ActewAGL Distribution

2017-21 Access Arrangement Information

ACT Gas Networks Asset Management Plan RY16-RY21

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Authorisation

Name	Role	Date	Signature
Prepared with Subject Matter Experts by:			
David Bennett	Gas Asset Investment	24 APR 2015	
Approved by:			
Lisa Rufatt	A/Gas Investment Manager	22 May 2015	
Philip Colvin	Gas Network Asset Manager	26 MAY 15	
Approved by:			
Peter Harcus	General Manager, Asset Strategy Gas	26/5/15	
Accepted by:			
Ed Gaykema	ActewAGL Gas Manager	17/6/15	

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ABBREVIATIONS

Acronym	Description
AA	Access Arrangement (e.g. AA2010 or AA2017)
AAD	ActewAGL Distribution
ACT Network	The Australian Capital Territory (**ACT**), Queanbeyan and Bungendore[1] gas network
AER	Australian Energy Regulator
AMP	Asset Management Plan
AMS	Asset Management System
APA	Australian Pipeline Trust (part of the APA group listed on the ASX)
AS	Australian Standard
CDP	Capacity Development Project
CP	Cathodic Protection
CTS	Custody Transfer Station
DA	Development Application
DAMS	Distribution Asset Management Services (DAMS) Agreement
DBYD	Dial Before You Dig
DCVG	Direct Current Voltage Gradient
DIMP	Distribution Integrity Management Plan
DPI	Delivery Point Identifier
DRS	District Regulator Set
DTIRIS	NSW Department of Trade and Investment Regional Infrastructure and Services
EA	Engineering Assessment
ECRC	Energy Consumer Reference Council
EMP	Environmental Management Plan
EPD	Environment and Planning Directorate
EGP	Eastern Gas Pipeline
E&I	Electrical and Instrumentation
EMP	Environment Management Plan
EMS	Environmental Management System
FA	Feasibility Assessment
FEED	Front-End Engineering Design
FIMP	Facility Integrity Management Plan
FSA	Formal Safety Assessment

[1] The 2010 Access Arrangement submission referred to Palerang – the Local Government Area (**LGA**) that includes Bungendore.

ABBREVIATIONS

Acronym	Description
GASS	Gas Accounting Service System
GAW	Government Authority Work
GPS	Global Positioning System
HDPE	High Density Polyethylene
HP / LP / MP	High Pressure / Low Pressure / Medium Pressure
HPFR	High Pressure Facilities Review
HSEQ	Health, Safety, Environment and Quality
HTI	Hume Tuggeranong Interconnect
I&C	Industrial and Commercial
ICAM	Incident Cause Analysis Method
ICRC	Independent Competition and Regulatory Commission
ILI	In-line Inspection
IT	Information Technology
JAM	Jemena Asset Management
JGN	Jemena Gas Network (NSW) Ltd
KPI	Key Performance Indicator
LGA	Local Government Authority
LMS	Land Management System
LPRS	Low Pressure Regulator Set
MAOP	Maximum Allowable Operating Pressure
MLV	Main Line Valve
MSP	Moomba to Sydney Pipeline
NECF	National Energy Customer Framework
NGL	National Gas Law
NGR	National Gas Rules
NERL	National Energy Retail Law
NERR	National Energy Retail Rules
OB	Opportunity Brief
OH&S	Occupational Health and Safety
PAS55	Publicly Available Specification (PAS55)
PE	Polyethylene
PIG	Pipeline Intelligent Gauge
PIMP	Pipeline Integrity Management Plan
PJ	PetaJoule
PMM	Project Management Methodology

Acronym	Description
POTS	Packaged Off-take Station
PoW	Program of Work
PRS	Primary Regulating Station
QA	Quality Assurance
RF	Radio Frequency
RIN	Regulatory Information Notice
RTU	Remote Telemetry Unit
RY	Regulatory Year (Jul-Jun)
SAOP	Safety and Operating Plan
SCADA	Supervisory Control And Data Acquisition
SMS	Safety Management Study
TPRC	Technical Policy Review Committee
TRS	Trunk Receiving Station
UAG	Unaccounted for Gas
WBH	Water Bath Heater

OVERVIEW

This Asset Management Plan (**AMP**) describes the capital and operating plans for the Australian Capital Territory (**ACT**), Queanbeyan and Bungendore[2] (**the ACT Network**) gas networks. This AMP covers the period 01 July 2015 to 30 June 2021, which encompasses the extension year (i.e. RY16) of the current Access Arrangement **(AA)** period and the upcoming five year AA period (RY17-RY21) (**AA2017**)).

The ACT Network consists of over 4,500 km of mains and pipelines, transporting natural gas to over 130,000 connections for consumption of almost 8 petajoules (**PJ**) of gas per annum. The opening value of the assets for the current access arrangement was $278M as at 30 Jun 2010.

Jemena provides the asset management services as part of the ActewAGL Distribution (**AAD**) agreement. The partnership provides for leveraging the benefits from synergies and expertise with the wider Jemena group including the Jemena Gas Network **(JGN**) in NSW and Jemena Gas Pipelines.

In line with changes in the natural gas market supply arrangements across the eastern seaboard, there are ongoing changes to the sources of supply to the ACT (and surrounding areas) markets. This will lead to variations in the volume of gas supply being delivered through the Moomba-Sydney Pipeline to Watson (in the North) compared to that delivered through the Eastern Gas Pipeline to Hoskinstown (in the East). Based upon modelling and future forecasts, there are no requirements for augmentation of the Hoskinstown to Fyshwick trunk pipeline, though the augmentation of related facilities will be required.

The assets that form the ACT gas network are generally in good condition, but need ongoing funding to support growth and prudent replacement or augmentation of assets. The Key Performance Indicators (**KPIs**) in Chapter 4 show effective controls are in place to ensure safe and reliable supply, responsiveness to customers and sound asset performance. Chapter 5 outlines the processes used to manage the assets.

The ACT Network incurs two broad types of costs or expenditure in providing gas services which are summarised in Chapter 6.

- **Capital expenditure** — to provide and maintain the physical assets, such as pipes, meters, and computer systems that are required to deliver gas services. This expenditure ranges from small routine works, like installing a small length of pipe and a meter to connect a new customer, to complex large multi-million dollar projects.

  The categories of capital expenditure that AAD incurs are:

  - *Market expansion* – laying new pipes and installing meters to connect new customers
  - *Stay in business* – upgrading and/or replacing pipes, facilities, gas stations and meters
  - *Capacity Development* - installing 'bigger' pipes or gas pressure equipment to cater for peak demand growth; and
  - *Non-distribution capital expenditure* - this category of capital expenditure includes other supporting assets, including costs associated with Geographic Information System (GIS) improvements.

[2] The 2010 Access Arrangement submission referred to Palerang – the Local Government Area (**LGA**) that includes Bungendore.

- **Operating expenditure** — covers the ongoing cost of operating and maintaining the assets (including emergency response) and performing related functions such as reading meters and providing billing information to retailers. Due to the partnership structure, other not directly asset management costs such as Government fees and levies, unaccounted for gas and marketing are not included in this AMP.

  These categories of operating expenditure that AAD incur are generally recurrent and are categorised by as follows:

  - *Management Services* – includes Regulatory Management, Asset Management, Commercial Management, Customer Management, Network Development and Marketing, Management of Operating and Maintenance Services, Asset Creation and General Management; and
  - *Asset Services* – includes operating, maintaining and repairing the gas network. The Asset Services covers operating and maintenance services to assure that the gas network is fit for purpose in all its operations, and where incidents occur on the network they are responded to in accordance with Customer Service commitments and rectified in a professional manner in accordance with the plans.

This AMP outlines the basis for these two categories of expenditure.

Capital Expenditure

All forecasts are in escalated $RY16. This AMP does not include the ActewAGL Overhead allocation.

Table OV–1 shows the one and five year (RY16-RY21) forecast capital expenditure is $137M, which includes forecast expenditure of $106M for the upcoming AA period (RY17-RY21).

Table OV–1: Total Capital funding

$M RY16	RY16 (not in Total)	RY17	RY18	RY19	RY20	RY21	RY17-21 TOTAL
Total Capex	**31.5**	**20.4**	**24.3**	**22.4**	**22.0**	**16.4**	**106**

Figures OV-1, OV-2 and Table OV-2 below provide a breakdown of the Actual/Forecast expenditure in the current AA period (RY11-RY15) with the forecast capital expenditure for the upcoming AA period (RY17-RY21). To assist comparison, the extension year (RY16) has not been included.

Figure OV–1: Capital expenditure RY11-15 vs RY17-21

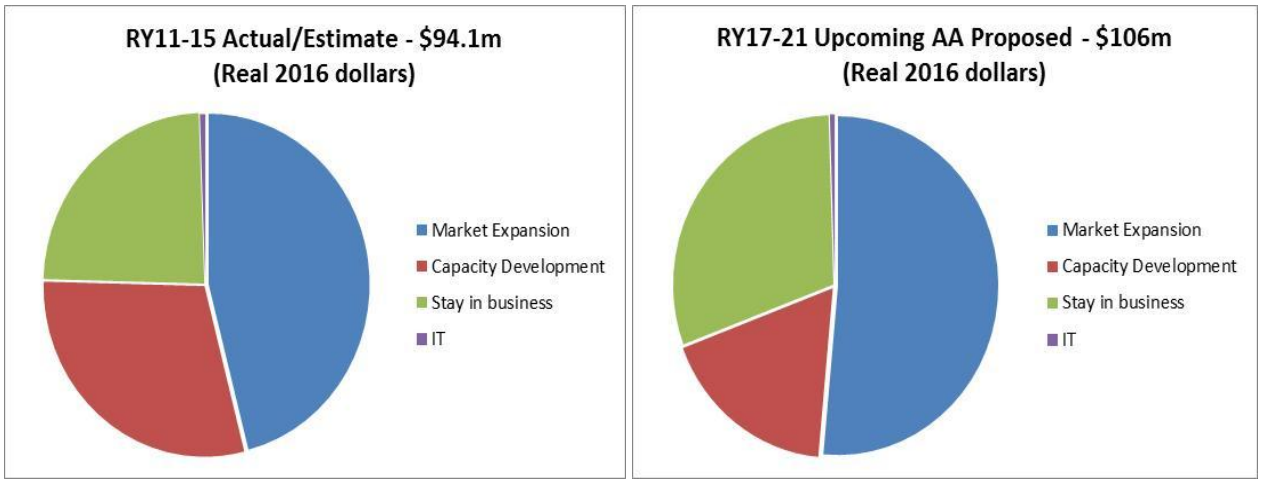


Table OV–2: Capital Breakdown - Access Arrangement Comparison table

RY16 $M	Allowance (RY11-RY15)	Actual/Forecast (RY11-RY15)	Upcoming AA Requirements (RY17-RY21)	Difference (Current AA Actual/Forecast vs Upcoming AA)
Market Expansion	40.9	43.3	54.4	11.1
Capacity Development	28.2	27.7	18.8	(8.9)
Stay in Business	28.6	22.6	32.0	9.4
IT	1.40	0.50	0.5	(0.0)
TOTAL	**99.0**	**94.1**	**105.7**	**11.6**

Additional capital funds are required compared to the current AA Forecast to address a seven per cent increase as a result of forecast real cost escalation over the 2016-21 access arrangement period, and the following changes in drivers

- **Market Expansion**

  The new connection forecasts are significantly higher than for the RY11-RY15 period. The forecast connection numbers are based on CORE forecasts (Mar 15) and show the number of connections of medium density residential connections to increase by 61 per cent due to growth in medium density housing in the ACT over the next five years. Additionally, unit costs have increased to reflect additional costs related to new market (National Energy Customer Framework **(NECF**)) requirements.

- **Capacity Development**

  Capacity Development costs are forecast to decrease reflecting the completion of a number of major projects in the RY11-RY15 period, and the variability of Capacity Development investment requirements.

- **Stay in Business**

  Stay in Business costs are forecast to increase despite being offset by a decrease in network renewal and replacement costs and successful completion of a number of major projects in RY11-RY15. The Stay in Business increases are driven by

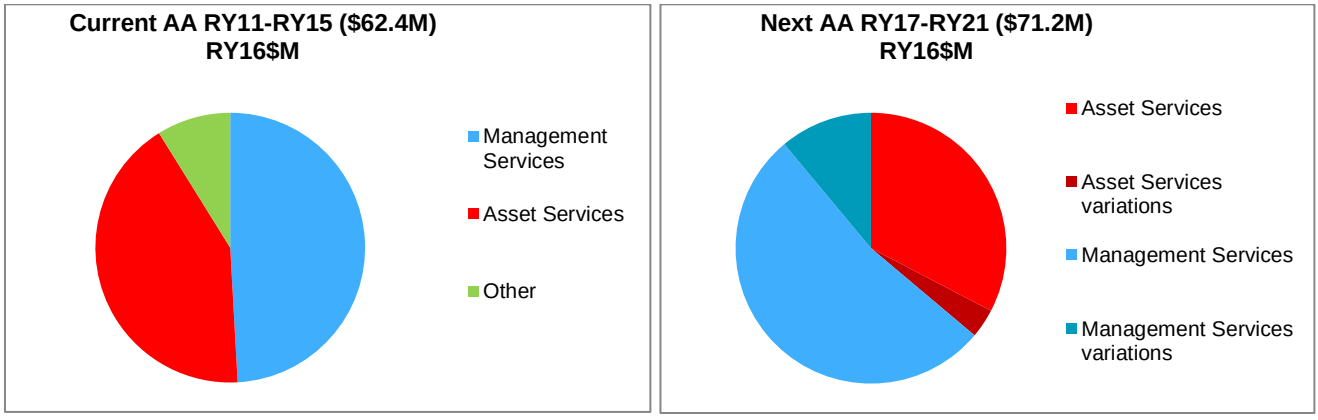
  - Metering renewal and upgrade - Expenditure on this program is forecast to increase primarily as a result of an increase in the replacement of residential meters as they reach their maximum extended life of 25 years during this period and addressing earlier than planned replacement of gas hot water system meters due to higher than forecasted failure rates. The increased volumes are required to meet regulatory requirements, and ensure the integrity of the assets and safety and convenience of the consumer and safety of our staff.
  - Inlet piping works - The addition of this new class of capex relates to replacement of inlet piping in shopping malls that have been identified as having an unacceptable level of risk to the shopping malls and their customers; and
  - Integrity works - The classification change of asset integrity works as capex. In-line inspection (**ILI**) and related projects such as integrity and validation digs to ensure the integrity of the high pressure Trunk and Primary Mains were treated as opex in the last AA period.

Operating Expenditure

The forecast operating expenditure to support this AMP is outlined below. Both the Asset Services and the Management Services contracts have annual variations built in to address the variable and/or cyclical requirements which are not required each year.

Figure OV–2 below summaries the operating expenditure plans and actuals.

Figure OV–2: Opex expenditure RY11-15 vs RY17-21



As Figure OV–2 indicates, additional operating funds are required for the upcoming AA period. Note that the RY11-RY15 expenditure is lower in part due to delays in the Canberra Primary Main pigging run project which is now planned to occur in the RY16 extension year and thus not shown in the graphs. RY11-RY13 included other costs that were included into the Management and Asset Services fees from RY14 onwards.

The increase is largely in the Management Services, reflecting new requirements and obligations. These include an IT asset utilisation fee, additional regulatory reporting requirements for Regulatory Information Notices (**RIN**) for Jemena Asset Management, NECF and B2B obligations.

The increase in the Asset Services primarily reflects the new annual requirement to renegotiate the Hoskinstown Custody Transfer Station (**CTS**) operation and maintenance agreement, compliance costs associated with the new ACT technical codes for metering and increased costs associated with new assets brought on line and customer growth.

Chapter 6 provides an annual summary of the operating expenditure and Chapter 7 outlines how the delivery of the programs (both capital and operating) is expedited through proven system and processes, resource management, prudent procurement, outsourcing and contracting strategies. Chapters 8 to 14 provide details of the Asset Strategies.

1. DOCUMENT OVERVIEW

1.1 PURPOSE

The primary purpose of this Asset Management Plan (**AMP**) is to describe the capital and operating plans required to deliver the Australian Capital Territory (**ACT**) gas network's asset management objectives for the ACT Network for the extension year RY16 and the Access Arrangement (**AA**) period RY17-RY21. The plans cover the following lifecycle activities

- Creation, acquisition and enhancement of assets
- Utilisation of assets
- Maintenance of assets; and
- Decommissioning and/or disposal of assets.

This document also provides an overview of the asset strategy, governance framework and key policies that influence the ongoing investment, operation and maintenance of the ACT gas distribution network. This AMP has also been prepared to assist internal and external stakeholders understand the key planning inputs that underpin the management of the ACT gas network.

1.2 SCOPE

This AMP covers the ACT network. The network resides in both the ACT and NSW. The network is broadly comprised of mains, services, pressure regulation facilities, metering, SCADA and communications assets and other associated facilities and ancillary equipment. Network assets are generally categorised by their operating pressure as follows

- Trunk (MAOP of 14,900 kPa)
- Primary (MAOP of 6,895 kPa)
- Secondary (MAOP of 1,050kPa); and
- Medium (MAOP of 400kPa).

In addition to the network assets there are non-distribution assets which are required to support operation of the network.

1.3 ASSET GROUPS

To reflect how Jemena plans and operates the network, the AMP is structured around the key asset groups listed in Table 1–1 below.

Table 1–1: Key Asset Groups

Asset Group	Sub category	Section
Pipelines	Trunk Pipelines	9.3
	Primary Mains	9.4
	Secondary Mains	9.5
	Medium Pressure Mains	9.6
Facilities	Trunk Receiving Stations	10
	Packaged Off take Stations (POTS)	10
	Water Bath Heaters	10
	Primary Regulating Stations	10
	District Regulators	11
Metering	Custody Transfer	12.2
	Non billing meters	12.3
	Industrial and Commercial	12.4
	Residential	12.5
Non Distribution	SCADA and Communications only in this AMP	13

For the ACT network's principal Asset Groups, the plan focuses on optimising the lifecycle costs for that asset class (including creation, operation, maintenance, renewal and disposal) to meet agreed service levels, future demand and to ensure that costs, risks and asset system performance are controlled across phases of the asset lifecycle.

While the AMP covers the period from 01 Jul 2015 to 30 June 2021, the focus of analysis is on the first two years. Analysis beyond this period is necessarily indicative as it is based on longer term forecasts. Activities described for that later period will be reviewed prior to their execution as new information becomes available. Notwithstanding the above, a longer term assessment of network needs is an important part of delivering prudent, efficient and reliable gas distribution services for its customers.

Over the RY16-RY21 period, it is expected that new requirements and growth areas will arise that have not currently been identified. These requirements may lead to changes in the mix of projects that are executed over the period as some existing projects are re-evaluated and consideration is given to new projects.

1.4 ITEMS NOT COVERED BY THIS PLAN

This AMP is focused on the operation and maintenance of, and investment in, the physical assets that comprise the ACT gas distribution network. Consequently it does not cover the demand market and volume market pricing arrangements or commercial agreements with external parties.

1.5 OWNERSHIP AND CONTROL

Figure 1–1: Partnership structure

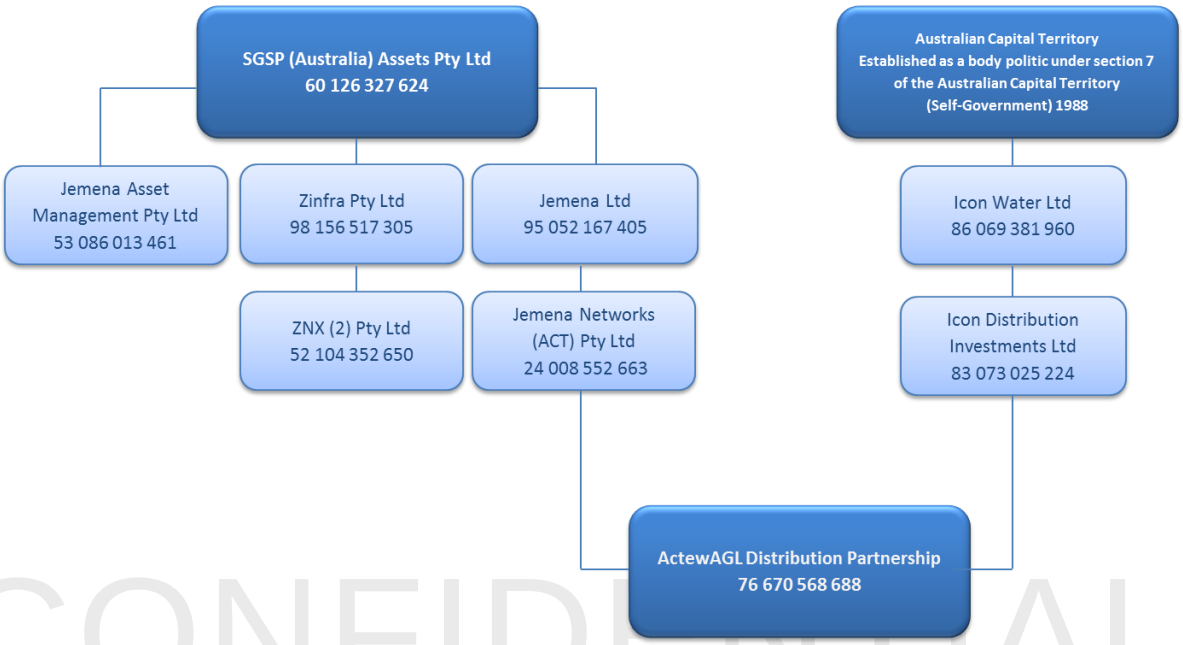


Figure 1–1 above outlines the ownership structure relevant to the ACT gas networks.

ActewAGL Distribution (**AAD**) owns, plans, develops, constructs, operates and maintains the gas networks in the ACT (this AMP) and also south east NSW (Nowra).

Jemena Networks (ACT) Pty Ltd, a subsidiary of Jemena Limited, has a 50 per cent interest in the AAD partnership, the remaining 50 per cent of the partnership is owned by Icon Distribution Investments, a subsidiary of Icon Water Limited. Jemena is a privately held entity that owns and operates a diverse portfolio of energy and water transportation assets across the east coast of Australia. Icon Water Limited is a government owned company with assets and investments in water, wastewater, electricity, gas and telecommunications.

Asset Management services are provided to AAD by Jemena Asset Management (**JAM**) Pty Ltd through the Distribution Asset Management Agreement (**DAMS**). Asset Services are provided to JAM through a service agreement with ZNX Pty Ltd and a series of other contractors.

The partnership approach leverages Jemena's significant expertise in managing gas assets. Jemena builds, owns and manages a portfolio of major electricity, gas and water assets. With over 1,300 employees across the country, Jemena manages more than $8.5 billion worth of Australian utilities assets and specialises in gas transmission and distribution as well as electricity distribution.

1.6 ACTEWAGL DISTRIBUTION BUSINESS OBJECTIVES

The ActewAGL Distribution Business Objectives are to

- meet or exceed all commercial, technical, safety and environment regulatory requirements
- be known as a safe, efficient and reliable deliverer of energy
- have a long term focus reflective of the type of asset owned
- be known as responsive to customers and other stakeholders needs; and
- respond to prudent customer growth opportunities.

1.7 ASSET MANAGEMENT

Good practice asset management is ultimately underpinned by the principles of prudent investment and business management. In the context of the ACT gas distribution network, this requires the consideration of a combination of industry experience, sound business management practices and familiarity with relevant asset management standards, as well as a range of asset specific Australian and international standards.

Asset management standards such as PAS55/ISO55000 broadly define an approach that starts with establishing the overarching strategy for the asset (in this case the ACT gas distribution network), and devolving this through policies, procedures and plans into all aspects of operations. The asset management practices utilised for the ACT gas networks are supported by well-developed documentation that records and provides assurance that decisions are made to maximise the value of the services delivered to customers by these gas distribution assets.

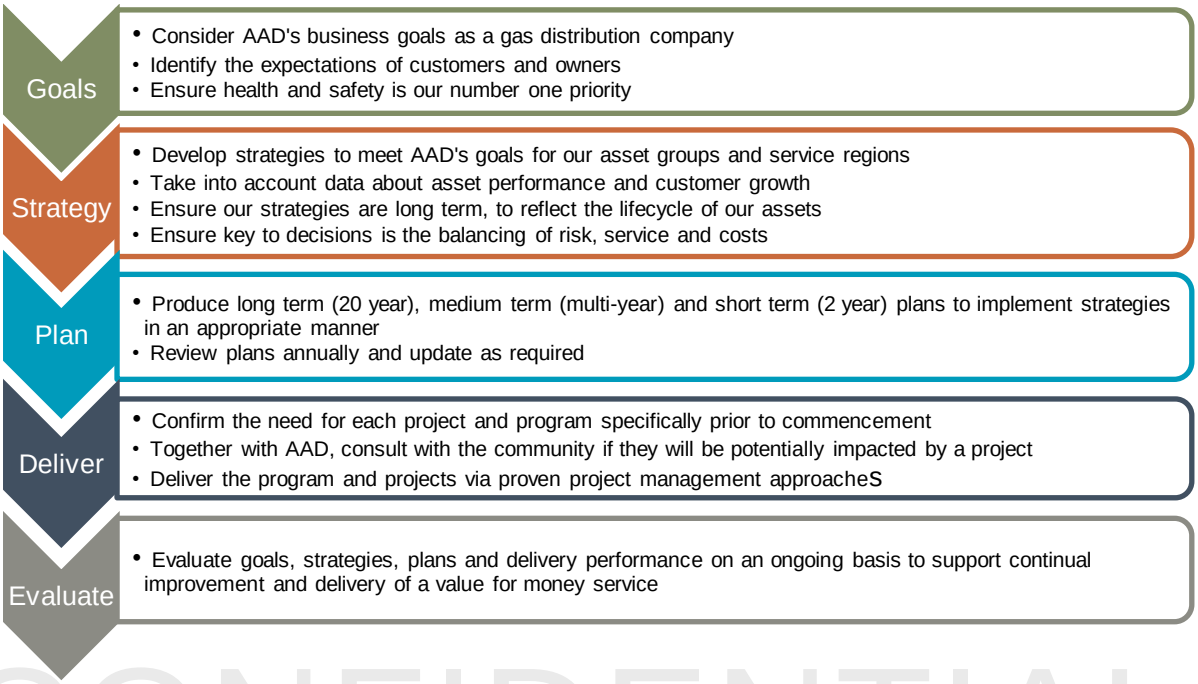
Sound capital governance is integral to good asset management practice, as demonstrated through business management practices. This includes:

- formal review and delegation protocols/level
- supporting policies and procedures to control capital investment; and
- appropriate audit and assurance measures.

In addition to these governance controls, investment decisions are evidenced through business documentation, which identify the driver for expenditure and demonstrates efficient decisions throughout the entire asset lifecycle as outlined in Figure 1–2.

These practices are ultimately integrated with risk management, quality management, compliance, work health and safety, and environmental management practices. These practices are outlined below.

Figure 1–2: Jemena's processes for making expenditure decisions



1.8 RELATION TO OTHER DOCUMENTS

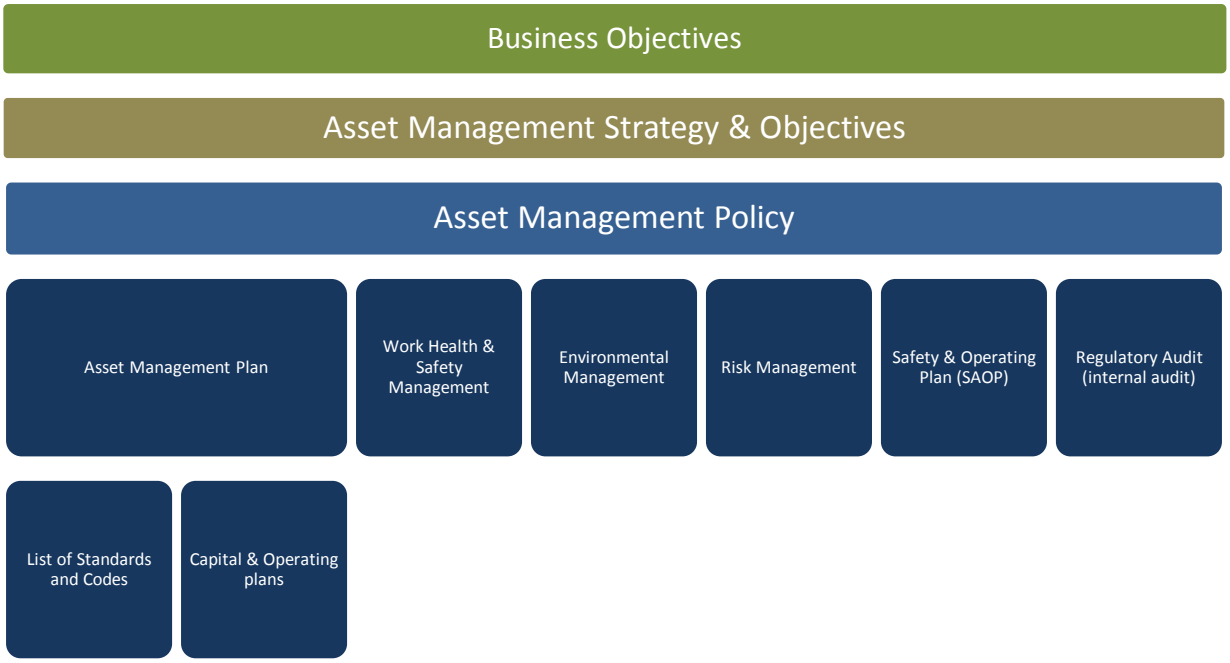
The AMP is derived from AAD's Business Objectives, Asset Management Strategy & Objectives, and the Asset Management Policy. Figure 1–3 below shows how the AMP is supported by the following processes:

- Work Health and Safety Management
- Environmental Management
- Risk Management
- Safety and Operating Plan (SAOP); and
- Regulatory Audit (internal audit).

The AMP references both the:

- List of Standards and Codes; and
- Capital Plan.

Figure 1–3: AAD Business Objectives Hierarchy



2. INTRODUCTION

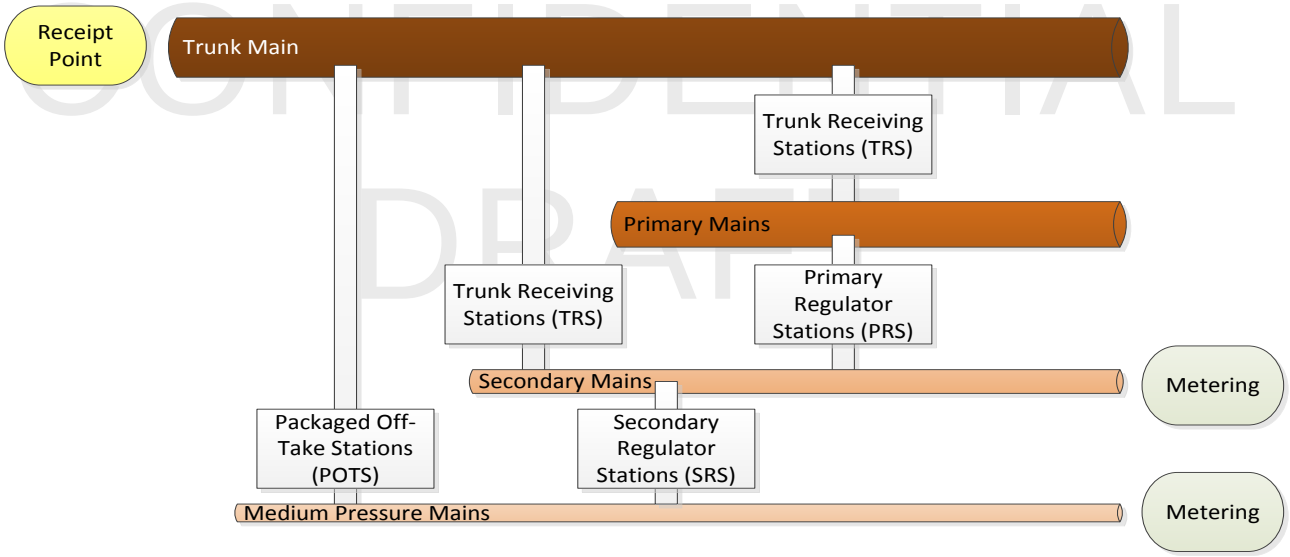
2.1 NETWORK OVERVIEW

The ACT network was initially commissioned in 1980s and was extensively developed through the mid-1990s. The network has since grown through a combination of extensions to new developments and infrastructure to support this growth. The network now provides gas to over 130,000 consumer connections across the ACT, Queanbeyan and Bungendore areas.

The ACT network distributes natural gas from the transmission pipeline receipt points to gas customers via a series of pipelines. Figure 2–1 below illustrates how the pressure steps down from 14,900 kPa (Trunk) to a minimum of 210 kPa (Medium Pressure) between these points via a series of receiving stations and regulators.

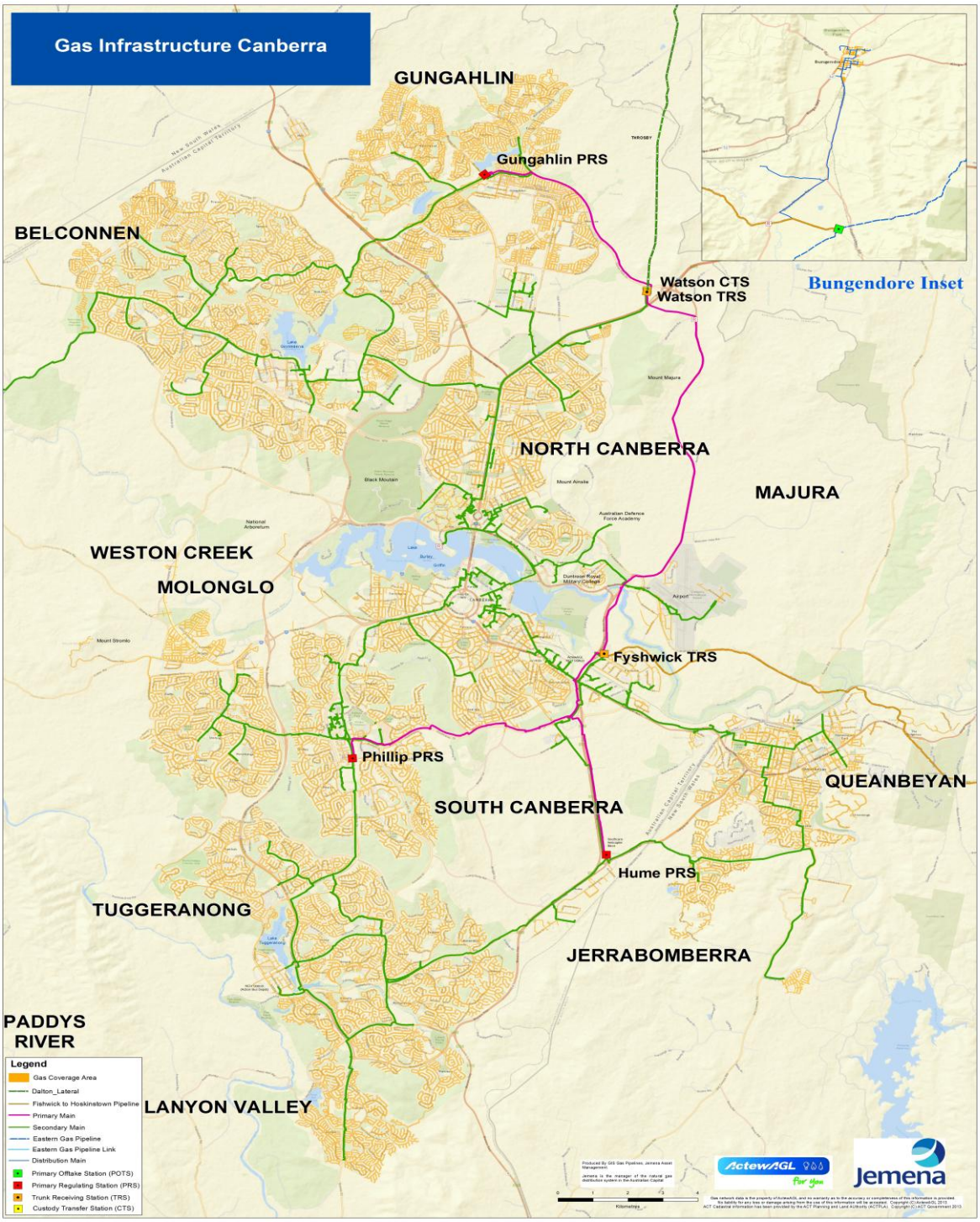
The customer then receives gas via a meter at the appropriate pressure. Residential and small commercial customers are generally connected to the medium pressure mains, whilst larger commercial and industrial customers are connected at secondary pressures.

Figure 2–1: ACT Network Mains



The key supply points and gas distribution areas are summarised below in Figure 2–2.

Figure 2–2: ACT Gas Network Map

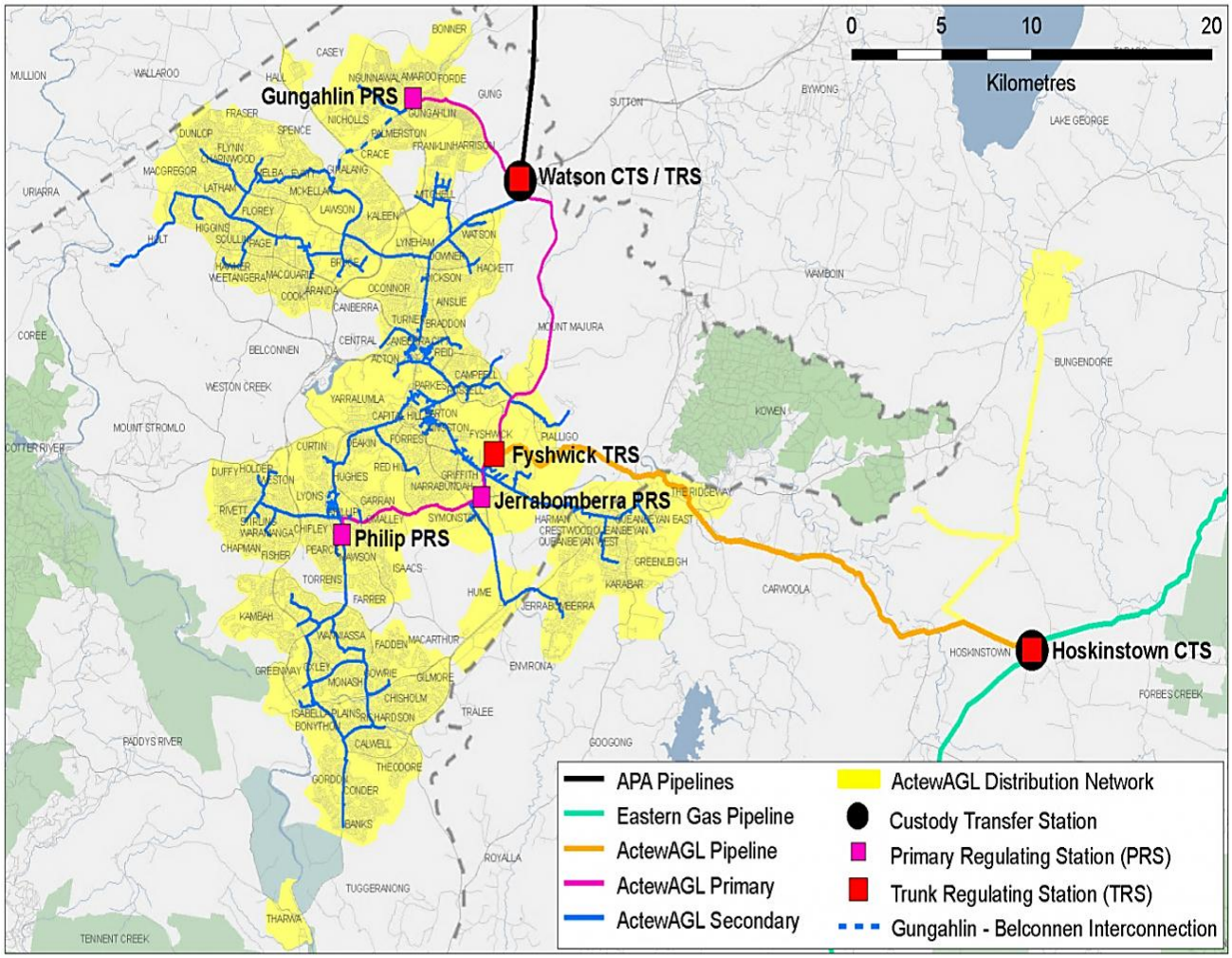


2.1.1 SUPPLY POINTS

Natural gas is supplied to the ACT network via connections to two high pressure gas transmission pipelines as shown in Figure 2–3 below[3]:

- The Dalton to Watson Pipeline in the north, owned by the Australian Pipeline Trust (**APA**) – part of the APA group listed on the ASX. This is a lateral of the Moomba to Sydney Pipeline (**MSP**) trunk pipeline. The MSP also transports natural gas from Moomba, South Australia and Queensland across NSW. Natural gas is received from the Dalton to Watson Pipeline into the ACT network through the Watson Custody Transfer Station (**CTS**); and
- The Eastern Gas Pipeline (**EGP**) in the east, owned by Jemena Limited. The EGP transports gas from Longford in Victoria through NSW to the Sydney Market. Natural gas is received from the EGP into the ACT network through the Hoskinstown Custody Transfer Station.

Figure 2–3: Key assets in ACT network



[3] Hume Primary Main Extension and Hume Primary Regulating Station to be added once operational in 2015.

2.1.2 KEY STATISTICS FOR THE ACT NETWORK

As at 30 June 2014, the ACT network had 134,264[4] connections and delivered approximately 7.7PJ of gas per annum to customers. Some other key network statistics are set out below.

Table 2–1: Key ACT Network Statistics

Network	
Trunk Mains	30.3km
Primary Mains	39 km
Mains <=1050kPa	4,546 km
Trunk Receiving Stations (incl. POTS)	2
Custody Transfer Stations	1
Primary Regulating Stations	4
Regulator Sets	90
Residential Gas Meters	119,269
Industrial and Commercial Gas Meters	5,237
Water Meters	10,888

2.1.3 REGULATORY FRAMEWORK

The ACT gas network is subject to a range of regulatory requirements, which are specific to its activities as a gas distribution business. The ACT gas network delivers gas to both ACT and NSW customers.

2.1.3.1 Access Regulation

The ACT gas distribution network is classified as a "covered pipeline" under the *National Gas Law* (**NGL**). As a covered pipeline service provider, AAD must:

- Prepare an Access Arrangement (**AA**) which must be submitted to and approved by the Australian Energy Regulator (**AER**) and then periodically reviewed and revised. The AA sets out the reference services offered to network users (including prospective users) as well as the terms and conditions (including prices), on offered for those services to network users; and
- Comply with a range of other obligations including those that deal with ring fencing.

2.1.3.2 Licensing and licence-related obligations

The ACT networks are governed by the following government authorisations:

- The ACT network is governed by a "Utility Services Licence"; and
- The Queanbeyan and Bungendore gas distribution networks is governed by a "NSW Reticulator's Authorisation".

[4] Delivery Point Identifiers reported to the ACT and NSW Regulators of 120,938 and 13,336 for the ACT and Queanbeyan respectively.

The licence and authorisation outline the obligations to technical regulations concerning the construction, operation and maintenance of its gas network. These regulations are administered by:

- In the ACT, these matters are regulated by the Environment and Planning Directorate (**EPD**); and
- In NSW, these matters are regulated by the Department of Trade and Investment, Regional Infrastructure and Services (**DTIRIS**) NSW.

2.1.3.3 The National Energy Customer Framework

The *National Energy Retail Law* (**NERL**) and *National Energy Retail Rules* (**NERR**) and associated amendments to the National Gas Rules (**NGR**)[1] as well as Regulations - together the *National Energy Customer Framework* (NECF) - commenced in ACT, in transitional form, on 1 July 2012. The NECF imposes a range of significant obligations on gas distributors including ActewAGL Distribution (AAD). From AAD's perspective, a key dimension to the NECF is the creation of new rights and obligations between AAD as the gas distributor and end consumers, in addition to rights and obligations, as between AAD and network users (and retailers and end-consumers). This includes a deemed contractual relationship between AAD and gas consumers. Other requirements relate to, among other things, the classification of customers, the provision of information to retailers and customers, billing as between AAD and retailers, and the provision of connection services.

2.1.4 THE ACCESS ARRANGEMENT

In the process of reviewing and approving the AA, the AER is required to approve the prices proposed to charge for defined reference services. The prices are set so as to provide "a reasonable opportunity to recover at least the efficient costs incurred in"

- providing those services; and
- complying with a regulatory obligation or requirement or making a regulatory payment."[5]

The NGR specifies how the AER is to go about assessing the efficient level of costs. In principle, the levels of capital and operating expenditure that the AER allows *'… 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'.*[6]

In addition to satisfying the above criteria, capital expenditure must be justifiable on the basis that the:[7]

a) the overall economic value[8] of the expenditure is positive,

b) the present value of the additional 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:

---

[1] Principally new parts 12A and 21 in the NGR.

[5] NGL, section 24(2).

[6] NGR, rules 79(1)(a) and 91.

[7] NGR, rules 79(1)(b) and 79(2).

[8] 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

d) to maintain and improve the safety of services or

e) to maintain the integrity of services or

f) to comply with a regulatory obligation or requirement or

g) to maintain the service provider's capacity to meet levels of demand for services' or

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

2.2 STANDARDS

The asset management processes for the ACT network comply with the relevant guiding standards and codes.

2.3 ASSET MANAGEMENT APPROACH

Jemena operates under an integrated Asset Management System (**AMS**), which is designed to optimise the performance of assets over its full life cycle.

2.3.1 ASSET MANAGEMENT POLICY

Jemena's Asset Management Policy was established by the Asset Management System Review Committee and approved by the Jemena Managing Director in January 2014. The policy was intentionally drafted to be relevant to both assets owned and asset managed by Jemena. The policy is detailed in Jemena's Asset Management Policy.

The key features of the policy commit Jemena to

- Manage the network in an environmentally friendly way with no compromise to health and safety
- Become world class owners and managers of energy delivery assets
- Comply with regulatory and legislative requirements
- Deliver corporate objectives and policy; and
- Establish, maintain and govern an effective AMS**.**

2.3.2 PAS 55

One of Jemena's key success factors is "Leading Asset Management". As an outcome of the review of initiatives to achieve this success factor, Jemena has committed to achieve PAS-55/ISO 55000 certification.

PAS-55 is a risk management focused approach to asset management. Certification requires the demonstration of robust and transparent asset management processes, policies, procedures, practices and a sustainable performance framework.

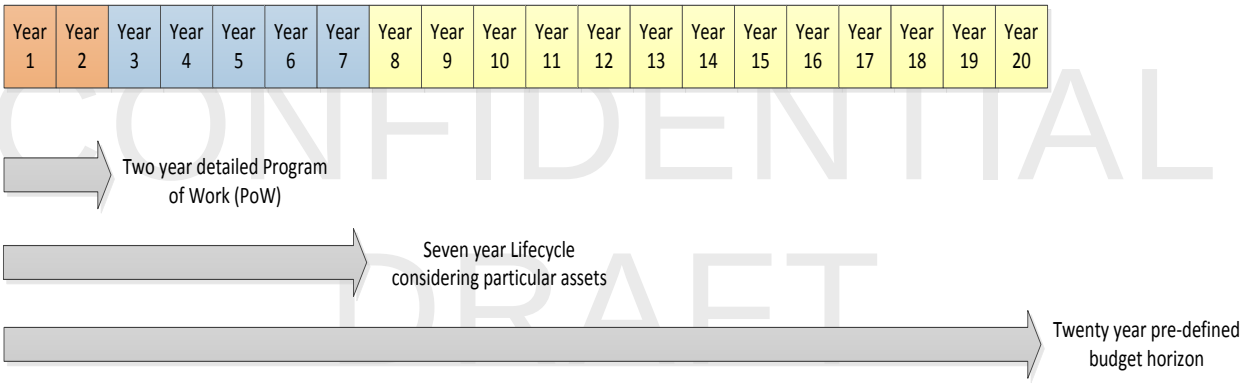
2.3.3 ASSET MANAGEMENT SYSTEM

The key linkage of the AMP to the business plan, strategy and objectives is the AMS[9] document, which provides a consistent, collaborative and integrated approach to the activities undertaken by Jemena to manage the lifecycle of its assets.

Jemena's AMS Diagram (see Figure 2–4) was endorsed by Jemena's AMS Review Committee in December 2013. The structure allows for "line of sight" from the AAD Business Plan through the 20 Year Asset Class Strategies (incorporating the longer term asset management strategy and objectives, 20 year strategy and asset class (or unit) strategies) onto the Asset Management Policy and then the two year Programs of Work (**PoW**) to AMP Delivery (see Figure 2–5). The outputs of the AMP and its sub-plans are the two-year PoW, which provide detailed activity level schedules.

The AMP is reviewed and updated annually within a planning cycle, which sequences the Preliminary (Draft) AMP and Draft PoW as the input to the annual budget. The final approved AMP is updated to be consistent with the approved budget. The final updated two year PoW is issued for continued planning and delivery.

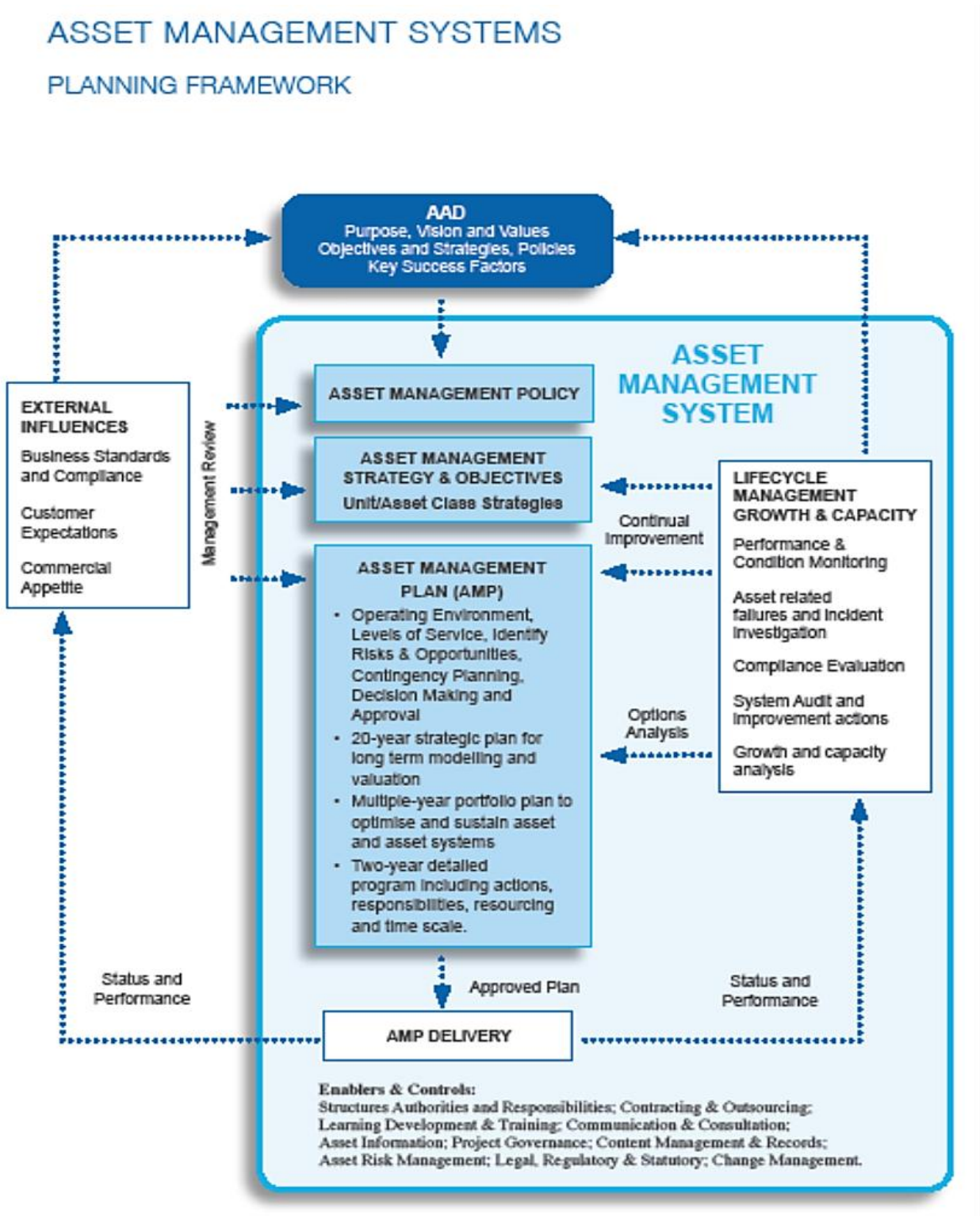
Figure 2–4: Asset Management System Planning Timeline



The AMS describes the consistent, collaborative and integrated approach to the management of the lifecycle of assets that has been adopted to ensure that optimum outcomes are delivered in an efficient way.

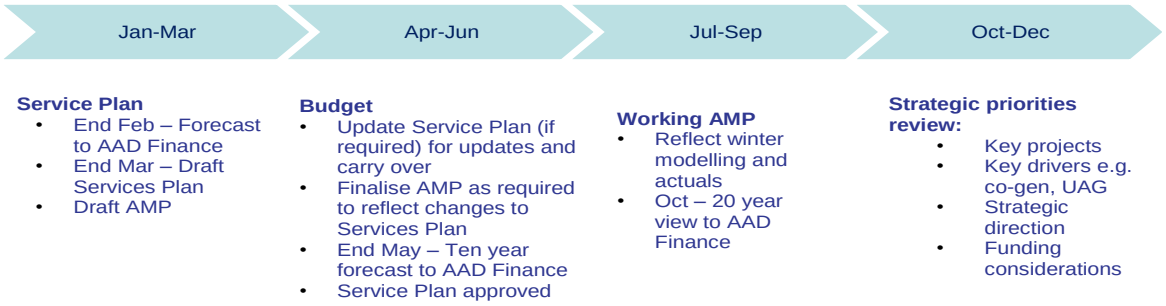
[9] Jemena Asset Management System March 2014

Figure 2–5: Jemena's AMS Planning Cycle



The AMP delivery plan and its alignment to budget processes are summarised below in Figure 2–6.

Figure 2–6: ACT Networks AMP and Budget Timelines



2.3.4 PROGRAM OF WORK

The AMP is structured, as with the normal development cycle of activities, with greater detail for year one and year two activities than for later years. The detail for years one and two is documented in a Services Plan, including:

- Capital PoW, which includes capital programs and individual projects
- Operating/Maintenance PoW, which includes all maintenance related activities; and
- Asset Management PoW, which includes the development of AMPs, technical compliance, project and program development and other activities within the accountability of the Asset Management Group.

The PoWs initially reflect the two year budget cycle and are updated quarterly to provide a rolling two-year cycle, setting out the actions, responsibilities, resourcing and time scales for the activities in the programs.

2.3.4.1 Capital PoW

The two year Capital PoW is currently being enhanced to become a rolling program, with quarterly updates and a full annual reset with the release of the approved AMP. The two year PoW is used to inform the detailed planning for the delivery of the program. The Capital PoW provides input for scope definition at a project level to progress the planning for delivery. As with any long-term program, as the actual delivery timeframe gets closer, the level (and detail) of planning becomes more granular, reflecting the greater definition of the projects that make up the program.

2.3.4.2 Maintenance PoW

The Maintenance PoW includes forecasted activity levels for planned and unplanned repair and maintenance activities aimed at maintaining an acceptable level of risk, customer service and integrity of services.

2.3.4.3 Asset Management PoW

The Asset Management PoW defines the detail, schedule and resource plan for development and documentation of Asset Class Strategies, Regional Capacity Strategies, Opportunity Briefs (**OB**) and Engineering Assessments (**EA**) or Feasibility Assessments (**FA**). Other activities performed as part of the Asset Management PoW include technical risk reviews, technical compliance reviews and audits and records management functions.

3. ASSET MANAGEMENT DRIVERS

This section outlines the key drivers for asset management decisions.

Along with the drivers' specific to a particular asset group, these drivers are used as the basis for the development of the strategies adopted for the management of the various asset classes forming the gas network. Where there is inconsistency between drivers, an understanding of the drivers and asset management experience and expertise is used to balance the drivers in order to optimise the outcomes from the strategies.

These drivers include

- Health and safety
- Community expectations
- Integrity
- Regulatory compliance
- Capacity
- Service age; and
- New/changing supply sources.

A detailed description of each of these drivers is contained in the 20 year asset class strategies

4. KEY SUCCESS FACTORS

Historical network performance is measured and recorded to assess success against the network objectives as well as for regulatory reporting purposes. Each measurement is a Key Performance Indicator (**KPI**). These are then grouped and summarised into five performance areas that are reported internally on a monthly basis. The five performance areas are

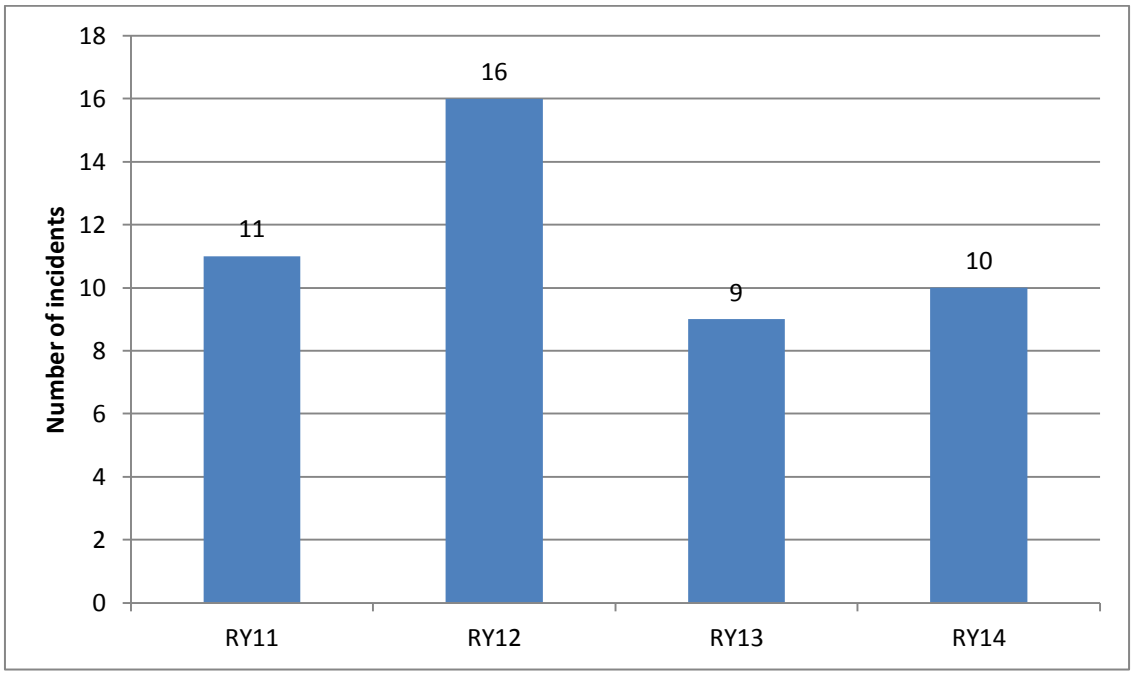
1. Public Safety
2. Customer Reliability
3. Customer Service
4. Risk Mitigation; and
5. System Audits.

4.1 PUBLIC SAFETY INDICATORS

4.1.1 NETWORK INCIDENTS NOTIFIED TO TECHNICAL REGULATOR

This metric provides a measure of the adequacy and effectiveness of asset safety controls. Figure 4–1 below sets out the number of gas network incidents reported to the Technical Regulator between RY10 and RY14. Current management activity to minimise the number of incidents includes the 'Dial Before You Dig' (**DBYD**) and other similar campaigns, which are carried to increase public and contractor awareness.

Figure 4–1: Network Incidents reported to the Technical Regulator

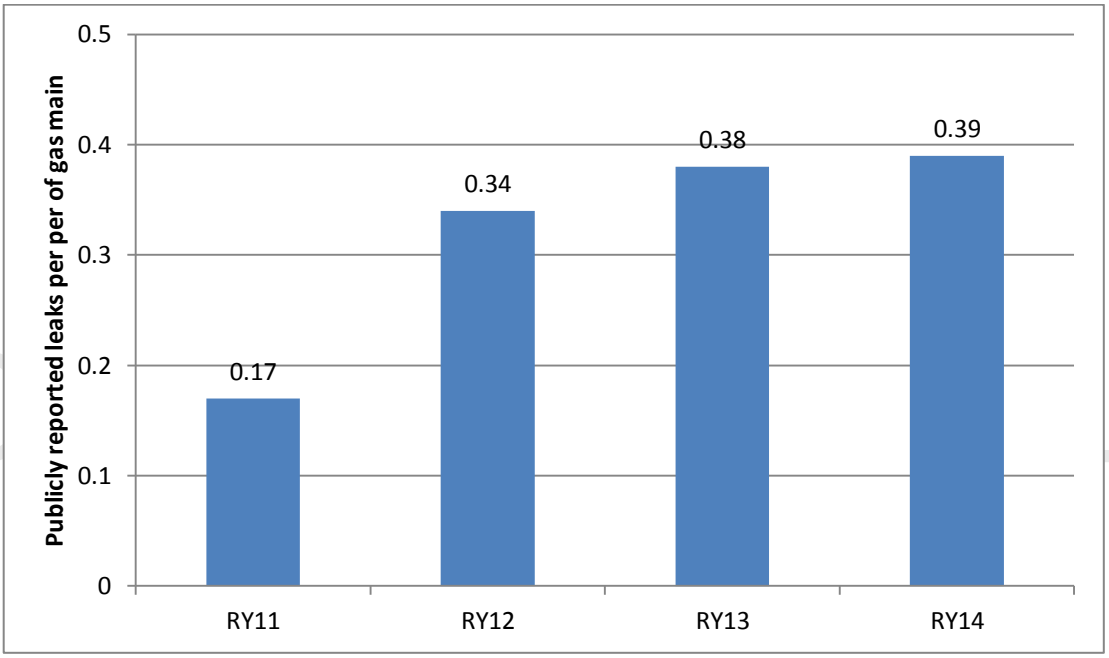


4.1.2 PUBLIC REPORTED ESCAPES

Gas leaks expose consumers to potential safety hazards and typically occur from meters, customer piping and older pipes. The majority of leaks are reported by the public due to odour. To minimise the risks associated with gas leakage, publicly reported escapes are closely monitored and managed with programs including leakage surveys, controlled mains laying techniques and rehabilitation programs.

Figure 4–2 sets out the number of publicly reported gas leaks per km of pipeline.

Figure 4–2: Publicly reported leaks per km of gas main



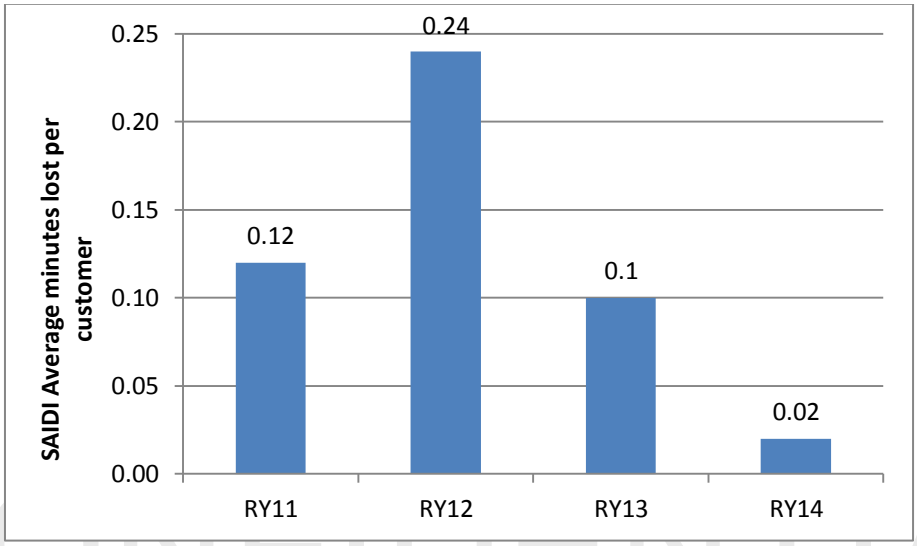
4.2 CUSTOMER RELIABILITY INDICATORS

System Average Interruption Duration Index (**SAIDI**) and System Average Interruption Frequency Index (**SAIFI**) are indices used to measure distribution system reliability. These indicators can be skewed by major incidents. For example in RY12, there were two asset damage incidents caused by third party affecting the Queanbeyan area.

4.2.1 SAIDI

SAIDI is an indicator of distribution system reliability and is measured as the average duration of interruptions per consumer during the year. (Figure 4–3).

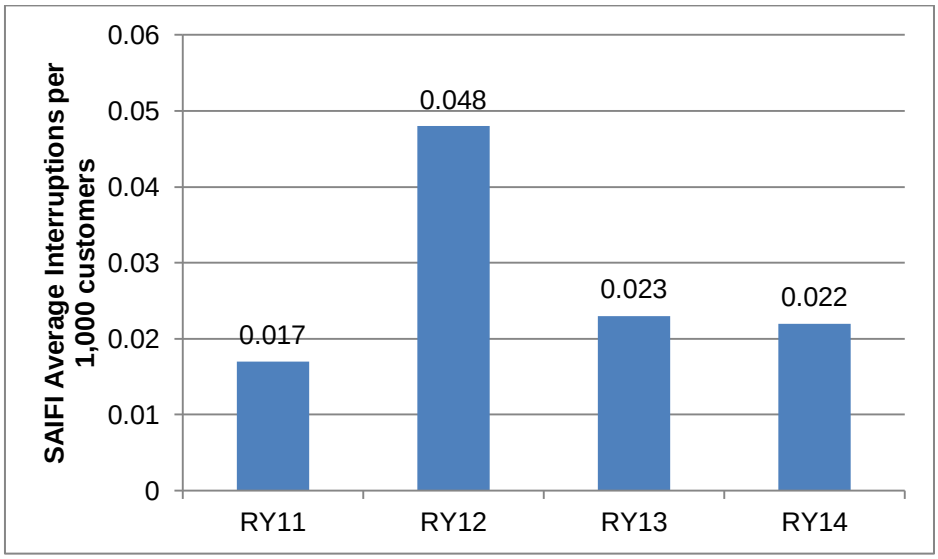
Figure 4–3: Unplanned SAIDI



4.2.2 SAIFI

SAIFI provides a measure of the number of interruptions per customer connection. (Figure 4–4)

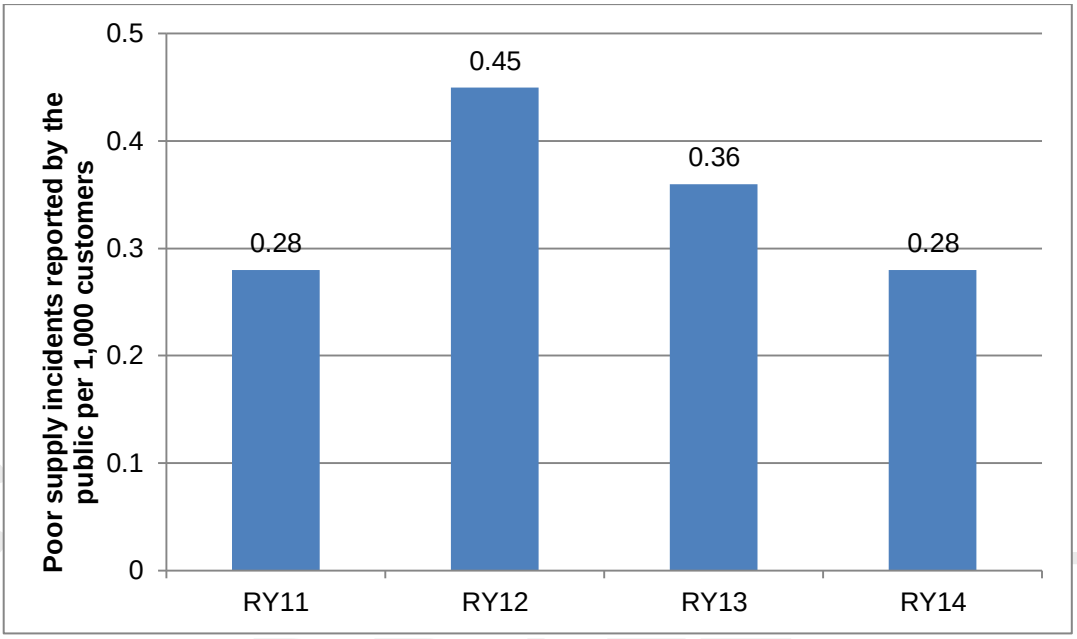
Figure 4–4: Unplanned SAIFI



4.2.3 POOR GAS SUPPLY INCIDENTS REPORTED BY THE PUBLIC

Figure 4–5 below sets out the number of poor gas supply incidents reported by the public, which are generally associated with low network pressures. This indicator is measured by counting work codes relating to poor gas supply. This KPI is monitored to identify areas that may need system reinforcement or additional maintenance.

Figure 4–5: Poor supply incidents per 1,000 customers



4.3 CUSTOMERS SERVICE INDICATORS

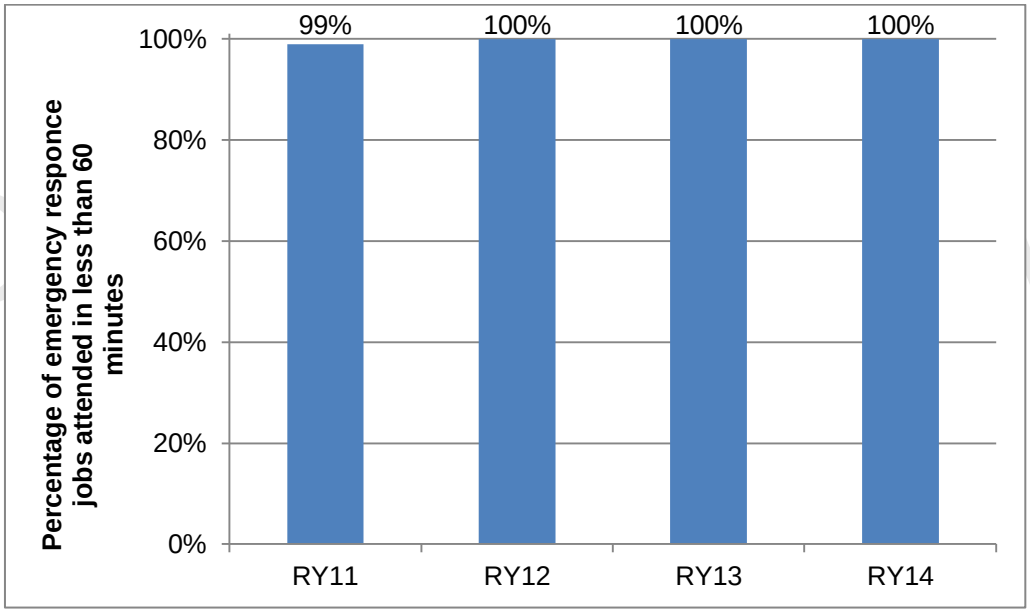
4.3.1 EMERGENCY RESPONSE LESS THAN 60 MINUTES

In the event of an emergency, the primary priority is to ensure public safety, minimise the impact of an emergency on the community, environment and safeguard the assets. The risk of uncontrolled gas escapes affecting the public can be high, and response to these incidents is required as soon as possible.

The primary KPI for emergency response is based on capacity to respond to emergencies within 60 minutes.

The aim is to address 95 per cent of emergencies within 60 minutes. As Figure 4–6 indicates, this target was consistently surpassed over the period.

Figure 4–6: Emergency Response within 60 minutes

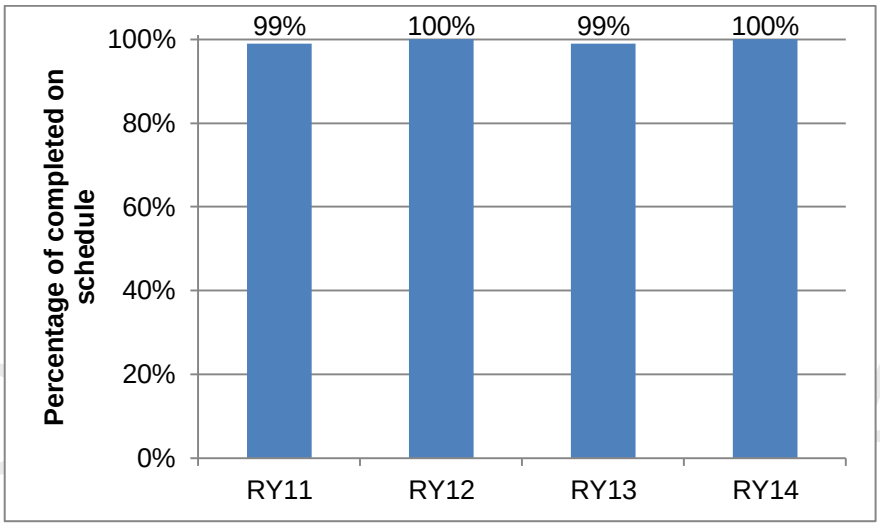


4.4 RISK MITIGATION INDICATORS

4.4.1 PIPELINE PATROL

Pipeline patrol is a key activity in ensuring no interference on the ACT network's higher risk assets. Figure 4–7 sets out the percentage of pipeline patrol work completed on schedule over the period. This work has been consistently carried out on schedule and non-compliances addressed in a timely and appropriate manner.

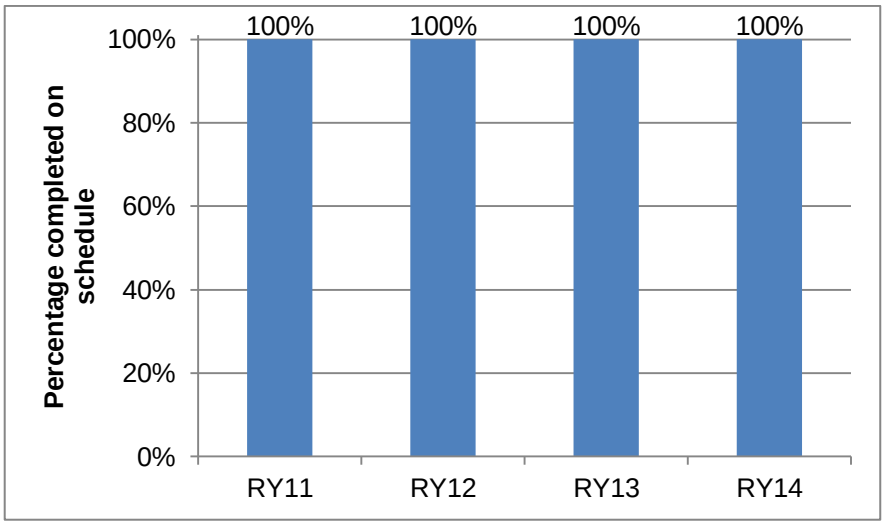
Figure 4–7: Pipeline Patrol compliance



4.4.2 LEAKAGE SURVEY

This indicator monitors whether planned leakage surveys are being completed to schedule. This KPI is tracked via job work codes. Figure 4–8 indicates strong performance in this area over the period. A five yearly survey operates for the bulk of the ACT network and more frequent for specific areas such as HQJOC in Bungendore.

Figure 4–8: Leakage Surveys



4.4.3 UNACCOUNTED FOR GAS (UAG)

The ACT network Unaccounted for gas (**UAG**) level increased over the AA2010 Access Arrangement period to a four year average of 1.96 per cent. The annual figures are shown in Figure 4–9. Analysis of UAG data demonstrates clearly that the ACT network UAG is largely attributable to measurement related issues rather than leakage. This is supported by the effect of the balance of supply into the network between its two receipt points on the level of UAG.

Recognised good industry practice is actively applied to manage UAG. This includes sound practices to ensure accurate metering, both into and out of the network. However, the causes of UAG by nature are subject to considerable uncertainty, because they cannot be directly measured, and inferences about any particular source of UAG are difficult to make despite best efforts to do so.

The main causes influencing UAG are

- Gas leakage, which can arise as a result of
  - physical leakage; and
  - venting (insignificant).
- Measurement error, which can be attributed to[10]
  - errors in meter reading (automated or manual)
  - incorrect estimations of gas consumption where readings are unavailable
  - metering uncertainty
  - linepack changes; and
  - heating value (HV) determinations.
- Gas Theft

[10] The calculation of UAG is largely dependent on the timing of meter reads. All meters at network receipt points and at demand market sites are read and reported daily. The daily quantities are aggregated into monthly totals. Calculation-based errors are not introduced in this process. However, volume market meters are read monthly or quarterly on a continuous cycle and this introduces three issues:

1. No daily information is available for quarterly-read or monthly-read meters
2. For any given time the Volume Market contribution to total sales can only be estimated because all volume meters are not and cannot be read at the same time; and
3. Quarterly and monthly reads means that the information as to the volumes of sales cannot (by definition) be known until 90 and 30 days, respectively, from the first day of "gas sales" through the meter.

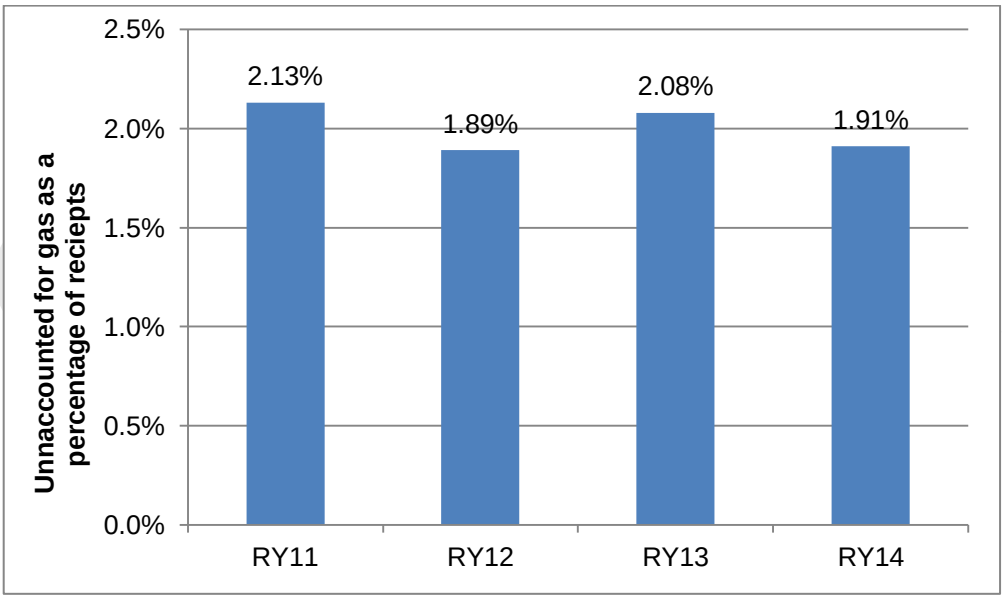
To deal with these three measurement related issues, Jemena does the following:

1. To deal with the first issue, Jemena assumes that the same daily profile (total of volume market usage and UAG for a day = total receipts minus demand market usage on the day) applies to volume market meter readings for a specific period within the cycle. This method appears to work satisfactorily during the summer and winter seasons where usage patterns are relatively predictable. However, in the spring and autumn shoulders volume market usage changes rapidly and the assumption to apply the daily profile introduces errors.
2. To deal with the second issue, Jemena calculates UAG over a 12 month rolling period; and
3. To deal with the third issue, UAG is reported with a three month lag.

The ACT network's UAG level is the lowest of any Australian gas network, if the one anomalous gas network is excluded. Accordingly, Jemena is proposing that the approved level of UAG be based on the same reasoning and approach as applied in the 2012/13 review of UAG for the Victorian gas network businesses by the Victorian Essential Service Commission. That is, that the approved UAG benchmark apply the revealed cost approach to incentive regulation.

Accordingly, Jemena is to apply the four year historical average of 1.96 per cent of gas receipts as the forecast for UAG for the AA2017 period. This approach is consistent with the requirements of Rule 91 of the NGR that opex "*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.*" In the case of UAG, only the cost of UAG that is prudent and efficient and will deliver the lowest sustainable cost may be included.

Figure 4–9: Unaccounted For Gas



5. PROCESS AND SYSTEM DESIGN

A range of strategies and processes are employed to manage the gas network to achieve the asset management objectives and ultimately the business objectives. The strategies and processes contain policies, a system and plan to implement and often a committee to own and oversee.

These processes and systems include

- Risk management
- Work, health and safety management
- Regulatory management (technical)
- Environmental management
- Asset management
- Maintenance planning
- Stakeholder management; and
- Land management.

Each of these factors forms and integral part of the asset management process.

Further detail on the strategies, policies, processes and systems used across each of these areas is provided below.

5.1 RISK MANAGEMENT

5.1.1 RISK MANAGEMENT POLICY

The process by which risks to assets are identified, rated and managed is through the Jemena Risk Management Policy and Management Manual. These documents were developed in line with AS/NZS ISO31000: Risk Management – Principles and Guidelines and have been ratified for use by AAD.

5.1.2 JEMENA COMPLIANCE AND RISK SYSTEM (JCARS)

JCARS is an implementation of SAI Global's Governance, Risk and Compliance (**GRC**) management tool. The system has been implemented to assist in the management of compliance with access, licence and licence-related, NECF and other relevant statutory obligations that apply to ACT Networks.

Jemena administers and maintains the JCARS content and obligation assignment and reports, on behalf of AAD, both internally and externally on its compliance status.

5.2 WORK, HEALTH AND SAFETY MANAGEMENT

This section refers to the occupational health and safety of Jemena employees and contractors working and discusses the Health, Safety, Environment and Quality (**HSEQ**) activities.

As Jemena has the prime responsibility for the delivery of the AMP, this section focusses upon the HSEQ activities undertaken by Jemena.

5.2.1 REGULATORY REQUIREMENTS

The legislative obligations and internal requirements around employee and contractor health and safety are managed by project and line managers and supported by the HSEQ processes and personnel.

5.2.2 HSEQ STRATEGIC DIRECTION

Jemena has, for some time, been actively building a World Class Generative HSEQ Culture. This culture prompts employees to approach tasks in a manner to “entertain doubt”, or what is sometimes described as “chronic unease”. This in turn prompts employees to look for what has been missed and what can be done better.

5.2.3 JEMENA HSEQ MANAGEMENT SYSTEM

The Introduction to Jemena HSEQ Management System describes the processes required to ensure that Jemena focuses on critical HSEQ needs as the basis for forecasting and allocation of resources. This Management System sets the direction for HSEQ activities and consistently delivers improved HSEQ performance for all business units within Jemena. HSEQ policy impacts the AMP in that all designs of facilities consider HSEQ policy.

Health and safety is a primary consideration in all projects and activities in the AMP.

5.2.4 JEMENA HSE COUNCIL

The Charter of the Jemena HSE Council states that the Council provides HSE leadership and assists Jemena to fulfil its overall responsibilities in relation to HSE matters as they affect workers (employees and contractors), customers and the community. Membership of the Council includes the Managing Director as the Chair, all Executive General Managers and the General Manager of HSEQ.

The HSE Council has established an Asset and Public Safety sub-committee, which monitors and reports on the effectiveness of strategies and practices to manage risks in this area.

The sub-committee oversees a number of operational and review committees which have specific objectives. The structure of this sub-committee is set out in Figure 5–1, while the objectives of this sub-committee and a number of other sub-committees that have been set up are set out in Table 5–1.

Figure 5–1: Asset and Public Safety Committee Structure

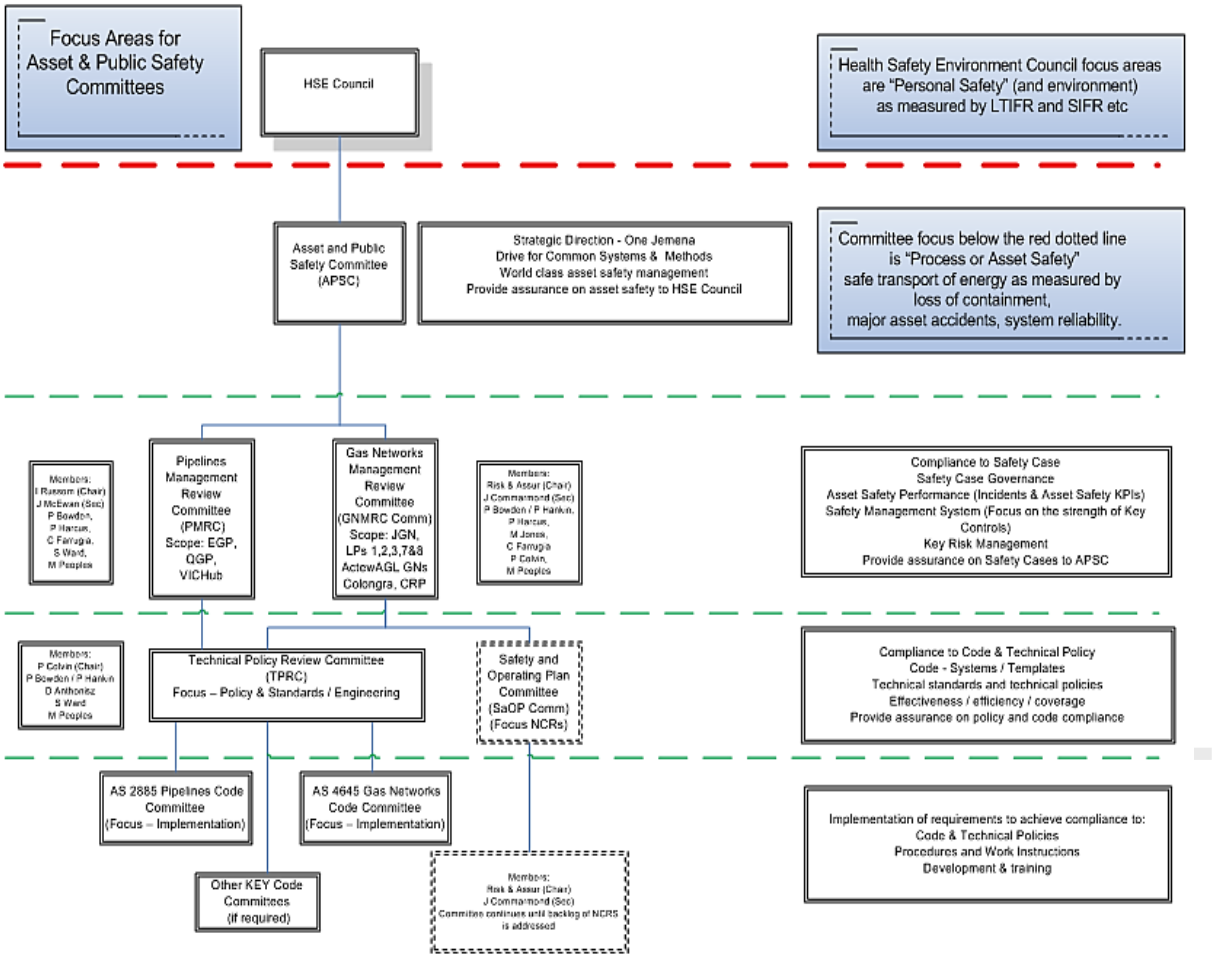


Table 5–1: Objectives of the Asset and Public Safety Committee and Sub-Committees

Sub-Committee	Objective
Asset and Public Safety Committee (APSC)	Reviews and monitors the operation of gas safety management processes and systems to ensure they deliver.
Technical Policy Review Committee (TPRC)	Ensure appropriate technical policies are in place for gas assets.
AS2885 Pipeline code committee	An operational level committee with the purpose of developing operational excellence across all gas infrastructure assets governed by the AS 2885 suite of standards for gas pipelines and facilities
AS4645 Pipeline code committee	An operational level committee with the purpose of developing operational excellence across all gas infrastructure assets governed by the AS4645 Suite of standards for gas networks

5.3 REGULATORY MANAGEMENT (TECHNICAL)

5.3.1 MANAGING REGULATORY CHANGE

Compliance with Legislation, Regulations and Standards is dependent on maintaining currency with Legislative changes. There are several mechanisms used to stay up to date with change. This includes stakeholder management and committee representation.

5.3.2 REGULATORY CHANGE AND IMPACT

A subscription is maintained with the external service provider SAI Global (Lawlex) for their legislative alerts service which provides alert and a synopsis of act or regulatory changes for nominated acts and jurisdictions. Any updates to legislation, regulation, code or other source impacting the compliance obligation impacting on the business will be reviewed and the compliance obligation in JCARS will be updated accordingly.

All proposed regulatory and legislative changes are closely monitored and reviewed and submissions or representations made as required.

5.3.3 SAFETY AND OPERATING PLAN

The Safety and Operating Plan (**SAOP**) is a key component of the compliance management system and describes the “safety management system” by which Jemena fulfils its legal obligations.

The SAOP has been developed as a reference document to Jemena’s Technical Policies and procedural manuals and is implemented at a management level. Regulatory and internal audits are conducted to test the implementation, compliance and accuracy of the systems and processes described by the SAOP.

5.3.4 REGULATORY AUDIT PLAN

The regulatory audit plan is a legislative requirement that provides assurance to regulatory bodies that the assets are operated and maintained in a safe manner as required by the Licence and Standards. The information from regulatory and internal audits is used to track trends across the business and provide assurance on the overall level of compliance. The regulatory required audits are referred to as “Safety and Operating Plan audits” and they are conducted once per year by an external auditor on behalf of the regulator.

Audit topics are selected by the auditor on a 5 yearly cycle and in consultation with the Asset Risk and Assurance Group and the ActewAGL Gas Networks representative based on past performance and risk to the business. These topics are detailed in the relevant SAOP.

The Asset Risk and Assurance Group develop an internal audit plan annually to complement the regulatory audits. It aims to provide assurances regarding the adequacy and effectiveness of internal controls associated with the safety management system. The internal audit plan has been developed based on risk and compliance management requirements; trending from regulatory audits, performance of KPI’s, and discussion with stakeholders including regulators, management and owners. Audit topics include the systems and processes developed to manage the controls around risks.

Non-conformances and Opportunities for Improvements, related to regulatory and internal audit findings, are tracked and reported through to the Gas Networks Management Review Committee.

5.3.5 INDUSTRY AND STANDARDS PRESENTATION

Representation is maintained on several industry bodies including Australian Standards Committees Energy Networks Association, Australian Pipeline and Gas Association and others. Representation on these committees provides a medium to develop relationship with other industry stakeholders and to keep abreast of industry trends and additional insights into industry best practice.

5.4 ENVIRONMENTAL MANAGEMENT

Protection of the environment, as well a commitment to reducing its environmental footprint, is integral to the philosophy of the Environmental Management System. This system consists of the Environmental Policy, Environmental Management System Manual, various procedures and aspects of impacts registers and has been designed in accordance with the ISO 14001:2004 Standard – Environmental Management System.

An Environmental Management Plan (**EMP**) supported by Operational Environmental Management Plans has been developed. The plans ensure that activities are undertaken consistently and with minimal impact on the environment.

Environmental incidents and hazards are reported and tracked.

Environmental awareness training is provided to all the relevant managers, supervisors and field staff to ensure that they are aware of their regulatory obligations and how to manage environmental issues during their day-to-day work activities.

5.5 ASSET MANAGEMENT

5.5.1 ASSET MANAGEMENT POLICY

Jemena's Asset Management Policy is supported by the Asset System Manual, the objective of which is to set out below

- a consistent, collaborative and integrated approach to the activities undertaken to manage the lifecycle of its assets to ensure that optimum outcomes are delivered in an efficient way. This document sets out the AMS to be used for ACT network's assets; and
- how asset management is 'done' (i.e. how asset management is directed, coordinated and controlled).

5.5.2 ASSET MANAGEMENT PLAN

This AMP is updated and released annually. At both the preliminary and finalisation stages, the AMP is released and communicated with stakeholders, including the delivery groups responsible for the ultimate delivery of the distribution portion of the Capital Plan. This enables stakeholders to have a long-term view for their own planning purposes.

5.5.3 ASSET MANAGEMENT COMMITTEE

An Asset Management Committee has been formed with the aim of incorporating PAS55 into the existing asset management processes. The committee has responsibility for the AMS and its overarching purpose is to strengthen the AMS by providing governance, alignment and review. The committee provides a senior management forum to ensure the system is fit for purpose and delivers the business objectives.

5.5.4 UAG TASK FORCE

An Un-accounted for Gas (**UAG**) Task Force exists to raise, monitor and manage issues related to UAG, in order to ensure UAG is maintained at an efficient level. The objectives of the Task Force are to:

- monitor the UAG trends and levels
- identify sources of UAG
- identify actions and controls
- assign sponsors and responsible persons to actions and controls
- report to management as part of the monthly reporting process; and
- support knowledge management and retention.

Key areas of review include:

- Monitoring and forecasting
- Calculation processes
- Metering
- Gas quality
- Billing
- Operations
- Maintenance; and
- Network protection.

5.6 MAINTENANCE PLANNING

Maintenance is undertaken to deliver a safe, reliable and efficient network. Maintenance planning covers both planned and unplanned (including emergency response) elements of maintenance. Maintenance planning is based upon ‘good industry practice’ as defined by the appropriate Australian Standards suites - AS4645 and AS2885 – covering Gas Distribution Networks and Gas Pipelines respectively. Both of these standards are founded on the performance (or risk) based approach.

Maintenance planning is aligned with the AMS and is designed to ensure that sufficient controls are in place to manage the risks identified in technical risk reviews, being either Formal Safety Assessments (**FSA**) or Safety Management Studies (**SMS**). The considerations used in developing the maintenance strategy include:

- Criticality of network assets, being either individual asset classes, components of these asset classes, or individual assets within the asset class. Criticality for this purpose include the potential for the consequences related to supply interruption, damage to property or personnel and/or environmental damage; and
- Asset specific criteria, which may include the current condition of the asset, design life or age, the cost of the asset, available asset operating information, supplier recommendations and available support (including spares availability), statutory requirements or the assets function within the distribution system.

Based on the assessments above maintenance strategies are implemented specific asset class, including:

- operate to failure
- reliability-based approach
- condition-based monitoring; or
- scheduled maintenance.

Maintenance strategies are articulated in its SAOP, which in turn is underpinned by the Technical Policies. These policies provide guidance on the development of maintenance scopes and procedures.

The location of individual assets is a key input to the maintenance planning given the effect of travel times (both for planned maintenance and unplanned maintenance, including incident response for good customer service) as is the location of available and competent personnel.

The balance of resource capacity and capability and proportion of planned to unplanned works are used to develop a schedule of planned maintenance work as well as the balance of internal versus external labour used to deliver the activities under the maintenance plan. Resource capacity and capability considerations include:

- the competence of personnel
- level of competence of contractors; and
- equipment requirements.

Forecast levels of activities for emergency response, corrective (breakdown) maintenance and externally generated works, such as standby activities for supervision, are based primarily on historical levels of activity as they are effectively initiated by third parties.

An enterprise IT system is utilised to manage its maintenance activities. Planned maintenance activities are loaded and scheduled. As corrective maintenance is identified, it is prioritised and scheduled and if required planned maintenance activities are rescheduled to maintain the resource balance. When an incident requiring emergency response occurs, the response activities are inputted with planned maintenance activities re-scheduled. This consolidation within the enterprise IT system provides an efficient process for balancing of both maintenance priorities and the available resources.

A key component of any maintenance planning process is the commitment to ensure staff and contractors are competent. Training is provided to all maintenance staff and maintenance skills are sustained through annual refresher training programs. Training associated with new technology and new assets is provided as the assets are constructed and introduced.

5.7 STAKEHOLDER MANAGEMENT

5.7.1 REGULATORS – EPD AND DITRIS

Stakeholder management is designed to ensure positive and open relationships with Environment and Planning Directorate (**EPD**) and Department of Trade and Investment, Regional Infrastructures and Services (**DTIRIS**), the key technical regulators. This ensures communications channels are open and the regulators are engaged early in projects that are potentially affected by legislation and licence conditions. This plays a crucial role in the current and future operating environment regarding network development, or changes that require technical regulatory approval and or involvement. The EPD is the Technical Regulator who administers technical regulation (Utilities (Technical Regulation) Act 2014).

5.7.2 CONSUMER ENGAGEMENT

Customer focus is key value. Customer focus is established to understand and meet the reasonable expectations of customers and customer groups, and ensure that customer and stakeholder engagement plays an important role in the prudent optimisation of costs, services and prices.

A two stage Consumer Engagement Strategy has been introduced that outlines a program of activities that include focus groups, community representations, an Energy Consumer Reference Council (**ECRC**) and meetings with consumer groups. The seven members appointed to the ECRC include Social Services, Small Business, Property and Housing, Community Councils, Engineers and non-profit Groups.

Details of meetings and current representation are on the ActewAGL website.

5.8 LAND MANAGEMENT

The ACT Network includes land within both the ACT and NSW. This brings with it an extensive number of management issues including

- leasehold requirements for land in the ACT as distinct from NSW
- landowners involved e.g. public and private
- unique land conditions e.g. national parks; and
- uses of the land (existing and proposed).

When planning or expansion of the respective networks is contemplated, a representative is typically involved early to assist the process.

5.8.1 TENURE OF LAND

In the ACT, Leasehold is the system of land tenure. Leasehold means a lease over the land required can be issued for 99 years and specific assets are subject to Development Application (**DA**) conditions. This leasehold approach has implications for the establishment and maintenance of long term gas network assets. In NSW, land rights are protected by easements, statutory rights or licence agreements.

5.8.2 LANDS MANAGEMENT SYSTEM

The Land Management System (**LMS**) is a database which contains information regarding Land Ownership such as contact details, tenure, previous communications/contact and specific land requirements. An annual mail-out is sent out to landowners affected by the Licensed Pipeline, reminding owners of the risks associated with activities near the pipeline and to obtain updated landowner details. Note this only applies to AAD's licenced pipelines being protected by easements in NSW.

6. EXPENDITURE SUMMARY

6.1 CAPITAL EXPENDITURE (CAPEX)

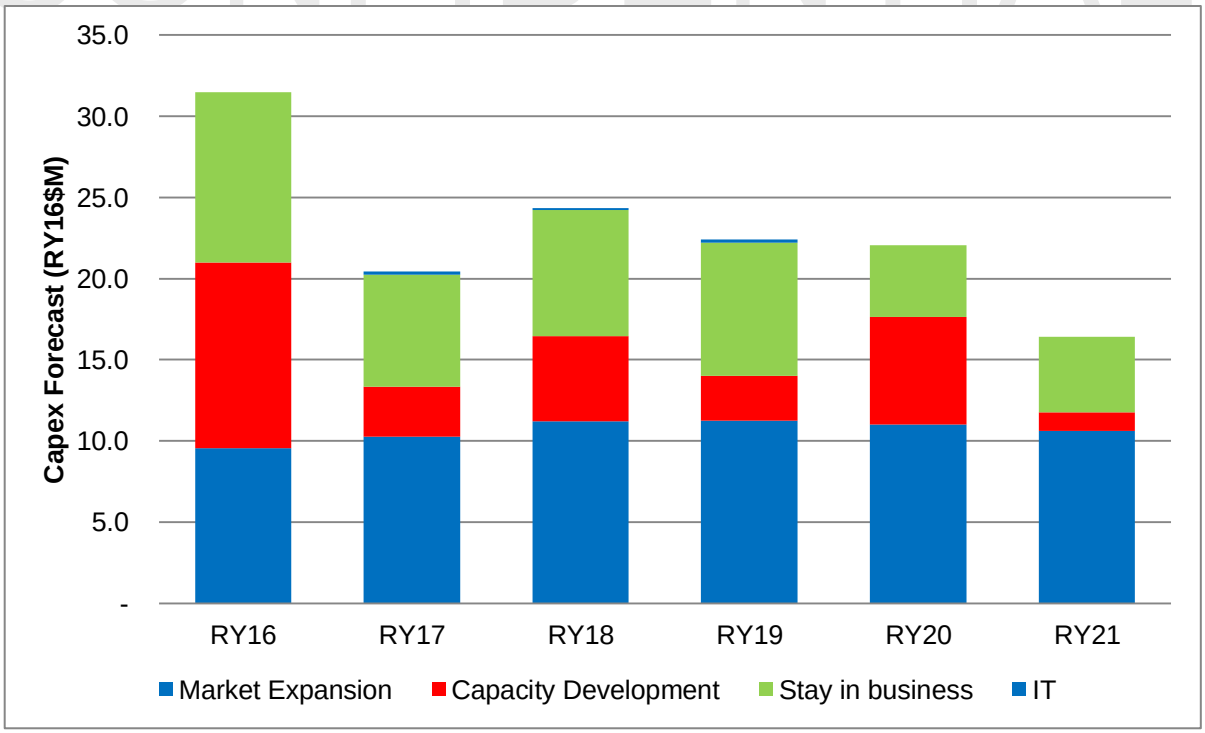
The Capital Plan is a schedule of planned and proposed projects consistent with the 20 year asset class strategies and the long-term plans for capacity requirements for the gas network. The Capital Plan is designed to ensure the ACT gas network's objectives are implemented as efficiently as possible by capturing input from multiple stakeholders.

The capital requirements outlined in the asset class strategies, in conjunction with the capacity requirements and KPI performance, provide the 'proposed' projects that form the basis of the Capital Plan. These proposed projects then become 'planned' when they are analysed as part of the Asset Management Program of Work (PoW). Activities performed as part of the Asset Management PoW may include a review of potential options, provision of a solution, including timing, cost estimation and scoped definition.

The timing of review of capital requirement as part of the Asset Management PoW is subject to the scheduling, complexity or risk of the project and/or the interdependency with other projects.

Figure **6–1** provides a snapshot of the Capital Plan for the AMP period RY16 to RY21.

Figure 6–1: Capex Plan RY16-RY21.



6.2 OPERATIONAL EXPENDITURE (OPEX)

The forecast presented is based on estimated RY15 costs (i.e. the RY15 base year) and adjusted for expected step changes and customer growth. The RY15 estimate was sourced from a mix of actual and forecast costs.

The Opex forecast is made up of the

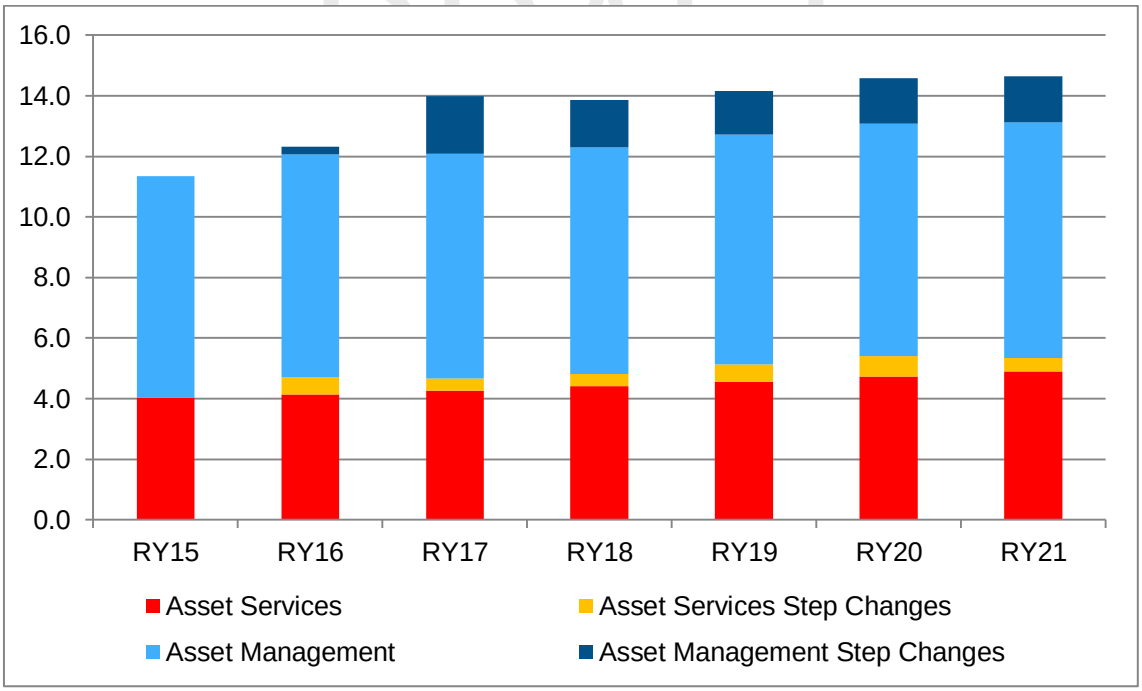
- *Management Services Fee* – includes Regulatory Management, Asset Management, Commercial Management, Customer Management, Network Development and Marketing, Management of Operating and Maintenance Services, Asset creation and General management; and
- *Asset Services Fee* – includes operating, maintaining and repairing the gas network. The Asset Services covers operating and maintenance services to assure that the gas network is fit for purpose in all its operations, and where incidents occur on the network they are responded to in accordance with Customer Service commitments and rectified in a professional manner in accordance with the plans.

These fees vary from time to time to reflect

- Periodic works that occur on greater than an annual basis, such as five yearly Safety Management Studies, etc; and
- New activities that are a result of changes in regulatory requirements, implementation of new assets, etc.

Figure **6–2** illustrates the operation and maintenance plan for the AMP period.

Figure 6–2: Opex Plan RY16-RY21



6.3 CONSISTENCY OF CAPITAL AND MAINTENANCE PLANS WITH THE NGR AND NGL

The consistency of the proposed Capital and Maintenance plans for the upcoming Access Arrangement (**AA**) period with rules 79 and 91(1) of the National Gas Rules (**NGR**) is set out in detail in the AAI.

The development of the AMP is influenced by the feedback provided by stakeholders including the ActewAGL Customer Council, customers, stakeholders and community groups on the appropriate balance between prices, the long-term safety of the network and service levels and customer preferences, more generally. The program of works identified in the Capital and Maintenance plans reflect these preferences and at a more fundamental level have been designed to promote the long term interests of consumers with respect to price, quality, safety, reliability and security of supply as required by the National Gas Objective (**NGO**).

If the ACT network was faced with a lower allowance for capital or operating expenditure than set out above, it would either defer or abandon plans for expenditure that would otherwise be prudent and efficient to undertake, including expenditure to maintain network reliability or to extend services to new consumers.[11]

Reduced expenditure on network reliability would result in:

- longer response times to incidents
- increased and more disruptive gas leaks
- higher prices in the longer-term because there may be a need for 'catch-up' expenditure in future periods and the costs of carrying out that expenditure may be higher.

Reduced expenditure on connecting new customers would also result in higher prices in the longer term, as the costs of operating the network are spread over a smaller customer base.

Viewed in this way it is clear that a decision not to allow any of the proposed capital or operating expenditure specified in the Capital and Maintenance plans will adversely affect customers and will therefore be contrary to the NGO and a number of revenue and pricing principles (e.g. sections 24(3), 24(6) and (7)).

[11] Jemena would not reduce expenditure on works and activities driven by perceived safety risks or concerns because safety is non-negotiable.

7. DELIVERY STRATEGY

7.1 INTRODUCTION

A delivery strategy encompassing the delivery of all assets used in provision of gas from the receipt point to end user's meter but excludes IT related and non-distribution assets has been developed. The delivery strategy provides the framework that will be used to deliver the projects specified in the Asset Management Plan (AMP) and an assessment of the deliverability and the delivery approach of the activities in the AMP.

7.2 FRAMEWORK FOR DELIVERY

There are a number of fundamentals that are critical to the delivery of the distribution portion of the Capital Plan. These fundamentals are applied to the delivery of the Capital Plan. Any improvements that may lead to increased effectiveness or efficiency are identified and implemented. This section summarises the fundamentals and improvements currently being implemented.

7.3 INTEGRATION WITH ASSET MANAGEMENT PROCESSES

The distribution portion of the Capital Plan is ultimately an output from the AMS and this integration provides for the iterative process of balancing the scheduling of proposed capital activities with the effective and efficient delivery of these activities. The communications processes through the development stages of capital activities under the auspices of the AMS, are one of the fundamentals that enable the delivery of the Capital Plan.

7.3.1 SCOPE DEFINITION

As with all long-term planning processes, the success of a project is enhanced through the systematic development of the scope during initial phases within the lifecycle of the project. The Project Management Methodology (**PMM**) utilised to deliver the program, involves preparation of Opportunity Briefs (OB) as an initial scope statement for projects to be considered in the AMP. For more complex projects, an enhancement of the scope is undertaken and documented in Feasibility Assessments (FA) or Engineering Assessments (EA).

The preparation of the OBs and FAs includes the key stakeholders and, upon completion, the finalised documents are made available to stakeholders to assist the preparation of the AMP and planning for the delivery of the projects.

7.3.2 SCHEDULING

For the purpose of assessing deliverability of the program, it has been analysed to ensure that the spread of projects across the period are optimised for efficient and effective delivery. As the scope of projects are further defined through the early stages of the projects' lifecycle (across the portfolio of works), the delivery plan will be adjusted accordingly as a rolling program of works. Amendments will be documented in the AMP and specified through the Capital Program of Work (PoW) and the subsequent detailed portfolio variation processes.

This optimisation of the portfolio is undertaken to balance both the prudency of scheduled delivery of the program of works as well as the efficiency in the delivery of the projects vis-a-vis resourcing requirements.

7.3.3 PROJECT GOVERNANCE

Effective project governance is an essential component to achieving effective and efficient project and program outcomes. Project governance encompasses project management oversight and timely and transparent decision-making. Project governance also needs to ensure that there is alignment and consistency with corporate policies and procedures. The PMM sets the specific governance arrangements for each project according to the size, risk and complexity of each project.

Regardless of the scale of governance required, project governance is used to oversee the key elements of projects. The governance processes are regularly reviewed and where necessary refined.

7.4 CURRENT DELIVERY ARRANGEMENTS AND PERFORMANCE

A mixture of long term and project specific contractors are used to deliver the programs of work. AAD leverages off the scale of Jemena in the engagement of these long term and project specific contractors.

The objectives of this approach are to

- improve the flexibility and responsiveness of AAD cost structure to changes in work volumes
- ensure external delivery channels have sufficient information on likely work volumes and mixes to encourage investment in capability and capacity (labour and fleet); and
- maintain control over high risk delivery areas.

Routine and proactive reviews of the contractors' performances and regular audits to ensure performance and efficiencies are undertaken.

Table 7–1 provides details of delivery channels.

Table 7–1: Delivery Channel summary

Delivery Channels	Description
Internal	AAD employees provide a governance framework and oversight of the program of works.
Jemena	Jemena's employees are engaged in the following operational delivery activities: – procurement and contract management – planning and scheduling – design and commissioning – construction and maintenance – project Jemena also Project Manage Capital Development projects that are either high complexity or construction for projects valued over $0.5M
Service Contractors	Low complexity, largely uniform, high volume capital activities based on unit rates set in contracts, with the majority applicable for the RY16-RY21 period. These unit rates typically relate to main and service construction for projects less than $0.5 million.

Delivery Channels	Description
Preferred Vendor	The preferred vendor model engages pre-qualified vendors based on panel arrangements. This approach is best suited to medium complexity work, such as secondary steel mains construction and meter programs, which are based on standard designs but which require a degree of contractor specialisation and which warrants the establishment of deeper relationships. This approach also facilitates Jemena's ability to manage volumes to best support the operation of a sustainable, competitive market to support delivery of this work.

7.5 DELIVERY STRATEGY

Expenditure planning and governance processes are focused on ensuring that capital expenditure is prudent and efficient.

The objective of the delivery strategy is to ensure that this program is delivered safely and efficiently.

The overarching objectives of the delivery strategy are

- **Safe and Efficient Delivery** – maximising competition between external suppliers and optimising internal processes to ensure efficiency without compromising safety
- **Deliverability** – ensuring that the optimal mix of labour, materials and fleet is available in accordance with program requirements
- **Building and Retaining Expertise** – develop and retain planning and control of the works delivery program to enable to enable efficient resource and material management, project development, and contact and commercial management; and
- **Performance Management** – a focus on delivering to time, cost and quality requirements facilitated by continuous improvement in project planning and controls as well as contractor management.

7.5.1 KEY FEATURES – INTERNAL AND EXTERNAL RESOURCES

The current portfolio of resources will continue to underpin the delivery strategy. Historically this approach has successfully provided an optimal mix of resources with the capability and capacity to deliver.

An important consideration is that AA2017 program volumes are generally consistent with the recent past. In the case of the Meter Replacement program where the volumes are significantly above recent trend, Jemena has engaged in preliminary commercial discussions with its contracting base and has developed a delivery strategy to provide capacity to meet the increase in demand.

An associated factor is that the relative complexity of the programs, which also remain generally consistent with recent past. Importantly, 60 to 80 per cent of the work depending on the year is low complexity, largely uniform, high volume activities that are delivered via established service contractors and preferred vendor arrangements. Internal management resources associated to project management of Capacity Development have remained relatively consistent over the program period.

The Delivery Strategies for the three groups of works are further illustrated in the section below.

7.5.2 MARKET EXPANSION

The delivery strategy for this program will continue to be based on the use of service contractors with Jemena staff providing some of the contractor management services. Service contract resources have historically managed any inter or intra-year variations.

7.5.3 CAPACITY DEVELOPMENT

The program delivery strategy will continue to be based on outsourced construction activity under service contracts, or preferred vendor arrangements, in accordance with individual project requirements.

Outsourcing of construction is the most efficient delivery model for AAD, which appropriately positions construction risk with contracting businesses and addresses the variable volume in this category.

Jemena retains technical, project planning, and contractor management capabilities to ensure that time, cost and quality objectives are met.

7.5.4 STAY IN BUSINESS

The delivery strategy for these projects will continue to be based on outsourced construction activity under preferred vendor arrangements, in accordance with individual project requirements.

Jemena retains technical, project planning, and contractor management capabilities to ensure time, cost and quality objectives are met.

The meter renewal and upgrade program will continue to be based on the use of service contractors. The program represents an increasing trend over previous periods and a plan is in place to manage this on-going increase. Service contractors' resources have historically managed any inter or intra-year variations.

7.6 MATERIALS

Jemena will continue with existing material supply arrangements, which have successfully supported delivery of previous programs, which includes

- Jemena has contracts in place to source Nylon pipe, PE Pipe and Steel pipes from a number of suppliers both local and international manufactures; and
- Meters are a commodity item supplied by a number of vendors depending on meter types. Based upon ongoing commercial discussions and briefings, Jemena is satisfied that suppliers will have the capacity to meet forecast volume requirements.

7.7 DELIVERY ASSESSMENT

Overall delivery assessment of this AMP program shows a low deliverability risk based on the following key reasons

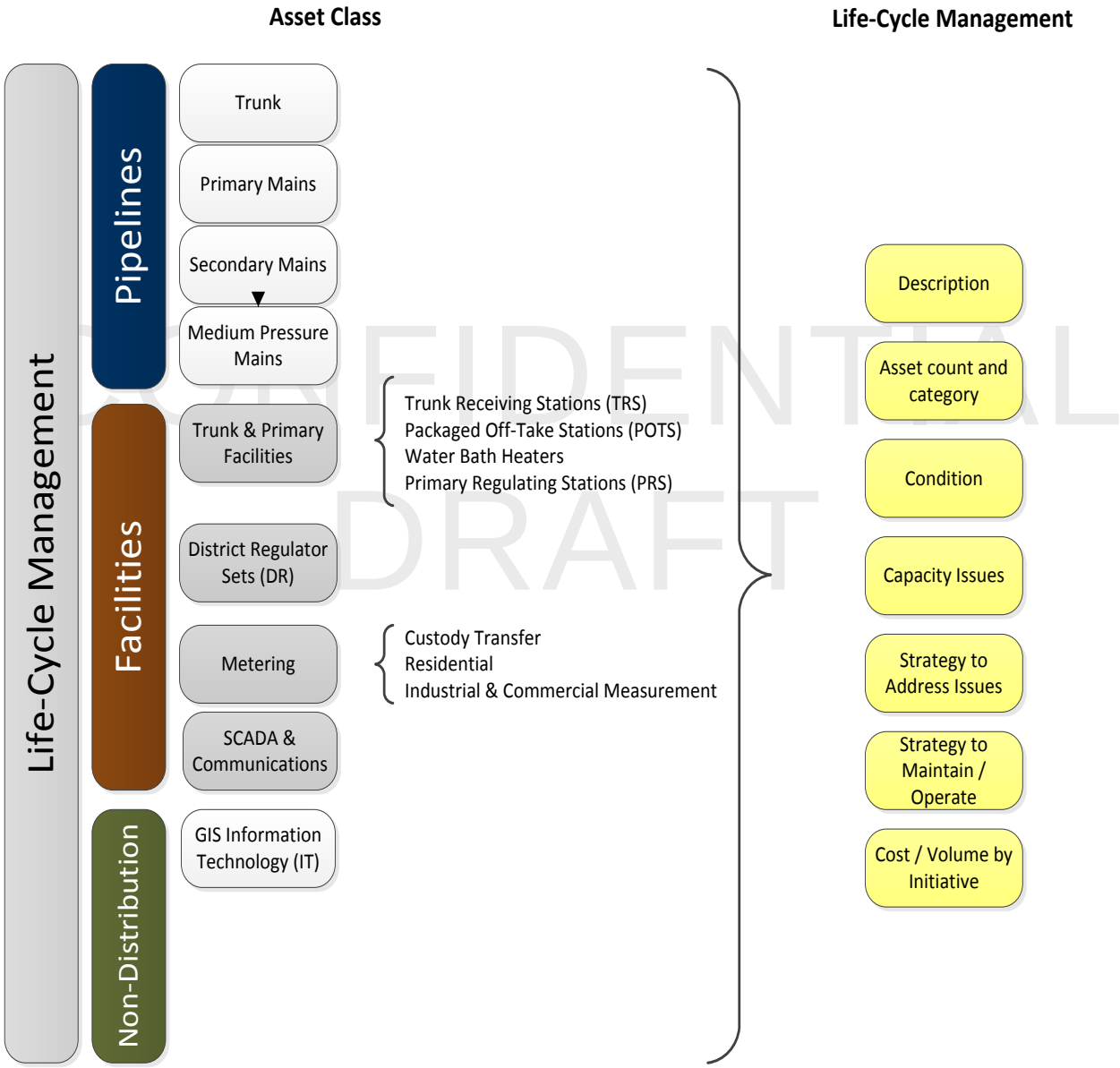
- Large percentage of the program is made up of routine high volume works that are delivered by external contractors with proven historical record.
- The remaining program is made up of a number of small to medium size projects that are governed by Jemena Project Management Methodology and related prudent procurement and outsourcing strategies; and
- Overall program activity is in line with the previous regulatory period.

8. ASSET STRATEGY

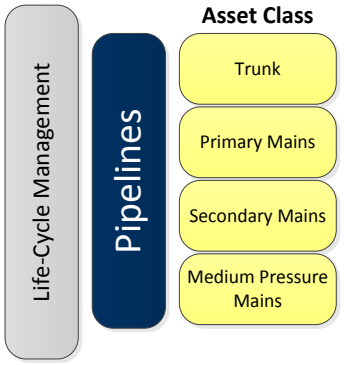
The assets comprising the network have unique life-cycle issues and are therefore grouped into the following asset classes: Pipelines, Facilities, and Non-Distribution with associated sub-classes as per Figure 8–1 below.

An overview of the asset strategies for each sub-asset class is provided in Chapters 9 to 14.

Figure 8–1: Asset Class Groups



9. ASSET STRATEGY – TRUNK PIPELINES AND PRIMARY MAINS



9.1 SUMMARY

The strategy for the Pipelines Asset Group is to ensure the safety and integrity of the asset, meet regulatory requirements, and cater for growth of the network.

9.2 BACKGROUND

The ACT gas distribution network includes over 4,500km of pipelines and mains of various sizes and operating pressures, ranging from 14,900kPa to 210kPa.

The pipes are divided into categories according to their Maximum Allowable Operating Pressure (**MAOP**) as summarised below

- Trunk pipelines (MAOP of 14,900kPa), including
  - Licence 29: NSW Section of the Hoskinstown to Fyshwick Trunk; and
  - ACT Section of the Hoskinstown to Fyshwick Trunk.
- Primary mains – known as the Canberra Primary Main (MAOP of 6,895kPa)
- Secondary mains (MAOP of 1,050kPa)
- Medium pressure mains (MAOP of 210kPa or 400kPa)

This Asset Group includes associated systems and services, such as cathodic protection (**CP**[12]) equipment and valves.

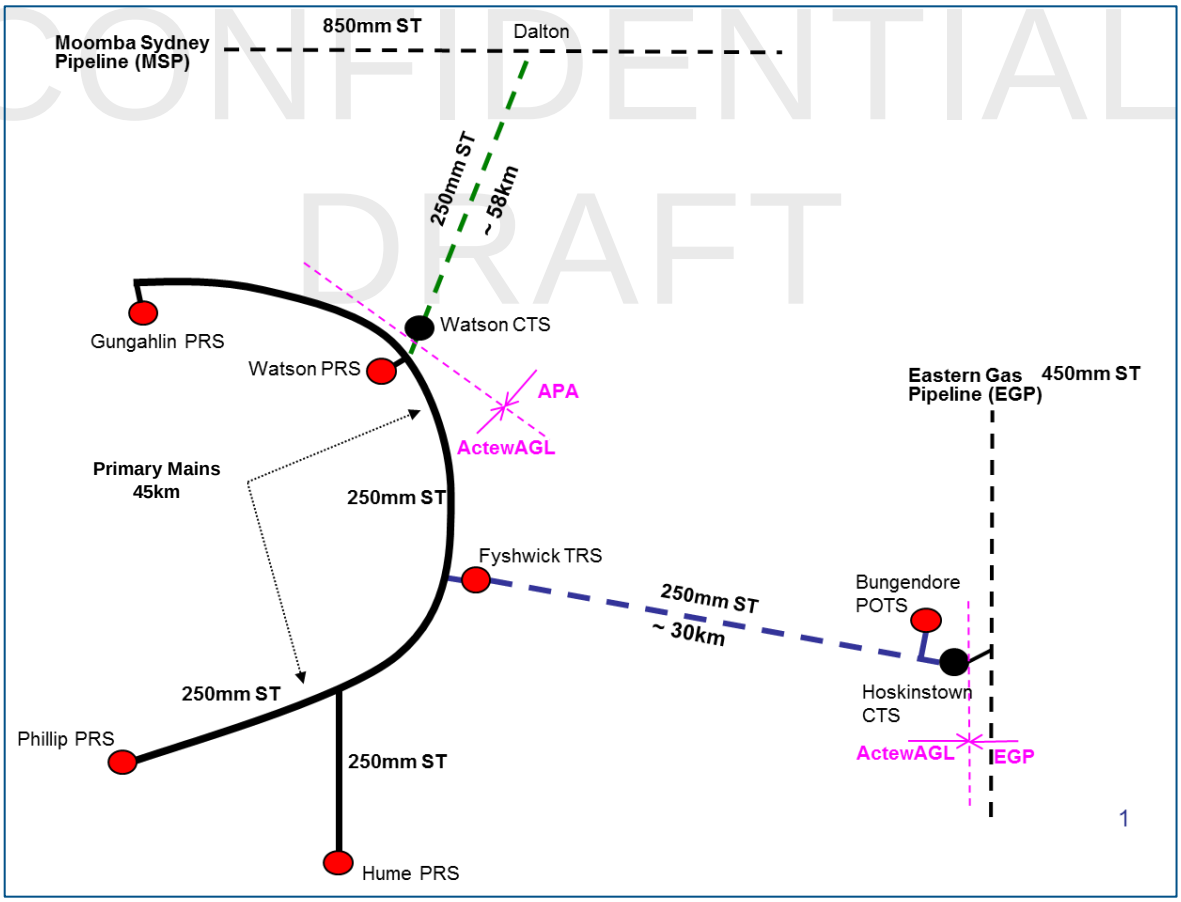
[12] The Cathodic Protection Systems protect all the steel pipe (Trunk, Primary and Secondary) in the ACT.

An overview of the ACT's pipeline assets is provided in Table 9–1 and Table 9–1 below.

Table 9–1: Pipeline Assets

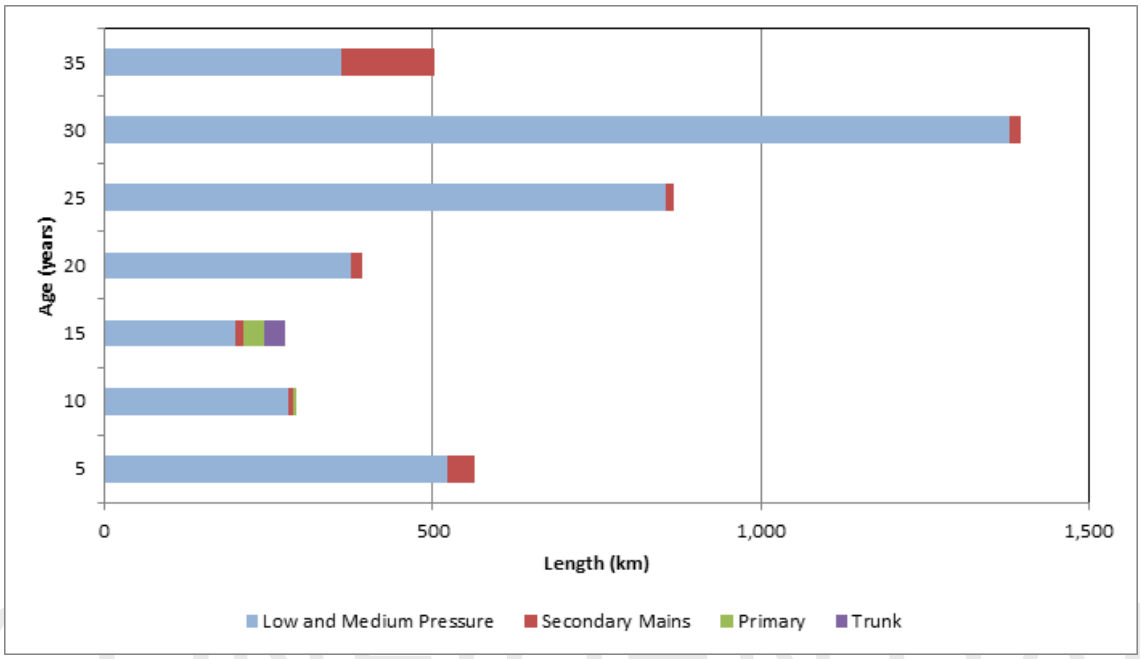
Pipeline	Pipelines (km)	Cathodic Protection (CP)	CP Test Points	Other
Trunk	30	4	23	2 (Scraper – launch and receiver facilities) 2 main line valves
Primary mains	45		73	2 exposed mains
Secondary mains	245		483	195 secondary line valves 1 exposed main
Medium Pressure mains	4,300	n/a	n/a	2 exposed mains, 30 sector valves and 18 high risk valves
Total	**4,615**	**4**	**579**	

Figure 9–1: Schematic of ACT gas network key assets

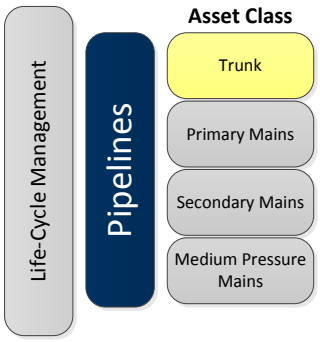


The age profile of the pipelines is summarised in Figure 9–2 below.

Figure 9–2: Age of Pipelines



9.3 TRUNK PIPELINES



The ACT gas network trunk pipeline system comprises of the Hoskinstown-Fyshwick Pipeline, cathodic protection systems, and pig launcher and receiver.

The Hoskinstown-Fyshwick pipeline falls under two jurisdictions:

- Hoskinstown to NSW-ACT Border. This 22km section is in NSW has been granted Licence No. 29 under the NSW *Pipelines Act 1967* and is connected to the Eastern Gas Pipeline (**EGP**) at the Hoskinstown Custody Transfer Station (**CTS**); and
- NSW-ACT Border to Fyshwick. This 8km section is in the ACT and continues from the border to the Fyshwick Trunk Receiving Station (**TRS**) at Fyshwick. There is no licensing regime in the ACT and this section is administered under the Utilities Services Licence.

The Hoskinstown-Fyshwick pipeline was commissioned in June 2001. It was designed, constructed, tested, and operated in accordance with the requirements of AS 2885. The MAOP of the pipeline is 14,900kPa. The pipeline is 30km long and has a nominal diameter of 250mm. The pipeline is constructed of high strength steel and is internally and externally protected against corrosion by an anti-corrosion pipe coating and has internal lining for flow efficiency. Additional external protection is also achieved with a CP system.

9.3.1 ASSET CONDITION

The condition of the trunk pipeline is assessed in accordance with:

- Australian Standard AS2885
- Pipeline Integrity Management Plans (**PIMP**); and
- the Safety and Operating Plan (**SAOP**).

The integrity of the trunk pipeline is assessed using data derived from inspections and testing. For the trunk pipeline, this data includes:

- Inline inspection (**ILI**) and associated validation digs (also referred to as “pigging” from the use of Pipeline Intelligent Gauge (**PIG**)), which are used to assess metal loss and mechanical damage. ILI is generally carried out at an industry-accepted 10 yearly interval
- CP Monitoring, which provides additional protection against corrosion at locations of poor pipe coating; and
- Direct Current Voltage Gradient (**DCVG**) measurement, which provides an indication of coating defects that can lead to corrosion.

The data from this testing is compiled and reviewed during a five yearly SMS which also assesses pipeline risk (safety, environmental and supply continuity), identifies threats, reviews controls and recommends additional protection measures where existing mitigations are inadequate. The SMS considers all relevant data obtained from inspection and testing activities to determine the pipeline integrity for purposes of confirming (or validating) the pipeline MAOP.

The most recent SMS for the trunk pipelines was conducted in 2011 and identified:

- No unauthorised landowner activities near the trunk pipelines
- No metal loss from corrosion was reported via pigging data; and
- No other events have occurred that have affected the pipeline integrity.

The trunk pipelines are managed to ensure continued performance in accordance with their design and operating requirements. There have been no failures of trunk pipelines.

To mitigate the risk of failure, the performance of trunk pipelines is managed through a condition monitoring and inspection program to identify potential issues before they can lead to a degradation of performance. For the pipeline operation, Jemena complies with AS2885 to ensure “continued pipeline integrity during the life of the pipeline”. Pipeline integrity is assessed and maintained through an integrated and systematic program of pigging (where applicable), periodic SMS reviews (five-yearly and when changes are made to the operating conditions) and integrity digs (based on operating and maintenance data).

The five yearly trunk pipeline SMS conducted confirmed that all control measures, procedural and physical, were implemented and remain effective.

There are no reported incidents, either operational or external, that have affected the integrity of the trunk pipeline. The MAOPs for the pipeline was confirmed.

9.3.2 ASSET PERFORMANCE

The trunk pipeline is a critical asset that must perform reliably to avoid disruption to customer supply. A trunk pipeline failure is likely to be catastrophic especially if the failure results in the ignition of gas. Consequences are likely to include personal injury, property and environmental damages and/or loss of supply.

The capacity of the Hoskinstown to Fyshwick trunk pipeline is assessed to be adequate to meet demand for the period of the AMP.

9.3.3 CAPITAL REQUIREMENTS

There are currently no plans to construct any new trunk pipelines or augment the existing trunk pipeline.

The key capital works for the trunk pipeline are related to the integrity management of the pipeline. The interval between ILIs is typically 10 years – an accepted industry practice for a well-managed pipeline in good condition.

Data obtained from an ILI will usually identify features that must be investigated with validation digs. Integrity digs are conducted during the period between ILIs in order to inform the pipeline integrity management process, which requires a periodic review of pipeline data at intervals not exceeding five years. In prior AA’s ILI has been treated as an Opex cost, but is now recognised as a capital expense.

The program of activity is summarised in Table 9–2.

Table 9–2: Trunk Pipelines Integrity Program

Trunk Pipe	RY16	RY17	RY18	RY19	RY20	RY21
Hoskinstown to Fyshwick	Nil	Nil	One Integrity Dig	One Integrity Dig	One Integrity Dig	Nil – Inline inspection early in RY22

Jemena's forecast for this asset category over the AMP period is summarised in Table 9–3 below.

Table 9–3: Trunk Mains Capex Requirements

(RY16 $,000)	RY16	RY17	RY18	RY19	RY20	RY21
Stay in Business	-	-	329	334	325	465
TOTAL	-	-	**329**	**334**	**325**	**465**

9.3.4 ASSET DISPOSAL

There are no Trunk Pipeline assets planned for disposal within RY16-RY21 period.

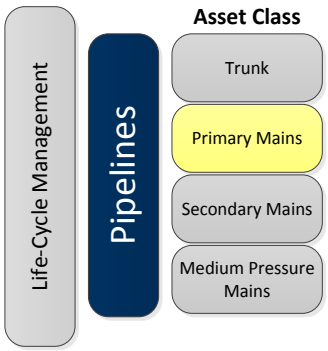
9.3.5 MAINTENANCE REQUIREMENTS

The maintenance of the trunk pipeline includes planned and corrective maintenance activities.

Examples of planned maintenance activities on the trunk pipeline include pipeline patrol, aerial patrol, easement maintenance, CP surveys, coating defect surveys, CP interference testing, scraper station coating inspections and valve operational/maintenance.

Corrective maintenance activities may be initiated from actions arising from an integrity review or from pipeline risk management, external activities and/or encroachment, aerial inspections and easement maintenance.

9.4 PRIMARY MAINS



The Canberra primary mains consist of 45 km of high-strength steel pipe with a MAOP of 6,895kPa. The pipes are externally protected against corrosion by an anti-corrosion pipe coating and internal lining for flow efficiency. Additional protection is also achieved with a CP system.

The Primary Mains were predominantly constructed in the mid-1990s and early 2000s with the new Hume Primary Main Extension being completed in 2015.

The ACT Gas Network Primary Main Network is detailed in Table 9–4.

Table 9–4: Summary of Primary Mains

Main	Construction Date	Diameter (mm)	Length (km)
Watson – Fyshwick	1996	DN250	16.0
Watson - Gungahlin	1997	DN250	7.16
Fyshwick – Philip	1998	DN250	9.07
Gungahlin to Belconnen (1)	2004	DN250	5.56
Hume Primary Main	2015*	DN250	5
Total			**45**

(1) The Gungahlin to Belconnen main is a part of a long term staged capacity development and currently operates as part of the secondary network, but was built to primary mains standards.

9.4.1 ASSET CONDITION

The primary mains are critical assets that must perform reliably to avoid disruption to customer supply and ensure safety to the public and staff. A primary main failure is likely to be catastrophic, especially if the failure results in the ignition of gas. Consequences are likely to include human injury, property and environmental damages and/or loss of supply.

The primary mains are critical assets that must perform reliably to avoid disruption to customer supply. A primary main failure is likely to be catastrophic, especially if the failure results in the ignition of gas. Consequences are likely to include personal injury, property and environmental damages and/or loss of supply.

The primary mains are managed to ensure continuous operations in accordance with their design requirements. There have been no failures of the primary mains to date.

There are no reported incidents, either operational or external, that have affected the integrity of the primary mains. The MAOP for the pipelines were confirmed by the recent SMS findings.

The primary mains' integrity is assessed from the data that are produced from the following activities which are assessed by the SMS in the five yearly integrity review

- Pipe wall condition: Inspection/testing using Pipeline pigging (as applicable) and/or integrity digs
- Corrosion protection: CP monitoring (planned activity) and DCVG
- Operation controls: pressure, temperature and gas quality monitoring; and
- Maintenance activities: planned work to the approved procedures and work methods.

The data from these activities is compiled and reviewed during a five yearly SMS which also assesses pipeline risk (safety, environmental and supply continuity), identifies threats, reviews controls and recommends additional protection measures where existing mitigations are inadequate. The SMS considers all relevant data obtained from inspection and testing activities to determine the pipeline integrity for purposes of confirming (or validating) the pipeline MAOP.

The most recent SMS for the primary mains was conducted in 2012 and identified:

- No unauthorised landowner activities near the trunk pipelines, however, the Majura Parkway Upgrade in the section between Watson and Fyshwick has resulted in additional pipeline protection for the road construction. Integrity digs validated the pipeline integrity for the MAOP.
- No metal loss from corrosion was reported, however, DCVG identified several coating defects that required repair
- Several construction weld defects were identified and repaired during integrity digs undertaken in conjunction with the works related to the Majura Parkway Upgrade; and
- No other events have occurred that have affected the pipeline integrity.

The primary mains are managed to ensure continued performance in accordance with their design and operating requirements. There have been no failures of trunk pipelines.

To mitigate the risk of failure, the performance of mains pipelines is managed through a condition monitoring and inspection program to identify potential issues before they can lead to a degradation of performance. Pipeline operation complies with AS2885 to ensure "continued pipeline integrity during the life of the pipeline". Pipeline integrity is assessed and maintained through an integrated and systematic program of pigging (where applicable), periodic SMS reviews (five-yearly and when changes are made to the operating conditions) and integrity digs (based on operating and maintenance data).

The five yearly primary mains SMS conducted confirmed that all control measures, procedural and physical, were implemented and remain effective.

The next SMS for the Canberra Primary Mains is due in 2017.

9.4.2 ASSET PERFORMANCE

The level of expansion activity of the primary network is dependent on location and volumes of expected growth over the medium to long term. The development plan includes primary main projects to enhance capacity in growth areas and provide security of supply for specific areas of the network.

9.4.3 CAPITAL REQUIREMENTS

Planned capacity requirements for primary mains include a 3.5 km extension of the Primary main from Phillip to Molonglo with associated facilities, which are driven by long term capacity requirements. The extension is proposed to be implemented in stages commencing in the period of this AMP and includes primary mains, a Primary Regulating Station (**PRS**), pigging facilities and secondary mains. The detail is included in the Capital Plan.

The Capital Plan also identified the installation of a main line isolation valve in the pipe section between Watson and Fyshwick to support emergency management.

Inspections and integrity digs are necessary in the Capital Plan to maintain the integrity of the primary mains. These include

- ILI, where applicable, and validation digs, which are used to assess the pipe wall conditions and identifies dents, gouges and corrosion. The Canberra Primary Main ILI is planned for 2015 following completion of installation of the pigging launchers and receivers; and
- Integrity digs provide supplement information of the pipeline condition between two successive ILIs. The nominal ILI interval for a well-managed pipeline is 10 years. However pipeline integrity management requires periodic review of pipeline data at intervals not exceeding five years.

The program of ILIs, validation digs, integrity digs for primary mains is set out below in Table 9–5.

Table 9–5: Primary Mains Integrity Program

Primary Main	RY16	RY17	RY18	RY19	RY20	RY21
Canberra Primary Mains	ILI and four Validation Digs*		Two Integrity Digs	One Integrity Dig	One Integrity Dig	One Integrity Dig

** The RY16 validation digs are part of the 2015 Pigging project, which is treated as Opex for the 2010-2015 Access Arrangement.*

Jemena's forecast for this asset category over the AMP period is summarised in Table 9–6 below.

Table 9–6: Primary Mains Capex Requirements

(RY16 $,000)	RY16	RY17	RY18	RY19	RY20	RY21
Capacity Development	-	-	1,313	1,117	6,338	-
Stay in Business	1,393	268	622	316	307	306
TOTAL	**1,393**	**268**	**1,935**	**1,433**	**6,645**	**306**

9.4.4 ASSET DISPOSAL

There are no Primary Main assets planned for disposal.

9.4.5 MAINTENANCE REQUIREMENTS

The maintenance of the primary mains includes planned and corrective activities. The timing of maintenance and pigging runs needs to reflect the peaky demand of the ACT network.

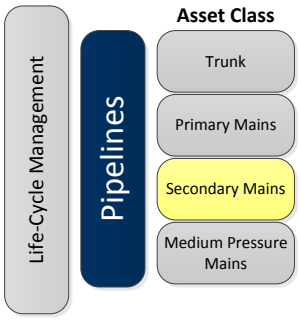
Examples of planned maintenance activities on the primary pipelines include pipeline patrol, aerial patrol, exposed mains inspections, easement maintenance, CP surveys, coating defect surveys, CP interference testing, scraper station coating inspections and valve operational/maintenance.

Corrective maintenance activities may be initiated from actions arising from an integrity review or from pipeline risk management, external activities and/or encroachment, planned inspections and easement maintenance.

The following special maintenance projects have been included in the Maintenance Plan

- DCVG coating survey is used to locate and size pipe coating defects. The technique involves measuring the voltage gradients in the soil above a cathodically protected pipeline. Surveys are completed every 10 years with the last survey undertaken in RY15. The next surveys planned are thus beyond this AMP period.
- Canberra Primary Main - Inline inspection and related validation digs to support asset integrity assessment. Note this will be expensed in this period, though future ILI will be capitalised; and
- Exposed mains inspection to enable a physical close-up inspection to support integrity management.

9.5 SECONDARY MAINS



The secondary mains asset category consist of 245km of steel pipe, which is externally coated with High-Density Polyethylene (**HDPE**) to protect it from corrosion and internally lined to reduce frictional loses and provide some internal corrosion protection. The secondary mains have an MAOP of 1,050kPa (with a minimum operating pressure of 525kPa).

The secondary mains asset category also consists of secondary services, line valves and CP systems.

9.5.1 ASSET CONDITION

Jemena assesses and confirms the condition of secondary mains in accordance with

- SAOP
- Australian AS4645 standards; and
- Distribution Integrity Management Plan (**DIMP**).

Integrity of the secondary mains is assessed through integrity and performance assessments which use indirect monitoring and performance methods including leakage survey, publically reported leaks, field reports and feedback, pipeline patrol and review of data from Cathodic Protection surveys and circuit checks.

The mains are not piggable.

The asset condition is generally good, however the above have identified some projects detailed in Capital Plan.

9.5.2 ASSET PERFORMANCE

Projects are been identified through the network capacity validation and planning process, to augment the capacity of the secondary mains to provide supply reliability for organic growth. The level of expansion activity on the secondary mains is dependent on location and volumes of load growth over the medium to long term.

New estate development areas are generally located along the fringes of established areas. The secondary network is expanded into these new estates as land is released. Expansion activity is concentrated in the growth areas of the Gungahlin, West Belconnen and Molongo.

9.5.3 CAPITAL REQUIREMENTS

Current planning for the secondary network includes a number of secondary mains extensions to provide and or improve reliability to new estate areas, capacity for growth areas and support for ongoing growth.

The Capital Plan provides the entire program detail for this asset class. The recent introduction of the requirement to undertake a Development Application (**DA**) process prior to the construction of any secondary mains in the ACT has also been recognised in the capital plan through

- an allowance for the works required for these development applications being separately identified to recognise the additional expense; and
- the scheduling of the works up to three years prior to the planned commencement of construction to meet a "gas on" date to recognise the time frame for preparation and approval of the DA.

Figure 9–3 shows a typical project in the construction phase.

The new major secondary mains projects are

- Moncrieff Capacity Development Project will involve laying approximately 2.4 km of secondary steel mains and the installation of a district regulator set to support new estates in the Gungahlin area;
- Molonglo Capacity Development Project(s) will involve the laying of 12 km of secondary mains and the installation of several district regulator sets, over several stages, to supply new estates in the Molonglo area; and
- West Belconnen Capacity Development Project(s) will involve the laying of 6 km of secondary mains and the installation of several district regulator sets, over several stages, to supply new estates in the West Belconnen area.

Figure 9–3: Secondary steel being laid for Hume Tuggeranong Interconnect (HTI) Stage 2.

The Hume Tuggeranong Interconnect (HTI) Stage 2 is to be completed in 2015. The HTI Stage 2 project provided for growth in the Tuggeranong Valley area and deferred the upgrade of the Phillip PRS.

The Stay in Business Secondary Mains projects are about supporting the integrity of the assets and protecting them from other construction works.

The forecast for this asset category over the AMP period is summarised in Table 9–7.

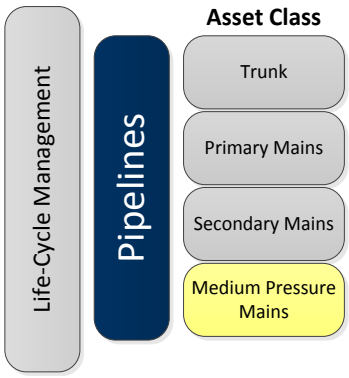
Table 9–7: Secondary Mains Capex Requirements

(RY16 $,000)	RY16	RY17	RY18	RY19	RY20	RY21
Market Expansion	7	7	7	7	7	7
Capacity Development	9,776	2,466	3,551	939	-	1,026
Stay in Business	134	296	54	55	54	54
TOTAL	**9,916**	**2,769**	**3,612**	**1,001**	**61**	**1,087**

9.5.4 OPERATIONAL REQUIREMENTS

Secondary Mains are operated and maintained in accordance with the Safety and Operating Plan and the requirements of AS4645. This includes providing cathodic protection to the network and maintaining it, CP surveys, leakage surveys and conducting Formal Safety Assessment (**FSA**).

9.6 MEDIUM PRESSURE MAINS



The Medium Pressure Mains and Services supply natural gas to domestic and Industrial and Commercial users. The networks comprise of mains, services, valves, boundary regulators and exposed mains. The medium pressure mains consist of 4,300 km of largely plastic pipe that supply gas to domestic, industrial and commercial users.

9.6.1 ASSET CONDITION

The medium pressure network is complex and continuously expanding into new growth areas. Jemena assesses and confirms the condition of the mains in accordance with Australian Standard AS4645. The majority of the network is in good condition. This statement is supported through numerous integrity assessments, including

- Network leakage tests
- Leakage survey
- Incident Cause Analysis Method (ICAM) - Network incidents assessments
- Formal Safety Assessments (**FSA**s)
- Field failure report; and
- Poor supply report reviews.

Leakage surveys are a maintenance strategy employed by distribution businesses to locate leaks in gas distribution networks. The frequency with which surveys are undertaken is based upon risk and past performance, with all sections being surveyed at least once every five years (the minimum requirements of AS4645). More frequent surveys are undertaken in high-risk areas and where previous surveys indicated an excessive level of leaks. All gas leaks located are assessed.

Network incidents are another indicator of network integrity and performance. An incident can be caused by a component failure. Failed components (pipe and fittings) are sent to a laboratory for analysis. A common cause of failure is poor joint quality, an issue that occurred during network construction. Significant work has been undertaken to improve construction quality for polyethylene mains. Further work is being undertaken to improve construction quality of the nylon system. Network reliability is monitored closely and remains focused on improving asset integrity and management practices to reduce installation related field failures on plastic distribution systems.

An FSA held into the installation of services and meters identified that eight shopping centres in the ACT were reticulated with a higher than standard service pressure. Although these installations were in accordance with the codes applicable at the time, the FSA identified a higher than acceptable risk from these installations. The eight shopping centres were originally investigated and the potential for gas leaks into enclosed areas was considered unacceptable. A project to remedy this situation is included in the Capital Plan.

9.6.2 ASSET PERFORMANCE

Network capacity validation and planning has identified projects to increase the capacity of the medium pressure networks to ensure ongoing supply reliability. Drivers for the increase in capacity for these assets include:

- Growth in customer numbers, requiring both local and deep infrastructure enhancement to provide supply and maintain security of supply
- Changes in customer consumption patterns as customers move to higher efficiency appliances, such as instantaneous hot water units that have a higher peak consumption compared to storage hot water
- Changes in population/housing density; and
- Demographic and other changes.

The changes required in the gas distribution network configuration are typically localised. Projects are planned and then confirmed through monitoring of pressure reduction in areas within the gas distribution network followed by modelling of the areas to account for the variability of temperature effects. A 1 in 20 winter standard is used as the basis of modelling to minimise the potential temperature effects. This 1 in 20 reflects the increased severity of an event for customers in the ACT Network where heating is major driver of the peaky winter use of gas. This planning parameter allows all customers to enjoy the same quality of service on the ACT network. There are a large number of Medium Pressure Mains projects detailed in the Capital Plan.

9.6.3 CAPITAL REQUIREMENTS

The Capital Plan provides the entire program detail for this asset class.

The material projects over the period are:

- Low and medium pressure market expansion mains program
- Low and medium pressure capacity development projects
- Inlet piping rectification project (eight shopping centres); and
- Additional valves for bush fire and high risk locations.

Figure 9–4 shows deliveries for such a typical project.

Figure 9–4: PE pipe for feeder main to supply gas to the new suburbs of Jacka and Moncrieff.

Jemena's forecast for this asset category over the AMP period is summarised in Table 9–8.

Table 9–8: Medium Pressure Mains Capex Requirements

(RY16 $,000)	RY16	RY17	RY18	RY19	RY20	RY21
Market Expansion	6,061	6,481	6,985	7,000	7,030	6,787
Capacity Development	1,672	578	391	359	265	125
Stay in Business	2,225	1,979	2,060	2,085	193	182
TOTAL	**9,958**	**9,038**	**9,436**	**9,444**	**7,487**	**7,094**

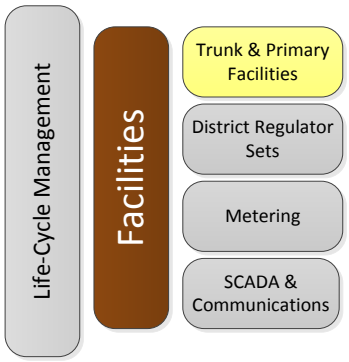
9.6.4 OPERATIONAL REQUIREMENTS

Medium Pressure Mains and Services are operated and maintained in accordance with the Safety and Operating Plan and Technical Policies. The plans include integrity reviews and maintenance activities representing an integrated system of requirements reflected in AS4645 and other technical regulatory requirements.

In May 2013, the ACT Government's Independent Competition and Regulatory Commission (**ICRC**) released a revised Gas Network Boundary Code. The outcome of this change to the Code is a requirement need to perform two yearly inspections of internal metering sets. This additional activity has been included as a step change in the AA2017 Access Arrangement submission.

The standard Maintenance Plan includes routine and non-routine activities.

10. ASSET STRATEGY – TRUNK AND PRIMARY FACILITIES



10.1 SUMMARY

The asset strategy for trunk and primary facilities over the AMP period is to ensure the safety and integrity of the asset, meet regulatory requirements, and cater for growth of the network. The strategy provides for the following asset categories

- Trunk Facilities; and
- Primary Facilities.

10.2 BACKGROUND

The ACT network consists of a number of Trunk and Primary Facilities as highlighted in Table 10–1.

Table 10–1: Trunk and Primary Facilities description

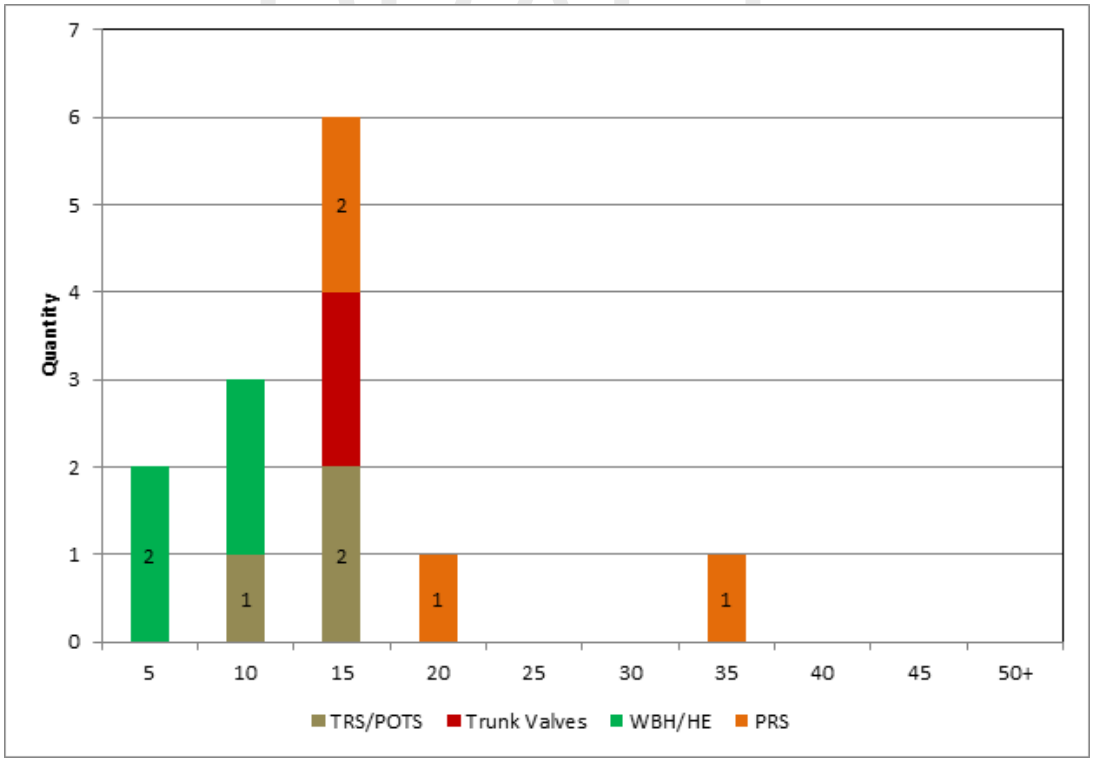
Facility	Pipeline	Quantity	Description
Trunk Receiving Station (TRS)	Trunk	1	Gas pressure reduction and filtration facilities that are supplied at trunk pressure and deliver gas at appropriate pressure to downstream network.
Packaged Off-Take Station (POTS)	Trunk	1	Smaller capacity gas pressure reduction and filtration facilities that are supplied at trunk pressure and deliver gas at the appropriate pressure to the downstream network.
Custody Transfer Station (CTS)	Trunk	1	Installations equipped with metering facilities to accurately measure gas transfer through the CTS. These meters are used for billing purposes and are calibrated in accordance with appropriate measurement standards.

Facility	Pipeline	Quantity	Description
Water Bath Heaters (WBH)	Trunk	2	Heat exchangers used to preheat gas to ensure that the temperature reduction (Joule Thompson Effect) caused by large pressure drops through regulators does not adversely affect the facility and downstream pipeline.
Water Boilers	Trunk	2	Heat exchangers used to preheat gas to ensure that the temperature reduction (Joule Thompson Effect) caused by large pressure drops through regulators does not adversely affect the facility and downstream pipeline.
Mainline Valves (MLV)	Trunk	2	Valve that are used to isolate certain segments of a pipeline.
Primary Regulating Stations (PRS)	Primary	6*	Gas pressure reduction and filtration facilities located at each off-take on the primary main. These facilities reduce the pressure from 6,895kPa to 1,050kPa to supply the secondary network or lower metering pressures to specific customer.

* Includes Jerrabomberra that is to be decommissioned in 2015.

The age profile of these facilities is depicted in Figure 10–1. It should be noted that individual components of the stations such as filters and regulators are replaced at various times during the life of the facility which are not reflected in the figure below, however an allowance has been included in the Capital Plan for such items.

Figure 10–1: Age Profile of High Pressure Facilities



10.3 ASSET CONDITION

A documented Facilities Integrity Management Plan (**FIMP**) is currently under development for approval. Amongst other things, the FIMP will describe in detail the integrity of the facilities and will encompass the whole of life cycle of the assets from creation to disposal. The FIMP will also:

- provide an integrated and structured plan for design, construction, commissioning, operation and maintenance of the facilities
- incorporate the requirements of AS1200 and AS2885 suite of Standards, which will provide the assurance of the integrity of the facilities; and
- outline the key processes, assessment methodologies, and recommendations of activities/practises for managing the integrity of the facilities.

The following activities are currently undertaken to assess, validate and manage the integrity of the Facility assets:

- Planned Maintenance Inspections and audits, which include:
  - corrosion monitoring; and
  - visual inspections.
- Field Failure and Incident Reports are reviewed to determine the level of significance in order to assign the appropriate level of assessment or investigation.
- High Pressure Facility Reviews (**HPFR**): Consistent with the philosophy of AS2885, the HPFR is carried out at 5 yearly intervals and/or when operating conditions change. These reviews identify new hazards that have arisen from any change in the operating environment and confirm the integrity of the facilities to operate and outline any required corrective actions.

The output of the activities is analysed with the following results

- The condition of the stations (TRSs/POTS/CTSs/PRSs) and equipment (MLVs/WBHs/Water Heaters with Heat Exchangers) vary across the network. Overall structural integrity is satisfactory for containment and reliability of supply.
- Requirement to update identified Electrical and Instrumentation (**E&I**) components which have a shorter design life than the mechanical components; and
- Corrosion of piping within trunk and primary facilities resulting in loss of containment is emerging as a key integrity issue. The action arising is to introduce additional maintenance projects to expose and inspect pipe under thermal lagging and pipe coating.

10.4 ASSET PERFORMANCE

The consequence of High Pressure Facilities failure can be catastrophic including fatalities, loss of assets and long term interruption to supply. The most significant performance issues are

- abnormally high levels of heavy hydrocarbons (wax) detected in the gas received over the last 4-5 years in some networks. Though these abnormally high levels of hydrocarbons have not been detected in any of the ACT gas network trunk and primary facilities, a winter “wax blockage” mitigation inspection program has been initiated
- high noise levels from the Fyshwick installation, with the potential to breach environmental approvals for the site; and
- with potential changes to the supply configuration of the overall ACT network, that is a higher percentage of gas being transported through Hoskinstown compared to Watson, the Hoskinstown and Watson sites require work.

10.5 CAPITAL REQUIREMENTS

The Capital Plan provides the entire program detail for this asset class.

The recent introduction of the requirement to undertake a Development Application process prior to the construction of any high pressure facilities, and the increase in difficulty in securing land, in the ACT has also been recognised in the capital plan through

- an allowance for the works required for these development applications being separately identified to recognise the additional expense
- the scheduling of the works up to three years prior to the planned commencement of construction to recognise the time frame for preparation and approval of the Development Applications; and
- purchase or securing of easements in a time frame that ensures the construction of the facilities is not impeded.

The most significant projects that are expected to be carried out over the AMP period are:

- installation of a bypass regulator on the Phillip PRS to support security of supply during planned or corrective maintenance
- noise reduction works at Fyshwick TRS to ensure compliance with ACT Environmental Protection Regulation requirements
- upgrade of Facilities to meet current standards such as the E&I works to replace non-conforming electrical equipment and for standardisation
- Remote Telemetry Unit (**RTU**) replacement at Hoskinstown due to obsolescence issues, including lack of further support, limited spares and potential increasing failure rates
- installation of a pressure limiting station in the vicinity of Watson CTS to support the change in supply configuration; and
- upgrade of Hoskinstown CTS to support the change in supply configuration.

The forecast for this asset category over the AMP period is summarised below.

Table 10–2: High Pressure Facilities Capex Requirements

(RY16 $,000)	RY16	RY17	RY18	RY19	RY20	RY21
Capacity Development	-	-	-	338	-	-
Stay in Business	3,991	1,369	1,969	1,990	161	540
TOTAL	**3,991**	**1,369**	**1,969**	**2,328**	**161**	**541**

10.6 OPERATIONAL REQUIREMENTS

Reviews of the key trunk and primary facilities are performed on a five year rolling program.

The reviews give an overall view of the condition of the facility and confirm the design and risk profile. Reviews are mandated under AS2885 (Pipelines – Gas and Liquid Petroleum – Operation and Maintenance) and are to be conducted at intervals of five years or whenever operating changes impact the facility.

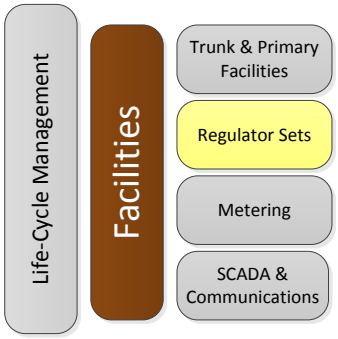
The reviews are included in the Asset Management PoW and include the following activities:

- Validate the accuracy of facility design
- Site hazard identifications by expert team
- SMS workshops and HAZOPS studies involving engineers, designers, controllers and field personnel
- Confirmation of routine and non-routine maintenance
- Hazards mitigation action items list generated and tracked.

Hazard mitigations may involve minor site rectification, procedural amendments or capital work. These are then generated into the PoW cycle.

Operational step changes are included for the cyclical inspections of Water Bath Heater, Heat Exchanges and new or upgraded assets coming on line. These cyclical inspections and new or upgrade assets are included ‘Variations to the Asset Services Fee’ reflecting their cyclical nature.

11. ASSET STRATEGY – DISTRICT REGULATOR SETS



11.1 SUMMARY

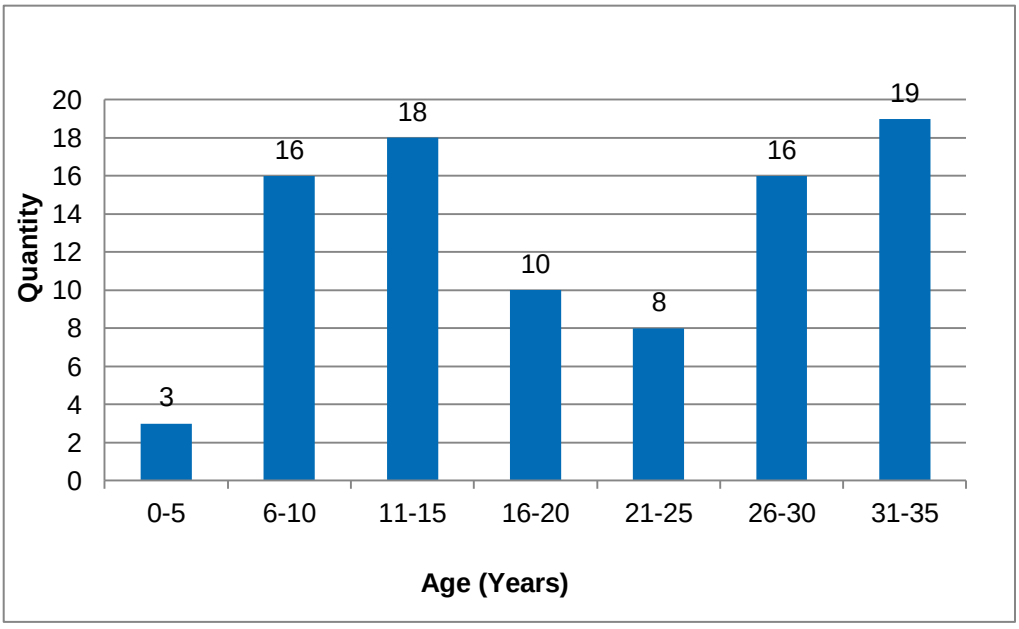
Jemena's current asset strategy for District Regulator Sets (**DRS**) over this period is inspection and replacement or refurbishment.

11.2 BACKGROUND

DRS is the generic term used to describe Regulators Sets that supply the medium pressure networks. The DRS reduce the pressure from the secondary network to supply the medium pressure networks. Most DRS are located on public land and are installed in underground boxes.

There are currently 90 DRS in service with an age profile shown in Figure 11–1 below.

Figure 11–1: Age profile of District Regulator Sets



11.3 ASSET CONDITION

In 2010, a program to address a number of DRS integrity issues was undertaken. Flaws with the design of the existing boxes result in numerous issues such as water ingress, maintainability issues, traffic hazards, ergonomics issues, etc. This included the fitting of vent pipes, drainage, removal of corrosion and painting.

A reassessment was undertaken in 2014 Jemena. This review concluded the rectification works had been successful and the DRS are in good condition and should operate in the medium term without incident or the need for replacement.

11.4 ASSET PERFORMANCE

The DRS have high reliability with respect to their primary function of delivering gas to the distribution network and the performance is reasonable.

Security of supply is at risk due to availability of the DRS because they do not have a fully redundant standby with numerous DRS on the network operating as a one-way feed into the network.

11.5 CAPITAL REQUIREMENTS

Expenditure on DRS is driven by demand growth (Market Expansion or Capacity Development). DRS retired from service are inspected for serviceable components. The components are reconditioned and re-stocked for future use to support the legacy population of DRS. Unserviceable DRS are scrapped.

The Capital Plan provides the entire program detail for this asset class. The material projects identified (noting that market expansion projects are not able to be identified ahead of time) over the period are to replace current regulator that will exceed capacity, including:

- South Canberra - Griffith DRS 19 Replacement
- Weston Creek - Rivett DRS 30 Replacement
- Woden - Garran DRS 27 Replacement
- Weston Creek - Waramanga DRS 29 Replacement
- Belconnen Replacement DRS 08 Replacement

The forecast for this asset category over the AMP period is summarised in Table 11–1 below.

Table 11–1: Regulators Capex Requirements

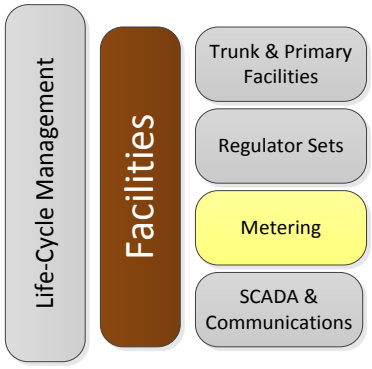
(RY16 $,000)	RY16	RY17	RY18	RY19	RY20	RY21
Market Expansion	-	-	-	-	-	-
Capacity Development	918	230	-	-	-	-
Stay in Business	-	-	-	-	-	-
TOTAL	**918**	**230**	**-**	**-**	**-**	**-**

11.6 OPERATIONAL REQUIREMENTS

District Regulator Sets are operated and maintained in accordance with the Safety and Operating Plan and Technical Policies.

A Formal Safety Assessment (FSA) was conducted for the District Regulator Sets. The FSA demonstrated that the DRS asset class is generally operating safely. The majority of the risks identified during the FSA were low or negligible. The FSA identified numerous opportunities for conducting maintenance activities in a safe manner.

12. ASSET STRATEGY – METERING



12.1 SUMMARY

Meters measure the volume of gas as it is transferred into and out of the network. This asset category includes meters and associated equipment, such as filters and pressure regulators. Meters within the ACT network fall into one of the following categories

- Custody Transfer
  - AAD Owned
  - Non-AAD Owned
- Non-billing meters
  - Trunk and Primary Receiver Stations
- Industrial and Commercial Measurement; and
- Residential Measurement.

The forecast for this asset category over the AMP period is summarised in Table 12–1 below.

Table 12–1: Total Metering Capex Requirements

(RY16 $,000)	RY16	RY17	RY18	RY19	RY20	RY21
Market Expansion	3,486	3,793	4,200	4,253	3,993	3,807
Stay in Business	2,736	3,001	2,763	3,425	3,377	3,109
TOTAL	**6,222**	**6,794**	**6,963**	**7,678**	**7,369**	**6,916**

12.2 CUSTODY TRANSFER

Custody transfer facilities are points where gas is received into the ACT network from other networks

There are two custody transfer receipt points, providing gas into the ACT Network. These receipt points are located at

- Watson, which is owned by APA. The Dalton to Watson Pipeline in the north, owned by the APA Group. This is a lateral of the Moomba to Sydney Pipeline (**MSP**) trunk pipeline. The MSP also transports natural gas from Moomba, South Australia and Queensland across NSW. Natural gas is received from the Dalton to Watson Pipeline into the ACT network through the Watson Custody Transfer Station; and
- Hoskinstown, which is owned by AAD. The Eastern Gas Pipeline (**EGP**) in the east, owned by Jemena Limited. The EGP transports gas from Longford in Victoria through NSW to the Sydney Market. Natural gas is received from the EGP into the ACT network through the Hoskinstown Custody Transfer Station.

12.3 NON BILLING METERS

Within the ACT network there are a number of Trunk and Primary Receiver Stations which are installed with non-billing meters.

Non-billing meters are installed where gas demand needs to be measured but where no network customer transaction takes place. They are used at network interconnections to measure gas supplied to certain areas and also at water bath heaters (**WBH**) and boilers with heat exchangers to measure the amounts of gas used for heating.

The volume of non-billing meters (including turbine, rotary and diaphragm) installed in the ACT gas network is shown in the Table 12–2.

Table 12–2: Non billing meters

Asset	Volume
TRS and PRS meters (Phillip PRS)	1*
WBH meters (Bungendore PRS)	2
Meters for Boilers with Heat exchangers (Fyshwick TRS)	1

* Insertion meter installed at Phillip

12.3.1 ASSET CONDITION

Meters covered within this asset group include an insertion meter as well as a variety of diaphragm type meters. All meters are considered to be in good condition.

12.3.2 ASSET PERFORMANCE

The non-billing meters have a measurement accuracy of +/-5 per cent. This uncertainty is considered adequate.

12.3.3 CAPITAL REQUIREMENTS

The strategy for lifecycle management of the meters is to refurbish and recalibrate at a frequency of fifteen years. There is no capital expenditure for this sub-asset class in the period of the AMP.

12.4 INDUSTRIAL AND COMMERCIAL MEASUREMENT

Industrial and Commercial (**I&C**) gas meter sets have the same functionality and purpose as residential meter sets. They provide filtration, pressure control and volumetric measurement at the point of final delivery from the network. I&C gas meter sets are installed wherever loads exceeds the capacity of normal residential meters.

There are three different types of I&C meters used on the ACT network, including:

- Diaphragm meters
- Rotary meters; and
- Turbine meters.

Further detail on these meters is provided in Table 12–3.

Table 12–3: Industrial and Commercial meters

Meter Type	Volume	Description
Diaphragm Meters	4,940	Positive displacement meters that utilise flow channels designed for low pressure losses. The volume is displayed on a direct read (odometer) or clock (pointer) style index. Diaphragm designs allow accurate measurement of very small gas loads. They are predominantly installed in residential and small commercial units. Their selection is based on (low) volume and pressure requirements.
Rotary Meters	286	Highly machined precision instruments capable of handling higher volumes and pressures than diaphragm meters. Within the meter, two figure "8" shaped lobes spin in precise alignment. With each turn, they move a specific quantity of gas through the meter. Rotary meters are typically used for small commercial loads.
Turbine Meters	11	Infer gas volume by determining the speed of the gas moving through the meter. A small internal turbine measures the speed of the gas, which is transmitted mechanically to a mechanical or electronic counter. Turbine Gas Meters can pass gas flow during meter service and are well suited in situations where continuity of gas is important.

The age profile of these meters is depicted in Figures 12-1 to 12-3 below.

Figure 12–1: Age profile of I&C Diaphragm meters

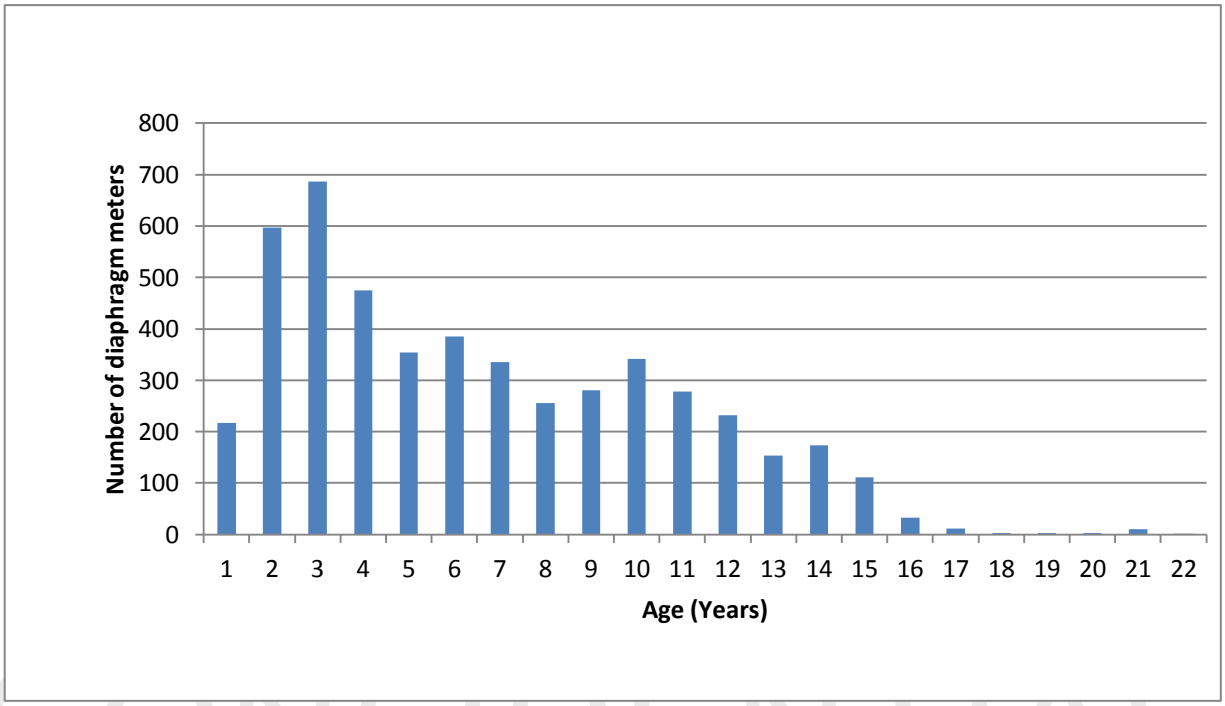


Figure 12–2: Years since last overhaul for turbine meters

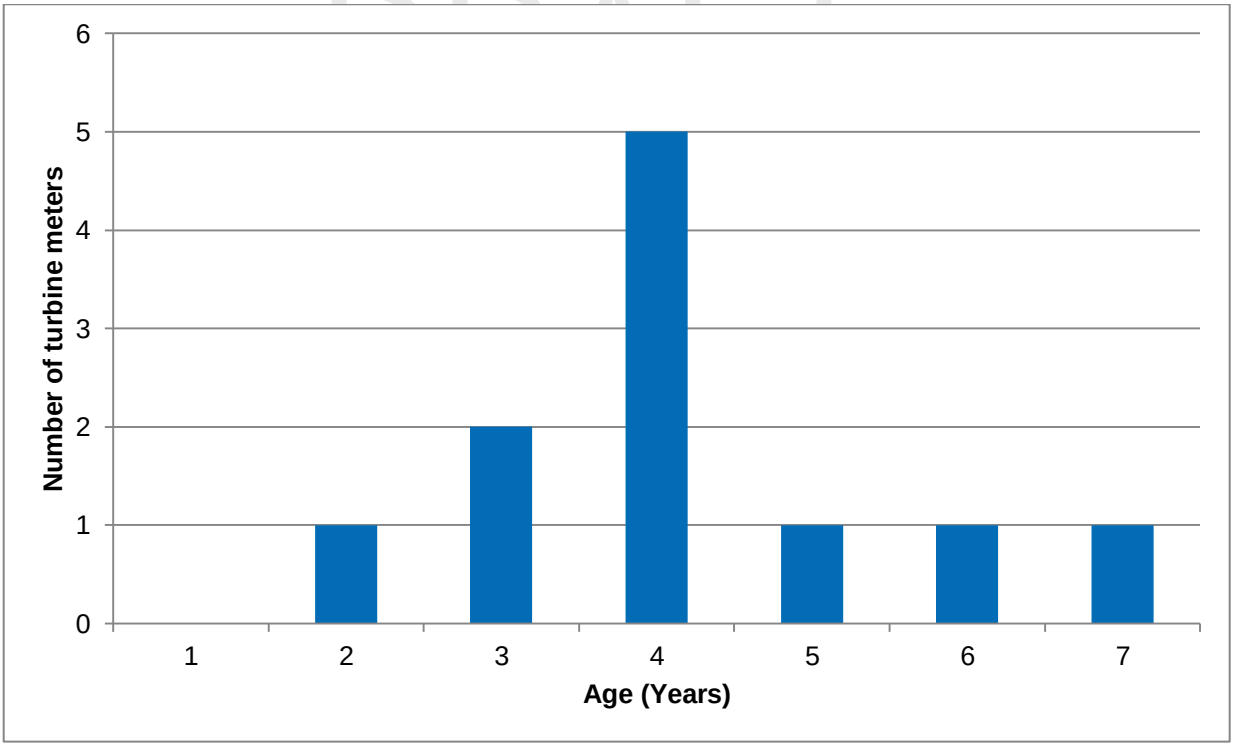
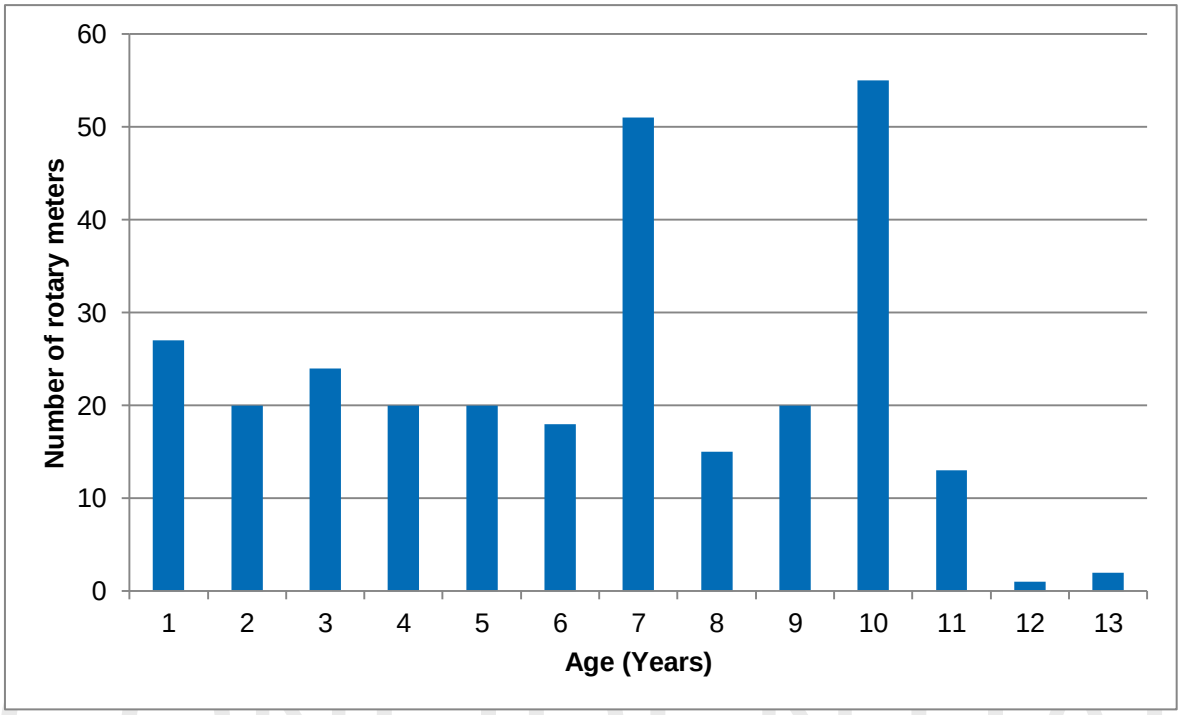


Figure 12–3: Age profile of Rotary meters



12.4.1 ASSET CONDITION

12.4.1.1 Diaphragm meters

The population of diaphragm meters is generally in good condition. There is an existing program to replace some small volumes and types of diaphragm meters (e.g. Rockwell M12 and Simbrunt G6 & G16) that are prone to development of excessive corrosion in their indexes. These meters are being replaced with AL425 and AL1000 meters under replacement programs.

There is a limited supply of AL2300 and AL5000 meters as the production of these types of meters has ceased. This issue is being managed by a meter resizing and a replacement program. Meters are replaced where possible with other meters more suitable for the application. The surplus AL2300 and AL5000 meters are being refurbished and stocked for reuse where required.

12.4.1.2 Rotary meters

The condition of the I&C rotary meter populations is mixed. The aged meter populations are deteriorating. High service life is eroding dimensional tolerances and reducing meter accuracy. Failures of Instrument meters caused by index failures have led to this type of rotary meter being replaced with the iMeter through the aged replacement program. Based on current performance trends, Jemena is anticipating that the Rotary meters life will be limited to a total of 20 years.

12.4.1.3 Turbine meters

The condition of the I&C turbine meter population is deteriorating. Although the majority of the turbine meters are recently refurbished, high service life is impacting reliability.

The majority of turbine meters are between 15 and 20 years old and have been refurbished up to three times. Some meters are over 30 years old and have been refurbished up to six times.

12.4.2 ASSET PERFORMANCE

12.4.2.1 Diaphragm meters

The I&C diaphragm meter population are installed for a period of 15 years and managed through the GASS system for meter family replacement.

There are several meter families with a history of failing indexes that are subjects of replacement programs.

12.4.2.2 Rotary meters

The accuracy of aged meters is decaying. Increasing dimensional tolerances are a product of wear and tear through high service life. Refurbishment cannot rectify tolerance issues. The ageing population exposes ACT gas network to increasing risks of meter integrity, specifically, the under-registration of gas flow.

12.4.2.3 Turbine meters

Although the majority of the turbine meters are recently refurbished high service life is impacting reliability. Due to the high service life of older turbine meters a Feasibility Assessment (**FA**) titled '*Replacement of Turbine Meters-30 years and older*' is being finalised. That draft FA recommends the progressive replacement of the ageing meters.

12.4.3 CAPITAL REQUIREMENTS

The strategy for lifecycle management of the meters is in accordance of AS4944.

12.4.3.1 Diaphragm meters

The volume of new assets created is driven by market expansion. Meter selection is based on the capacity requirement of the customer.

The primary drivers for the renewal and upgrade plan are accuracy and integrity. Diaphragm meters are retired after 15 years of service. This strategy ensures the population is maintained in good condition.

Diaphragm meters that fail or are removed from service are refurbished and re-stocked for future use where commercially and technically justified.

12.4.3.2 Rotary meters

The volume of new assets created is driven by market expansion. Meters selection is based on the capacity requirement of the customer.

A renewal and upgrade program has been developed. The primary drivers for the renewal and upgrade are operational deficiency and asset integrity. Rotary meters are scheduled for replacement on a 10 year cycle. This replacement cycle reflects feedback from reviews of the accuracy decay over time. Where commercially and technically feasible rotary meters are refurbished and reused.

12.4.3.3 Turbine Meters

The volume of new assets created is driven by market expansion. Meters selection is determined by the capacity requirement of the customer.

Turbine meters are used to measure some of the largest consumers in the network. Inaccurate metering can expose AAD to significant financial impacts. The primary drivers for the renewal and upgrade plan for gas meters are operational deficiency and asset integrity. Turbine meters are scheduled for replacement on a 5 year cycle. This replacement cycle reflects feedback from reviews of the accuracy decay over time.

Where commercially and technically feasible turbine meters are refurbished and reused.

The volume of replacement meters over the AMP period is set out in Table 12–4.

Table 12–4: Stay in Business driven Meter replacement – I&C

Plan (Number of Meters)	RY16	RY17	RY18	RY19	RY20	RY21
Diaphragm	155	164	189	281	311	406
Rotary	49	29	23	37	11	24
Turbine	5	2	1	3	-	**5**
Total I&C Replacement	**208**	**192**	**213**	**321**	**322**	**435**

The volume of new industrial and commercial meters installed as part of the market expansion program over the AMP period is set out in Table 12–5.

Table 12–5: Market Expansion driven Meter programs – I&C

Plan (Number of Meters)	RY16	RY17	RY18	RY19	RY20	RY21
New Meter – I&C Contract	Commercially driven					
New Meter - I&C Tariff	120	123	126	129	132	136
New – Meter Data Loggers & Metreteks	82	91	101	101	101	95
Total I&C – Market Expansion	**202**	**214**	**227**	**230**	**233**	**231**

The forecast for this asset category over the AMP period is in Table 12–6 below.

Table 12–6: Industrial and Commercial Metering Capex Requirements

(RY16 $,000)	RY16	RY17	RY18	RY19	RY20	RY21
Market Expansion	831	850	884	911	904	944
Stay in Business	282	177	33	42	36	76
TOTAL	**1,112**	**1,026**	**917**	**953**	**939**	**1,021**

12.4.4 OPERATIONAL REQUIREMENTS

Gas meters are operated and maintained in accordance with technical policies, technical regulatory requirements and the Integrity Management Plans. These form an integrated system to achieve efficient management of the asset with respect to levels of service, cost and risk.

An FSA is conducted on the I&C meter category every five years in accordance with the requirements of AS4645.

12.4.4.1 Diaphragm meters

Replacement of aged I&C diaphragm meter populations is a statutory requirement. The current age for meter replacement is 15 years. However, in accordance with the requirements of AS4944 life extension can be justified where supported by a testing program. Technical compliance is achieved through in-service compliance testing of meters that have been installed for their specified life ensuring that they continuing to operate in accordance with the meters' metrological specifications.

12.4.4.2 Rotary meters

Rotary meter populations are installed for a period of 10 years and managed through the GASS+ system for downsizing and corrective maintenance programs. Historical as well as on-going monitoring of performance data for meter families is achieved through data obtained the Metretek system, which enable predicative condition monitoring through its service life.

I&C rotary meters installed in medium and low pressure installations are assessed under the FEED program for review and condition of the meter set. In addition, quantities of rotary meters are performance tested for accuracy prior to refurbishment and results recorded.

The current replacement frequency for rotary meters is 10 years. Meters that have been installed for this period are refurbished and performance tested where possible and returned to service.

12.4.4.3 Turbine meters

Turbine meter populations are installed for a period of five years and managed through the GASS+ system for downsizing and corrective maintenance programs. Historical as well as on-going monitoring of performance data for meter families is achieved through data obtained the Metretek system, which enable predicative condition monitoring through its service life

Integrity reviews provide information required for integrity management and drives future renewal and upgrade planning activities. The statutory requirement for aged meter replacement is 15 years. However, Turbine meters for removed for overhaul after five years of service. This strategy is based on historical and trend information.

The following integrity review activities will be undertaken over the next five years.

- Used meter assessment - All turbine meters removed from service will be tested for accuracy and inspected for features which may impact reliability. The analysis will provide input into future replacement plans; and
- Customer load review - A load assessment will be carried out on customers with dropping consumption rates. The analysis will be used to revise the replacement plan for meter matching to ensure accuracy of metering across the full range of gas demand by the customer.

12.5 RESIDENTIAL

Residential gas meter sets provide filtration, pressure regulation and metering to small end-point users connected to the network. Residential metering is divided into the following sub-classes:

- Residential gas meters and regulators
- Hot water meters
- Meter data loggers.

Further detail on these assets is provided Table 12–7 below.

Table 12–7: Residential gas meters

Type	Volume	Description
Residential Gas meters	117,368	Gas meter sets provide filtration, pressure regulation and metering to small end-point users connected to the network
Hot water meters	8,834 hot 170 cold	Residential Water Meters are used to measure the consumption of hot water in medium density developments. Typical medium density developments have centralised hot water systems which consist of one or more hot water heaters with master gas and cold water meters and a circulating ring main system serving a number of residential customers through a domestic hot water meter. These meters are used to apportion the gas measured at the master gas meter.
Meter data loggers	500	Meter data loggers (MDL) are remote electronic devices installed in the network to record and transmit the consumption of gas and/or hot water meters from apartment blocks.

The age profiles of these assets are illustrated in Figures 12-4 to 12-6.

Figure 12–4: Age profile of residential meters

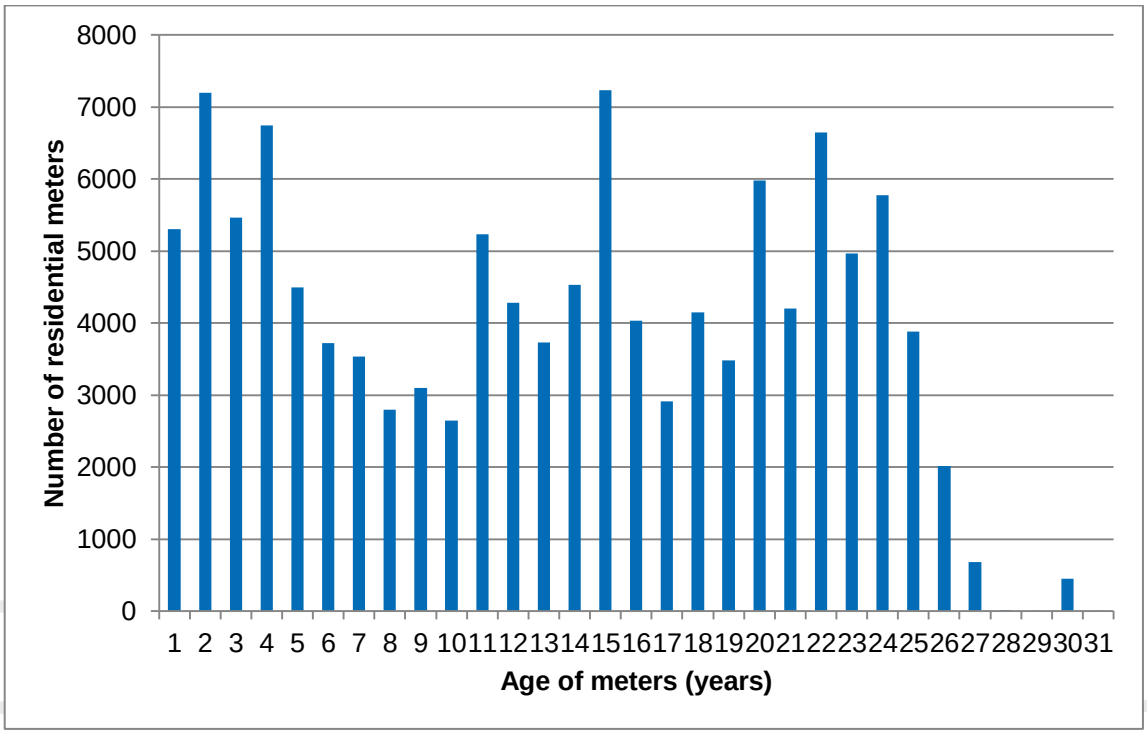


Figure 12–5: Age profile of water meters

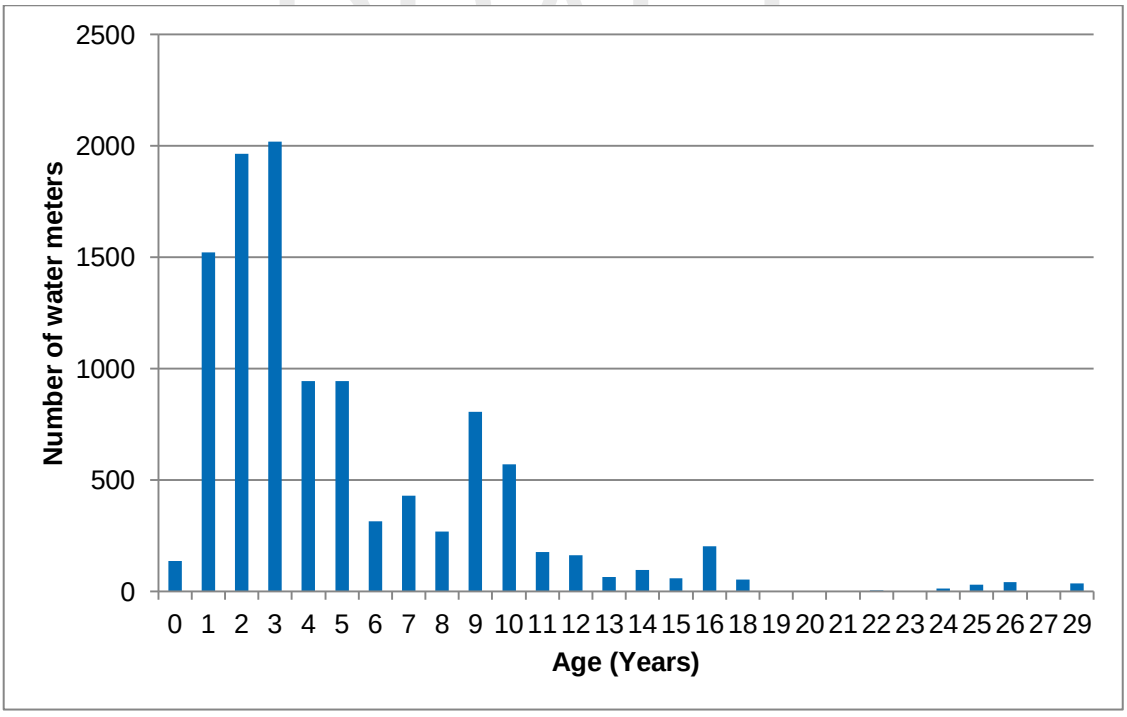
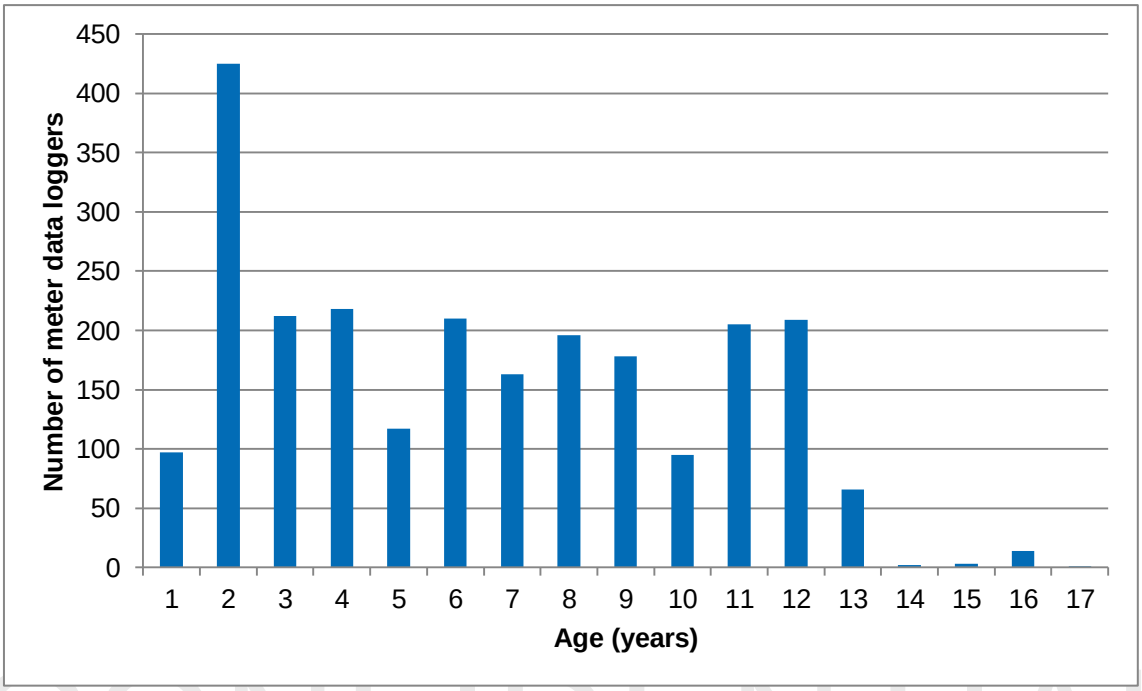


Figure 12–6: Age profile of meter data loggers (MDLs)



12.5.1 ASSET CONDITION

12.5.1.1 Gas meters

The condition of residential gas meter populations is maintained through integrity activities enforced through AS/NZS 4944. The requirement to replace meter populations failing statistical sampling programs ensures a healthy asset base.

12.5.1.2 Residential gas regulators

Although statistics are not available to report an age profile for residential gas regulators, there is growing awareness that the general population of residential regulators in service is ageing. Jemena is performing analysis on this asset in order to baseline volumes of regulators replaced annually through defective replacement program in order to establish an aged replacement program.

12.5.1.3 Hot water meters

The condition of hot water meters in service is deteriorating with increasing volumes of failures over the last five years. There is a planned replacement program to replace the type of faulty meter over a six year period.

12.5.1.4 Meter data loggers

The current technology installed requires a physical connection (cable) between the customer's meter and the data logger. The current approach to obtain readings from in-accessible meters is to ask customers to complete self-read cards.

Approximately 150 realignments are done annually. Misalignments between the meter and the data logger occur for various reasons including meter faults, cable faults and power failures. The lack or loss of meter data leads to inaccurate billing and customer complaints.

12.5.2 ASSET PERFORMANCE

12.5.2.1 Gas meters

The strategy for managing residential gas meters is in accordance with the requirements of AS4944. Meters are retired after 15 years of service unless granted a life extension.

12.5.2.2 Residential gas regulators

The strategy for lifecycle management of residential gas regulators is to operate to failure and replace. All medium pressure horizontal regulators are replaced when found. This group of regulators are susceptible to moisture condensation, freezing and corrosion and present high risks of failing.

Jemena is reviewing the strategy of operating gas regulators to failure. At present aged regulators are replaced during the residential aged gas meter replacement program. The replacement of regulators is based on 60 per cent change-out, with horizontally mounted given priority, of yearly residential gas meter replacements.

12.5.2.3 Hot water meters

The current strategy for lifecycle management of water meters is to commence an aged replacement program and progresses from the previous strategy of operate to failure and replace. Where drivers exist strategies will be developed to address specific issues. This includes renewal and upgrade and sampling plans.

12.5.2.4 Meter data loggers

The current strategy for lifecycle management of MDLs is to operate to failure and replace. Jemena is reviewing this strategy due to the cost of failures and maintenance, the rollout of the National Broadband Network, the age of the units and the improvements in Radio Frequency (**RF**) technologies.

12.5.3 CAPITAL REQUIREMENTS

12.5.3.1 Gas meters

Planning activity for new gas meters is driven by market expansion.

The renewal and upgrade plan for residential gas meters is driven by the integrity review plan, specifically the statistical sampling program. Statistical sampling programs are performed two years before a population is due for renewal.

The current strategy for domestic gas meter disposal is to scrap all meters when they are retired. It was determined they were uneconomical to overhaul. Refurbished meters have lower standards than new meters and are less likely to pass life extension criteria. Bench tests revealed high levels (>2 per cent) of refurbished meters failed compliance tests.

12.5.3.2 Residential gas regulators

Planning activity for new gas regulators is driven by market expansion.

New technology from different vendors is constantly being evaluated. All new regulators purchased are sample tested before installation to maintain quality control.

There is no statutory requirement to replace regulators. The primary drivers when developing a renewal and upgrade strategy for gas regulators is operational deficiency and asset integrity.

Figure 12–7: Typical residential gas meter

12.5.3.3 Hot water meters

The volume of new assets commissioned is driven by the level of market expansion.

Replacement of aged residential water meter populations is not a statutory requirement. The primary drivers when developing a renewal and upgrade strategy for water meters is accuracy and integrity.

Water meters are replaced when they become operationally deficient. This is driven by sizing requirements or critical failure. The planned replacement program for water meter populations is driven by the results of the integrity activities. Implementing a policy for aged water meter replacement aims to reduce the volume of corrective maintenance.

12.5.3.4 Meter data loggers

The volume of new assets commissioned is driven by the level of market expansion.

The current wired MDL system has been in operation for 17 years and has been accepted by all major builders and developers. Wireless Radio Frequency (**RF**) technologies are available and testing is underway to determine the advantages and disadvantages of this technology.

Table 12–8 sets out the new residential gas meters to be installed as part of the Market Expansion program.

Table 12–8: Market Expansion meter requirements - Residential

Gas Meters – Volumes	RY16	RY17	RY18	RY19	RY20	RY21
New Meter - E to G	781	781	781	781	781	781
New Meter - New Estates	1,530	1,629	1,752	1,752	1,752	1,548
New Meter - Medium Density	1,368	1,521	1,686	1,686	1,686	1,584
Total Residential (ME) Meters	**3,679**	**3,931**	**4,219**	**4,219**	**4,219**	**3,913**

Table 12–9 sets out the planned volume replacement, renewal and upgrade over the AMP period.

Table 12–9: Stay in Business driven meter requirements - Residential

Gas Meters – Volumes	RY16	RY17	RY18	RY19	RY20	RY21
Planned replacement of residential aged gas meters	3,839	5,545	5,075	5,919	5,211	5,268
Planned statistical sampling of residential gas meters	315	320	430	260	355	350
Planned replacement of residential gas regulators	-	-	-	-	-	-
Planned replacement of residential hot water meters	174	281	288	695	920	377
Defective replacement of residential gas meters	242	242	242	242	242	242
Defective replacement of residential hot water meters	292	344	418	418	418	418
Defective replacement of residential gas regulators	1,423	1,423	1,423	1,423	1,423	1,423
Field failure testing *	1,741	1,741	1,741	1,858	1,858	1,858
Total Meters	**8,026**	**9,896**	**9,617**	**10,815**	**10,427**	**9,936**

* Includes I &C

The forecast for this asset category over the AMP period is summarised in Table 12–10.

Table 12–10: Residential Metering Capex Requirements

(RY16 $,000)	RY16	RY17	RY18	RY19	RY20	RY21
Market Expansion	2,656	2,944	3,316	3,343	3,090	2,863
Stay in Business	2,454	2,824	2,730	3,383	3,341	3,032
TOTAL	**5,110**	**5,768**	**6,047**	**6,726**	**6,431**	**5,896**

12.5.4 OPERATIONAL REQUIREMENTS

12.5.4.1 Gas meters

Gas meters are operated and maintained in accordance with Metering Equipment Maintenance, Service and Disposal, technical regulatory requirements and Jemena's Integrity Management Plans. These form an integrated system to achieve efficient management of the asset with respect to levels of service, cost and risk.

Replacement of aged meter populations is a statutory requirement with current age for meter replacement 15 years. In accordance with the requirements of AS4944 life extension can be justified where supported by a testing program.

The integrity of residential gas meters is managed through statistical sampling programs. This drives future renewal and upgrade planning activities.

A review of the assets operating environment and to ensure compliance for residential meters a FSA is conducted at a period not exceeding five years in accordance with the requirements of AS4645.

12.5.4.2 Residential gas regulators

Gas regulators are operated and maintained in accordance with technical regulatory requirements and Jemena's Policy - Metering Equipment Maintenance, Service and Disposal. This forms an integrated system to achieve efficient management of the asset with respect to levels of service, cost and risk.

There is limited data on residential regulator modes of failure and service life. Failure analysis will bridge this gap. Future renewal and upgrade programs will be driven by feedback from the integrity review plan. Integrity review activities forecast include a failure mode analysis which is an ongoing activity through 2015.

A review of the assets operating environment and to ensure compliance for residential regulators a FSA is conducted at a period not exceeding five years in accordance with the requirements of AS4645.

12.5.4.3 Hot water meters

There is no specific policy for operating and maintaining water meters. However, work is progressing on developing a system to achieve efficient management of the asset with respect to levels of service, cost and risk.

Planned integrity reviews include endurance performance accuracy testing, lifecycle analysis, failure mode analysis and a statistical sampling program. The results will assist with the identification of a maximum service life and provide the information required to develop an aged replacement program.

12.5.4.4 Meter data loggers

An FA is planned to review the proposed MDL replacement program. This is included in the engineering PoW.

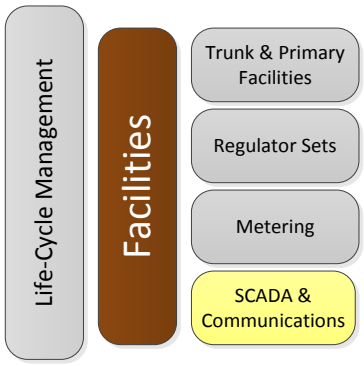
MDL's are operated and maintained in accordance with technical regulatory requirements and Jemena Policy - Metering Equipment Maintenance, Service and Disposal.

The maintenance strategy for meter data loggers is limited to the following activities:

- weekly dial-up data collection of all MDL sites
- weekly data audits to identify problematic MDL's
- MDL battery replacements at 4.5 year intervals.

In general terms the devices are operated to failure.

13. ASSET STRATEGY – SCADA AND COMMUNICATIONS



13.1 SUMMARY

The ACT Network Supervisory Control and Data Acquisition (**SCADA**) and Communications assets are infrastructure put in place by Jemena to enable safe and efficient delivery of gas to the ACT gas network's customers, and timely business and operational management decisions to be made. The ACT network leverages the wider Jemena SCADA and Communication assets to monitor and control the network.

Generally, the SCADA system includes gas network monitoring and control signal hardware (input and output), controllers, SCADA and telemetry data networks, user interface (HMI), telecommunications equipment and software.

SCADA and communications assets are critical infrastructure to core business functions, such as billings, gas dispatch/distribution and demand management.

The asset strategy for SCADA and communications over the AMP period is to ensure:

- the SCADA system continues to function at high levels of reliability and availability
- the continuity, availability and integrity of operational and business intelligence data to Control Centre operations, Real Time system business users and business stakeholders
- plan for end-of life
- mitigation of SCADA operations risks; and
- enhancements to improve the efficiency and effectiveness of SCADA operations.

13.2 ASSET CONDITION

Conditions of all SCADA and communications are detailed in the NSW/ACT SCADA and Communications Asset Strategy document. This document is reviewed on an annual basis or whenever there is any business, facility, system or functionality change, which significantly affects this document.

13.3 ASSET PERFORMANCE

Assets are scheduled for daily, weekly and monthly operational checks. The types of inspections and tests vary for the different SCADA and communication asset classes. The key objectives for the scheduled operational checks are to see if the agreed asset availability and operating pattern are achieved, and if the asset's ability to facilitate transportation of the required quantity and quality of gas is within the designed operating condition and safety standards, at minimum resource cost with respect to the asset class's specific purposes are met.

13.4 CAPITAL REQUIREMENTS

There are nil plans to directly invest in several areas of the SCADA network over the AA period.

Asset renewal and upgrade strategies for SCADA and communications equipment are driven by network growth, expected operating life and expected usage life.

There is no provision for capital expenditure in the AA period for SCADA.

13.5 OPERATIONAL REQUIREMENTS

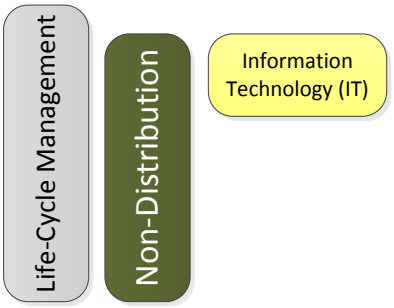
The SCADA and communications asset strategy is updated annually, or if there are significant changes.

SCADA and communications assets are required to operate continuously for as long as possible. There is little to no window for off-line maintenance. Therefore, subsystems are designed with built in redundancies.

The Jemena SCADA and communications asset is operated and maintained in accordance with the SAOP, technical regulatory requirements and Jemena's integrity management plans. These form an integrated system of processes and procedures to achieve efficient management of the asset with respect to levels of service, cost and risk.

The nature of the Jemena SCADA and communications asset and environment it operates in, drives the current strategy of "operate to failure and replace". However, there are ongoing maintenance activities performed on the assets to ensure the assets remain serviceable. These activities include preventative maintenance and corrective maintenance, as well as specialised maintenance projects or step change activities.

14. ASSET STRATEGY – NON-DISTRIBUTION



14.1 SUMMARY

This Asset Management Plan (AMP) only covers those non-distribution assets operated by Jemena. ActewAGL have provided the details for the Geographical Information System (**GIS**)-IT below and are to provide details and cost for other non-distribution assets separately to this AMP.

14.2 ASSET CONDITION

The ActewAGL GIS platform is in sound condition.

14.3 ASSET PERFORMANCE

The program of work is to leverage the ActewAGL GIS platform to provide greater availability, accuracy and efficiency of data to support field mobility, interoperability between ActewAGL and Jemena to improve data accuracy and thus reduce the likelihood of asset damage by enhanced and timely locational and Dial Before You Dig (DBYD) information.

14.4 CAPITAL REQUIREMENTS

The program of work includes a mobility solution, differential Geographical Positioning Systems (GPS), upgrading ARCGIS and ArcFM, AAM Imagery and related GIS services. The forecast for this asset category over the AMP period is in Table 14–1.

Table 14–1: GIS-IT Capex Requirements

(RY16 $,000)	RY16	RY17	RY18	RY19	RY20	RY21
TOTAL		**198**	**105**	**212**	-	-

14.5 OPERATIONAL REQUIREMENTS

The cost to support the program is reflected in the Operating Plan.