or capability is presenting significant risks. The SCADA system has an effective life driven by factors such as functionality, environment, technological obsolescence and the initial quality of the hardware.

The overall key drivers of SCADA CAPEX include network growth, improved consistency in network operation and fringe pressures, reduction in identified network risks, regulatory compliance and improved operating costs through greater automation. SP AusNet's long-term objective is to have automated pressure control for all networks, governed by the fringe point. This will optimize the operation of the network, reducing UAFG, asset deterioration and system leakage, while enhancing control in emergency situations and operability in times of abnormal gas demand.

The SCADA capital program falls within the following categories. Refer to SP AusNet's Gas SCADA Strategy (AMS 30-57) for further details.

- **SCADA Control to High and Medium Pressure Networks:** Upgrade to SCADA control of all high and medium pressure networks. Upgrade enables increased efficiency in network operation and ability to remotely operate networks in emergency situations.
- **SCADA Communication:** Includes new communication radio base stations and GPRS communications replacement.
- **Asset Replacement:** Replacement of defective or obsolete equipment due to age and serviceability constraints.
- **Fringe RTU installation / relocation:** SP AusNet is progressively implementing fringe point based pressure control for high and medium pressure networks. New fringe RTU's are to be installed in line with networks with SCADA control. As the size and flow characteristics of networks change, the fringe points of existing networks also change. Existing fringe points need to be relocated to correctly control and monitor the networks
- **Innovation:** Introduction of innovative solutions to improve the acquisition of data from the field, implement gas detectors in identified high risk regulating stations, permanent installation of remote recorders (pressure, flow and cathodic protection) to improve and enhance current network management.

7.7.4 Operational Requirements

An in-house team of qualified technicians maintain SP AusNet's SCADA network. Operational activities include:

- Periodic operational checks and full maintenance of core and auxiliary equipment,
- Breakdown maintenance as required,
- Data collection activities.

SP AusNet's Gas Maintenance Plan (Document AMP 30-02) provides details of required maintenance frequencies for SCADA assets.

7.7.5 Plant Specific Strategies

The following plant specific strategies are employed for the management of SP AusNet's SCADA assets. Refer to SP AusNet's SCADA Strategy (AMS 30-57) for further details

- Fringe point control (i.e. closed loop) to be implemented on all high and medium pressure networks.
- Ongoing replacement of defective or obsolete equipment to ensure network integrity.
- Increased network innovation, including the trial and introduction of gas detectors in confined spaces, float level switches for flood prone pits, and semi-permanent pressure data recorders.
- Review of communications technologies for integration with SP AusNet's "3 networks" SCADA strategy.

7.8 Exposed Pipework

7.8.1 Asset Overview

Exposed pipes consist of gas mains infrastructure that is located above ground due to the requirement for the gas main to cross or straddle a natural or manmade obstacle. Typically exposed pipes occur on roads, rivers,

creeks and drainage crossings, as well as in some instances due to historical maintenance activity or previously removed above ground assets i.e. Meter or Regulators.

In total, SP AusNet has 74 sites classified as exposed pipework. Table 16 provides a summary of exposed pipes within SP AusNet's network. Please note that most of the 74 identified locations feature multiple descriptors.

Table 16: Asset Summary – Exposed Pipework

Description	TP	HP2	HP	MP	LP	Total
Pipe attached to side of bridge	-	1	14	3	2	**20**
Pipe suspended under structure	2	1	30	3	6	**42**
Pipe over railway	-	-	2	2	1	**5**
Pipe over channel	3	2	48	4	8	**65**
Pipe under walkway / roadway	2	1	30	3	6	**42**
Encased pipe / conduit	-	-	17	-	2	**19**
Pipe not exposed, but subject to erosion	-	-	1	-	1	**2**

7.8.2 Current Performance

Of the 74 exposed pipework installations the vast majority were installed in the 70's and 80's, with a dramatic decline in their use post 1990. This is likely due to a number of attitude, policy and technology developments around this time. No new exposed pipework has been installed in the SP AusNet network since 1997; instead, it has actively been removed. Three sites have been decommissioned over the four year period since 2006.

Periodic inspections of this asset class began in 2006 with 15 if the inspected sites initially 'failing' one or more of the inspections criteria (coating, pipework / corrosion, transition zone, supports and insulating pad conditions) and requiring priority repair works. Subsequent inspections have resulted in one repair (2008) of exposed assets to 2010.

7.8.3 Capital Requirements

As exposed pipework represents an increased risk both in terms of safety and security of supply, it remains SP AusNet's preference that above ground pipework be isolated and removed if alternatives are available, or decommissioning becomes possible. As such the future capital requirements of SP AusNet's above ground pipework assets are aimed at their removal from the system.

The basis of this approach is computer modelling of the individual networks featuring exposed pipework to determine if they can be isolated and removed without a detrimental impact on the natural gas supply to the area. This modelling may also indicate that removal is possible provided additional reinforcement mains are installed at an alternate location.

7.8.4 Operational Requirements

Inspection frequencies of exposed pipework is determined based on a risk based methodology. Inspections have been conducted to evaluate asset condition based on seven (7) critical parameters;

- Coating
- Crevice Corrosion
- Mechanical Damage
- Pitting and General Corrosion
- Transition Zone
- Insulating Pads
- Supports

Outcomes of asset assessments - where parameters are rated Fail, Borderline or Satisfactory – lead to allocation of priorities which in turn sets timeframes for future inspection or remediation. Sites that obtain a 'fail' score for any parameter must result in remediation works.

Please note, exposed transmission pipelines and HP2 sites are inspected on an annual basis regardless of inspection outcomes due to asset criticality and public risk.

7.8.5 Plant Specific Strategies

The following plant specific strategies are employed for the management of SP AusNet's exposed pipework assets. Refer to SP AusNet's Exposed Pipework Strategy (AMS 30-55) for further details.

- Where possible, it is SP AusNet's preference that above ground pipework be isolated and removed if alternatives are available, or decommissioning becomes possible.
- Installation of exposed pipework as a last resort, following a risk assessment.
- Periodic inspections of all known exposed pipe assets through the application of AMS 30-19.

7.9 LPG Reticulation

7.9.1 Asset Overview

SP AusNet owns and operates a liquefied petroleum gas (LPG) vapour reticulation network at Mt. Baw Baw alpine village from a single LPG source. The network is known as an island network, as is not subject to SP AusNet's Access Arrangement, instead it represents an unregulated revenue stream for the business.

The network supplies reticulated gas to the village's commercial and club premises, and 2 gas-fired generators operated by SP AusNet (electricity), which supply electricity to the mountain village. The network was commissioned in May 1998.

In total, the network comprises of 1,700m of polyethylene mains operated at 140kPa, supplying 33 metered customers.

7.9.2 Current Performance

The design of the distribution network provides for a 20-year forecast gas demand for the village, including the generator station. At present it is functioning at 50% of available capacity (Total capacity = 750m^3/hr).

No new applications for gas have been received for the Mt Baw Baw network in last 12 months.

No unplanned works were required in 2010.

The annual inspection of all LPG assets (regulatory requirement) has revealed numerous instances of tampering with the regulators currently installed at Mt Baw Baw to disable the over pressure shut out (OPSO) protection built into each regulator. This has been illegally performed to prevent false trip outs of the regulator under sudden surges of gas pressure from consumer appliances suddenly shutting off. SP AusNet is currently working on a solution to this safety breach.

7.9.3 Capital Requirements

Due to the physical size and unutilised capacity within the network, capital requirements to 2018 are limited. Proposed work to 2018 is highlighted by the replacement of all meters (as part of the time expired meter replacement program in 2013), combined with the upgrade of consumer regulators in 2013 as a precaution due to tampering of the OPSO device. Refer to SP AusNet's LPG Reticulation Strategy (AMS 30-58) for further details.

7.9.4 Operational Requirements

Maintenance is conducted annually on all LPG assets at Mt. Baw Baw. This includes:

- Leakage survey of the total mains, service and meter/regulator system; performed by walking the entire reticulation system, including regulator/ meter installations and generator room, with a specialised highly sensitive gas detector,
- Operational check of the gas reticulation system isolation valve,

- Gas samples from the two (2) odorant test points are also taken and tested, ensuring they are within required levels.

Elgas Ltd is the owner of the LPG tank supplying the reticulation network. They are responsible for the control, maintenance, safety and security of the LPG storage vessel, its associated pressure regulators, vaporizer unit and pipework to the boundary of the security compound.

Energy Safe Victoria conducts an annual audit of the facility usually coinciding with programmed maintenance.

Refer to SP AusNet's LPG Reticulation Strategy (AMS 30-58) for additional details on OPEX programs.

7.9.5 Plant Specific Strategies

The following plant specific strategies are employed for the management of SP AusNet's alpine LPG reticulation assets at Mr Baw Baw. Refer to SP AusNet's LPG Reticulation Strategy (AMS 30-58) for further details.

- Replacement of all meters in 2013 due to expiry of initial life. (29 domestic & 4 small I&C meters in total).
- Replacement of consumer regulators in 2013 as a safety precaution due to consumer tampering of OPSO device.
- Increased signage requirements to increase public awareness and safety.
- Installation of meters at currently unmetered sites (2) and the Elgas vaporizer to enable accurate measurement of Unaccounted for Gas (UAFG) and subsequent carbon emissions.