

Jemena Gas Networks (NSW) Ltd

2015-20 Access Arrangement Information

Appendix 6.2

JGN Asset Management Plan 2015-20

Public

30 June 2014



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JEMENA GAS NETWORKS

ASSET MANAGEMENT PLAN

1 JULY 2014 TO 30 JUNE 2020

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West Hoxton Primary Regulator Station

Key Notes for Readers

- 1. All dollars are in \$2015 Real unless otherwise stated.**
- 2. As dollars are rounded, actual dollars are as per Capital Plan**

JEMENA GAS NETWORKS

ASSET MANAGEMENT PLAN

1 JULY 2014 to 30 JUNE 2020 (6 YEAR PLAN)

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EXECUTIVE SUMMARY

This Asset Management Plan (AMP) describes JGN's distribution and non-distribution capital and operating plans over the period 1 July 2014 to 30 June 2020, which encompasses one year of the current Access Arrangement (AA) period (i.e. regulatory year 2015 (RY15)) and the upcoming five year AA period (i.e. regulatory years 2016-2020 (RY16-RY20)).

The AMP relates to JGN's gas distribution network, which is used to deliver gas in Sydney, Newcastle, Wollongong, the Central Coast region and over 20 country centres within the Central Tablelands, Central West, Southern Tablelands and Riverina regions of NSW. The network consists of over 25,000 km of mains and pipelines, transporting natural gas to approximately 1.2 million customers who consume nearly 100 petajoules (PJ) of gas per annum. The value of the assets for regulatory purposes is \$2,698.4 million as at 30 June 2013.

JGN incurs two broad types of costs or expenditure in providing gas services:

- Capital expenditure — which is incurred in providing the physical assets, such as pipes, meters, and computer systems that are required to deliver gas services. The capital expenditure incurred by JGN ranges from small standard works, like installing a small length of pipe and a meter to connect a new customer, to large multi-million dollar projects. The three categories of capital expenditure that JGN incurs are:
 - *Market expansion capital expenditure* – this category of capital expenditure includes the costs of laying new pipes and installing meters to connect new customers
 - *Reinforcement, renewal and replacement capital expenditure* – this category of capital expenditure includes the costs associated with replacing old and/or broken pipes, gas stations and meters, and installing 'bigger' pipes or gas pressure equipment to cater for peak demand growth (also referred to as *Capacity Development*)
 - *Non-distribution capital expenditure* – this category of capital expenditure includes the costs of other supporting assets, such as information technology (IT), motor vehicles, buildings, land and facilities.
- Operating expenditure — which 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. These costs are generally recurrent and are categorised by JGN as follows:
 - *Operations and maintenance* – this category of operating expenditure includes the costs of operating and maintaining the network to ensure gas flows safely and reliably and also includes meter reading costs
 - *Corporate support* – this category of operating expenditure includes the costs of back-office support and front-line staff (e.g. human resources and payroll legal and finance teams)
 - *Information technology* – this category of operating expenditure includes the cost of specific IT support, such as the IT help-desk

- *Government fees and levies* – this category of operating expenditure includes the costs of licences, fees and taxes, as well as costs associated with carbon emissions and unaccounted for gas (UAG).¹

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

The one + five year (RY15-RY20) forecast capital expenditure is \$1,398M, which includes forecast expenditure of \$1,149M for the upcoming AA period (RY16-RY20).

| \$M | RY15 (not included in Total) | RY16 | RY17 | RY18 | RY19 | RY20 | RY16- RY20 Total |
|--------------------|------------------------------------|------|------|------|------|------|------------------------|
| Total Capex | 249 | 238 | 236 | 249 | 226 | 200 | 1,149 |

Table 1 Capital expenditure

Figure 1 and Table 2 provide a breakdown of the Actual/Forecast expenditure in the current AA period (RY11-RY15) (\$953M) with the forecast capital expenditure for the upcoming AA period (RY16-RY20) (\$1,149M).

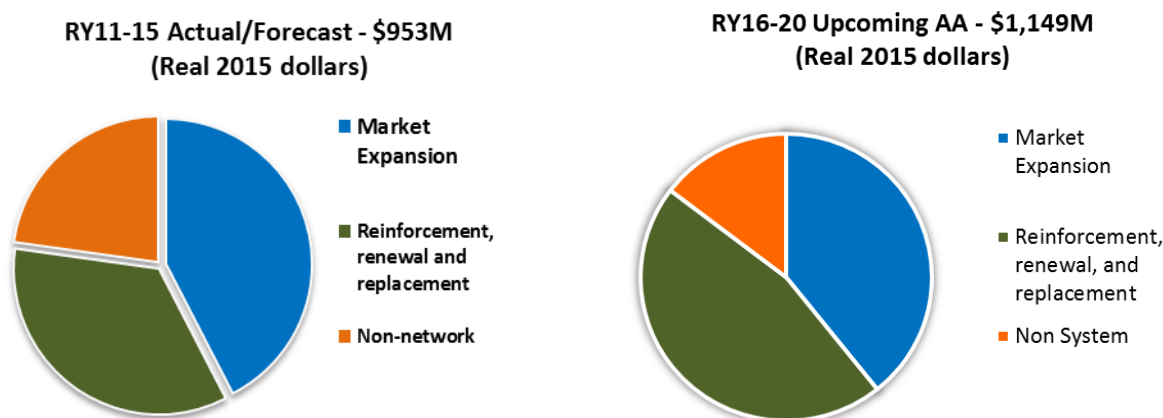


Figure 1 Capital expenditure RY11-15 vs RY16-20

| \$M | Current AA (RY11-15*) | | Upcoming AA (RY16-20) | Difference (Current AA Actual/Forecast vs. Upcoming AA) |
|--|--------------------------|-----------------|-----------------------------|--|
| | Allowance | Actual/Forecast | Forecast | |
| Market Expansion | 410 | 398 | 451 | 53 |
| Reinforcement, Renewal, and Replacement | 332 | 329 | 529 | 200 |
| Non-System | 132 | 226 | 168 | (58) |
| Total | 875 | 953 | 1,149 | 196 |

*Forecast relates to the 18 month period Jan 14 to Jun 15 inclusive.

Table 2 Breakdown of capital expenditure

¹ UAG is the difference between the quantities of gas measured as entering and leaving the network. The principal components of UAG are metering differences and leakage from the network. Meter differences arise because gas into the network is measured by a small number of sophisticated devices whereas the quantity leaving the network is measured by over a million relatively simple devices that will generally under-read if they are faulty. Jemena purchases gas to make up for UAG.

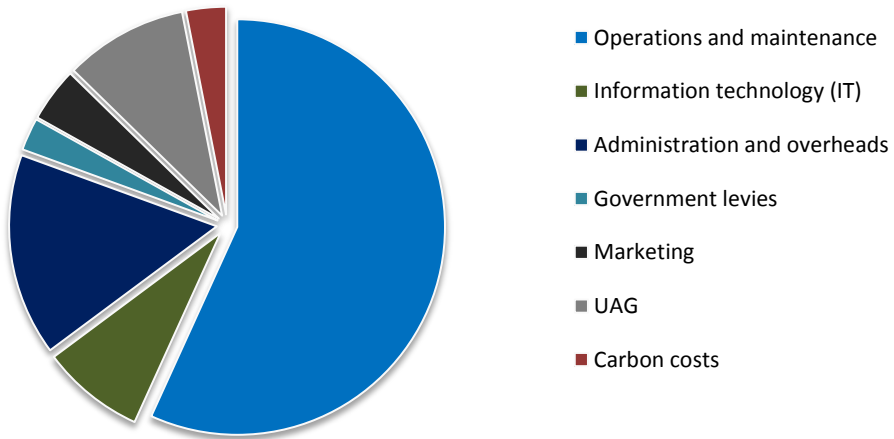
As Figure 1 and Table 2 indicate, capital expenditure is expected to increase in the upcoming AA period. This increase can largely be attributed to the following projects:

- Market Expansion:
 - The Market Expansion new connection forecast for the RY16-RY20 period is higher than for the RY11-RY15 period. RY16-RY20 connection numbers are based on CORE forecasts (Mar14) and additional volume generated by increased marketing expenditure. Costs are based upon the northern and southern tendered construction unit rates established in 2013.
- Replacement, Reinforcement and Renewal:
 - The increase in expenditure on Replacement, Reinforcement and Renewal can largely be attributed to the following programs:
 - Metering renewal and upgrade - expenditure on this program is expected to increase in the RY16-RY20 period as a result of an increase in the replacement of residential meters and aged gas hot water system meters. The increased volumes are required to meet regulatory requirements, and ensure the integrity of ageing, already life extended, assets.
 - Other Stay in Business programs required to ensure the integrity of ageing assets, such as:
 - Two key risk mitigation projects:
 - The Penrith Primary Mains Thin Wall Project (\$17M commencing in RY15, with the majority of work to occur in the RY16-RY20 period). This project will involve remediating a section of high pressure pipeline to bring it into line with current integrity standards
 - The Meter Data Logger Project - MDL (\$32M commencing in RY15, with the majority of works to occur in the RY16-RY20 period). This project will mitigate a revenue risk that would otherwise occur with the failure of the ageing MDL assets
 - Integrity digs and in-line inspection (**ILI**) projects to ensure the integrity of the high pressure Trunk and Primary mains. These costs were treated as opex in the RY11-RY15 period.
 - Two externally driven projects: the APA driven Riverina Packaged Off-take Station (POTS) Upgrades (\$15M for seven stations) and the Northern Trunk Pressure Increase Mitigation Project (\$16M for five stations). Both projects require upgrades to existing stations, including gas pre-heating solutions due to increased operating pressures of the pipelines as a result of upstream supply configuration changes supplying the JGN distribution system.
 - The renewal of the Mt Druitt steel main, with expenditure of \$16M (commencing in RY15, with the majority of work to occur in the RY16-RY20 period) expected to be incurred across the project life.

-
- While a number of significant Capacity Development projects are to occur in the RY16-RY20 period, overall expenditure on these projects is expected to be lower than it was in the RY11-RY15 period. One of the more significant Capacity Development projects to be undertaken is the Northern Primary project, which will provide capacity to the North East suburbs of Sydney. It is expected to cost \$27M (commencing in RY15, with the majority in the RY16-RY20 period) to secure land and extend the primary main. Land acquisition is a key element of the long term strategy.
 - Non-distribution:
 - Overall expenditure on the Non-distribution program is expected to be lower in the RY16-RY20 period compared to the RY11-RY15 period.
 - Leasehold improvements will be lower in RY16-RY20 period due to exceptional items within the RY11-RY15 period, such as property relocation from existing sites at Sydney Olympic Park and North Sydney, as well as JGN's contribution to the relocation of the Jemena's corporate office.
 - IT related expenditure is discussed in a separate IT specific AMP.

In relation to total operating expenditure, JGN is currently expecting a decrease in RY16-RY20. This is not withstanding that JGN is forecasting additional operating expenditure due to the cost of changing systems and additional resources to meet new regulatory obligations, such as AER regulatory reporting and the National Energy Customer Framework (NECF). Figure 2 provides a breakdown of the operating expenditure in the current AA period (\$802M) and the upcoming AA period (\$797M).

RY11-15 Actual / Forecast - \$802M (Real 2015 dollars)



RY16-20 - \$797M (Real 2015 dollars)

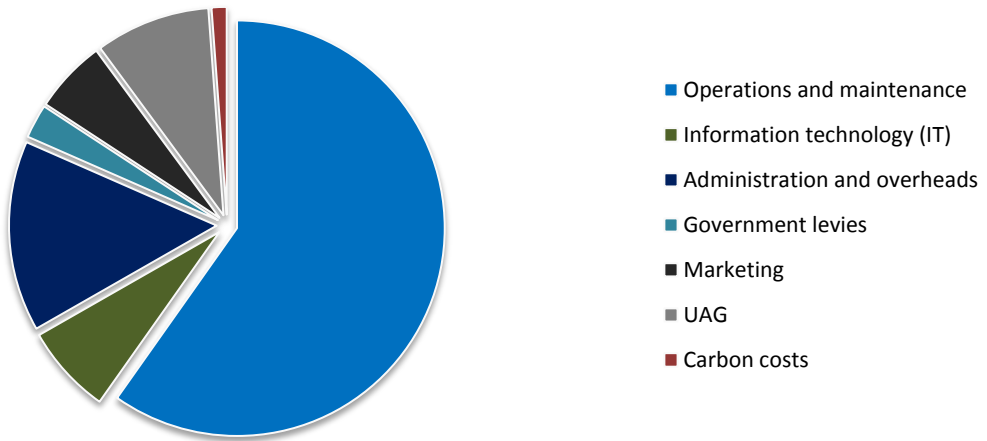


Figure 2 Operating expenditure RY11-15 vs RY16-20

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ABBREVIATIONS

| Acronym | Description |
|---------|---|
| AA | Access Arrangement |
| ACQ | Annual Contract Quantity (ACQ) |
| AER | Australian Energy Regulator |
| ALARP | As Low As Reasonably Practical |
| ALBV | Automatic Line Break Valve |
| AMA | Asset Management Agreement |
| AMP | Asset Management Plan |
| APA | Australian Pipeline Trust (part of the APA group listed on the ASX) |
| AS | Australian Standard |
| CABS | Contract Administration and Billing System |
| CDP | Capacity Development Project |
| CEF | Clean Energy Future |
| CHOS | Consumers Hours Off Supply |
| CM | Corrective Maintenance |
| CP | Cathodic Protection |
| CTS | Custody Transfer Station |
| CY | Calendar Year |
| DBYD | Dial Before You Dig |
| DCVG | Direct Current Voltage Gradient |
| DPI | Delivery Point Identifier |
| DRS | District Regulator Set |
| DTIRIS | NSW Department of Trade and Investment Regional Infrastructure and Services |
| EGP | Eastern Gas Pipeline |
| E&I | Electrical and Instrumentation |
| ELMS | Emergency Load Management System |
| EMP | Environment Management Plan |
| EMS | Environmental Management System |
| EPA | Environment Protection Authority |
| FA | Feasibility Assessment |
| FEED | Front-End Engineering Design |
| FIMPS | Facility Integrity Management Plan |
| FSA | Formal Safety Assessment |
| GASS | Gas Accounting Service System |
| GAW | Government Authority Work |
| GC | Gas Chromatograph |
| GPS | Global Positioning System |

| Acronym | Description |
|--------------|---|
| GST | Gas Supply Technician |
| HDPE | High Density Polyethylene |
| HP / LP / MP | High Pressure / Low Pressure / Medium Pressure |
| HSEQ | Health, Safety, Environment and Quality |
| I&C | Industrial and Commercial |
| ICRC | Independent Competition and Regulatory Commission |
| ICT | Information and Communications Technology |
| ILI | In-line Inspection |
| IT | Information Technology |
| IPART | Independent Pricing and Regulatory Tribunal |
| JAM | Jemena Asset Management |
| JGN | Jemena Gas Network (NSW) Ltd |
| KPI | Key Performance Indicator |
| LMS | Land Management System |
| LPRS | Low Pressure Regulator Set |
| MAOP | Maximum Allowable Operating Pressure |
| MHQ | Maximum Hourly Quantity |
| MLV | Main Line Valve |
| MOMs | Munmorah Off take Metering Station |
| MPRS | Medium Pressure Regulator Set |
| MTF | Meter Testing Facility |
| NGR | National Gas Rules |
| NGERS | National Greenhouse and Energy Reporting Scheme |
| NECF | National Energy Customer Framework |
| NGSF | Newcastle Gas Storage Facilities |
| NPI | National Pollutant Inventory |
| NRC | Non-Routine Capital |
| OB | Opportunity Brief |
| OH&S | Occupational Health and Safety |
| O&M | Operating and Maintenance |
| PE | Polyethylene |
| PIG | Pipeline Intelligent Gauge |
| PIMP | Pipeline Integrity Management Plan |
| PM | Planned Maintenance |
| PMM | Project Management Methodology |
| POTS | Packaged Off-take Station |
| PoW | Program of Work |
| PPM | Penrith Primary Main |

| Acronym | Description |
|---------|--|
| PRS | Primary Receiving Station |
| QA | Quality Assurance |
| RTU | Remote Telemetry Unit |
| RUGS | Request for Gas Supply |
| RY | Regulatory Year |
| SAOP | Safety and Operating Plan |
| SCADA | Supervisory Control And Data Acquisition |
| SIMPS | Secondary Integrity Management Plans |
| SMS | Safety Management Study |
| SOE | Software Operating Environment |
| SOP | Sydney Olympic Park |
| SPL | Sydney Primary Loop |
| SRS | Secondary Regulator Set |
| TPRC | Technical Policy Review Committee |
| TRS | Trunk Receiving Station |
| UAG | Unaccounted for Gas |
| WBH | Water Bath Heater |

Table 3 Abbreviations

1 DOCUMENT OVERVIEW

1.1 PURPOSE

The primary purpose of this AMP is to describe the plans required to implement Jemena's asset management strategy and ultimately deliver Jemena's asset management objectives for the NSW gas distribution network for the period RY15-RY20. The plans cover the following lifecycle activities:

- a) Creation, acquisition and enhancement of assets
- b) Utilisation of assets
- c) Maintenance of assets
- d) 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 JGN's NSW gas distribution network. This AMP has also been prepared to assist internal and external stakeholders understand the key planning inputs that underpin JGN's approach to managing its network.

1.2 SCOPE

This AMP covers the NSW gas distribution network, which is owned and operated by JGN. 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 6,895kPa)
- Primary (MAOP of 3,500kPa)
- Secondary (MAOP of 1,050kPa)
- Medium (MAOP of 210kPa)
- Low Pressure (MAOP of either 2kPa or 7kPa).

In addition to the network assets there are the Information Technology (IT), vehicle fleet and property assets, which are required to support operation of the network.

1.3 ASSET CATEGORIES

To reflect how JGN plans and operates the network, the AMP is structured around the key asset groups listed in the Table 4.

| Asset Group | Sub Category | Section |
|---------------------------------|---------------------------------|---------|
| Pipelines | Trunk Pipelines | 9.3 |
| | Primary Pipelines | 9.4 |
| | Secondary Pipelines | 9.5 |
| | Medium & Low Pressure Pipelines | 9.6 |
| Facilities | Trunk Receiving Stations | 10 |
| | Packaged Offtake Stations | 10 |
| | Water Bath Heaters | 10 |
| | Primary Regulating Stations | 10 |
| | Automatic Line Break Valves | 10 |
| Metering | Custody Transfer | 12.2 |
| | Industrial & Commercial | 12.4 |
| | Residential | 12.5 |
| Regulator Sets | Secondary Regulator Sets | 11 |
| | Medium Pressure Regulator Sets | 11 |
| | Low Pressure Regulator Sets | 11 |
| SCADA and communications | | 13 |
| Non Distribution Assets | Information Technology | 14.2 |
| | Building, Lands & Facilities | 14.3 |
| | Vehicles | 14.4 |

Table 4 Key asset categories

For JGN's principal asset classes, the plan focuses on optimising the lifecycle costs for that asset class (including creation, operation, maintenance, renewal and disposal) to meet agreed service levels and 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 six year period from 1 July 2014 to 30 June 2020, 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, JGN recognises that 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 RY15-RY20 period, JGN expects that new requirements 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 JGN NSW gas distribution network, other than IT assets. Consequently it does not cover demand market and volume market pricing arrangements or commercial agreements with external parties.

1.5 ASSET MANAGEMENT

Jemena is committed to being recognised as a world class owner and manager of energy delivery assets. Jemena's aim is to act in accordance with best practice asset management standards throughout the group without compromising health and safety or the environment.

Jemena's Asset Management Policy, which JGN complies with, is attached in APPENDIX 1 - Asset Management Policy.

Good practice asset management is ultimately underpinned by the principles of prudent investment and business management. In the context of JGN's gas distribution network, this requires the consideration of a combination of industry experience, sound business management practices and familiarity with the 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 JGN's gas distribution network), and devolving this through policies, procedures and plans into all aspects of operations. Jemena's asset management practice is supported by well-developed documentation that records and provides assurance that decisions are made to maximise the value of the services delivered by JGN's gas distribution assets.

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

- formal delegations from the board level through to Jemena's operational level
- supporting policies and procedures to control capital investment
- appropriate audit and assurance measures.

In addition to these governance controls, JGN's capital investment decisions are evidenced through its business documentation, which identify the driver for expenditure and demonstrates efficient decisions throughout the entire asset lifecycle as outlined in Figure 3.

These practices are ultimately integrated with Jemena's risk management, quality management, compliance, work health and safety, and environmental management practices. These are outlined in the following section.

Jemena develops a seven year AMP based on an April – March financial year basis. This AMP has been recut for regulatory years (July-June) to support JGN's AA submission.

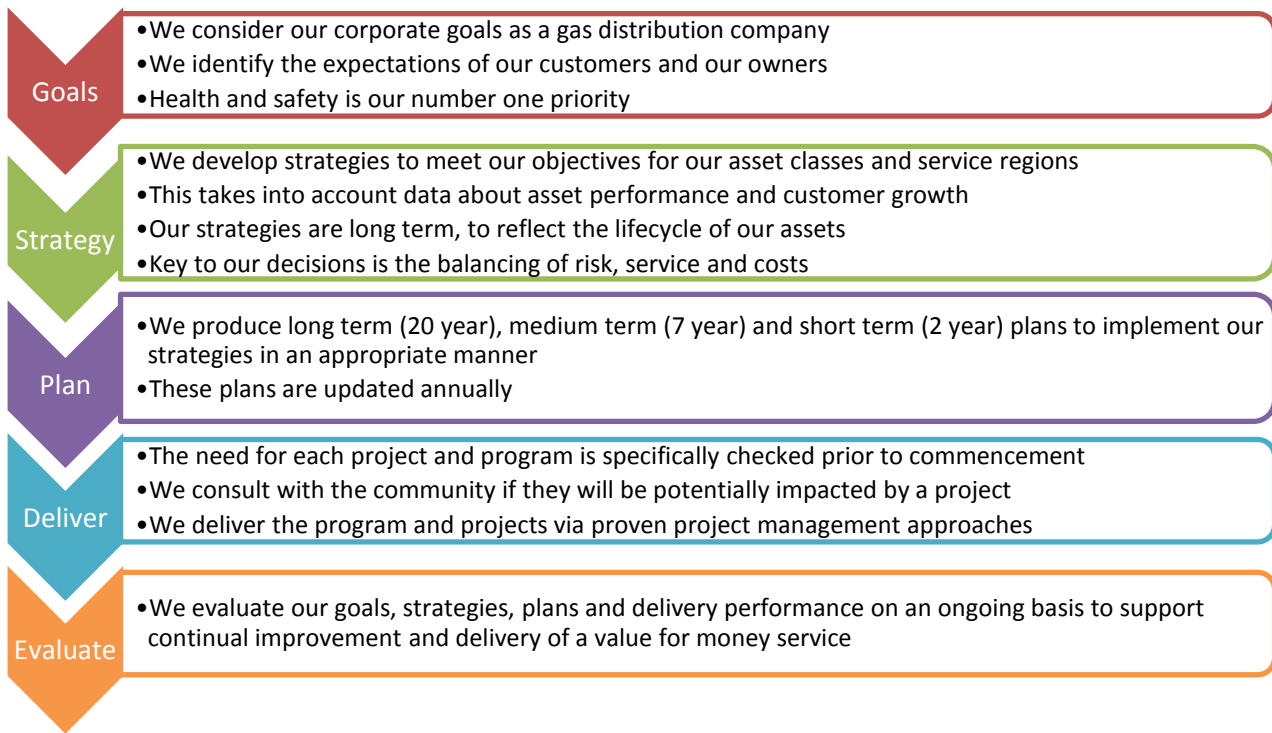


Figure 3 JGN process for making expenditure decisions: Planning and consultation

1.6 RELATION TO OTHER DOCUMENTS

The AMP is derived from Jemena’s Business Plan, Asset Management Strategy & Objectives, and the Asset Management Policy. Figure 4 indicates how the AMP is supported by the following documents:

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

The AMP references both the:

- List of Standards and Codes
- Capital Plan.



Figure 4 Document relationship

2 INTRODUCTION

2.1 ABOUT JEMENA

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.

JGN is a wholly owned by the Jemena group. It provides natural gas distribution services to users of the JGN NSW gas distribution network.

The JGN NSW gas distribution network traces its origins back to 1837 when The Australian Gas Light Company was formed to light the streets of Sydney. The network has grown through a combination of extensions, new developments and acquisitions. It now provides gas to approximately 1.2 million consumers across Sydney, Newcastle, the Central Coast, and Wollongong, and over 20 country centres including those within the Central Tablelands, Central West, Southern Tablelands and Riverina districts of NSW.

2.2 ORGANISATION STRUCTURE

Figure 5 below shows the line of accountability for JGN from individual asset class owners to the Board:

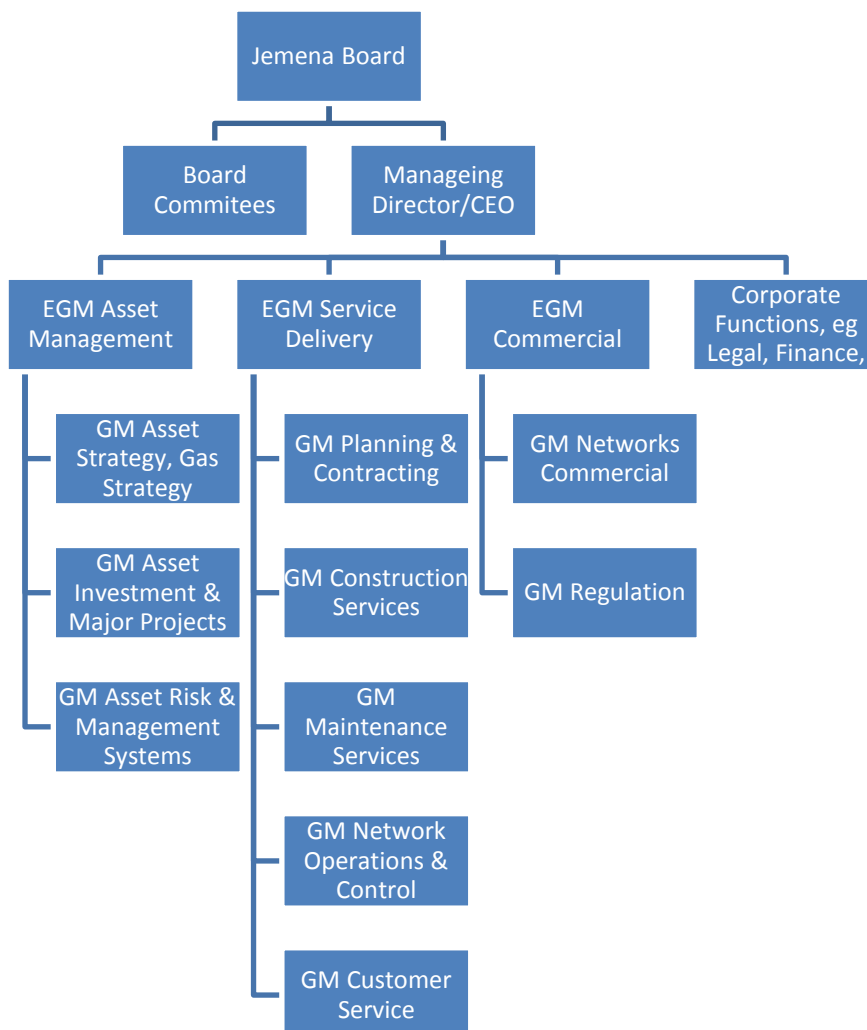


Figure 5 Accountability of individual asset owners

2.3 STRATEGIC OBJECTIVES

Jemena’s vision is to be recognised as a world class owner and manager of energy delivery assets and plans to realise this vision through developing a corporate culture that achieves the following specific objectives for its gas network:

- Embed a world class safety culture
- Be a high performing and engaged workplace that attracts, develops and retains industry leaders
- Have highly efficient operations
- Deliver customer focused operational excellence
- Be an influential market leader with strong customer, regulatory, stakeholder and community relationships
- Deliver financial performance that is superior to industry peers
- Achieve regulatory outcomes aligned to the business plan.

These objectives are supported by a strategy that establishes the core operations of the Jemena business, pursues industry leadership and extends the business to capitalise on new opportunities. In turn, the strategy is aligned to the five key success factors by which the business’ performance is measured.

The Jemena strategy, which links the vision, strategy and key success factors, has been summarised in a ‘one-page strategy statement’ and is reproduced in Figure 6



Figure 6 JGN strategy

2.4 JEMENA'S VALUES

Achieving Jemena's strategic objectives is reliant on an ongoing commitment to its core values and behaviours of **Health and Safety**, **Customer Focus**, **Excellence**, **Accountability** and **Teamwork** as represented in Figure 7.



Figure 7 JGN values

2.5 NETWORK OVERVIEW

JGN distributes natural gas from the transmission pipeline receipt points to NSW gas customers via a series of pipelines. Figure 8 illustrates how the pressure steps down from 6,895kPa to a minimum of 2kPa 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 and low pressure mains, whilst larger commercial and industrial customers are connected at secondary or primary pressures.

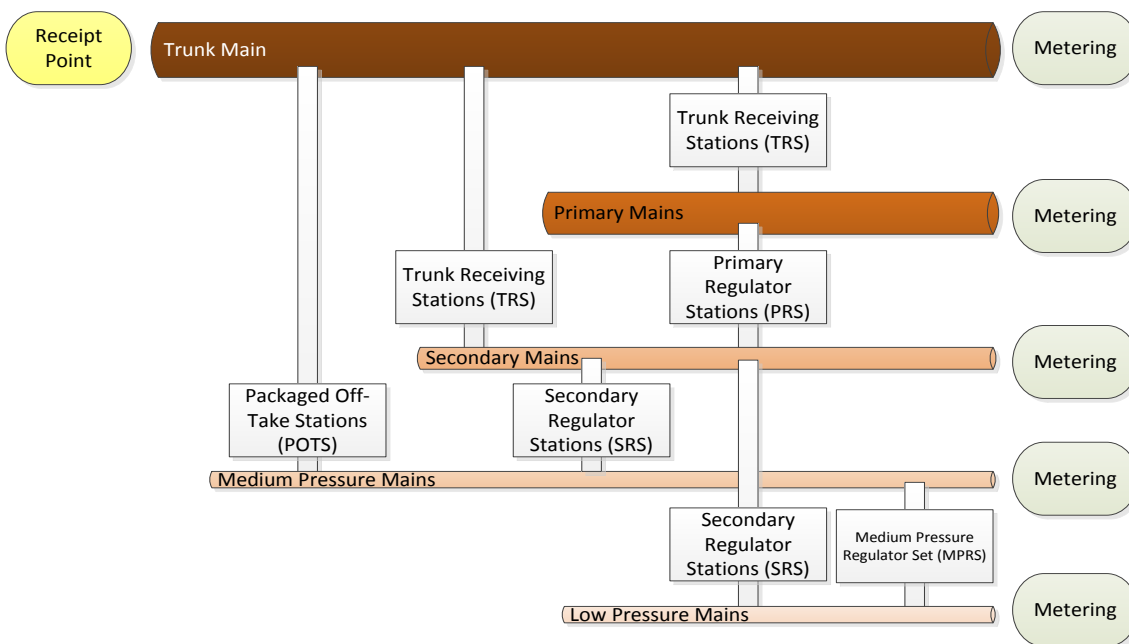


Figure 8 Network pipelines

The key supply points and JGN’s distribution areas are summarised below in Figure 9.

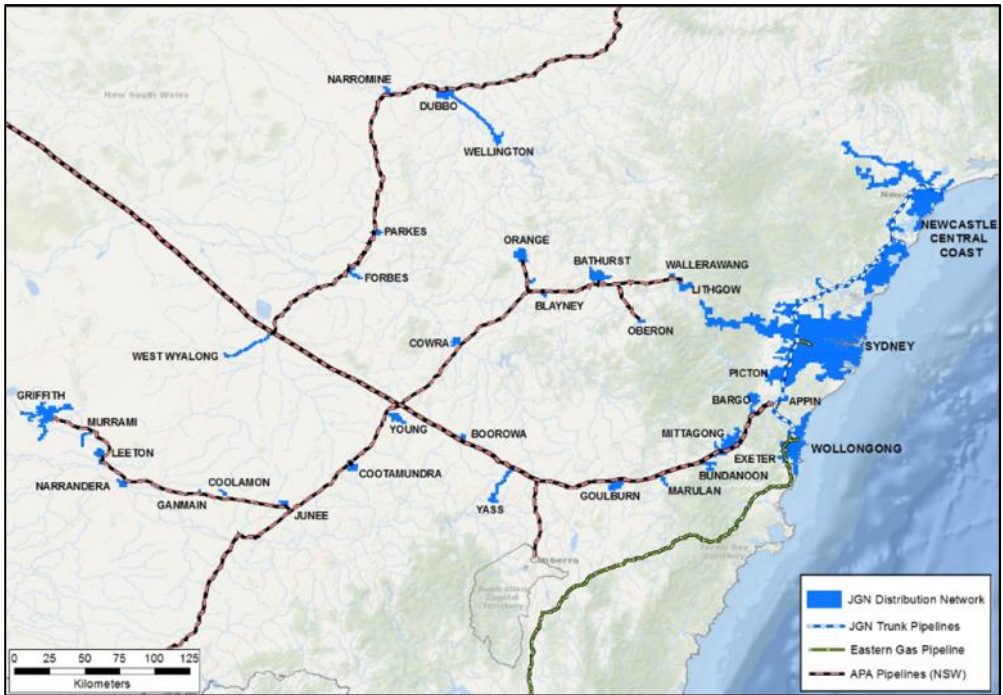


Figure 9 JGN network

In Figure 9, the areas shown in blue represent the geographical coverage of JGN’s distribution network. The trunk pipelines are the backbone of the network in the Sydney, Newcastle and Wollongong region. The Eastern Gas Pipeline (EGP) is a key supply artery between Victoria and NSW, while APA’s Moomba to Sydney Pipeline (MSP) delivers gas from the Cooper Basin and Queensland to Sydney and JGN’s country networks.

2.5.1 SUPPLY POINTS

The network section that supplies Sydney, Newcastle and Wollongong has five receipt points through which it accepts gas from three principal sources as per Table 5.

| Trunk Pipeline receipt point | Owner | Sources of Supply |
|--|----------------------------|--|
| Wilton receipt point | APA) | This receipt point is supplied via APA’s MSP, which is used to transport gas produced in the Cooper Basin and Queensland |
| Horsley Park receipt point | Jemena-owned EGP (not-JGN) | These three receipt points are supplied via the EGP, which is used to transport gas from the Gippsland Basin |
| Port Kembla receipt point | | |
| Albion Park receipt point | | |
| Rosalind Park receipt point near Camden | AGL Upstream Investments | This receipt point is supplied with coal seam methane produced in the Camden region |

Table 5 Five gas receipt points supplying Sydney, Newcastle, and Wollongong

Additionally, a new supply point located adjacent to the existing JGN Hexham facility in the northern trunk is proposed to be operational in RY15. This supply point is configured to both supply gas to, and receive gas from, AGL’s Newcastle Gas Storage Facility (NGSF). Over the period this AMP covers, further supplies of gas are anticipated either through this or additional facilities, and will require augmentation of other JGN facilities.

There are separate country receipt points for each of the country centres served by the JGN network. All of the country centres are connected to APA's MSP. The relevant sections of the MSP that are used to supply these areas are set out in the table below.

| MSP Pipelines Section | Supply |
|---|--|
| MSP - Young to Lithgow lateral | Cowra, Blayney, Orange, Millthorpe, Bathurst, Oberon, Lithgow, Wallerawang |
| MSP - Young to Wagga Wagga lateral | Young, Cootamundra |
| MSP - Burnt Creek to Griffith lateral | Junee, Coolamon, Ganmain, Narrandera, Rockdale Beef, Leeton, Murrami, Griffith |
| MSP - Young to Wilton | Boorowa, Yass, Goulburn, Marulan, Moss Vale, Berrima, Bowral, Bargo, Sally's Corner, Bingara Gorge, Wilton |
| Central West Pipeline – Marsden to Dubbo | Dubbo, Dubbo West, Forbes, Parkes, Narromine, West Wyalong |

Table 6 MSP pipeline sections

2.5.2 JGN NETWORK

As at 30 June 2013, JGN's network had 1,174,552 connections (equating to greater than 1.2 million customers) and delivered approximately 100PJ of gas per annum. Some other key network statistics are set out in Table 7.

| Network | Statistic |
|--|---------------|
| Trunk Mains | 267 km |
| Primary Mains | 147 km |
| Mains <=1050kPa | 24,963 km |
| Trunk Receiving Stations (incl. POTS) | 55 |
| Bulk Metering Stations | 2 |
| Primary Regulating Stations | 17 |
| Regulator Sets | 619 |
| Residential Gas Meters | 1,121,553 |
| Industrial and Commercial Gas Meters | 43,865 |
| Water Meters | 173,188 units |

Table 7 JGN network statistics

2.5.3 REGULATORY FRAMEWORK

JGN is subject to a range of regulatory requirements, which are specific to its activities as a gas distribution business.

Access regulation

JGN's distribution network is classified as a "covered pipeline" under the *National Gas Law (NGL)*. As a covered pipeline service provider, JGN must:

- Prepare an 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 that JGN offers to network users (including prospective users) as well as the terms and conditions (including prices), on which JGN will offer those services to network users.
- Comply with a range of other obligations including those that deal with ring fencing.

Licensing and licence-related obligations

As operator of a gas distribution pipeline, JGN must hold a reticulator's authorisation under the *Gas Supply Act 1996 (NSW)*. Authorisations are granted by the NSW Minister for Resources and Energy on advice from the NSW Independent Pricing and Regulatory Tribunal (**IPART**).

JGN also holds five pipeline licences under the *Pipelines Act 1967 (NSW)*. The licences cover the construction, operation and maintenance of its trunk pipelines. The licences have each been granted by the Governor of NSW. Regulatory oversight of these pipelines and licences rests with the NSW Department of Trade and Investment, Regional Infrastructure and Services (**DTIRIS**).

Between them, the *Gas Supply Act 1996* and the *Pipelines Act 1967* and Regulations made under these Acts, as well as the authorisation and pipeline licences themselves, impose a significant number of obligations on JGN, including obligations relating to metering, asset safety, and compliance with standards and reporting.

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)² as well as Regulations—together the *National Energy Customer Framework (NECF)*—commenced in NSW, in transitional form, on 1 July 2013. The NECF imposes a range of significant obligations on gas distributors including JGN. From JGN's perspective, a key dimension to NECF is the creation of new rights and obligations between JGN as the gas distributor and end consumers, in addition to rights and obligations, as between JGN and network users (and retailers and end-consumers). This includes a deemed contractual relationship between JGN 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 JGN and retailers, and the provision of connection services.

2.5.4 THE ACCESS ARRANGEMENT

In the process of reviewing and approving JGN's AA, the AER is required to approve the prices JGN proposes to charge for defined reference services. The prices are set so as to provide JGN with "a reasonable opportunity to recover at least the efficient costs [that JGN] incurs in":

- providing those services
- complying with a regulatory obligation or requirement or making a regulatory payment."³

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*'.⁴

In addition to satisfying the above criteria, capital expenditure must be justifiable on the basis that the:⁵

² Principally new parts 12A and 21 in the NGR.

³ NGL, section 24(2).

⁴ NGR, rules 79(1)(a) and 91.

⁵ NGR, rules 79(1)(b) and 79(2).

- (a) the overall economic value⁶ 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:
 - to maintain and improve the safety of services or
 - to maintain the integrity of services or
 - to comply with a regulatory obligation or requirement or
 - to maintain the service provider's capacity to meet levels of demand for services' or
- (d) 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).

2.6 STANDARDS

JGN complies with the relevant guiding standards and codes. A register of the applicable standards is available in JGN's List of Standards and Codes.

2.7 JEMENA ASSET MANAGEMENT APPROACH

JGN operates under an integrated Asset Management System (AMS), which is designed to optimise the performance of assets over its full life cycle. Jemena is in the process of reviewing its AMS and approaches to leverage learnings and harmonise some processes with the Jemena Electricity Network and Jemena's gas transmission pipelines.

2.7.1 ASSET MANAGEMENT POLICY

Jemena's Asset Management Policy (as applied by JGN) was established by the Asset Management System Review Committee and approved by the Managing Director in January 2014. The policy is included in full in APPENDIX 1 - Asset Management Policy.

The key features of the policy commit JGN 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
- Establish, maintain and govern an effective AMS.

⁶ 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

2.7.2 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.

2.7.3 ASSET MANAGEMENT SYSTEM

The key linkage of JGN’s AMP to the business plan, strategy and objectives is the AMS⁷ document, which provides a consistent, collaborative and integrated approach to the activities undertaken by JGN to manage the lifecycle of its assets

Jemena’s AMS Diagram (see Figure 11), was endorsed by Jemena’s AMS Review Committee in December 2013. The structure allows for “line of sight” from the Jemena 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 10). The outputs of the AMP and its sub-plans are the two-year PoW, which provide detailed activity level schedules.

The AMP is 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.

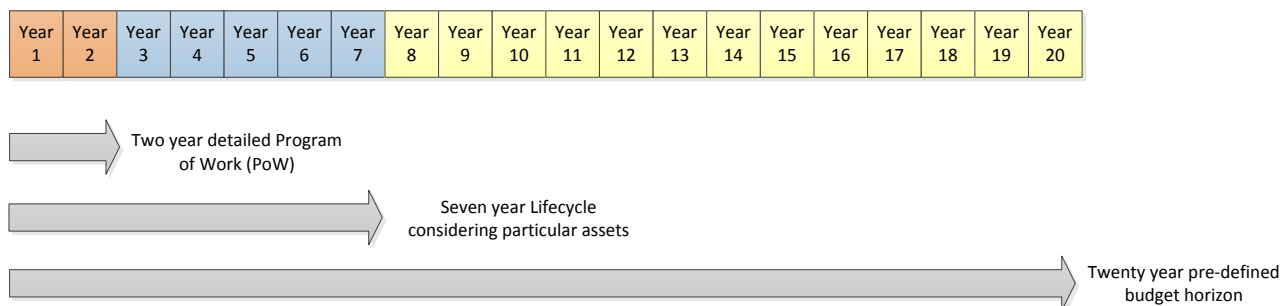


Figure 10 Asset Management System planning timeline

The AMS describes the consistent, collaborative and integrated approach to the management of the lifecycle of assets that Jemena has adopted to ensure that optimum outcomes are delivered in an efficient way across Jemena. Whilst the AMS is functioning effectively, augmentation of the system, supporting processes and documentation are in the final stages of being scoped and will be approved for implementation in preparation for certification under PAS55. This augmentation will also align the Jemena Electricity Networks, Pipelines and Gas Networks asset management systems.

⁷ JGN Asset Management System Mar14

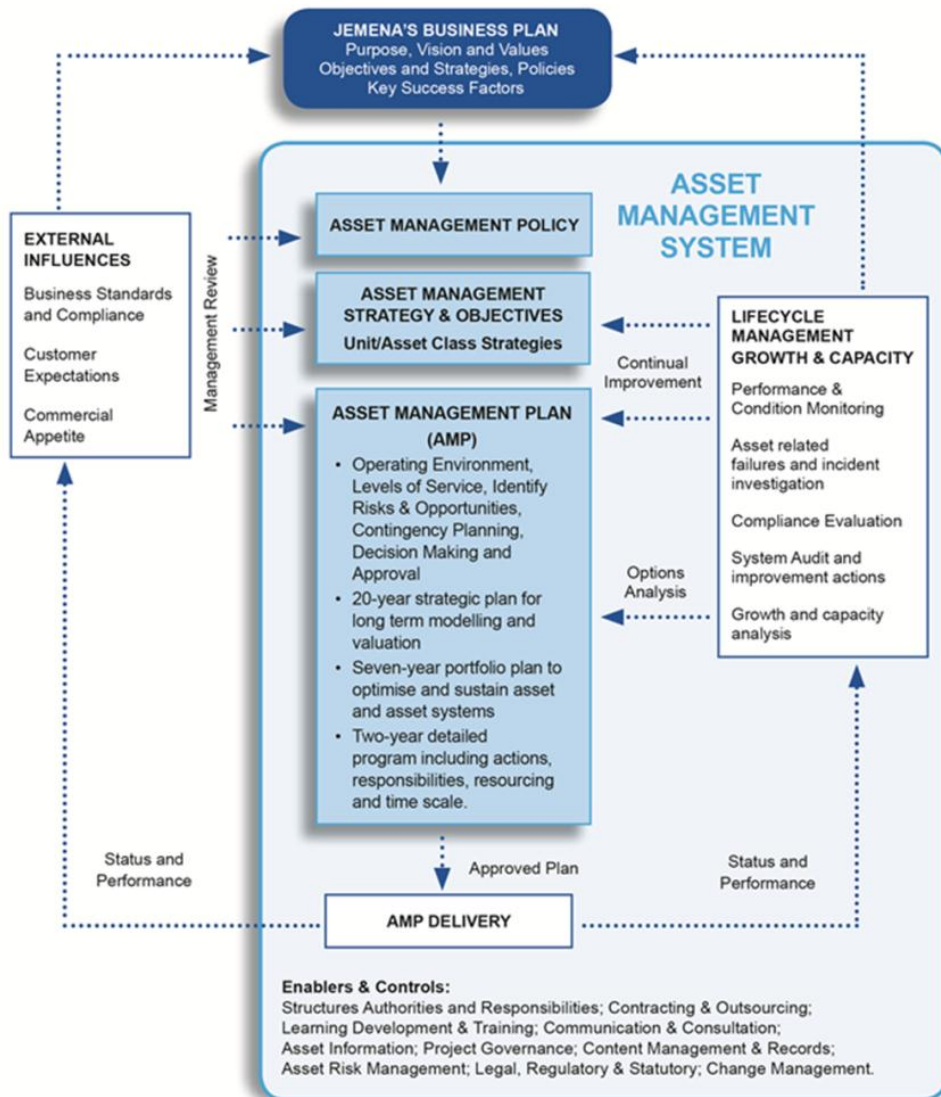


Figure 11 JGN AMS planning cycle

The AMP delivery plan and its alignment to budget processes are summarised below in Figure 12.

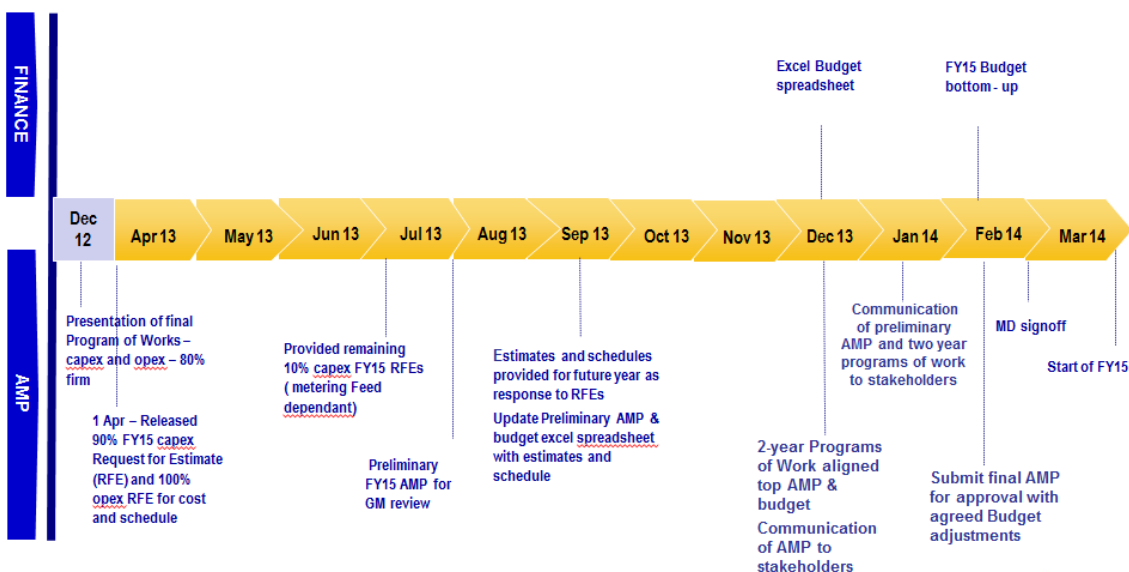


Figure 12 AMP/Budget timelines

2.7.4 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 series of PoW, including:

- Capital PoW, which includes capital programs and individual projects
- Operating/Maintenance PoW, which includes all maintenance related activities
- 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 groups.

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.

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 key client of the two year PoW is the Operations Program Management team, which uses the PoW 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.

Maintenance PoW

JGN details its maintenance activities in the Maintenance PoW. The plan includes forecasted activity levels for planned and unplanned repair and maintenance activities aimed at maintaining an acceptable level of risk and integrity of services.

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 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 JGN's asset management decisions.

JGN has identified a series of strategic asset management drivers. Along with the drivers' specific to a particular asset class, 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 distribution network. Where there is inconsistency between drivers, JGN uses its' understanding of the drivers and its asset management experience and expertise to balance the drivers in order to optimise the outcomes from the strategies. These drivers include:

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

A detailed description of each of these drivers is contained in the JGN 20 year asset class strategies (appendix 6.1 of the AA proposal).

4 KEY SUCCESS FACTORS

JGN measures and records its historical network performance to assess success against the Jemena group's 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:

- Public Safety
- Customer Reliability
- Customer Service
- Risk Mitigation
- System Audits.

4.1 PUBLIC SAFETY INDICATORS

4.1.1 NETWORK INCIDENTS NOTIFIED TO TECHNICAL REGULATOR

Figure 13 sets out the number of gas network incidents reported to the Technical Regulator between RY10 and RY13. This metric provides a measure of the adequacy and effectiveness of JGN's asset safety controls. Current management activity to minimise the number of incidents includes the 'Dial Before You Dig' and other similar campaigns, which are carried to increase public and contractor awareness.

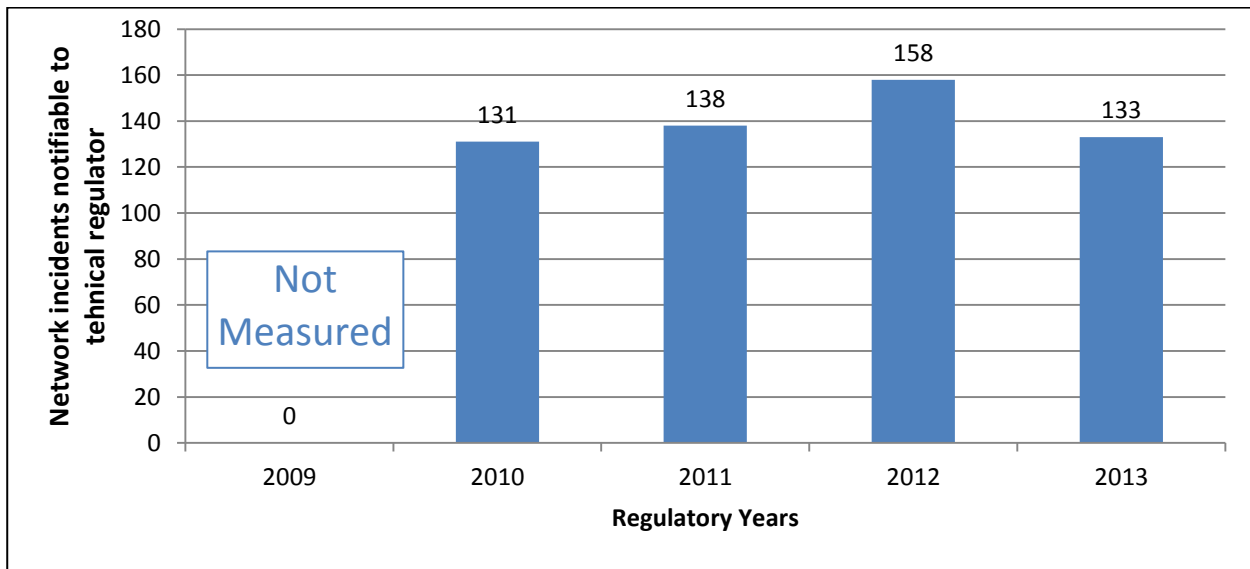


Figure 13 Network incidents notifiable to technical regulator

4.1.2 PUBLIC REPORTED ESCAPES

Gas leaks expose consumers to potential safety hazards and typically occur from meters, customer piping and corroded or broken metal pipes found in older suburbs. The majority of leaks are reported by the public due to odour. To minimise the risks associated with gas leakage, JGN closely monitors publicly reported escapes and manages it with programs including leakage surveys, controlled mains laying techniques and rehabilitation programs.

Figure 14 sets out the number of publicly reported gas leaks per km of pipeline between RY09 and RY13. This metric is considered to be within acceptable levels. In its recent annual performance report, the DTIRIS also made favourable comments about this metric, as reflected in the following extract:⁸

“Both the number of gas leaks reported per km and per 1000 customers remain at low levels.”

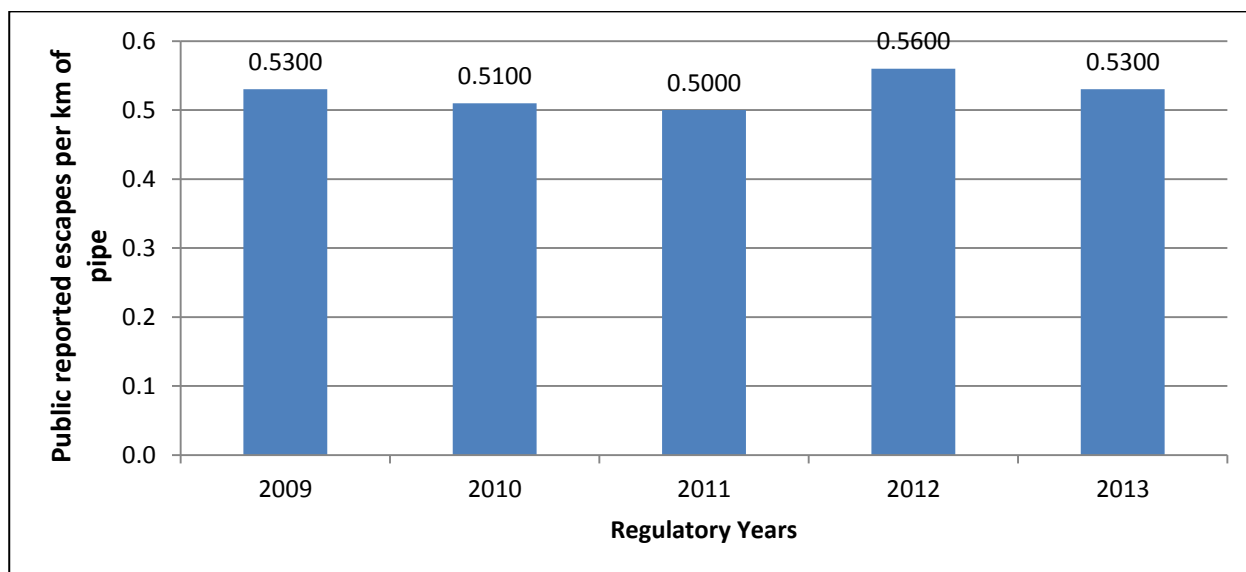


Figure 14 Public reported escapes

4.2 CUSTOMER RELIABILITY INDICATORS

SAIDI (System Average Interruption Duration Index) and SAIFI (System Average Interruption Frequency Index) are indices used to measure distribution system reliability.

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 15 sets out the SAIDI between RY09 and RY13. Before examining this figure, it is worth noting that this indicator can be skewed by major incidents. For example:

- In RY10, the Bowral Trunk Station suffered a failure (due to upstream causes unrelated to JGN), which resulted in the loss of supply to almost 9,000 customers for an extended period. This was an abnormal incident resulting from contaminated gas being delivered to the Trunk Station. Additional controls have been implemented to minimise the risk of similar incidents in the future.
- In RY12 there were two major incidents, including flooding across areas of the JGN gas distribution network.

Once the effect of these incidents are removed, JGN’s performance can be considered quite positive, as noted in the following statement by the DTIRIS in the 2012-13 Gas Networks Annual Performance Summary Report:⁹

“...the reliability indicators show that Network Operators continue to provide a reliable supply of gas to consumers.”

⁸ DTIRE, NSW 2012-13 Gas Networks Annual Performance Summary Report, p15.

⁹ DTIRE, NSW 2012-13 Gas Networks Annual Performance Summary Report, p19.

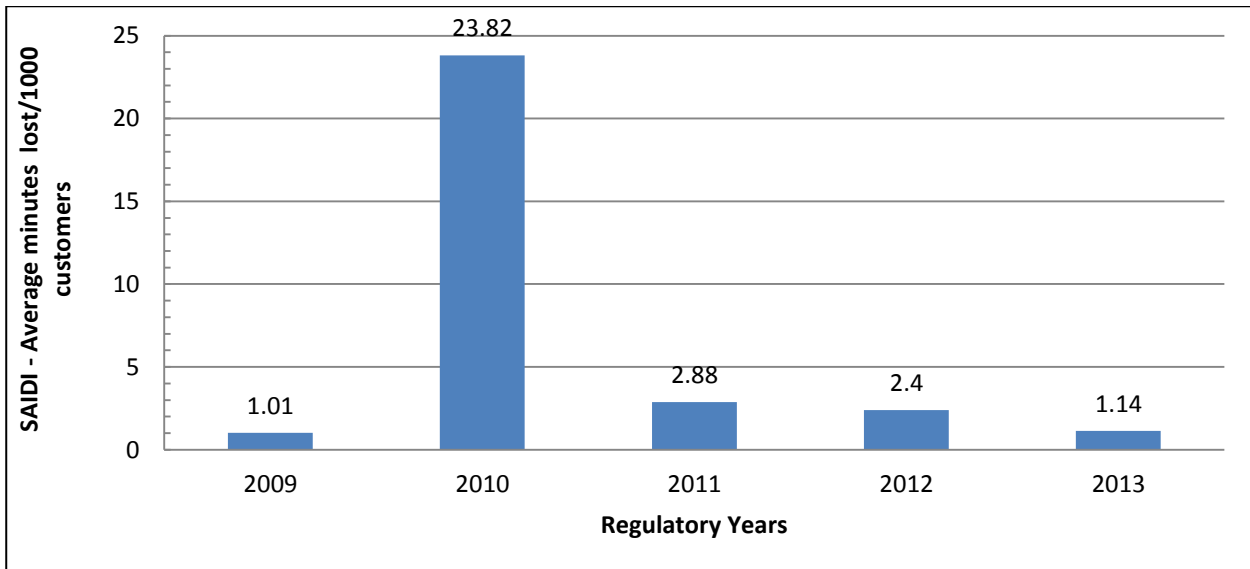


Figure 15 SAIDI outcomes

4.2.2 SAIFI

SAIFI provides a measure of the number of interruptions per customer connection and is illustrated in Figure 16 for the RY09-RY13 (Figure 16).

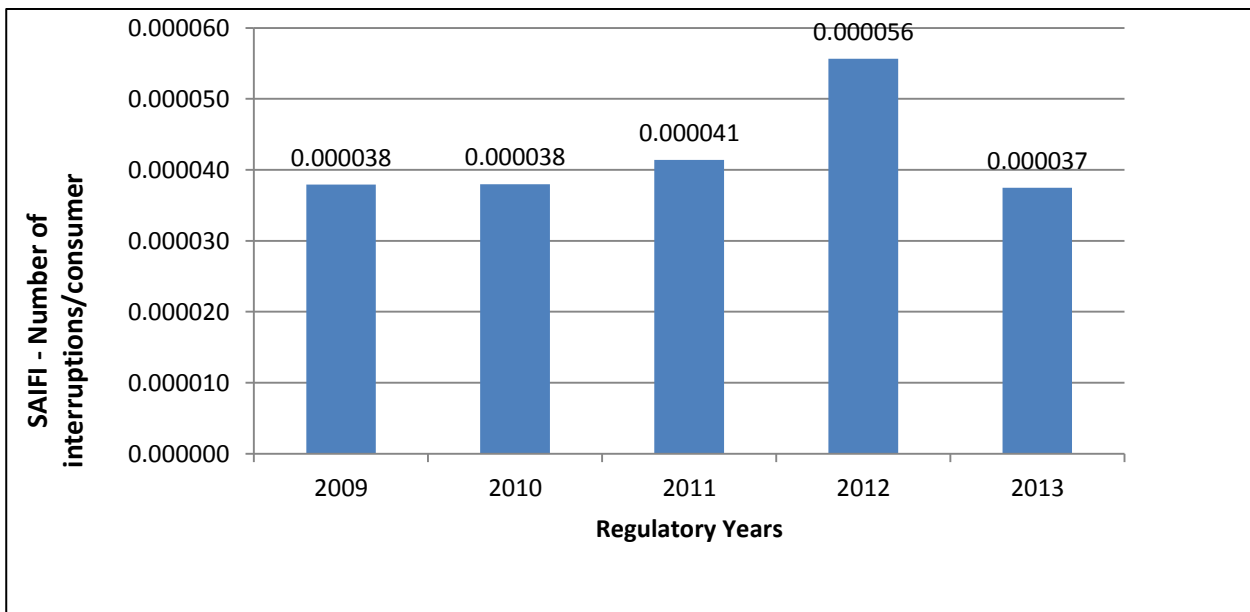


Figure 16 SAIFI

4.2.3 POOR GAS SUPPLY INCIDENTS REPORTED BY THE PUBLIC

Figure 17 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. JGN only started monitoring this KPI in RY12 and is using it to identify areas that may need system reinforcement or additional maintenance.

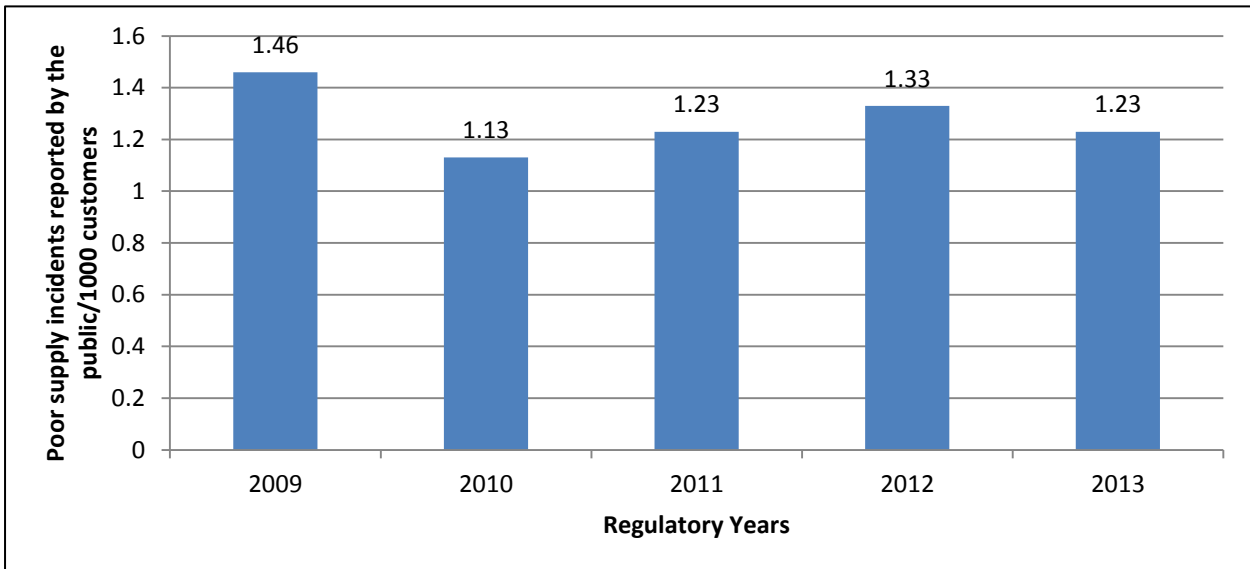


Figure 17 Poor gas supply incidents reported by the public

4.3 CUSTOMERS SERVICE INDICATORS

4.3.1 PERCENTAGE OF STANDARD ELECTRICITY TO GAS (E-G) CONNECTIONS COMPLETED WITHIN 20 DAYS

Figure 18 sets out the percentage of standard electricity to gas connections that have been completed within 20 working days of the customer accepting JGN’s offer to connect over the period RY09-RY13. As this figure highlights, JGN has achieved a 100 per cent success rate over this period.

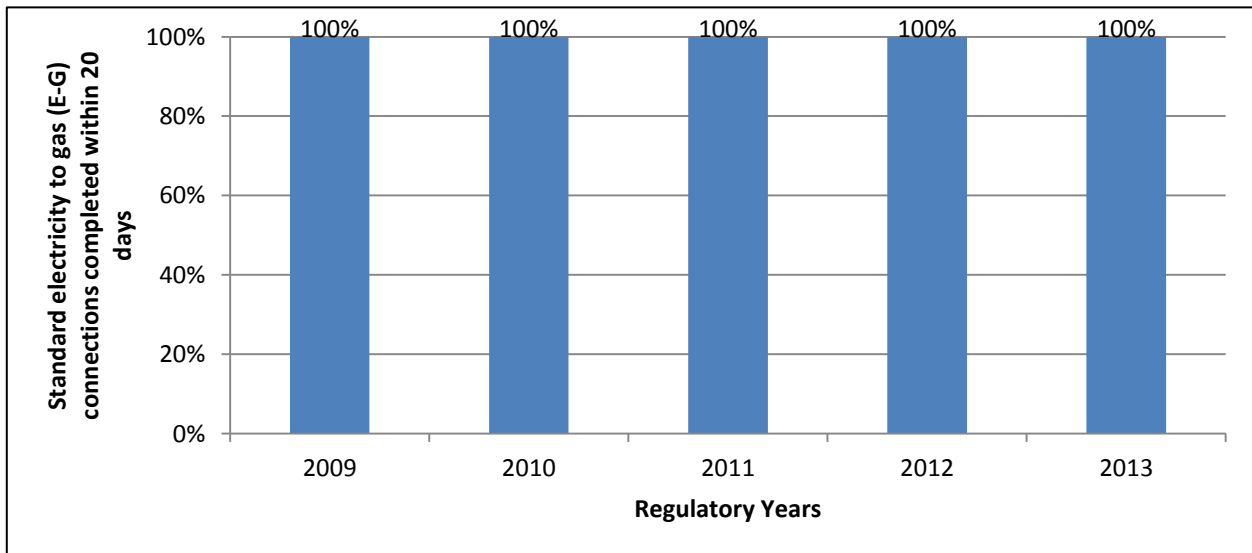


Figure 18 Percentage of standard electricity to gas (E-G) connections completed within 20 days

4.3.2 EMERGENCY RESPONSE LESS THAN 60 MINUTES

In the event of an emergency, JGN’s priorities are to ensure public safety, minimise the impact of an emergency on the community and the environment and to safeguard the facilities. The risk of uncontrolled gas escapes affecting the public can be high, and JGN needs to respond to these incidents as soon as possible.

The primary KPI for emergency response is based on JGN’s capacity to respond to emergencies within 60 minutes. JGN aims to address 95 per cent of emergencies within 60 minutes. As Figure 19 indicates, JGN

has consistently surpassed this benchmark over the last five years. In its recent annual performance report, the DTIRIS noted that while the response times to emergencies had increased slightly, the response times “still remain strong”.¹⁰

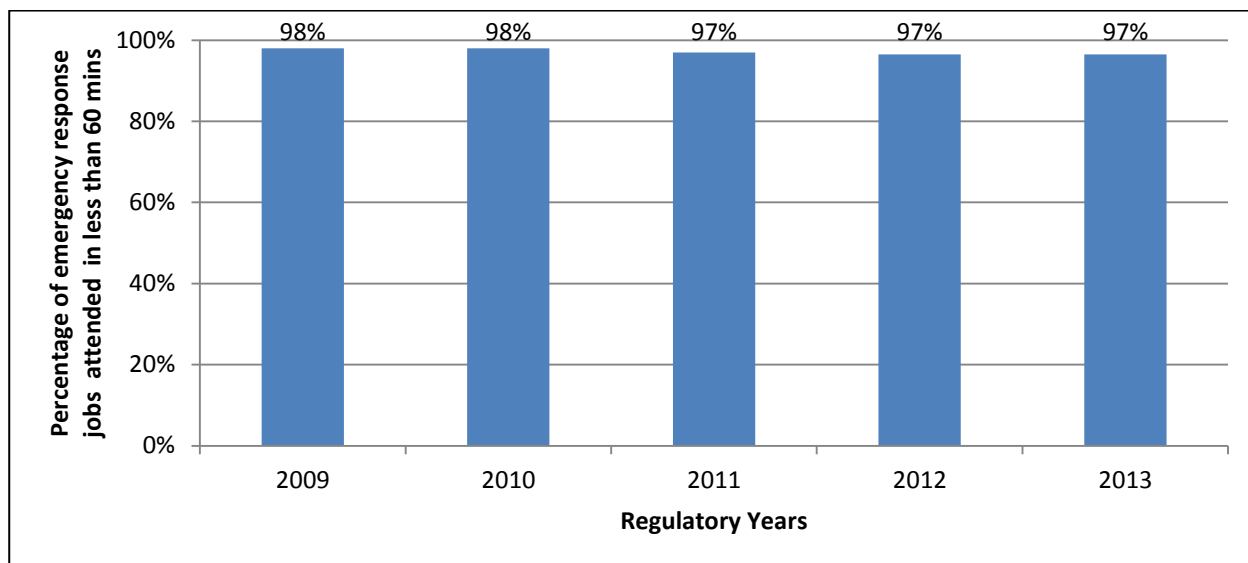


Figure 19 Emergency Response less than 60 minutes

4.4 RISK MITIGATION INDICATORS

4.4.1 PIPELINE PATROL

Pipeline patrol is a key activity in ensuring no interference on JGN’s higher risk assets. Figure 20 sets out the percentage of pipeline patrol work completed on schedule over the last five years. As this figure indicates, JGN has consistently carried out this work on schedule over this period.

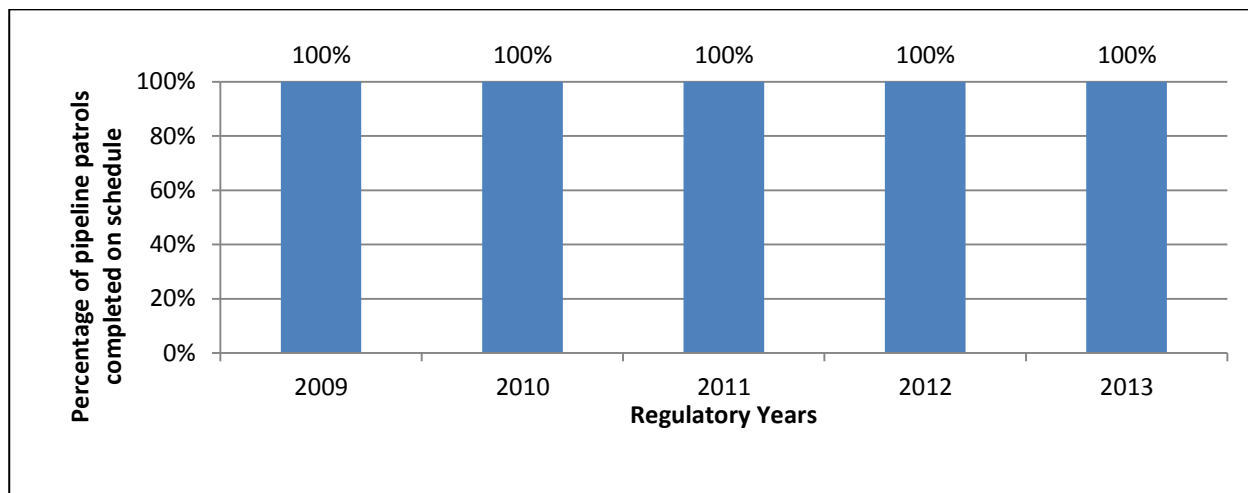


Figure 20 Pipeline patrol (distribution)

4.4.2 LEAKAGE SURVEY (KPI 12)

This indicator monitors whether planned leakage surveys are being completed to schedule. JGN began tracking this KPI in RY11 via job work codes. JGN’s performance in relation to this indicator is set out in

¹⁰ DTIRE, NSW 2012-13 Gas Networks Annual Performance Summary Report, p19.

Figure 21. As this figure indicates, JGN has performed strongly in this area over the last three years. In relation to slight reduction in 2013, it is worth noting that bad weather across the Hunter and Newcastle in September 2012 caused backlogs, which extended into RY13.

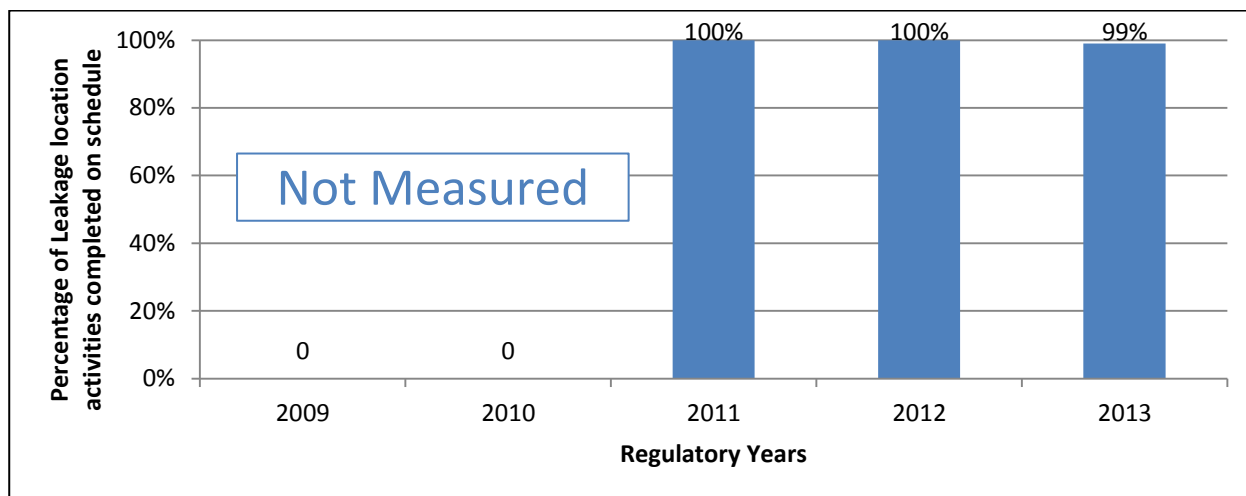


Figure 21 Leakage location

4.5 UNACCOUNTED FOR GAS

The prescribed UAG target for the RY11-RY15 period is 2.34 per cent of network receipts. JGN cannot recover the cost of UAG in excess of the target. This provides an incentive for JGN to minimise UAG. The main factors influencing this measure are:

- Gas leakage, which can arise as a result of:
 - physical leakage
 - venting (insignificant).
- Measurement error, which can be attributed to:¹¹
 - errors in meter reading (automated or manual)

¹¹The 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, JGN does the following:

1. To deal with the first issue, JGN 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, JGN calculates UAG over a 12 month rolling period.
3. To deal with the third issue, UAG is reported with a three month lag.

- incorrect estimations of gas consumption where readings are unavailable
 - metering uncertainty
 - linepack changes
 - heating value (HV) determinations.
- Gas Theft

JGN’s historical UAG is set out in Figure 22. While not shown in this figure, it is worth noting that the percentage of UAG on JGN’s network over the last five years (1.9-2.63 per cent) compares favourably to the industry weighted average of approximately 3 per cent, as reported in the ESAA’s recent *Electricity Gas 2013* report.

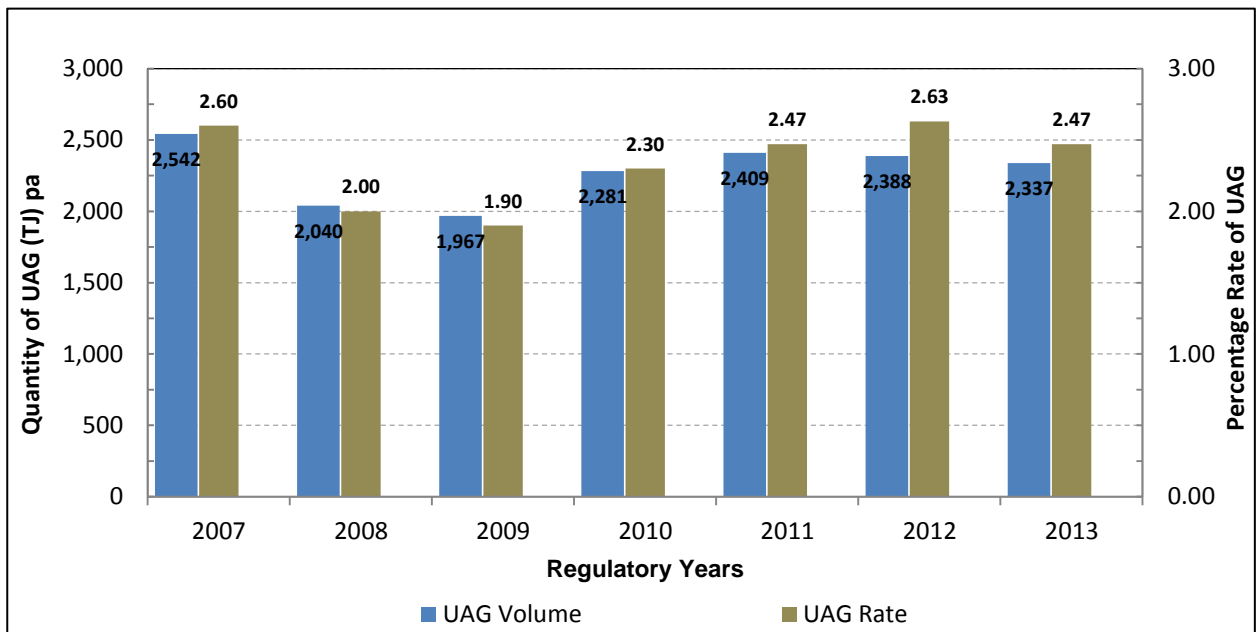


Figure 22 Unaccounted for Gas

5 PROCESS AND SYSTEM DESIGN

JGN employs a range of strategies and processes 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
- Regulatory management
- Environmental management
- Resource management
- Asset management
- Stakeholder management
- Land management.

Each of these factors forms an integral part of the asset management process. Further detail on the strategies, policies, processes and systems JGN uses across each of these areas is provided below.

5.1 RISK MANAGEMENT

5.1.1 RISK MANAGEMENT POLICY

JGN operates under Jemena's Risk Management Policy (SPIAA PO 0050) and Group Risk Management Manual (SPIAAMA 0050). These documents were developed in line with AS/NZS ISO31000: Risk Management – Principles and Guidelines.

5.1.2 JEMENA COMPLIANCE AND RISK SYSTEM (JCARS)

JCARS is Jemena's 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 Jemena's assets and operations, including JGN.

JGN administers and maintains the JCARS content and obligation assignment and reports both internally and externally on its compliance status.

5.2 WORK, HEALTH & SAFETY MANAGEMENT

This section refers to the occupational health and safety of Jemena employees and contractors working in JGN and discusses the Jemena's Health, Safety, Environment and Quality (HSEQ) Group and their activities.

5.2.1 REGULATORY REQUIREMENTS

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

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.

Jemena maintains a company-wide Health and Safety Policy which expresses Jemena’s commitment, goals and responsibilities for Health and Safety performance. The policy is reproduced in APPENDIX 2.

5.2.3 JEMENA HSEQ MANAGEMENT SYSTEM

JEM-PO-0025 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 (JEM-PO-0015) 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 23, while the objectives of this sub-committee and a number of other sub-committees that have been set up within JGN are set out in Table 8.

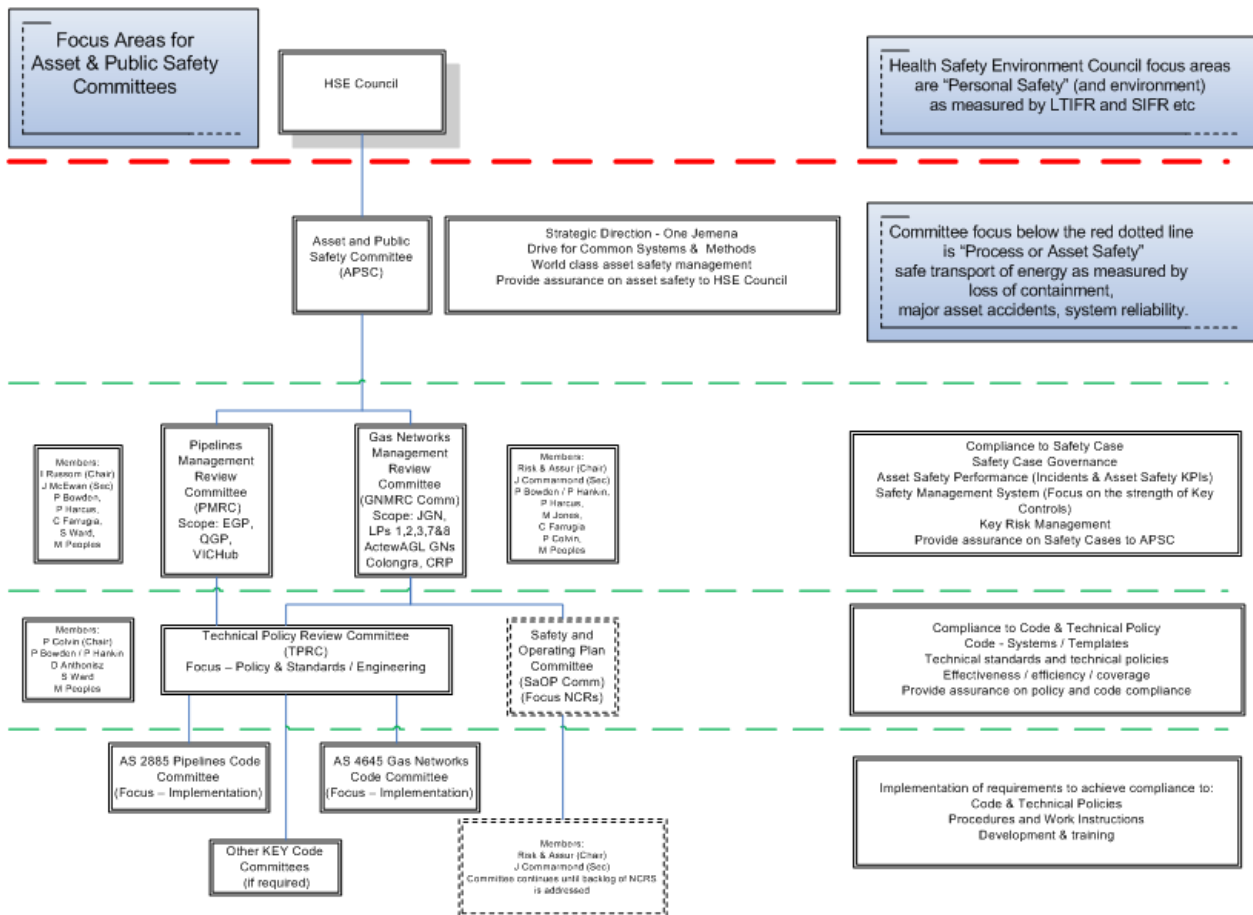


Figure 23 Asset and public safety committee structure

| Sub-Committee | Objective |
|---|---|
| Asset and Public Safety Committee (APSC) | Reviews and monitors the operation of Jemena’s gas and electricity safety management processes and systems to ensure they deliver on Jemena’s corporate commitments. |
| Technical Policy Review Committee (TPRC) | Ensure appropriate technical policies are in place for gas assets under management by Jemena Networks and Pipes - Asset Management |
| 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 |

Table 8 Scope of Asset and Public Safety Committees

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 JGN uses to stay up to date with these types of changes, including stakeholder management and industry representation.

5.3.2 REGULATORY CHANGE AND IMPACT

JGN maintains a subscription with the external service provider SAI Global (Lawlex) for their legislative alerts service, which provides alerts and a synopsis of changes for nominated legislation and jurisdictions. Any updates to legislation, codes or other sources of obligations that apply to the business are reviewed and entries in JCARS updated accordingly. This complements functions provided by Jemena's legal team.

5.3.3 SAFETY AND OPERATING PLAN

JGN has developed and maintains a Non Conformance and Opportunity for Improvement tracking report, which contains all regulatory and internal audit findings aimed at maintaining and improving safety of services. Audit actions are tracked and progress on closing out issues is reported to management on a monthly basis through management reports and through the Safety and Operating Plan (SAOP) Steering Committee meeting.

The SAOP is a key component of the compliance management system and describes the safety management system by which JGN fulfils its legal obligations under the *Gas Supply Act 1996*, the *Pipelines Act 1967* and relevant Australian Standards.

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, which provides assurance to regulatory bodies that the assets are operated and maintained in a safe manner as required by the licence and relevant Australian Standards. The Jemena Technical Compliance Group monitors and utilises the information from regulatory and internal audits 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". JGN is audited once each year by an external auditor.

Audit topics are selected by the auditor on a five yearly cycle and in consultation with JGN, based on past performance and risk to the business. These topics are detailed in the relevant SAOP.

JGN develops 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 JGN safety management system. The internal audit plan is developed based on risk and compliance management requirements, trending from regulatory audits, performance of KPIs, and discussion with stakeholders including regulators, management and owners.

5.3.5 INDUSTRY REPRESENTATION

JGN is a member of a number of industry bodies and committees including the Australian Standards Committees, the Energy Networks Association, the Australian Pipeline Industry Association and others. Representation on these committees provides a medium for JGN to develop relationships with other 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 as Jemena's commitment to reducing its environmental footprint, is integral to the philosophy of Jemena's 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.

JGN has developed an Environmental Management Plan (EMP) supported by two JGN Operational Environmental Management Plans. One is for licensed transmission pipelines (JGN-PL-0061) and the other is for gas distribution networks (AAM-PL-0064). The plans ensure that activities are undertaken consistently and with minimal impact on the environment.

Environmental incidents and hazards are reported through Jemena’s integrated HSEQ Incident Management System (IMS).

Environmental awareness training is provided to all the relevant Jemena 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.

5.4.1 JEMENA ENVIRONMENTAL POLICY

Jemena maintains a company-wide Environmental Policy, which sets out Jemena’s commitment to reducing its environmental footprint and makes high level statements about how that commitment will be achieved. The policy is reproduced in APPENDIX 3.

5.4.2 ENVIRONMENTAL REPORTING

JGN is required to report the following:

- National Pollutant Inventory Reporting - JGN is required to report on air emissions under the National Environment Protection (National Pollutant Inventory (NPI)) Measures legislation.¹² NPI emission reports are prepared for the Australian financial year and submitted to the relevant NSW EPA by September 30 each year.
- The National Greenhouse and Energy Reporting Scheme (NGERS) – JGN is required to report annually on greenhouse gas (GHG) emissions and energy data to the Clean Energy Regulator. JGN’s emissions predominantly result from fugitive emissions, leakage of natural gas from pipelines and contractor fleet fuel use (if major construction activities are being undertaken).
- Carbon Tax and Clean Energy Future Legislation – Following the introduction of the Clean Energy Future (CEF) legislation package in 2012, JGN has been subject to an annual carbon price obligation for its combustion and fugitive (pipeline leakage) emissions. The first carbon price compliance year commenced in July 2012 with annual emissions obligations based upon NGERS calculation methodologies. It is unclear at this stage how much longer JGN will be subject to this obligation.

5.5 ASSET MANAGEMENT

5.5.1 ASSET MANAGEMENT POLICY

Jemena’s Asset Management Policy is detailed in Appendix 1. Supporting the Asset Management Policy is the JGN Asset System Manual, the objective of which is to set out:

¹² The threshold categories which are triggered are emissions to air from products of combustion (Categories 2a and 2b), triggered by compressor stations, water bath heaters and generators and natural gas losses (Category 1a, use of Volatile Organic Compounds). The calculation and reporting of emissions uses fuel data provided and verified by the *National Greenhouse and Energy Reporting Scheme (NGERS)* process and published emission factors. The methodology has been approved by the EPA.

- a consistent, collaborative and integrated approach to the activities undertaken by JGN to manage the lifecycle of its assets to ensure that optimum outcomes are delivered in an efficient way across JGN. This document sets out the AMS to be used for JGN’s assets
- how asset management is ‘done’ at JGN (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

Jemena has formed an Asset Management Committee with the aim of incorporating PAS 55 into the company. The committee has responsibility for the AMS across Jemena and its overarching purpose is to strengthen the AMS by providing governance, alignment and review across Jemena. The committee provides a senior management forum to ensure the system is fit for purpose and delivers the Jemena business objectives.

5.5.4 UAG TASK FORCE

JGN has assembled a UAG Task Force 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
- support knowledge management and retention.

Key areas of review include:

- Monitoring and forecasting
- Calculation processes
- Metering
- Gas quality
- Billing
- Operations
- Maintenance

- Network protection.

5.6 MAINTENANCE PLANNING

JGN's maintenance is undertaken to deliver a safe, reliable and efficient network. Maintenance planning covers both planned and unplanned (including emergency response) elements of maintenance. JGN's 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.

JGN's maintenance planning is aligned with Jemena's Asset Management Policy 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 JGN's maintenance strategy for its assets 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
- 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 JGN implements one of the maintenance strategies below for a specific asset class:

1. operate to failure
2. reliability-based approach
3. condition-based monitoring
4. scheduled maintenance.

JGN's maintenance strategies are articulated in its SAOP, which in turn is underpinned by the Jemena 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). So too does the location of available and competent personnel.

The balance of resource capacity and capability and the proportion of planned and unplanned works are used to develop the 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

- 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 outside the control of JGN.

JGN's uses its enterprise IT system 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 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. JGN provides initial training to all maintenance staff and refreshes maintenance skills through annual refresher training programs. JGN also ensures training associated with new technology and new assets is provided as they are constructed and introduced.

5.7 STAKEHOLDER MANAGEMENT

5.7.1 DTIRIS

The Jemena Technical Compliance Group and Jemena generally, maintain a positive and open relationship with DTIRIS. This ensures communications channels are open and DTIRIS is engaged early in projects that are potentially affected by legislation and licence conditions. This plays a crucial role in JGN's current and future operating environment regarding network development, or changes that require technical regulatory approval and or involvement.

5.7.2 CONSUMER ENGAGEMENT

Customer focus is one of JGN's values. In particular, JGN strives 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 JGN's costs, services and prices.

The JGN Customer Council has been established to provide valuable insights on issues that are important to customers and stakeholders. This includes issues relating to the services JGN provides, the forecast costs of providing those services, and the prices JGN charges retailers for use of JGN's distribution network.

Membership of the JGN Customer Council consists of representatives of a diverse set of consumer and stakeholder organisations, advocating on behalf of residential, small business, vulnerable and industrial customers as well as other stakeholders including energy retailers and local councils.

JGN also consults with the following stakeholders:

- Direct customer engagement (small and large customers)
- Retailer forums
- One-on-one stakeholder engagement.

In engaging with its customers, JGN aims to:

- Assist customers to understand how gas services and prices are determined, including where customers' money goes
- Inform customers of emerging factors influencing the gas market
- Involve customers in JGN's decision making and responding to customer feedback
- Highlight what JGN can do to manage gas prices, what JGN can't do, and what customers can do
- Measure, report and improve the effectiveness of JGN's engagement activities.

The AMP reflects customers' preferences and concerns, and promotes their long-term interests. This has been validated through a series of forums where JGN engaged with customer, stakeholder and community groups.

At the forums, JGN explained the context for the AMP, including the role of gas as a competitive fuel in NSW, the different parts of the gas supply chain, the costs associated with each part and the roles of the AER in regulating reference services and IPART in regulating some retail prices.

During the forums, JGN explored the various stakeholder views on the decisions within the AMP, in particular the balance between the prices for services, the long-term safety of gas distribution network, and the service levels the gas distribution network provides to current and new customers.

JGN expects to continue consultation with customers during the AMP period on specific projects, which are likely to have a community interest.

5.8 LAND MANAGEMENT

JGN's network extends across a significant area of land in NSW. This brings with it an extensive number of lands management issues given the range of:

- landowners involved (public¹³ and private)
- unique land conditions (e.g. national parks and water ways)
- uses of the land (existing and proposed).

5.8.1 TENURE OF LAND

Generally, JGN's land rights are protected by easements, statutory rights or licence agreements. JGN currently has easements registered in approximately 1150 land parcels.

5.8.2 LANDS MANAGEMENT SYSTEM

JGN's Land Management System (LMS) is a database that 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 JGN's trunk pipelines, reminding owners of the risks associated with activities near the pipeline and to obtain updated landowner details.

¹³ Some examples of public landowners include: Transport NSW and related agencies e.g. Roads and Maritime Services, Rail Corp; local councils; Port corporations; Commonwealth of Australia (Crown Land); Australian Rail Track Corporation and National park and wildlife agencies.

6 EXPENDITURE SUMMARY

6.1 CAPITAL EXPENDITURE (CAPEX) – CAPITAL PLAN

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 distribution network. The plan is designed to ensure JGN’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, 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 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 24 provides a snapshot of the Capital Plan for the AMP period RY15 through to RY20.

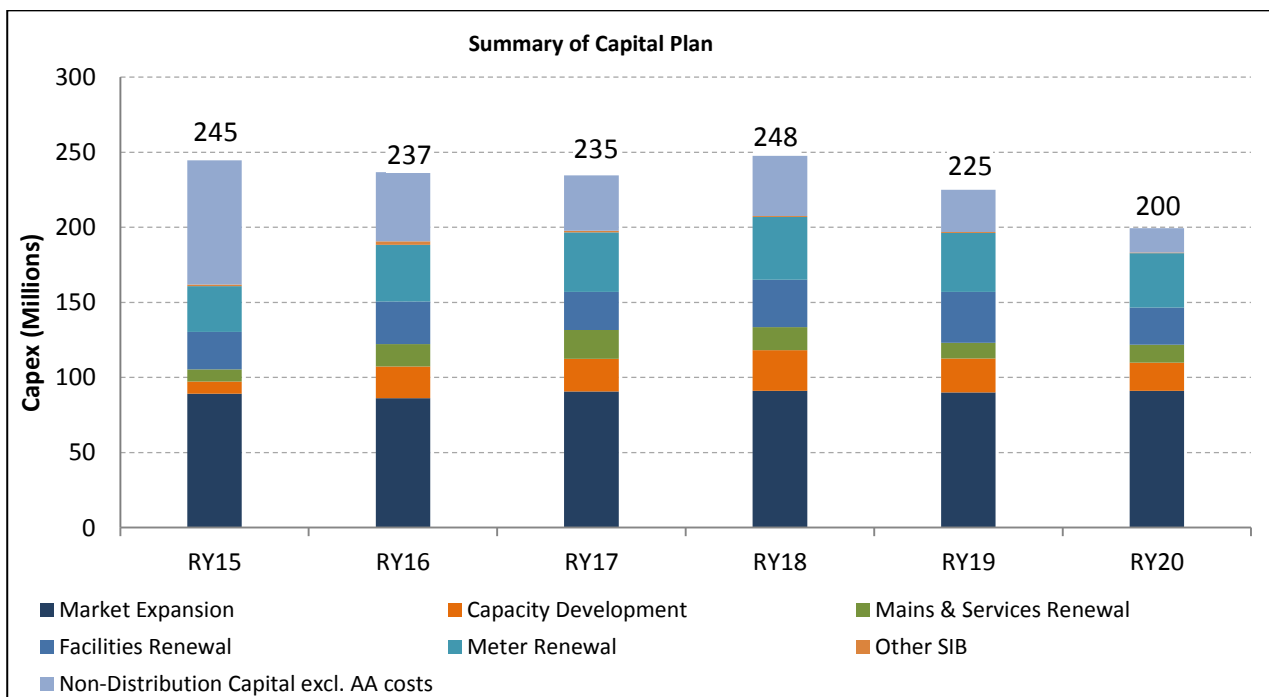


Figure 24 Capex Plan RY15 -RY20

6.2 OPERATIONAL EXPENDITURE (OPEX) AND MAINTENANCE PLAN

Figure 25 illustrates JGN’s operation and maintenance plan for the RY15–RY20 period. The forecast presented in this figure is based on estimated RY14 costs (i.e. the RY14 base year), adjusted for expected step changes, cost escalators (for labour and materials), scale and productivity improvements. The RY14 estimate was sourced from a mix of actual and forecast costs.

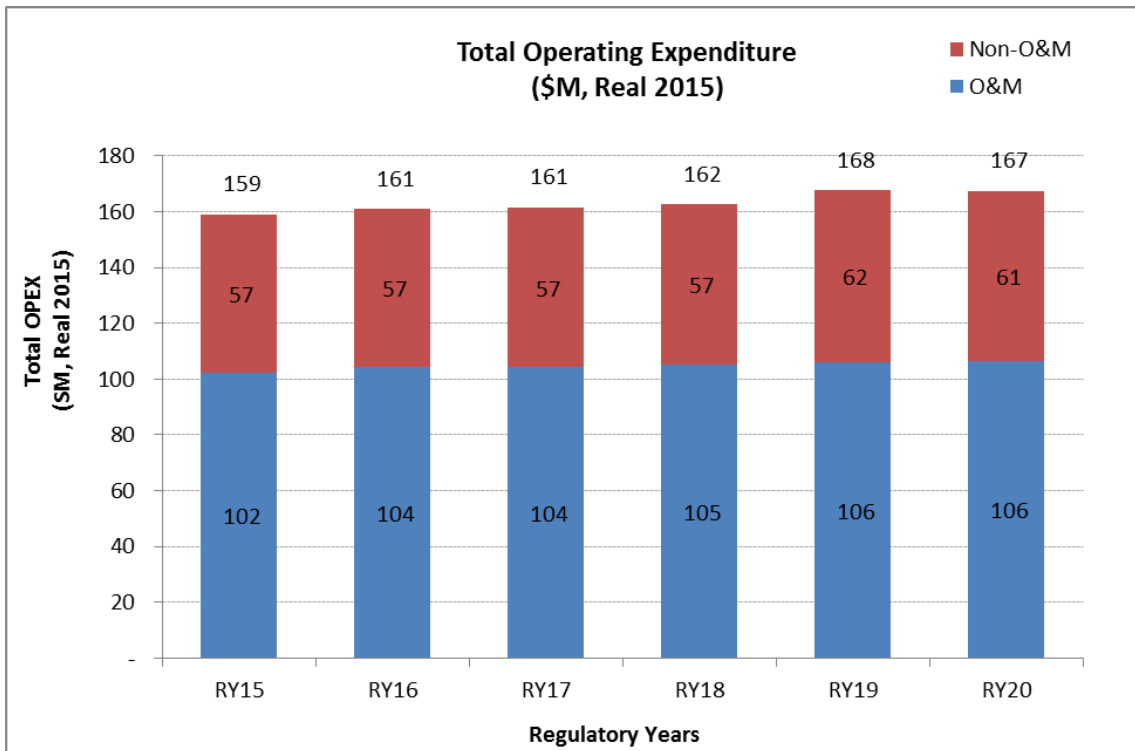


Figure 25 Opex Plan RY15- RY20

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 AA period with rules 79 and 91(1) of the NGR is set out in detail in the AAI.

As noted in section 5.7.2, the development of the AMP has been heavily influenced by the feedback provided by JGN’s 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 JGN 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 efficient to undertake, including expenditure to maintain network reliability or to extend services to new consumers.¹⁴ 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.

¹⁴ JGN would not reduce expenditure on works and activities driven by perceived safety risks or concerns because ‘safety is non-negotiable.’

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)).

7 DELIVERY STRATEGY

7.1 SUMMARY

JGN's delivery strategy relates to all assets used in the delivery of gas from the receipt point to meter but excludes IT and non-distribution assets. The remainder of this section provides a summary of:

- the framework JGN will use to deliver the projects specified in the AMP
- JGN's assessment of the deliverability of the AMP, including the delivery approach.

7.2 FRAMEWORK FOR DELIVERY

JGN has identified a number of fundamentals that are critical to the delivery of the distribution portion of the Capital Program. JGN applies these fundamentals to the delivery of the distribution portion of the Capital Plan and as any improvements that may lead to increased effectiveness or efficiency are identified, implements these improvements. This section summarises the fundamentals and improvements currently being implemented.

7.2.1 INTEGRATION WITH ASSET MANAGEMENT PROCESSES

The distribution portion of the Capital Plan is ultimately an output from JGN's 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 distribution portion of the Capital Plan.

7.2.2 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. JGN prepares Opportunity Briefs (OB) as an initial scope statement for projects to be included in the AMP. For more complex projects, an enhancement of the scope is undertaken and documented in Feasibility Assessments (FA).

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.

7.2.3 SCHEDULING

For the purpose of assessing deliverability of the RY16 to RY20 program, the capital program has been analysed to ensure that the spread of the 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 (and program lifecycle), the delivery plan for the program will be adjusted accordingly as an ongoing exercise. Amendments will be documented in the AMP and specified through the PoW and the subsequent detailed planning processes.

This optimisation of the program is undertaken to balance both the prudence of scheduled delivery of projects and sub-programs, and the efficiency in the delivery of the projects *vis-a-vis* resourcing requirements.

7.2.4 PROJECT GOVERNANCE

Effective project governance is an essential component to achieving effective and efficient project and program outcomes. Within Jemena, 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 Jemena's corporate policies and procedures. The specific governance arrangements for each project will change according to the risk and complexity of each project.

Regardless of the scale of governance required, project governance within Jemena is used to oversee the key elements of projects.

Jemena continues to review and where necessary refine its governance processes.

7.2.5 FUNCTIONAL AND ORGANISATIONAL STRUCTURE

Jemena has recently implemented a number of organisational changes that have resulted in improved efficiency and effectiveness in capital works delivery. The key improvements have included:

- the formation of high and moderate complexity teams to better focus and specialise resources on particular projects
- centralisation of the Contracts and Procurement Team to provide more depth across the full range of Jemena assets.

7.2.6 HUMAN RESOURCE MANAGEMENT

To ensure that Jemena is able to adapt to changing resourcing requirements, it has implemented a number of initiatives that have increased the responsiveness of HR management across the business. These include:

- the re-contracting of 'Preferred Supplier Agreements', which provides a panel of specialist employment agencies with agreed terms and conditions, briefed to Jemena's requirements (including technical, corporate culture and commercial) and includes the sourcing of permanent, temporary or contract positions
- allocation of specific positions within HR to manage the identification, employment and 'on-boarding' of employees
- electronic lodging of resource requests, reducing the processing time and ensuring faster approval for vacancies.

7.2.7 PROCUREMENT MANAGEMENT

Over the past five years, Jemena has continued on a path of consolidating core support groups to ensure efficiency and the ability for the various subject matter experts to work closely together to provide a more integrated and consolidated approach.

Procurement is now structured centrally but delivered regionally to provide a focused but flexible support to the various delivery teams, including the JGN focused delivery teams.

The procurement team has been engaged in the preparation of the AMP as part of the strategy of ensuring visibility to the various support groups in the business. Through this process, procurement has engaged in commercial negotiations with key suppliers (primarily with the Standard Materials class suppliers and to a lesser extent the Specialist material class suppliers) to ensure suppliers understand the demand for materials and services, thus confirming availability of sufficient materials required to deliver the distribution portion of the Capital Plan. The procurement teams also provide feedback to internal stakeholders with any market intelligence that may influence delivery of the distribution portion of the Capital Plan.

7.3 CURRENT DELIVERY ARRANGEMENTS AND PERFORMANCE

JGN adopts a balanced portfolio approach in relation to its available delivery channels, utilising a mix of internal and external resources as part of its delivery strategy. The objectives of the balanced portfolio are to:

- improve the flexibility and responsiveness of JGN’s cost structure to changes in work volumes
- maintain and grow core competencies
- maintain control over high risk delivery areas
- maintain a market position that ensures JGN remains an informed buyer and supplier value
- ensure external delivery channels have sufficient information on likely work volumes and mixes to encourage investment in capability and capacity (labour and fleet)
- enable benchmarking across delivery mechanisms, so as to promote the pursuit of efficiency gains through price and comparative competition.

Internal management resources are engaged in the planning, estimating, scheduling and delivery management of externally delivered work. Internal construction crews are used in core competency areas (high pressure crews, electrical and instrumentation technicians). JGN gas service technicians are used to deliver a significant percentage of domestic meter replacements.

External delivery channels are implemented through competitive processes in accordance with our procurement policy. Contractual terms (based on Jemena’s Procurement Policy) are reviewed and refined continuously in light of on-going experience.

Table 9 provides an overview of the alternative delivery channels used by JGN.

| Delivery Channels | Description |
|--------------------------|--|
| Internal | <p>JGN’s employees are engaged in the following operational delivery activities:</p> <ul style="list-style-type: none"> ● procurement ● planning and scheduling ● design and commissioning ● construction and maintenance ● project and contract management |
| Service contract | <p>Low complexity, largely uniform, high volume capital activities based on unit rates set in contracts, with the majority applicable for the RY15-RY20 period. These unit rates relate to main and service construction for projects less than \$0.5 million.</p> |
| Standard contract | <p>Standard contract forms are a traditional delivery channel, with the form of contract used based on best fit commercial basis.</p> <p>This approach is generally most appropriate for complex AS2885 projects that require Front-End Engineering Design (FEED) based on non-standard designs.</p> |
| Preferred Vendor | <p>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 JGN’s ability to manage volumes to best support the operation of a sustainable, competitive market to support delivery of this work</p> |

Table 9 Delivery channels summary

Further detail on JGN’s Service Model can be found in Appendix 4.1 of the AA proposal.

7.3.1 PERFORMANCE

Service contracts were entered into under a procurement strategy intended to improve contractor performance levels by consolidating the contractor base from a number of small contracting businesses to three medium to large contractors that are able to maintain the quality systems needed to provide services in accordance with JGN’s expectations. These expectations are articulated via contract Key Performance Indicators.

As part of ongoing Internal Audit process reviews JGN initiated a Contractor Management System project to improve processes and procedures within the operations and procurement functions. This initiative will support continuous improvement in the areas of contract development and contractor performance management.

7.4 AA2015 DELIVERY STRATEGY

JGN's expenditure planning and governance processes are focused on ensuring that capital expenditure is prudent and efficient.

The objective of the AA2015 Delivery Strategy (DS) is to ensure that the AA2015 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 in house expertise – develop and retain planning and control of the works delivery program in-house to enable to enable efficient resource and material management, project development, and contact and commercial management
- 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.

7.4.1 KEY FEATURES – INTERNAL AND EXTERNAL RESOURCES

The current portfolio of internal and external resources will continue to underpin the DS for the AA2015 program. Historically this approach has successfully provided an optimal mix of resources with the capability and capacity to deliver.

An important consideration is that AA2015 program volumes are generally consistent with the recent past. In the case of the Meter Replacement program where AA2015 volumes are significantly above recent trend, JGN 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, approximately 60 per cent of the work is low complexity, largely uniform, high volume activities that are delivered via internal resources, service contracts or preferred vendor arrangements. Internal management resources associated with this work have remained relatively consistent with volume risk managed by the contracting base.

Outsourcing arrangements also provide the required flexibility to align delivery resources to medium and complex work expenditure forecasts. Contract arrangements are commonly used to manage internal management resources to meet peak demand.

Table 10 provides a summary of the allocation of program categories to main delivery channels

| Program | Delivery Channel |
|-----------------------------|---|
| Market Expansion | Service Contracts |
| Meter Renewal and Upgrade | Internal & Preferred Vendor |
| Growth Capacity Development | Service Contracts, Preferred Vendor, Standard Contracts |
| Mains and Service Renewals | Preferred Vendor |
| SIB Facilities and SCADA | Standard Contracts |

Table 10 Programs and delivery channels

7.4.2 MATERIALS

JGN will continue with material supply arrangements, which have successfully supported delivery of previous programs. In summary these include:

- Nylon pipe, which is supplied by a single manufacturer who has proven track record in meeting demand requirements. In the unlikely event that the supplier cannot meet future demand, JGN has the flexibility to substitute polyethylene (PE) pipe
- PE pipe is a commodity item, which JGN purchases from a panel of suppliers
- Steel pipe is procured by JGN from two key suppliers, who are able to draw from a wide range of international manufacturers, and is supported by long lead time forecasting processes to accommodate more complex manufacturing processes compared to plastic pipe. Note that key objective of demand planning for all key material classes, including plastic and steel pipes, is timely delivery at best price
- Meters are a commodity item supplied by a number of vendors depending on meter types. Based upon ongoing commercial discussions and briefings, JGN is satisfied that suppliers will have the capacity to meet forecast volume requirements.

7.4.3 CENTRALISED PLANNING

Integration between portfolio, program and project levels will be facilitated by a robust centralised program planning function, which will optimise activity scheduling, resource planning, and material demand planning.

JGN is currently implementing Microsoft Project Server (MSPS) to support the program management function and replace an existing Microsoft Project based system. MSPS will be a significant improvement over the current system because it will provide enhanced system stability and program scenario modelling.

7.4.4 PROJECT PLANNING AND CONTROLS

JGN continues to adopt a continuous improvement approach to ensuring best practice project planning and controls underpin the management of capital delivery. Process and governance aspects have been described above. Additionally, JGN has implemented a standardised approach to its project management methodology across its three different asset groups, including JGN.

A standard project management methodology will lead to standardised reporting and enable efficient project management across the organisation. Also, this initiative will allow flexibility in the transfer of project resources across groups.

7.5 DELIVERY ASSESSMENT

7.5.1 MARKET EXPANSION

JGN's market expansion program volumes over the RY15-RY20 period are forecast to remain consistent with recent years. The delivery strategy for this program will continue to be based on the use of mains and service construction contractors with JGN staff providing contractor management services. Both internal and contract resources have historically managed any inter or intra-year variations. As of 1 July 2013, the JGN market expansion program is delivered using three primary contractors over two regions, Northern and Southern NSW. The only exception to this is in country areas, where services will continue to be delivered by local contractors with regional JGN staff providing management support. The majority of the contracting arrangements applicable to the market expansion program have been secured for the RY15-RY20 period.

7.5.2 METER RENEWAL AND UPGRADE

The JGN meter renewal and upgrade program volumes are forecast to experience significant growth over the AA2015 period, primarily in domestic gas meter and domestic hot water replacement sub programs.

The delivery strategy will continue to be based on the use of gas supply technicians to replace 10,000 meters per year and to outsource the remainder of the volume. The remaining volumes will be replaced using contractors under long term service style contracts with established service providers. To ensure effective management of contractor resources into the future, JGN has implemented a program of industry briefings with contractors and material suppliers to keep them abreast of future program requirements.

The briefings are intended to provide contractors and suppliers with adequate time to review their resourcing levels and make necessary adjustments to meet forecast demand.

In FY 2015, JGN will also establish a Meter Testing Facility (MTF) and commence a series of meter testing sub-programs. Operation of the MTF will be subcontracted.

7.5.3 GROWTH AND CAPACITY DEVELOPMENT

The JGN growth capacity development program volume and expenditure forecast shows some variability across the period, including a peak associated with the Northern Primary Main Strategy in RY18. There is a significant increase in expenditure forecast for general projects including main extensions and Cocon installations compared to the recent past; however, the underlying pattern is similar to RY11 and RY12.

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 JGN, which appropriately positions construction risk with contracting businesses. JGN retains technical, project planning, and contractor management capabilities to ensure that time, cost and quality objectives are met.

Project planning and management will be performed by the Medium Complexity Projects Group in the JGN Capital Projects Team to ensure delivery objectives are met. In RY11 and RY12 this approach safely and successfully delivered a significantly larger JGN growth and capacity development program than is forecast for any individual year during the AA2015 period.

7.5.4 MAINS AND SERVICES RENEWAL

The forecast expenditure for the JGN mains and services renewal program over the AA2015 period will average approximately 177% above RY12-13 levels. This increase is primarily due to underlying cost increases and the inclusion of the Mt Druitt steel main rehabilitation project (\$16M) and the Penrith Primary Thin Wall Project (\$17M). However, the underlying standard rehabilitation levels remain generally unchanged.

The program delivery strategy for the JGN Mains and Services Renewal program will continue to be based on outsourced construction under preferred vendor arrangements, with project and construction management provided by the Low Complexity Projects Group in the JGN Capital Projects Team to delivery objectives are met.

7.5.5 STAY IN BUSINESS FACILITIES AND SCADA PROGRAM

The forecast expenditure for the JGN Stay in Business Facilities and SCADA program over the RY15-RY20 period will be significantly higher than RY11-RY13 levels. The increase is mainly due to the inclusion of in-line inspections (ILI) and integrity digs in the program as well as the APA driven Riverina POTS upgrades (\$15M) and the Northern Trunk Pressure Increase Mitigation Project (\$16M).

The program delivery strategy for the JGN Stay in Business Facilities & SCADA program will continue to be based on outsourced construction under standard contracts, with project and construction management performed by the High Complexity Projects Group in the JGN Capital Projects Team.

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 (see Figure 26). An overview of the asset strategies for each sub-asset class is provided in chapters 9 -14.

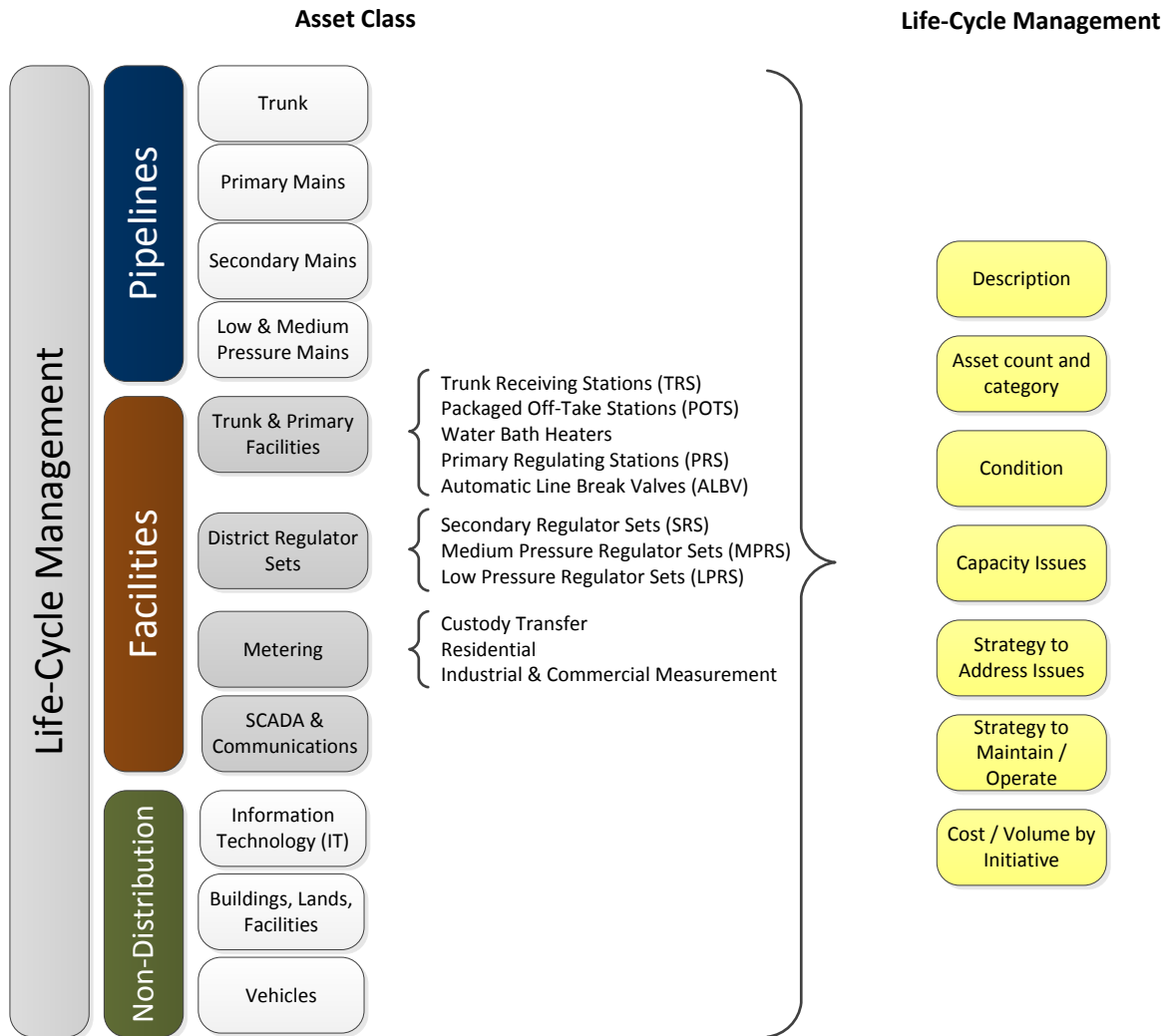
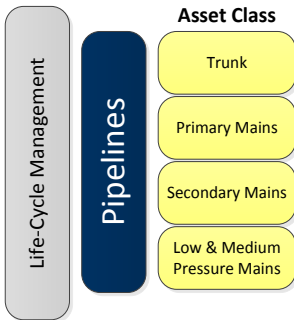


Figure 26 Grouped asset classes

9 ASSET STRATEGY – PIPELINES AND MAINS



9.1 SUMMARY

JGN's asset strategy for the pipelines and mains asset category over the AMP period is to ensure the safety and integrity of the asset, meet regulatory requirements, and cater for growth of the network.

9.2 BACKGROUND

The JGN gas distribution network comprises approximately 25,000km of pipeline of various sizes and operating pressures, ranging from 2kPa to 6,895kPa. These are divided into categories according to their MAOP:

- Trunk pipelines (MAOP of 6,895kPa), including:
 - Licence 1: Central Trunk
 - Licence 2: Southern Trunk
 - Licence 3: Horsley Park to Plumpton
 - Licence 7: Plumpton to Killingworth
 - Licence 8: Killingworth to Kooragang Island
- Primary mains , including:
 - Sydney Primary Main & Sydney Primary Loop (MAOP of 3,500kPa)
 - Wollongong Primary Main (MAOP of 3,500kPa)
 - Penrith Primary Main(MAOP of 3,500kPa)
- Secondary mains (MAOP of 1,050kPa)
- Medium pressure mains (MAOP of 30kPa, 210kPa, 300kPa or 400kPa)
- Low pressure mains (MAOP of either 2kPa or 7kPa)

These pipelines include the pipeline or mains and associated systems and services, such as cathodic protection (CP) and valves. An overview of JGN's pipeline assets is provided in Table 11.

| Pipeline | Pipelines (km) | Cathodic Protection Systems | Cathodic Protection Test Points | Other |
|--------------------------------------|----------------|-----------------------------|---------------------------------|---|
| Trunk | 267 | 19 | 438 | 8 (Scraper – launch and receiver facilities) 14 ALBVs |
| Primary mains | 147 | 21 | 457 | 2 (Scraper – launch and receiver facilities) 18 ALBVs |
| Secondary mains | 1,493 | 112 | 4,209 | 1,172 (line valves) 1,527 (services) |
| Medium and low pressure mains | 23,470 | | | 175 (exposed mains) 884 (sector valves) 2,002 (high risk valves) 900 (high risk areas) |
| Total | 25,377 | 152 | 5,104 | |

Table 11 Pipeline Assets

The age profile of the pipelines is summarised in Figure 27 below.

The trunk pipelines were predominantly constructed in the mid-1970s to the early 1980s in order to introduce natural gas to the NSW market and are between 35-40 years old. Similarly, the age profile of the primary mains reflects the development of the gas distribution network as part of the introduction of natural gas to NSW.

The secondary mains age profile reflects both the initial development of the gas distribution system related to the introduction of natural gas and the on-going expansion of the network.

The age profile for medium and low pressure mains reflects a large scale rehabilitation program that was carried out in the 1990s to replace the ageing and leaking network. During the renewal program most cast iron and steel pipe in the low and medium pressure networks was inserted with nylon pipe. The profile also shows the increase in the life of these mains as the gas distribution network expanded. A small amount of old cast iron and steel pipe (less than 2,000 km) still remains in service in the medium and low pressure networks and is shown as more than 50 years old in the age profile. These legacy sections of the network continue to be managed under rehabilitation programs.

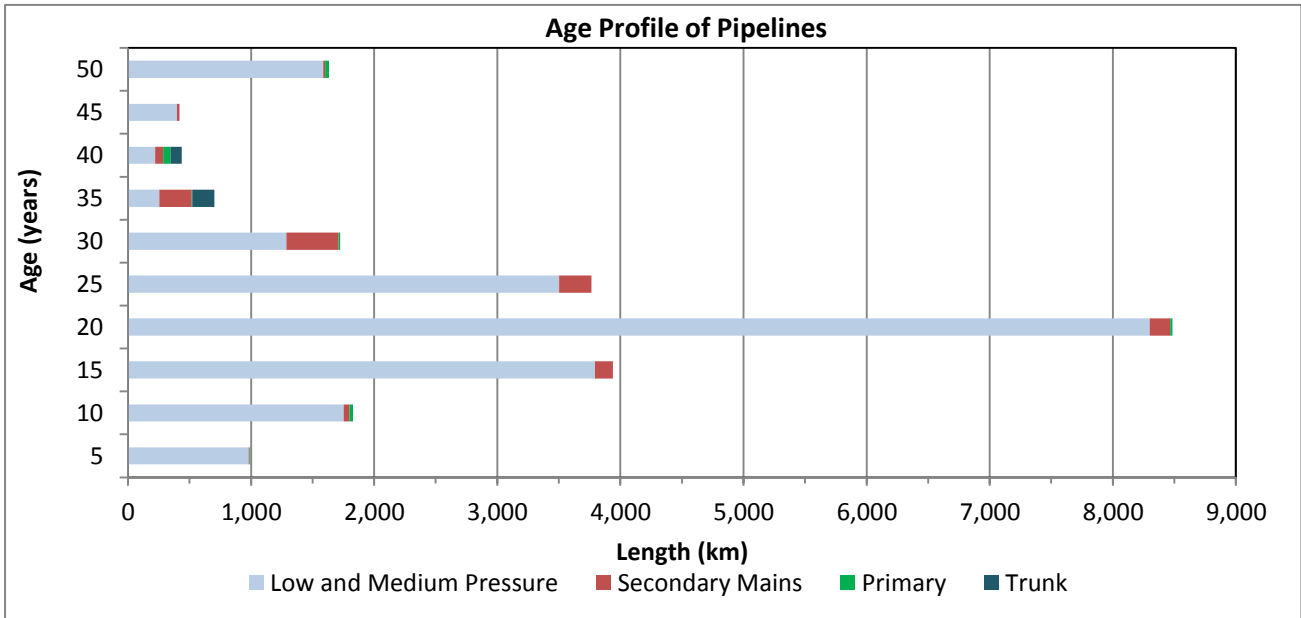
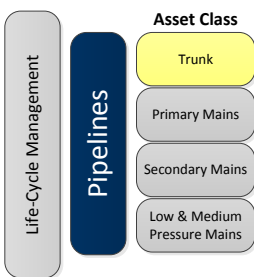


Figure 27 Age profile of pipelines

9.3 TRUNK PIPELINES



The trunk pipelines consist of 267km of high-strength steel pipe with a MAOP of 6,895kPa. They are internally and externally protected against corrosion by an anti-corrosion pipe coating and internal lining. Additional protection is also achieved with a CP system.

The trunk pipeline system comprises the trunk pipelines, CP systems, pig launcher and receiving stations and easements.

There are three trunk pipelines in JGN's network:

- the Central Trunk, which transports gas from Wilton to Horsley Park to serve the Sydney region and onwards to the Northern Trunk
- the Northern Trunk, which is an extension of the Central Trunk and transports gas from Horsley Park to serve the Central Coast and Newcastle regions
- the Southern Trunk, which transports gas from Wilton to serve the Wollongong region.

These are operated under licences issued in accordance with the *Pipelines Act 1967 (NSW)*. The key features of the trunk pipelines are set out in Table 12.

| Licence | Original Issue | Trunk | Location | Distance (km) | Diameter | MAOP | MOP |
|------------------|----------------|----------------|---|---------------|----------|-----------|---------------------------------------|
| Licence 1 | Nov 74 | Central Trunk | Wilton TRS to Horsley Park TRS | 51km | DN850 | 6,895 kPa | 4,500 kPa |
| Licence 2 | May 75 | Southern Trunk | Wilton TRS to Govett Crescent, Wollongong | 32km | DN500 | 6,895 kPa | 4,500 kPa ("2a"); 3,500 kPa ("2b") |
| Licence 3 | June 75 | Northern Trunk | Horsley Park TRS to Plumpton TRS | 9.4km | DN500 | 6,895 kPa | 4,500 kPa |
| Licence 7 | July 78 | Northern Trunk | Plumpton TRS to Killingworth | 143km | DN500 | 6,895 kPa | 4,500 kPa |
| Licence 8 | Dec 79 | Northern Trunk | Killingworth to Hexham TRS | 19.6km | DN500 | 6,895 kPa | 4,500 kPa |
| | | | Hexham to Kooragang Island | 11.5km | DN350 | | |
| | | | Kooragang Island to Walsh Point. | 1.6km | DN250 | | |

Table 12 Trunk pipelines key features



Figure 28 Exposing the Licence 1 pipeline at Simpsons Creek during mine subsidence works

9.3.1 ASSET CONDITION

JGN assesses and confirms the condition of trunk pipelines in accordance with:

- the JGN SAOP
- Australian standard AS2885
- JGN Pipeline Integrity Management Plans (PIMP).

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

- Inline inspection (ILI) (also referred to as “pigging”), which is used to assess metal loss and mechanical damage. It is generally carried out at an industry-accepted 10 yearly interval
- Cathodic Protection (CP) Monitoring, which provides additional protection against corrosion at locations of poor pipe coating

- Direct Current Voltage Gradient (DCVG) measurement, which provides an indication of coating defects that can lead to corrosion under the coating
- Integrity Digs, which provide measured pipe data at selected locations.

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 RY10 and identified:

- No unauthorised landowner activities near the trunk pipelines. However, two commercial developments were undertaken in close proximity to a pipeline, which were reviewed through the SMS
- Minor metal loss from corrosion was reported via pigging data. The metal loss was assessed as not affecting the pipeline integrity
- River bank erosion was surveyed in multiple locations due to flooding, with Wyong River requiring restoration works, which were completed as a joint project with the local council
- Mine subsidence is managed through Mine Subsidence Management Plans. The SMS identified evidence of subsidence effects on the Central Trunk, which requires rehabilitation and restoration of coal tar enamel once the subsidence effects have stabilised.

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, JGN 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 in RY10 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 pipelines. The MAOPs for the pipelines were confirmed at the levels stated in Table 12.

9.3.2 ASSET PERFORMANCE

JGN’s trunk pipelines are critical assets 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 Wilton to Newcastle section of the trunk pipeline is assessed to be adequate to meet demand for the period of the AMP.

As described in section 2.5.1, AGL’s Newcastle Gas Storage Facility (NGSF) project is forecast to begin operation at Hexham in RY15. When it commences injecting gas, (expected to be during winter peak or times of high demand), the NGSF will increase the pressure at Hexham effectively increasing the capacity of the Northern Trunk at those times.

The Wilton to Wollongong trunk pipeline has sufficient capacity to cater for organic growth and committed demand market loads for the foreseeable future.

9.3.3 CAPITAL REQUIREMENTS

For each capital project such as integrity digs, or ILI, (or any other project related to the potential capital spend for trunk pipelines) an FA is completed, generally several years prior to the commencement of the project to confirm the options, solution and thus scope. Allowance for the FAs have been made in the Asset Management PoW.

The key capital works for the trunk pipelines are the ILIs. The interval between ILIs is typically 10 years. 10 year intervals are an accepted industrial 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 provide information to JGN’s pipeline integrity management process, which requires a periodic review of pipeline data at intervals not exceeding five years.

The program of ILIs, validation digs and integrity digs is summarised in Table 13.

| | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|-----------------------|------|-------------------|------------------|------------------------|---|---------------------------------------|
| Northern Trunk | | 5 Integrity digs | 5 Integrity digs | ILI 1 Integrity dig | ILI 7 Validation digs 1 Integrity dig | 2 Integrity digs 4 Validation digs |
| Central Trunk | ILI | 4 Validation digs | | 3 Integrity digs | 2 Integrity digs | ILI 1 Integrity dig |
| Southern Trunk | | 2 Integrity dig | 2 integrity digs | ILI 1 Integrity dig | 4 Validation digs 1 Integrity dig | 2 Integrity digs |

Table 13 Program RY15-RY20

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

There are currently no plans to construct any new trunk pipelines or augment the capacity of the existing pipelines. JGN’s Capital Plan for trunk pipelines over the AMP period is set out in Table 14.

| \$'000s | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|------------------------------|-------|-------|-------|-------|-------|-------|
| Trunk Pipelines Capex | 1,357 | 5,407 | 2,081 | 3,098 | 3,947 | 3,256 |

Table 14 Summary of Trunk mains Capital Plan

9.3.4 MAINTENANCE REQUIREMENTS

The maintenance of the trunk pipelines includes planned and corrective activities. Most activities are managed through JGN's in-house enterprise IT system.

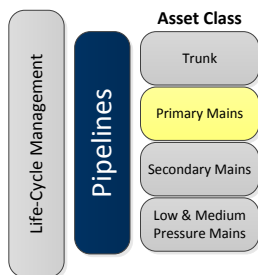
Examples of planned maintenance activities on the trunk pipelines include pipeline patrol, easement maintenance and CP surveys.

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

The following special maintenance project is included in the Maintenance Plan:

- DCVG coating survey, which is used to locate and size pipe coating defects. The technique involves measuring the voltage gradients in the soil above a cathodically protected pipeline. Several surveys are planned for RY15 and RY18.

9.4 PRIMARY MAINS



The primary mains consist of 147km of high-strength steel pipe with a MAOP of 3,500kPa. There are elements of the primary network in the Sydney and Wollongong distribution networks. The pipes are internally and externally protected against corrosion by an anti-corrosion pipe coating and internal lining. Additional protection is also achieved with a CP system.

The primary main system consists of various pipe sizes and configurations as follows in Table 15.

| Primary Main | Physical Description | Diameter | Length |
|---------------------------------|------------------------------|-------------------|--------|
| Sydney Primary Main | Horsley Park to Mortlake and | DN550 | 30km |
| | Mortlake to Banksmeadow | DN550 | 26km |
| | Mortlake to Willoughby | DN500/DN200/DN150 | 17km |
| Sydney Primary Loop | West Hoxton to Casula and | DN550 | 11km |
| | Casula to Tempe | DN500 | 28km |
| Penrith Primary Main | Eastern Creek to Penrith and | DN200 | 19km |
| | Penrith to Emu Plains | DN200 | 3km |
| Wollongong Primary Mains | Figtree to Wollongong | DN200/DN150 | 7.3km |

Table 15 Primary mains

9.4.1 ASSET CONDITION

The primary mains are predominantly operating in an urban environment including areas of high density population, schools and hospitals and greater concentration of services and utilities than the trunk pipelines. The majority of the primary mains are laid in road reserve with only minimal areas covered by easements. The primary mains need to meet the “no rupture” and “maximum gas release rate” requirements of the AS2885 to prevent risk to community safety, property and environmental damages and loss of supply.

JGN’s 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 continued operating in accordance with their design and operating requirements. There have been no significant failures of primary mains to date.

To mitigate the risk of failure, the condition of primary mains is managed through a rigorous condition monitoring and inspection program to identify potential issues before they can lead to a degradation of performance. For the pipeline operation, JGN complies with AS2885 to ensure “continued pipeline integrity during the life of the pipeline”. Primary mains 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).

There are no reported incidents, either operational or external, that have affected the integrity of the primary mains. The MAOPs for the pipelines were confirmed at the levels state in Table 12.

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) with DCVG as required
- Operation controls: pressure, temperature and gas quality monitoring
- Maintenance activities: planned work to the approved procedures and work methods
- External interference controls: SMS undertaken as required to assess, monitor and control proposed work.

The data from testing is compiled and reviewed resulting in the following:

- There are generally no unauthorised activities near the primary pipelines. However, the Penrith Primary main contains a thin wall pipe section that is vulnerable to external interference of damage and is therefore included in a replacement project in the Capital Plan
- Minor surface pitting and coating anomalies were identified by integrity digs and coating surveys. The corrosion features were assessed to not affect the MAOP. The identified areas are being repaired and re-coated

- Known areas of CP interference, such as railway yards are monitored and are within the required protection range
- There were no reported natural incidents, or ground subsidence along the primary mains route.

9.4.2 ASSET PERFORMANCE

The level of expansion activity on 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 and provide security of supply for specific areas of the network.

There are three sub-networks in the JGN NSW Primary network. These include the Sydney Primary Main (including the Sydney Primary Loop), the Penrith Primary Main and the Wollongong Primary Main. The overall utilisation of these primary networks is ~ 38 per cent, ~46 per cent and ~23 per cent, respectively.

A capacity limitation is forecast to occur in the northern area of Sydney’s secondary mains, which will require enhancement of the primary network in stages over the next 20 years. This work is referred to as the ‘Northern Primary Main Project’ and will support the capacity of the secondary network.

9.4.3 CAPITAL REQUIREMENTS

For each major project (integrity digs, ILI, other) a FA is conducted before the capital project commences to confirm the site specific scope/solution. These are included in the Asset Management PoW and are required to meet the standards and technical compliance of the Primary Network.

The Penrith to Emu Plains primary main extension is awaiting completion of a railway crossing for full implementation of the enhancement to alleviate capacity limitations in the Blue Mountains.

Planned capacity requirements for primary mains include an extension of the Northern Primary main 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 PRS, pigging facilities and secondary mains. Implementation of the suite of projects extends to 2035 on current projections. The detail is included in the Capital Plan.

The Capital Plan also indicates the schedule for the installation of several pig launching and receiving facilities. Where possible, to gain project synergy, these facilities are included with primary mains projects for capacity upgrades, such as the Penrith and Northern Primary extensions.



Figure 29 Site preparation for protective works prior to a road crossing

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
- 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 in Table 16.

| | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|---|------------------|-------------------------|---------------------------------------|------------------|------------------|---------------------------------------|
| Sydney Primary Main, including Sydney Primary Loop | 4 Integrity digs | 6 Integrity digs ILI | 6 Integrity digs 3 validation digs | 7 Integrity digs | 6 Integrity digs | 5 Integrity digs ILI |
| Penrith Primary Mains | | 2 Integrity digs | | | ILI | 3 Integrity digs 4 Validation digs |
| Wollongong Primary Mains | | 2 Integrity digs | 1 integrity dig | | 1 Integrity digs | |

Table 16 Program RY15-RY20

The Capital Plan provides the entire program detail for this asset class. The more significant projects that are expected to be undertaken over the period are:

- The Northern Primary project (\$27M in the AMP period) remains a key item to provide capacity to the North East suburbs of Sydney. This is a staged project involving primary mains, land for facilities and secondary mains extensions. This project is part of a longer term strategy.
- The Sydney Primary Main ILI, facilities and integrity management program (\$20M over the AMP period) to ensure the integrity of the high pressure primary main.
- The Penrith Primary Mains Thin Wall (\$17M) project, which is being undertaken to remediate a section of high pressure pipeline that does not meet current integrity and safety standards.

JGN's forecast primary mains capex over the AMP period is set out in Table 17.

| \$'000s | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|--|--------------|--------------|---------------|---------------|--------------|--------------|
| Total Primary Mains (CDP) Capex | 1,972 | 1,673 | 4,980 | 11,514 | 5,250 | 2,275 |
| Total Primary Mains (SIB) Capex | 2,336 | 5,074 | 5,919 | 7,125 | 4,094 | 3,895 |
| Total Primary Mains Capex | 4,308 | 6,747 | 10,899 | 18,639 | 9,344 | 6,170 |

Table 17 Summary Primary mains Capital Plan

9.4.4 MAINTENANCE REQUIREMENTS

The maintenance of the primary mains includes planned and corrective activities. Most activities are managed through JGN's in-house enterprise IT system.

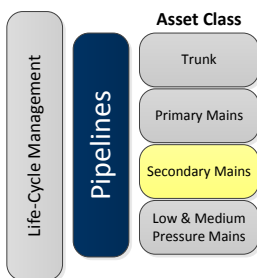
Examples of planned maintenance activities on the primary mains include pipeline patrol and CP surveys.

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

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

- Pipeline review including coating surveys and SMS workshops
- DCVG coating surveys, which are used to locate and size pipe coating defects. The technique is fundamentally based on measuring the voltage gradients in the soil above a cathodically protected pipeline. Several surveys are planned for RY15 and RY18 with proposed number and locations over the five year period for the respective pipelines.

9.5 SECONDARY MAINS



The secondary mains asset category consist of 1,493km of steel pipe, which is externally coated with High-Density Polyethylene (HDPE) to protect it from corrosion and internally lined to reduce frictional losses and provide some internal corrosion protection. A limited number of older mains have a coal tar coating. Additional corrosion protection is also achieved with a CP system.

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

9.5.1 ASSET CONDITION

JGN assesses and confirms the condition of secondary mains in accordance with:

- JGN SAOP
- Australian AS4645 standards
- JGN Distribution Integrity Management Plan (DIMP).

System integrity of the secondary mains is assessed through integrity and performance assessments, which use indirect monitoring and performance methods, including leakage survey mains escapes, UAG, publicly reported leaks, field reports and feedback, pipeline patrol and review of data from CP surveys and circuit checks.

Integrity monitoring has identified the following issues:

- Two secondary mains have been affected by soil erosion and will require not only reinstatement of ground cover, but management of the root cause. Work on the worst of these mains, Old Northern Road Maroota, is scheduled to commence in RY14. An FA for the second site corner of Manns Road and Nells Road Gosford is complete. The RY15 budget has an allocation to fund the works.
- There are approximately 300 exposed mains across the JGN gas distribution network to manage, which require inspection and potential rectification works. Exposed mains inspections are included in the opex budget as non-routine maintenance step changes.

9.5.2 ASSET PERFORMANCE

Various projects have been identified in the Capital Plan 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 along the growth corridors of the North West Sector and South West Sector within the Sydney Metropolitan area and the West Dapto area in Wollongong, Newcastle and some areas of the Central Coast.



Figure 30 Steel main being laid

9.5.3 CAPITAL REQUIREMENTS

Current planning activities for secondary network creation include a number of secondary mains extensions to improve capacity within the network in Rouse Hill, Kotara, Kellyville and Castle Hill. There are also some long term projects planned for the Northwest Growth Sector, Sydney City and the Southwest Growth Sector.

The Capital Plan provides the entire program detail for this asset class. The significant projects that are expected to be undertaken over the period are:

- the Rouse Hill Capacity Development project, which will involve laying approximately 7km of secondary steel mains as part of a staged expansion into the North-West growth sector (\$9M)

- the Darlington to Alexandria project, which will involve 2.7km of secondary mains with two railway crossings required for proposed high-density and I&C loads in the city (\$3M)

JGN's forecast Capital Plan for secondary mains over the AMP period is set out in Table 18.

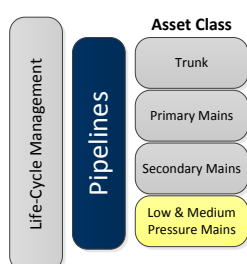
| \$'000s | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|--|--------------|---------------|---------------|---------------|---------------|--------------|
| Total secondary mains (ME projects) capex | 7,037 | 145 | - | - | - | - |
| Total secondary mains (CDP) capex | 2,326 | 13,681 | 13,301 | 13,530 | 14,584 | 9,297 |
| Total Secondary Mains Capex | 9,363 | 13,826 | 13,301 | 13,530 | 14,584 | 9,297 |

Table 18 Summary Secondary mains Capital Plan

9.5.4 OPERATIONAL REQUIREMENTS

Secondary mains are operated and maintained in accordance with the JGN SAOP and the requirements of AS4645. This includes providing and maintaining CP systems to protect the network as well as, CP surveys, leakage surveys, exposed mains inspections, incident response and conducting FSAs.

9.6 MEDIUM AND LOW PRESSURE MAINS



This asset category consists of medium and low pressure mains, services, valves, boundary regulators, and a small number of CP circuits. The medium and low pressure mains consist of 23,470km of largely plastic pipe (with approximately 10 per cent being cast iron and steel) that supply gas to domestic, industrial and commercial users.

9.6.1 ASSET CONDITION

The low and medium pressure network is vast and complex and continuously expanding into new growth areas. JGN assess 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
- ICAM (Network incidents assessments)
- Field failure report
- 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.

The outcomes of leakage surveys, combined with leakage tests, help to identify poorly performing networks that may need rehabilitation, such as Stockton, Warringah and Bowral. For example, results from recent leakage tests revealed the Stockton 7kPa network leakage rate was 56 per cent of UAG, Warringah 210kPa network leakage rate was 36 per cent and Kensington 7kPa network in the order of 27 Per cent.

A number of leakage surveys are scheduled for RY15 in the following areas of the network:

- Wollongong/ Coniston 7kPa network
- Drummoyne 210kPa network
- Goulburn Sector 2 7kPa network
- Newcastle MP1 7kPa network
- Bidwell 210kPa network.

In RY16 and RY17, JGN is planning a similar level of leakage survey of approximately four networks per annum.

JGN is planning to investigate trends in leakage surveys that show an increase in minor leaks, which may in time deteriorate to become major leaks. These observations coincide with more reliable electronic leak surveys. The RY14 surveys will provide the first opportunity to compare two sets of data from the one network.



Figure 31 Typical cast iron mains condition prior to rehabilitation

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. JGN continues to monitor network reliability closely and remains focused on improving asset integrity and management practices to reduce installation related field failures on plastic distribution systems.

To address the results from leakage surveys and network incidents, an asset renewal program strategy has been developed. Renewal program strategies are driven by factors including age, condition, performance and capacity. This was reviewed and has been updated for the AMP period, with an FA conducted for each capex project.

In RY15, data generated from the laboratories field failure reports will be consolidated then reviewed. The purpose of this review is to identify the root causes of failures and provide improvements in network construction.

Some other aspects that will be investigated over RY15-RY20 are set out below:

- Identify critical components of the JGN gas distribution network and how to support, for example where imperial sized pipe may be damaged with no parts readily available to replace
- Ensuring adequate high risk valving is installed due to commercial and residential developments changing the risk profile across the JGN gas distribution network. Valves will be installed as part of the Capital Plan and then tested as part of the maintenance plan to test valves can be operated to isolate the network
- Review the Pennant Hills mains, which has known integrity issues that are causing leaks. The main is difficult to reach at depths up to 3-4m and situated on a major arterial road.

9.6.2 ASSET PERFORMANCE

Network capacity validation and planning has identified projects to increase the capacity of the medium and low 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
- Demographic and other changes.

The changes required in the gas distribution network configuration are 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. JGN utilises a 1 in 10 winter as the basis of modelling to minimise the potential temperature effects.

There are a large number of projects in this category. The key projects have been grouped by regions as follows:

- Central Coast and Newcastle
- Illawarra
- Country NSW and Southern Highlands
- Sydney Metropolitan area, N/NW, West, South.

The projects required to support the medium and low pressure networks are outlined in the Capital Plan.

There are still some remaining pockets of the network, including the majority of those rehabilitation projects identified in the section above, that have not been rehabilitated. As a result these areas operate at lower pressures, meaning customers in these areas may:

- be restricted in their choice of appliances – for example, the pressure may be too low to operate continuous flow hot water heaters and central heating systems, which consume gas at a high rate over short periods
- need to install more expensive pipework inside their properties in order to operate these appliances.

The projects above will install plastic pipes that can operate at higher pressures, allowing these customers to enjoy the same quality of service as other customers across the JGN network. These are referred to as mains and services renewal projects in the Capital Plan.



Figure 32 Insertion of nylon pipe as part of rehabilitation project

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
- Mt Druitt Steel Mains Renewal project, which spans multiple years and is required to ensure the integrity of the asset. This project will occur in a staged manner because it requires significant mains (110 mm PE and 160 mm PE) to be laid (\$16M over the RY15-RY20 period)
- Wollongong Coniston Mains Renewal project also spans multiple years and is required to ensure the integrity of the asset. The project involves mains upgrade through mains insertion (\$7M over the RY15-RY20 period).

JGN's forecast Capital Plan for low and medium pressure mains over the AMP period is set out in Table 19.

| \$'000s | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|---|---------------|---------------|---------------|---------------|---------------|---------------|
| Total low and medium mains & services (ME) capex | 63,874 | 66,644 | 69,924 | 69,154 | 69,138 | 70,266 |
| Total low and medium mains (CDP) capex | 3,821 | 5,824 | 3,390 | 2,117 | 2,816 | 7,212 |
| Total low and medium mains (SIB) capex | 9,727 | 15,453 | 19,845 | 15,916 | 11,090 | 12,568 |
| Total Low and Medium Mains Capex | 77,421 | 87,921 | 93,160 | 87,186 | 83,045 | 90,046 |

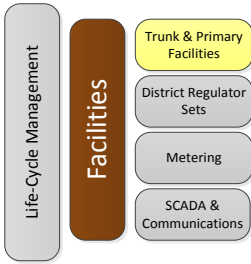
Table 19 Summary of medium and low pressure mains Capital Plan

9.6.4 OPERATIONAL REQUIREMENTS

Low and medium pressure mains and services are operated and maintained in accordance with the JGN SAOP and DIMP. The plans include integrity reviews and maintenance activities representing an integrated system of requirements reflected in AS4645 and other technical regulatory requirements.

The Maintenance Plan for these assets includes planned, corrective and emergency response activities.

10 ASSET STRATEGY – FACILITIES



10.1 SUMMARY

JGN's 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 projects:

- Trunk Facilities:
 - electrical and instrumentation upgrade to replace obsolete equipment and earthing refurbishment
 - corrosion protection through recoating and CP refurbishment
 - installation of station preheating in conjunction with new shippers' delivery requiring pressure enhancements
 - mitigation against bushfire threats.
- Primary Facilities:
 - Replacement of quieter control valves to mitigate detrimental high level of vibration
 - Concrete wall and lids refurbishment.



Figure 33 Underground PRS installation

10.2 BACKGROUND

JGN's network consists of a number of facilities that enable the network to operate at a pressure of between 2kPa and 6,895kPa, as highlighted in Table 20.

| Facility | Pipeline | Quantity | Description |
|---|----------|----------|---|
| Trunk Receiving Station (TRS) | | | Gas pressure reduction and filtration facilities that are supplied at trunk pressure and deliver gas at the appropriate pressure to the downstream network |
| Packaged Off-Take Stations (POTS) | Trunk | 55 | Smaller capacity installations combining or 'packaging' the functions of measurement, filtration and pressure reduction. They are supplied at trunk pressure and deliver gas at the appropriate pressure to the downstream network |
| Water Bath Heaters (WBH) | Trunk | 15 | 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 |
| Main Line Valve (MLV) with ALB function (ALBV) | Trunk | 11 | Safety devices used to automatically isolate certain segment of a pipeline when a rapid change in system pressure (representing a rupture) is detected. |
| Mainline Valve (MLV) | Trunk | 5 | Valve |
| Bulk Metering Stations | Trunk | 2 | Delivers gas to single user (generally large industrial customers). Two bulk metering stations in Trunk Facilities group are Incitec at Kooragang Island and Munmorah Off Take Metering Station (MOMS). |
| Primary Regulating Stations (PRS) | Primary | 17 | Gas pressure reduction and filtration facilities located at each off-take on the primary main. These facilities reduce the pressure from 3,500kPa to 1,050kPa to supply the secondary network or lower metering pressures to specific customer. |
| Primary Automatic Line Break Valves | Primary | 17 | Safety devices used to isolate sections of the primary main upon detection of rapid depressurisation across the valve as occurred in the event of a rupture. |
| Primary Main Line Valves | Primary | 6 | Valve |

Table 20 Trunk and primary facilities

The age profile of these facilities is depicted in Figure 34. Since the Sydney Trunk Pipelines were laid in the mid to late 1970s the majority of the trunk facilities have the same age profile. As the network grew, Packaged Off-Take Stations (**POTS**) were installed where needed. Water Bath Heaters (**WBH**) are a recent addition to the network as supply pressures are increased.

The majority of Primary Regulating Stations (**PRS**) were commissioned in 1976 when natural gas was introduced to the Sydney market. Recently added to the list of assets were Moorebank PRS, Riverwood PRS and Lane Cove PRS.

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. This is not reflected in Figure 34.

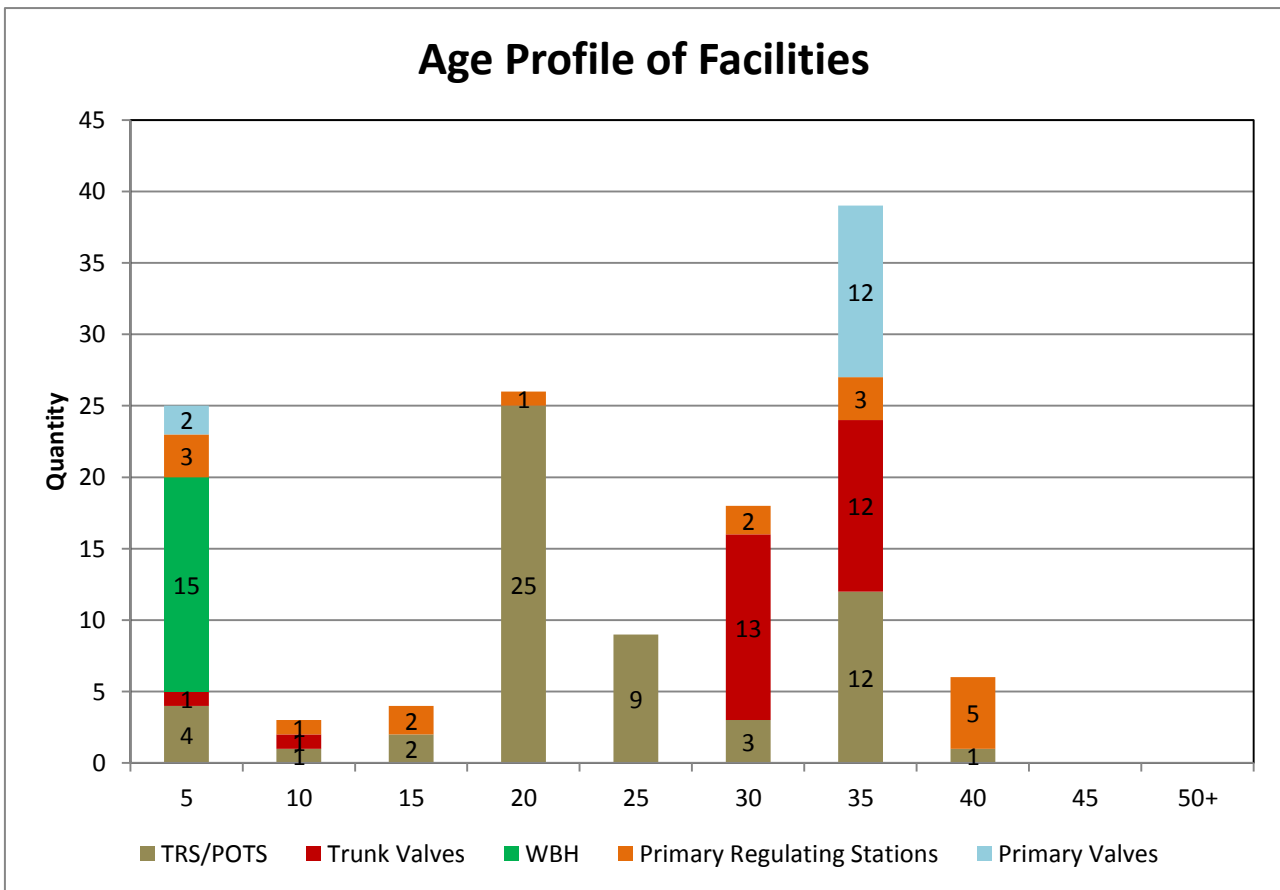


Figure 34 Age Profile of Facilities

10.3 ASSET CONDITION

A documented Facilities Integrity Management Plan (FIMP) is currently under development and is to be approved in RY15. 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 AS2885.0 and AS1200 suite of Standards, which will provide the assurance of the integrity of the facilities
- 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
 - 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.

The output of the activities is analysed with the following results:

- Trunk Receiving Stations (TRS)/ POTS/ Automatic Line Break Valves (ALBV)/WBH/MOMs. The overall structural integrity was found to be satisfactory for containment and reliability. The Electrical & Instrumentation (E&I) components, which have a shorter design life than mechanical components, are in need of refurbishment.
- The trunk ALBV are deteriorating, showing signs of wear with components requiring replacement. A refurbishment program will run between RY15 and RY20 to replace obsolete control panels and refurbish actuators.
- Extending the design life of the PRS as they are performing well and overall integrity is reasonable considering their age.
- The Primary ALBVs are currently being refurbished by replacement of seals on the actuator vanes and replace obsolete control panels.
- Corrosion of facilities equipment is a continual issue leading to leaks in the system. A recoating program of the Trunk Receiving Stations was approved as an Opex step change. Additionally a replacement program will be put in place for RY15 to install additional Double Block and Bleed (DBB) valves to bring them in to line with new standards for working in confined spaces and to maintain integrity of the network and safety of service.

10.4 ASSET PERFORMANCE

The consequence of Facilities failure can be catastrophic including fatalities, loss of assets and long term interruption to supply. The most significant performance issue is abnormally high level of heavy hydrocarbons (wax) in the gas received over the last 4-5 years, which was discovered through mitigation programs and has resulted in total blockage of the regulator silencer trims that constituted to the interruption of supply. Two new replacement silencers were installed as a trial for an effective permanent solution.

10.5 CAPITAL REQUIREMENTS

Capital expenditure on trunk and primary facilities is primarily driven by demand growth. A number of Trunk Receiving Stations (TRS) require upgrade over the next six years, including::

- Windsor TRS
- Yass
- Appin
- Flemington PRS, Mascot PRS, Auburn PRS, Tempe PRS, Horsley Park PRSA

A new above ground station at North Ryde also needs to be developed.

Asset integrity in the creation phase of the asset lifecycle is achieved by ensuring the design, construction and commissioning of HP facilities complies with the established Codes and Standards.

The Capital Plan provides the entire program detail for this asset class. The most significant projects that are expected to be carried out over the AMP period are:

- The APA driven Riverina POTs Upgrades (\$16M for seven stations)¹⁵ and the Northern Trunk Pressure Increase Mitigation Project (\$15M for five stations). Both projects are externally driven and will require upgrades to existing stations, including gas pre-heating solutions due to increased operating pressures of the pipelines supplying the JGN distribution system, with Riverina also requiring additional land
- Significant renewal of High Pressure E&I is required as a result of existing assets reaching the end of their lives and compliance to new code (\$5M program over the AMP period)
- Program of TRS facility upgrade and renewal to meet Work Health & Safety and code requirements. This includes installation of double block and bleed and valve control. (\$9M over the AMP period).

JGN’s forecast Capital Plan for trunk and primary facilities over the AMP period is set out in Table 21.

| \$'000s | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|---|---------------|---------------|--------------|---------------|---------------|---------------|
| Total Trunk Facilities Capex | 7,983 | 6,353 | 5,845 | 11,317 | 16,232 | 8,542 |
| Total Primary Facilities Capex | 8,954 | 4,123 | 3,934 | 1,226 | 1,181 | 2,668 |
| Total Trunk and Primary Facilities | 16,937 | 10,476 | 9,779 | 12,543 | 17,413 | 11,210 |

Table 21 Summary trunk and primary facilities Capital Plan

10.6 OPERATIONAL REQUIREMENTS

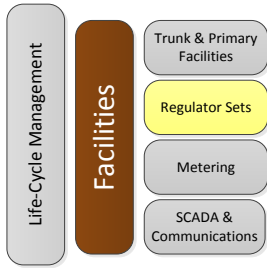
Reviews of the key trunk and primary facilities are performed on a five year rolling program. The reviews give an overall view of the condition of the facility and confirm the design and risk profile. Reviews are mandated under AS2885 (Pipelines – Gas and Liquid Petroleum – Operation and Maintenance) 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 designers, controllers, field personnel and Operation Engineering
- Confirmation of routine and non-routing 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.

¹⁵ Note: If the Riverina POTs upgrade timing is delayed, one of the stations (Coolamon POTs) will require capacity upgrade within the period.

11 ASSET STRATEGY - REGULATOR SETS



11.1 SUMMARY

JGN’s asset strategy for regulator sets over the AMP period is to:

- replace ageing district regulator sets with Cocon Regulators
- undertake trial overhauls of corroded Secondary Regulator sets.

11.2 BACKGROUND

District Regulator Set (**DRS**) is the generic term used to describe regulators that supply medium and low-pressure networks. There are three types of DRS in operation to provide regulation at different stages on the network.

1. Secondary Regulator Sets (SRS) are installed at each off-take from the secondary network to supply medium pressure networks. SRS reduce the inlet pressure from 1,050kPa to 400, 300, 210, 30 or 7kPa.
2. Medium Pressure Regulator Sets (MPRS) are installed at each off-take from the medium pressure network to supply low pressure networks. MPRS reduce the pressure from 210 and 400kPa inlet to 7 or 2kPa.
3. Low Pressure Regulator Sets (LPRS) reduce an inlet pressure of 7kPa to 2kPa to supply low pressure networks.

Most DRS are located on public land and are installed in underground boxes. A small number of DRSs are above ground installations.

There are currently 619 DRS in service with an age profile shown in Figure 35.

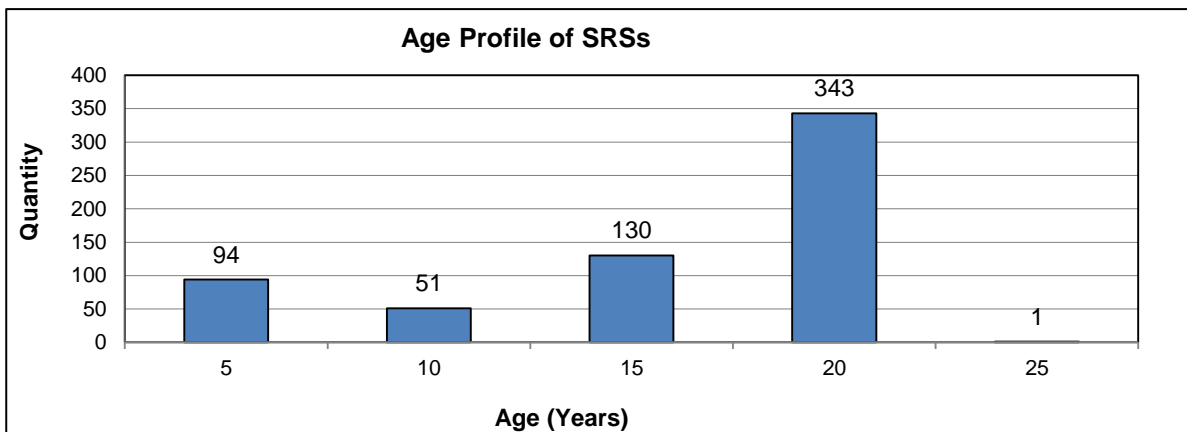


Figure 35 Age profile of SRS

11.3 ASSET CONDITION

While all DRS are operational, some DRS are in poor condition due to corrosion. This is a factor of design, exposure to water ingress and other elements that aid corrosion. In 2008, a strategic decision was made to replace DRS beyond economic repair. In 2013, further investigation was conducted to assess the integrity of 100 DRS. The operational performance of the DRS is considered satisfactory. However, a large number of issues were identified in the review.

Most of the old black box designs have serious ergonomic and maintainability issues. Narrow boxes, confined spaces, heavy cartridges, etc. are some of the issues that affect the maintainability of the DRS.

The outcome of this review was three-fold:

1. A number of DRS will need to be replaced
2. A number of DRS to have various levels of additional maintenance to address integrity issues
3. The remainder will have planned maintenance as they have no integrity issues.

In spite of the issues, the DRS do not pose significant threat to the safety of public or workers with the DRS generally operated in a safe manner.

11.4 ASSET PERFORMANCE

The DRS have high reliability with respect to their primary function of delivering gas to the distribution network. Despite the concerns over its condition, the performance is reasonable.

However, 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 either by demand growth (market expansion or capacity development) or replacement due to asset condition or performance.

The planned asset renewal and upgrade program is continuing in accordance with the strategy to retrofit the DRS.

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 over the period are:

- A planned asset renewal and upgrade program, which is continuing in accordance with the strategy to retrofit approximately 4-5 DRSs with Cocons per year
- Regulatory replacement and boundary regulator upgrade projects.

JGN's forecast Capital Plan for DRS over the AMP period is set out in Table 22.

| \$'000s | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|------------------------|-------|-------|-------|-------|-------|-------|
| Total DRS Capex | 3,675 | 3,061 | 2,924 | 2,531 | 2,522 | 2,386 |

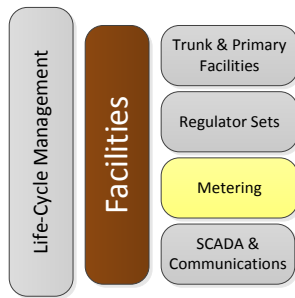
Table 22 Summary DRS facilities Capital Plan

11.6 OPERATIONAL REQUIREMENTS

A FSA of the DRS was conducted by JGN in RY13. This indicated that the DRS asset class is generally operating safely. The majority of the risks identified during this process were found to be low or negligible. The FSA identified numerous internal systems and processes though that should be reviewed to ensure that the network continues to operate safely in future. The next scheduled FSA for this asset category is in RY18.

The Maintenance Plan for DRS includes planned and corrective activities.

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 JGN network fall into one of the following categories:

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

JGN’s forecast Capital Plan for Metering over the AMP period is set out in Table 23 below.

| \$'000 | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|---------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Meter (ME) Capex | 16,517 | 17,620 | 19,101 | 20,190 | 19,073 | 19,076 |
| Meter (Replacement) Capex | 30,345 | 37,646 | 39,676 | 41,720 | 39,265 | 36,079 |
| Total Meter Capex | 46,862 | 55,266 | 58,777 | 61,910 | 58,338 | 55,155 |

Table 23 Summary Meter Capital Plan

12.2 CUSTODY TRANSFER

Custody transfer facilities are points where gas is received into the JGN network from other networks. The major transfer points are generally part of the transmission pipeline infrastructure and are owned and operated by the pipeline operator. There are a number of smaller custody transfer facilities owned, operated and maintained by JGN.



Figure 36 Custody transfer station

12.2.1 NON JGN GAS NETWORKS OWNED FACILITIES

The major custody transfer receipt points and network interconnection points are located at:

- Wilton TRS –MSP
- Rosalind Park – AGL CSM
- Horsley Park TRS – EGP
- Port Kembla – EGP.

These custody transfer receipt points are not the responsibility of JGN, they perform inputs only. Maintenance for these receipt points is performed by the relevant transmission pipeline operator.

12.2.2 JGN GAS NETWORKS OWNED FACILITIES

There are a number of smaller custody transfer facilities owned and operated by JGN Gas Networks. These consist of:

- Albion Park TRS
- 17 Packaged Off-Take Stations (POTS) with billing meters
- Munmorah Off-Take Metering Station
- An additional receipt point is to be established at Hexham TRS for AGL’s Natural Gas Storage Facility.

The meters in these facilities are billing meters and are a mix of rotary and turbine types.

Operations, maintenance, lifecycle and capital cost drivers for these meters are as per the description in the Industrial and Commercial section below.

12.3 NON BILLING METERS – INTRA-NETWORK METERING

Within the JGN network there are a number of Trunk and Primary Receiver Stations. Facilities at these TRS and PRS include:

- non-billing meters

- gas chromatographs
- flow computers
- hydrocarbon and water dewpoint analysis.

The purpose of these meters and associated equipment is to monitor gas flow, and trunk balancing, heating value calculation and measurement of WBH consumption. Gas flow data assists the capacity development team in network modelling. Non-billing meters performance is monitored through the SCADA system.

These facilities are described in Table 24.

| Description | Type | Number | Description |
|--|---|--------|---|
| Billing & Non-Billing Meter | TRS and PRS meters, | 94 | Installed where gas consumption needs to be measured but where no transaction takes place |
| | Non billing (water bath, interconnect) meters | 6 | |
| Gas Chromatographs | Horsley Park TRS, Plumpton TRS, West Hoxton TRS | 3 | Instruments that analyse the components of gas. From the components they calculate the specific gravity and heating value of the gas. This is used in general billing and in particular where different sources of gas are supplied to the network. |
| Flow Computers | Various location | 23 | Collect actual volume, pressure and temperature and calculate a standard volume. They have two way communications with the SCADA. The flow computers communicate with gas chromatographs to calculate real time energy. |
| Hydrocarbon and Water Dewpoint analysis | Wilton TRS | 1 | Installed in meter stations to monitor the gas quality and provide alerts when the gas is out of specification |
| | Plumpton TRS | 1 | |

Table 24 Custody transfer summary

12.3.1 ASSET CONDITION

Meters covered within this asset group include Barton and American Turbine Meters as well as a variety of rotary type meters. All meters installed at TRS and PRS are classified as non-billing meters. There are limited alternatives for the Barton meters without requiring upgrades to the piping. Refurbishment of these meters and the turbine meters is the preferred strategy.

Gas chromatographs are prone to occasional communication losses with the SCADA, drift in calibrations and failure of measuring elements. The method of monitoring the performance of gas chromatographs is through daily analysis and trending through the SCADA system. In addition the gas chromatographs are configured in parallel, which enables the instruments to perform not only individual self-testing, but perform verification testing on each other.

Flow computers performance is currently monitored through the SCADA system. However, the flow computers are prone to occasional communication losses with the SCADA.

12.3.2 ASSET PERFORMANCE

The non-billing meters have a measurement accuracy of +/-5 per cent. This uncertainty is considered adequate. The meters are between 10-15 years old. A FA is being drafted for the replacement of some

turbine type meters that may be suffering bearing issues. The project includes an option to replace TRS meters.



Figure 37 Civil works for construction of Lane Cove PRS

12.3.3 CAPITAL REQUIREMENTS

The strategy for lifecycle management of the meters is to refurbish and recalibrate at a frequency of five years.

Non-billing meters

There is no requirement to procure additional meters at this time as there are sufficient meter spares to establish a maintenance refurbishment program through all the TRSs over the AMP period.

The 'Barton' turbine meters are expected to be refurbished through the JGN Meter Centre.

Gas chromatographs (GC)

The suppliers of GCs introduce new technologies and stop supporting existing GCs every five to eight years. Therefore, the strategy for managing gas chromatographs is to keep abreast of new technologies and to use an eight year replacement period as a starting point.

Flow computers

Models of flow computers become obsolete every five to eight years as new technologies become available and suppliers stop supporting them. The strategy for managing flow computers is to replace them every eight years. The replacement plan is therefore based upon an age profile of the asset.

12.3.4 OPERATIONAL REQUIREMENTS

Non-billing meters

A FA is being drafted on whether TRS meters should undergo a planned replacement program.

Flow computers

Flow computers are operated and maintained in accordance with the SAOP and technical regulatory requirements.

Flow computers are maintenance managed through JGN's in-house enterprise IT system utilising the service order process. Flow computers at Albion Park are tested every six months and every three months at MOMs and Incitec.

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 industrial and commercial meters used on the JGN network, including:

- Diaphragm meters
- Rotary meters
- Turbine meters.

Further detail on these meters is provided in Table 25.

| Meter Type | Volume | Description |
|-------------------------|--------|---|
| Diaphragm Meters | 41,960 | 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 | 1,785 | 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 | 120 | 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. |

Table 25 Summary of industrial and commercial meters

The age profile of these meters is depicted in the figures below.

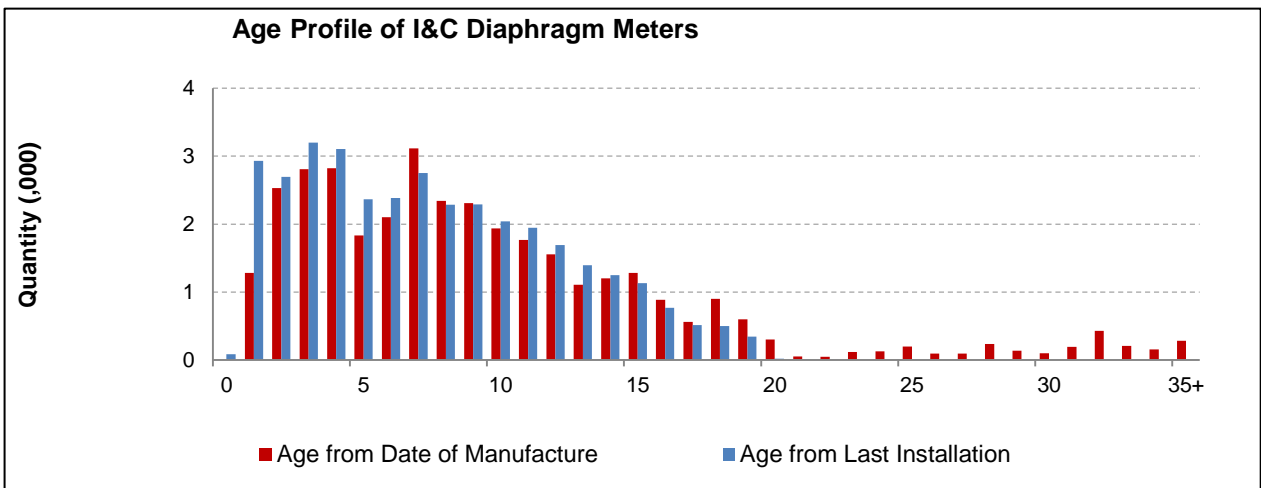


Figure 38 Diaphragm meters age profile

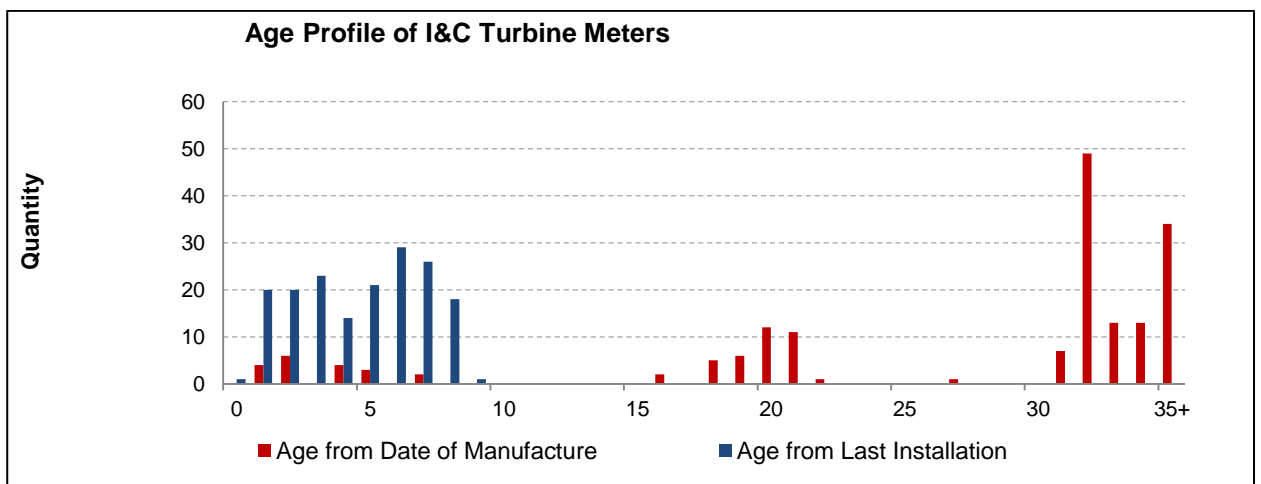


Figure 39 Turbine meter age profile

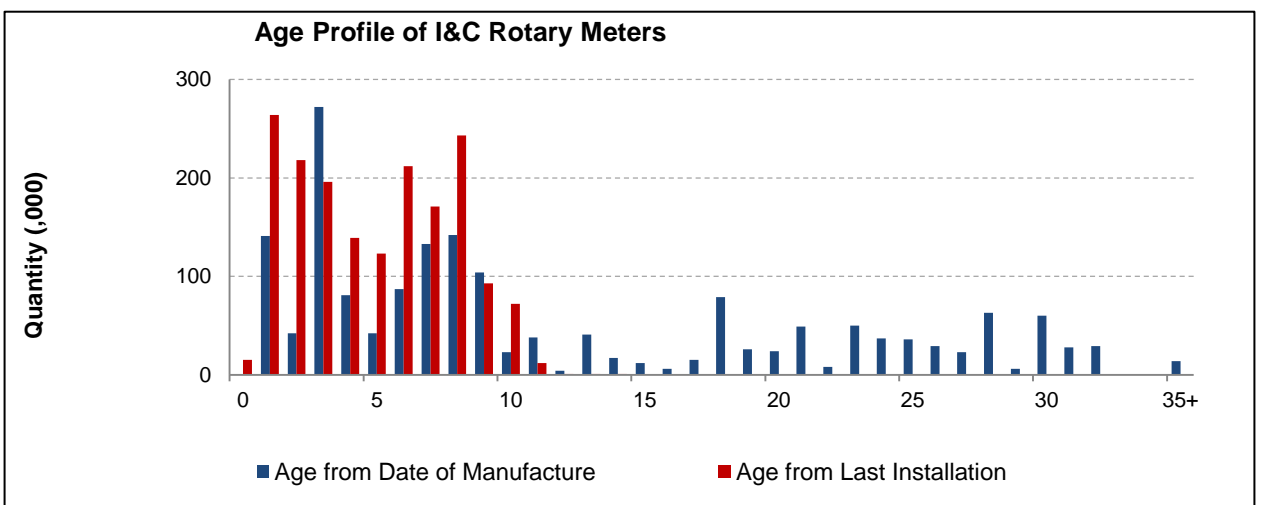


Figure 40 Rotary meter age profile

12.4.1 ASSET CONDITION

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.

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. JGN is planning to limit meter life to 20 years.

Turbine meters

The condition of the I&C turbine meter population is deteriorating. Although the majority of JGN's 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

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 statistical sampling and replacement.

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

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 JGN to increasing risks of meter integrity, specifically, the under-registration of gas flow. JGN is planning to limit meter life to 20 years.

Turbine meters

Although the majority of JGN's turbine meters are recently refurbished high service life is impacting reliability. Due to the high service life of older turbine meters an FA has been drafted and titled 'Replacement of Turbine Meters-30 years and older'. The 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.

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. JGN has created a replacement plan based on initial integrity activities.

Diaphragm meters are retired after 15 years of service with the exception of type AL425 and AL1000. These meters may be granted a life extension on successful sampling data. 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.

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. As per JGN's policy (TPC PROC 4.99.7), rotary meters are scheduled for replacement on a 10 year cycle. This is shorter than the statutory life of 15 years and reflects feedback from integrity review activities.

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

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 JGN's network. Inaccurate metering can expose JGN 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 is shorter than the statutory life of 15 years and reflects feedback from integrity review activities. 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 26.

| Replacement Plan (number of meters) | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|--|-------------|------------|-------------|-------------|-------------|--------------|
| Diaphragm Replacement | 846 | 737 | 968 | 980 | 700 | 1,127 |
| Rotary Replacement | 200 | 208 | 222 | 230 | 305 | 260 |
| Turbine Replacement | 33 | 29 | 29 | 28 | 28 | 28 |
| Total I&C Replacement | 1079 | 974 | 1219 | 1238 | 1033 | 1,415 |

Table 26 I&C Measurement replacement meter volumes

The volume of new industrial and commercial meters installed as part of the market expansion program is set out in Table 28.

| Market Expansion (number of meters) | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|--|------|------|-------|-------|-------|-------|
| I&C Meters (All types) | 930 | 988 | 1,050 | 1,116 | 1,186 | 1,262 |

Table 27 New I&C meters - market expansion

JGN's forecast expenditure on industrial and commercial meters over the AMP period is set out in Table 28.

| (\$'000s) | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|----------------------------------|--------------|--------------|--------------|--------------|--------------|---------------|
| I&C Meter (ME) Capex | 3,495 | 3,641 | 3,813 | 4,227 | 4,192 | 4,297 |
| I&C Meter (Replacement) Capex | 5,185 | 4,293 | 4,567 | 4,462 | 4,006 | 5,879 |
| Total I&C Meter Capex | 8,680 | 7,934 | 8,380 | 8,689 | 8,199 | 10,176 |

Table 28 Summary of I&C metering capital plan

12.4.4 OPERATIONAL REQUIREMENTS

Gas meters are operated and maintained in accordance with Jemena's Technical Policies, technical regulatory requirements and JGN'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.

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.

JGN manages the integrity of I&C diaphragm meter types with sufficient volumes through statistical sampling programs. This drives future renewal and upgrade planning activities.

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

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.

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

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.

In accordance with the requirements of AS4645, an FSA of the I&C rotary meters and the assets operating environment is to be conducted at a period not exceeding five years.

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, JGN removes turbine meters for overhaul after five years of service. This strategy is based on historical and trend information.

JGN is planning the following integrity review activities 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
- 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. These meter sets have capacities of up to 380MJ/h and can be configured for connection to low pressure networks (< 7kPa) and medium pressure networks (< 400kPa).

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 in Table 29.

| Type | Volume | Description |
|-------------------------------|---------------------------|---|
| Residential Gas meters | 1,121,553 | Gas meter sets provide filtration, pressure regulation and metering to small end-point users connected to the network |
| Hot water meters | 163,371 hot 9,817 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 | 8,791 | Meter data loggers (MDL) are remote electronic devices installed in the JGN to record and transmit the consumption of gas and/or hot water meters from apartment blocks. |

Table 29 Overview of residential meters

The age profile of these assets is illustrated in Figure 41.

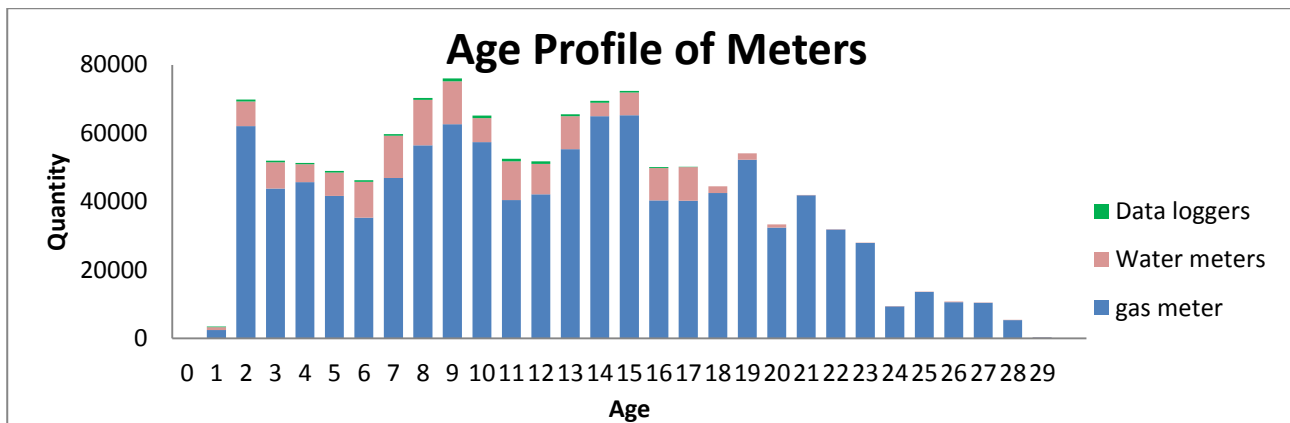


Figure 41 Age profile of residential meter assets

12.5.1 ASSET CONDITION

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.

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. JGN 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.

Hot water meters

The condition of hot water meters in service is deteriorating with increasing volumes of failures over the last five years. Current assessment estimates in excess of 10,000 faulty units remain in the network. The volume of faulty units is expected to accelerate over the coming years. There is a planned replacement program to replace the type of faulty meter over a six year period.

A review of hot water metering assets has been performed with initial alternative assets acquired during RY14.

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 2700 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

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.

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.

JGN 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.

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.

Meter data loggers

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

12.5.3 CAPITAL REQUIREMENTS

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.



Figure 42 Residential gas meter

Residential gas regulators

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

JGN is constantly reviewing new technology from different vendors. 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.

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 meter replacement aims to reduce the volume of corrective maintenance.

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 in NSW. Wireless RF technologies are available, but require testing and assessment. JGN has two buildings with about 300 RF enabled meters being tested. These are being read using a laptop. A review is needed to determine the advantages and disadvantages of this technology.

Table 30 sets out the new residential gas meters to be installed as part of the market expansion programs over the AMP period.

| Gas Meters – Volumes (number of new meters) | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|--|---------------|---------------|---------------|---------------|---------------|---------------|
| Meters - Residential - Infill | 7,395 | 7,426 | 7,285 | 7,148 | 7,013 | 6,881 |
| Meters - Residential - New Estates | 12,913 | 13,906 | 14,899 | 13,906 | 13,906 | 13,906 |
| Meters - Home units/villas | 13,906 | 14,899 | 15,893 | 15,893 | 14,899 | 14,899 |
| Total Residential (ME) Meters | 34,214 | 36,231 | 38,077 | 36,947 | 35,818 | 35,686 |

Table 30 New residential gas meters - market expansion

Table 31 Asset replacement program per category volumes

sets out the planned volume replacement, renewal and upgrade of residential meters over the AMP period.

| Volumes | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|-------------------------------|--|--------|--------|--------|--------|--------|
| Residential Gas Meters | 25 year old aged meter replacement | | | | | |
| | 22,110 | 24,627 | 35,559 | 36,754 | 36,412 | 36,193 |
| | Residential defective meter replacement | | | | | |
| | 5,300 | 5,312 | 5,300 | 5,300 | 5,300 | 5,300 |
| | Residential meter statistical sampling program | | | | | |
| | 731 | 740 | 684 | 671 | 690 | 660 |
| Residential Regulators | Planned Replacement | | | | | |
| | 13,454 | 14,775 | 21,335 | 22,052 | 21,847 | 21,715 |
| Hot Water Meters | Planned Replacement | | | | | |
| | 15,487 | 22,654 | 22,603 | 22,603 | 17,352 | 1,337 |
| Meter Data Loggers | Renewal and Upgrade of MDL | | | | | |
| | 375 | 1,503 | 1,500 | 1,500 | 1,500 | 1,500 |
| | Renewal and Upgrade of MDL - communications | | | | | |
| | 1,500 | 1,125 | 0 | 0 | 0 | 0 |

Table 31 Asset replacement program per category volumes

JGN's forecast expenditure on residential meters over the AMP period is set out in Table 32 over the AMP period.

| \$'000s | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|--|---------------|---------------|---------------|---------------|---------------|---------------|
| Residential Meter (ME) Capex | 13,022 | 13,979 | 15,289 | 15,963 | 14,881 | 14,779 |
| Residential Meter (Replacement) Capex | 15,965 | 23,542 | 25,300 | 26,529 | 23,682 | 16,342 |
| Total Residential Gas Meter Capex | 28,986 | 37,521 | 40,588 | 42,493 | 38,562 | 31,121 |

Table 32 Total residential meter capex

12.5.4 OPERATIONAL REQUIREMENTS

Gas meters

Gas meters are operated and maintained in accordance with Metering Equipment Maintenance, Service and Disposal, technical regulatory requirements and JGN'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.

JGN manages the integrity of residential gas meters 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.

Residential gas regulators

Gas regulators are operated and maintained in accordance with technical regulatory requirements and JGN 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 RY15.

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.

Hot water meters

JGN does not have a 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.

Meter data loggers

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

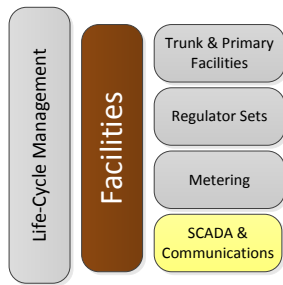
MDL's are operated and maintained in accordance with technical regulatory requirements and JGN Policy - Metering Equipment Maintenance, Service and Disposal.

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. The estimated volume of faulty MDLs replaced per year is 150 units.

13 ASSET STRATEGY - SCADA & COMMUNICATIONS



13.1 SUMMARY

JGN Supervisory Control And Data Acquisition (SCADA) and communication assets are infrastructure JGN uses to monitor and control its network assets.

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 JGN's core business functions, such as billings, gas dispatch/distribution and demand management.

JGN's 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
- enhancements to improve the efficiency and effectiveness of SCADA operations.

13.2 ASSET CONDITION

Conditions of all JGN 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 JGN's 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 plans to invest in several areas of the SCADA network over the AMP period. Additional telemetry is planned for installation to support network growth. Other proposals include Metretek redundancy and SCADA backup.

JGN forecasts six to eight additional telemetry per annum due to network growth over the AMP period.

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

The most material asset renewal project during the AMP period is the GENE and SCADA System Replacement project (\$6M) to ensure alignment and cost effective integration of technologies deployed by the industry and Jemena as a whole.

The Capital Plan for RY15 to RY20 also includes remote telemetry unit (RTU) end-of-life replacement, SCADA security on-going review and upgrade, and Digital Mobile Radios end-of-life replacement.

Assets are disposed of in accordance with the JGN security policy for hardware disposal. JGN is planning to dispose all replaced SCADA, telemetry and digital mobile radio hardware over the AMP period.

JGN's forecast Capital Plan for SCADA over the AMP period is set out in Table 33.

| \$'000s | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|--------------------------|------|-------|-------|-------|-------|------|
| Total SCADA Capex | 965 | 1,317 | 2,706 | 2,767 | 2,177 | 745 |

Table 33 Summary of SCADA facilities Capital Plan

13.5 OPERATIONAL REQUIREMENTS

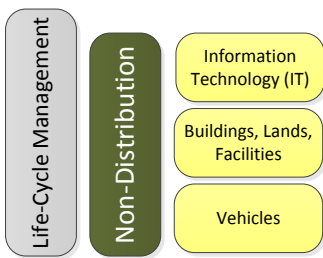
The NSW SCADA and communications asset strategy is updated annually. It was last updated in July 2013.

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 JGN SCADA and communications asset is operated and maintained in accordance with the SAOP, technical regulatory requirements and JGN'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 JGN 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.

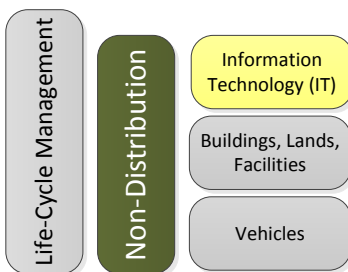
14 ASSET STRATEGY - NON-DISTRIBUTION



14.1 SUMMARY

The non-distribution assets include those that are not directly responsible for the distribution of gas on the JGN's network. These assets include Information Technology (IT), building, land and facilities, and Vehicles.

14.2 INFORMATION TECHNOLOGY



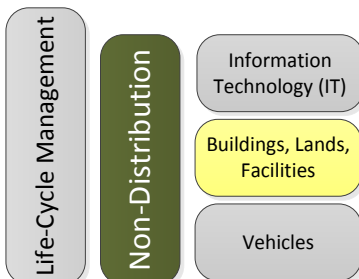
The IT component of the Asset Management Plan is set out in the IT AMP. Please refer to the Information Technology Asset Management Plan for further details.

JGN's forecast Capital Plan for IT over the AMP period is set out in Table 34.

| \$M | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|-----------------------|--------|--------|--------|--------|--------|--------|
| Total IT Capex | 38,462 | 37,454 | 30,896 | 33,311 | 18,572 | 10,771 |

Table 34 Summary IT Capital Plan

14.3 BUILDINGS, LAND AND FACILITIES



JGN's property portfolio consists of the following assets:

- Sydney Olympic Park (SOP) (leased office and depot premises)
- North Sydney Office (leased office premises)
- Alexandria Equinix Sy3 JGN SCADA and Control Disaster Recovery (DR)

- NSW Training Facility Chullora
- Meter Test Facility (MTC)
- Emergency Equipment Holding Areas (EEHAs)
- Depots
- High-pressure sites.

14.3.1 ASSET CONDITION

JGN has established a set of property principles under which all significant property decisions are tested against. These principles include:

- Being financially sustainable
- Being cognisant of employee impacts
- Seek to co-locate and seek collaboration across groups
- Being mindful of proximity to JGN Assets
- Facilitate JGN’s future operating model and the “Jemena Way”.

Property and land performance are periodically reviewed and measured against current and future operational requirements. These assessments generally coincide with lease expiries and renewals for existing premises and the procurement of new premises taking into consideration:

- Opex/Capex expenditure budgets
- Size/capacity
- Configuration
- Age and condition of the premises
- Geographical location
- Health Safety and Environment.

The SOP lease expires on 30 April 2015 while the North Sydney lease expires on 30 June 2015. JGN will therefore be required to source new accommodation in the next year.

JGN also plans to establish a new training facility to replace the current arrangement with Chullora TAFE by May 2015 (the Chullora TAFE has limited facilities). JGN and the NSW Gas Industry Training Advisory Bodies (ITAB) are embarking on a significant upgrade of its national skills qualifications with the field based documentary proof (“the passport”), which will increase diligence in the areas of induction and accreditation training. Improving training facilities will ensure that going forward, JGN field delivery teams will always be competently trained and equipped to work on JGN assets.

14.3.2 CAPITAL REQUIREMENTS

Key strategic property activities for the period are as follows:

- the purchase of land and establishment of a depot and training facility strategically placed within the JGN network
- Cardiff Depot replacement (Project underway) with expenditure to continue in 2015
- Relocation of functions currently located at the SOP and North Sydney premises during the 1st half of 2015.
- These decisions will trigger the following associated activities:
 - The leasing and fit out of suitable office accommodation for approximately 410 employees
 - Relocation of SCADA boxes from the SOP Control Room/Response Centre to a managed data centre environment
 - Upgrade of existing EEHAs at Seven Hills, Warriewood and Riverwood as well as the High Pressure site at Horsley Park to provide additional storage capability
 - Unspecified capital works allocated throughout the period for both owned and leased premises.

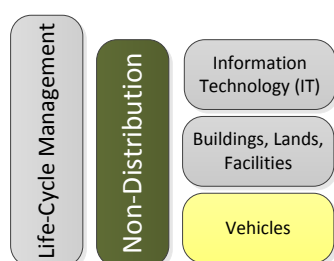
The existing Emergency Equipment Holding Area (EEHA) on leased premises at Wetherill Park with services provided from the new depot will be closed.

JGN's forecast Capital Plan for Buildings over the AMP period is shown in Table 35 below.

| \$'000s | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|------------------------------|--------|-------|------|------|------|------|
| Total Buildings Capex | 39,522 | 3,793 | 428 | 476 | 477 | 478 |

Table 35 Summary Buildings, land and facilities Capital Plan

14.4 VEHICLES



JGN owns an array of vehicles, plant and equipment (fleet), which consists of standard passenger vehicles through to specialised light/heavy commercial vehicles and plant (trailers, forklifts etc.). Table 36 sets out the number of vehicles in JGN's fleet.

| Vehicle Type | Number of vehicles |
|----------------------------------|--------------------|
| Heavy Commercial Vehicles | 19 |
| Light Commercial Vehicles | 205 |
| Passenger Vehicles | 29 |
| Plant | 13 |
| Trailers | 40 |
| Total | 306 |

Table 36 Vehicle summary

JGN has outsourced the Fleet Management functions. The Fleet Management Strategy for vehicle replacement is based around the following principles:

- fit for purpose vehicle selected for the task at hand
- least cent per kilometre methodology
- up to date safety features at hand
- mitigation of age related failures and potential consequences of personnel injury
- decreased response times
- reduction in operational costs (service, repairs and fuel).

14.4.1 CAPITAL REQUIREMENTS

JGN’s forecast Capital Plan for vehicles over the AMP period is set out in Table 37.

| \$'000s | RY15 | RY16 | RY17 | RY18 | RY19 | RY20 |
|-----------------|-------|-------|-------|-------|-------|-------|
| Vehicles | 2,519 | 2,520 | 2,060 | 2,729 | 6,136 | 3,402 |

Table 37 Summary of Vehicle Capital Plan

14.4.2 OPERATIONAL REQUIREMENTS

All fleet assets are maintained in line with the manufacturers recommended service schedules. This is managed via an array of reports provided by a fleet management company.

OUR POLICY



Jemena Asset Management Policy

Jemena is committed to being recognised as a world class owner and manager of energy delivery assets.

To deliver on this commitment, it is the policy of Jemena to:

- Manage our assets without compromising our employees, contractors and public safety, as per the Jemena Health and Safety Policy
- Manage our assets in an environmentally sustainable manner in support of the Jemena Environmental Policy
- Comply with all relevant regulatory and legislative requirements
- Actively engage with customers and key stakeholders to understand and respond to their requirements to ensure outcomes are achieved that are in their long term interests
- Develop asset management plans which deliver the corporate objectives and business plan
- Facilitate continual improvement in the safety and performance of the assets, through the establishment, maintenance and governance of effective asset and safety management systems
- Make best practice asset management an accepted and important part of our "business as usual" approach, and measure it against an internationally recognised asset management framework
- Apply the Jemena risk management approach to asset management activities
- Develop and maintain asset information systems which support asset management decisions and activities throughout the asset lifecycle
- Establish a consistent, collaborative and integrated approach to the management of the lifecycle of the assets, to ensure that the optimum outcomes are delivered in an efficient way across Jemena
- Develop the skills and knowledge of our people to sustain and re-enforce our asset management capabilities

A handwritten signature in black ink, appearing to read "Paul Adams", with a long horizontal flourish extending to the right.

Paul Adams
Managing Director
Jemena Limited
January 2014

Jemena produces detailed policies which support this policy statement.

Vital Service. Vital Planet.

OUR POLICY



Health & Safety

At Jemena, we believe that the health and safety of our people and the community in which we operate is not only an organisational value, but also a key success factor in achieving our vision to be recognised as a world class owner and manager of energy delivery assets.

We are committed to:

- Providing a safe and healthy workplace where the risk of injury and illness is minimised;
- Having systems and processes that enhance the way our people work, thus maximising reliable performance;
- Complying with applicable statutory obligations, standards, codes of practice and other regulatory requirements relevant to our assets and our operations;
- Designing, operating and maintaining our assets in a way that protects or enhances community safety; and
- Creating a positive, trusting, caring and learning health and safety culture.

Wherever we operate, we strive to achieve this through:

- Setting, communicating and monitoring realistic and meaningful measures that are consistent with, and move us toward, our vision of world class;
- Establishing and maintaining health and safety management systems and processes, and asset specific safety management systems consistent with our business needs;
- Listening to and consulting with our people and other stakeholders to proactively identify hazards and manage the associated risk, safely;
- Providing training and education to our people in relation to health and safety leadership, hazards and their associated risk, our systems and process, culture and our journey to world class;
- Seeking feedback on our systems and risk control effectiveness for learning and continuous improvement;
- Continually improving the focus and effectiveness of our asset management approaches and practices;
- Maintaining a strong focus on employee health and wellbeing;
- The proactive participation in business, community and government programs to enhance our own and the community's health and safety;
- Providing adequate resources; and
- Continuing to mature and nurture our culture.

In Jemena, we believe that individual responsibility plays an important part in achieving a healthy and safe workplace and, for that reason, our people are empowered to take action that protects themselves, fellow employees, the public and other stakeholders.

A handwritten signature in black ink, appearing to read "Paul Adams", with a long horizontal flourish extending to the right.

Paul Adams
Managing Director
Jemena Limited
August 2013

Safety First. Hear, Listen and Think before we Act.

Vital Service. Vital Planet.

OUR POLICY



Environment

Jemena is committed to reducing its environmental footprint.

In delivering on this commitment it is the policy of Jemena to:

1. Comply with all relevant legal and other environmental requirements and provide employees and contractors with the necessary training and tools to maintain its assets in compliance to such requirements.
2. Conduct its business in a way that employees and contractors understand and ensure that they are accountable, for Jemena's environmental performance in their day to day activities.
3. Facilitate continual improvement in environmental performance by establishing and maintaining an appropriate Environmental Management System for all assets.
4. Identify and minimise risk by continually assessing, controlling and monitoring our environmental aspects and impacts.
5. Utilise its knowledge and expertise by supporting and pursuing strategies and projects that reduce our impact on the environment as well as providing customers with the necessary tools and information to understand and better manage their environmental impacts.
6. Identify, set and monitor realistic environmental performance measures and communicate them to all employees and stakeholders.
7. Actively engage with customers, government and other stakeholders to recognise and respond to all environmental concerns.

It is a requirement that all employees, contractors and visitors comply with the requirements of this policy and our Environmental Management standards at all times.

A handwritten signature in black ink, appearing to read "Paul Adams".

Paul Adams
Managing Director
Jemena Limited
January 2012

Vital Service. Vital Planet.