

Appendix 3.4

Asset Management Plan

Prepared by Jemena for Evoenergy

Access arrangement information

ACT and Queanbeyan-Palerang gas
network 2021–26

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Evoenergy

Asset Management Plan

ACT-QBN 2021-2026

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ABBREVIATIONS

ABS	Asset Business Strategy
ACT	Australian Capital Territory
AER	Australian Energy Regulator
AIP	Asset Investment Plan
ALARP	As Low As Reasonably Practicable
AMP	Asset Management Plan
AMS	Asset Management System
AMSRC	Asset Management System Review Committee
APGA	Australian Pipeline and Gas Association
APSC	Asset Public Safety Committee
AS 2885 ATCC	AS 2885 Assets Technical Code Committee
AS 4645 ATCC	AS 4645 Assets Technical Code Committee
Capex	Capital expenditure
CAPs	Capacity Augmentation Projects
CMS	Compliance Management System
COWP	Capital and Operational Work Plan
CP	Cathodic Protection
CY	Calendar Year (1 January - 31 December)
DAMS	Distribution Asset Management Services
DFA	Delegated Financial Authority
DMS	Distribution Management System
DRS	District Regulator Sets
E2G	Electricity to Gas (conversion)
ECMS	Enterprise Content Management System
EEHA	Emergency Equipment Holding Areas
EMP	Environmental Management Plan
EMS	Environmental Management System
EPIs	Environmental Performance Indexes
Evoenergy	Evoenergy
FSA	Formal Safety Assessments
GCs-6	Gas Chromatographs
GIS	Geographic Information System
GSMRC	Gas Safety Management Review Committee
HDPE	High Density Polyethylene
HSE	Health, Safety and Environment
HSEQ	Health, Safety, Environment and Quality
I&C	Industrial and Commercial
IC&E	Instrumentation, Control and Electrical
IT	Information Technology
JAM	Jemena Asset Management
JCARS	Jemena Compliance and Risk System
JCM	Jemena's Content Management
JGN	Jemena Gas Networks

KPIs	Key Performance Indicators
LGA	Local Government Areas
LNG	Liquified Natural Gas
MAOP	Maximum Allowable Operating Pressure
MDL	Meter Data Loggers
NBN	National Broadband Network
NGERS	National Greenhouse and Energy Reporting Scheme
NGL	National Gas Law
NGR	National Gas Rules
NSW	New South Wales
OEMPs	Operational Environmental Management Plans
OHS	Occupational Health and Safety
OMS	Outage Management System
Opex	Operating Expenditure
OPSO	Over Pressure Shut Off
PE	Polyethylene
PMM	Project Management Methodology
POTS	Packaged Offtake Station
PRS	Primary Regulating Station
RF	Radio Frequency
RTS	Real Time Systems
RTU	Remote Telemetry Unit
RY	Regulatory Year (1 July - 30 June)
SAMP	Strategic Asset Management Plan
SAOP	Safety and Operating Plan
SCADA	Supervisory Control and Data Acquisition
SDRS	Secondary District Regulator Sets
SGSPAA	State Grid Singapore Power (Australia) Assets
SLA	Service Level Agreement
SMS	Safety Management Study
SPM	Sydney Primary Main
TJ	Terajoule
TRIFR	Total Recordable Injury Frequency Rate
TRS	Trunk Receiving Station
UAG	Unaccounted For Gas
WBH	Water Bath Heater

EXECUTIVE SUMMARY

This Asset Management Plan (**AMP**) outlines how Evoenergy's ACT Gas Network, including the Queanbeyan and Bungendore networks will be managed. Further, it provides information about how the network assets will be managed to continue to provide a safe, reliable and affordable gas supply to our customers.

Our asset management practices and strategies inform the expenditure plans and programs of work, and are a key input into the forecast expenditure program for the forthcoming Access Arrangement period (1 July 2021 to 30 June 2026). This document should therefore be read in conjunction with the 2021-26 Access Arrangement proposal and its associated attachments.

In summary, over the Access Arrangement period, we plan to:

- connect approximately 10,000 new dwellings and businesses across the ACT Gas Network continuing to expand the network to meet demand, where efficient to do so;
- replace more than 38,000 residential and commercial gas and water meters;
- install a new pressure limiting station at Watson to effectively manage the safety risks associated with encroaching dwellings on the pipeline;
- undertake key inline inspection ('pigging') activities of the high-pressure pipelines including the entire Canberra Primary Main and Hoskinstown-Fyshwick pipeline;
- rectify and upgrade of internal piping, meters and regulators within shopping centres to lower the safety risk and comply to new code;
- continue to pursue new technology and asset management practices that will allow us to defer capital expenditure where prudent and safe to do so.

This is not intended to be an exhaustive list, nor does it include all ongoing corporate or non-asset management related costs/projects we plan to deliver over the next seven years. Asset management requirements are continually reviewed and will likely change over the course of program delivery. The forecast works program also includes ongoing maintenance, provision for reactive asset replacement, and other minor works not included in the summary list above.

For full details of required capital expenditure and the works program scheduled for the coming years, refer to the expenditure forecast detailed in the Evoenergy Access Arrangement Proposal.

ISO 55001 accreditation

The asset management approach for Evoenergy (and the asset management system (**AMS**) that underpins it) have been externally audited and accredited as conforming to the requirements outlined in the international standard ISO 55001. In keeping with ISO 55001, we focus on the value assets provide to both Evoenergy and its customers, and aim to balance risk and safety performance against reliability, customer expectations and cost.

We also build continual improvement practices into our AMS and decision-making process. We do this by regularly reviewing and improving the asset data, the systems that hold our data, and the way we apply that data in our investment decisions. As a result, we are continually refining and enhancing our asset management capabilities, which in turn leads to more fully informed and prudent expenditure forecasts.

Climate change policy

Our asset management decisions are shaped by our operating environment and by consumer feedback. The Australian energy market is changing with the onset of technology, changes in environmental policy and the increasing competitiveness of renewable energy resources. As a result, the way customers use natural gas and the gas network itself are evolving and will continue to do so over the coming decades.

A focus of our planning is the ACT Government's climate change policy, which involves a legislated target for the ACT of achieving net zero greenhouse gas emissions by 2045. Evoenergy supports a responsible transition to achieve this target, whilst acknowledging significant uncertainty remains about the best pathway for the ACT energy sector to achieve it.

Achieving net zero greenhouse gas emissions while providing energy to customers that is safe, secure, reliable and affordable, involves solving major strategic, technical, social and operational issues. We will support Evoenergy as it continues to collaborate with the ACT Government, technical experts, the gas user community, and industry to thoroughly investigate available options and choose a pathway to net zero emissions that ensures consumers continue to have access to energy that meets their needs, minimises costs and ensures we are equipped for the future.

Consumer engagement

Evoenergy has also undertaken a comprehensive program of consumer engagement as part of the 2021 Access Arrangement proposal which coincided with the release of an update to the ACT Government's Climate Change Strategy 2019–25 (Climate Change Strategy). The release of the Climate Change Strategy significantly increased community discussion relating to the future of gas in the Canberra region. As well as directly seeking the views of customers, views of gas retailers and stakeholders such as customer advocate groups were also sought.

Affordability remains a major concern for all consumers and are seeking reduced network charges. These views were often coupled with feedback that consumers seek price stability and certainty related to their gas supply. They are concerned about the impacts that a transition away from natural gas would have on their appliances and costs that would be incurred in replacing or upgrading these appliances. They want continuing reliable services during the transition.

While supporting environmental sustainability as a key driver and despite the uncertainty surrounding natural gas over the longer term, consumers indicate they value natural gas and will continue to use it for the foreseeable future. While consumers believe steps should be taken to avoid significant price increases, they also support investment in the research, planning and transition towards a net zero emissions future, where prudent to do so.

These factors above and potential network changes, then inform our asset objectives and how we aim to manage the gas network business in an evolving energy market. The asset objectives provide the basis for the various asset class strategies, which define how we will manage each class of assets in our gas network such a facilities, pipelines, distribution network and metering.

Outcomes of our asset management plan

Over the 2021-26 Access Arrangement period, Evoenergy will limit expenditure as we work with the ACT Government to achieve climate change policy targets while still continuing to provide safe, secure, reliable and affordable energy services.

We will measure our asset management performance against our suite of asset safety, reliability and customer service key performance indicators (KPIs), detailed in Chapter 8 of this AMP.

1. INTRODUCTION

We believe sound asset management and governance processes are essential for prudent and efficient investment in the gas distribution network. Perhaps more importantly, having sound asset management and governance processes allows us to maintain a safe, reliable and affordable gas supply, and ensure the services we provide are consistent with the expectations of customers in and around the ACT.

The purpose of this AMP is to provide an overview of how we manage our assets and our business. Our aim is to demonstrate that our asset management activities are prudent and based on good practice, which help ensure our work program and expenditure forecasts are both prudent and efficient.

This AMP should be read in conjunction with the Evoenergy Access Arrangement Proposal and its associated attachments.

1.1 SCOPE

This AMP covers the ACT Gas Network's assets excluding supporting assets such as Information Technology (IT) systems and Corporate services (including training) as detailed in the Capital and Operational Work Plan (COWP).

Jemena has developed this AMP and the supporting asset class strategies for Evoenergy's ACT gas network and non-network assets. The Asset Class Strategies define the specific asset and risk management activities for each type of asset. The AMP summarises the high-level asset management activities required to meet asset and organisational objectives.

The AMP identifies operating and capital expenditure for the next seven years. The AMP is supported by the (COWP), which provides additional information on the first two-year expenditures required to implement the AMP.

1.2 ABOUT EVOENERGY

The ACT Gas Network was commissioned in 1980s and was extensively developed through the mid-1990s and has continued to grow. It now has almost 5,000 km of pipelines that distribute natural gas to almost 160,000 homes and businesses. The ACT Gas Network supplies gas to about 150,000 customers in the Australia Capital Territory and surrounding areas and it has grown rapidly over the past 5 years connecting about 15% of its customers during that period.

Evoenergy transports gas through our network on behalf of network users (such as retailers) to customers' premises. Jemena builds and maintains the network on behalf of Evoenergy and we also install, read and maintain the meters that measure how much gas is being used by each customer. We are part of a broader energy supply chain that spans from gas transmission to gas distribution, and our charges make up around 30% of a typical residential customer's gas bill.

Natural gas is supplied to the ACT Gas Network via two high-pressure gas transmission pipelines.

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

- The Eastern Gas Pipeline (EGP) in the east, owned by Jemena Limited. The EGP transports gas from Longford in Victoria through NSW to the Sydney Market. Natural gas is received from the EGP into the ACT network through the Hoskinstown Custody Transfer Station. Gas then flows into the Hoskinstown to Fyshwick Pipeline owned by Evoenergy, and the pipeline up to the ACT/NSW border is covered by Licence 29 under the New South Wales Pipelines ACT 1967. The remaining section of the pipeline situated in the ACT operates under the Utility Services Licence.

Figure 1–1: Evoenergy’s ACT Gas Network

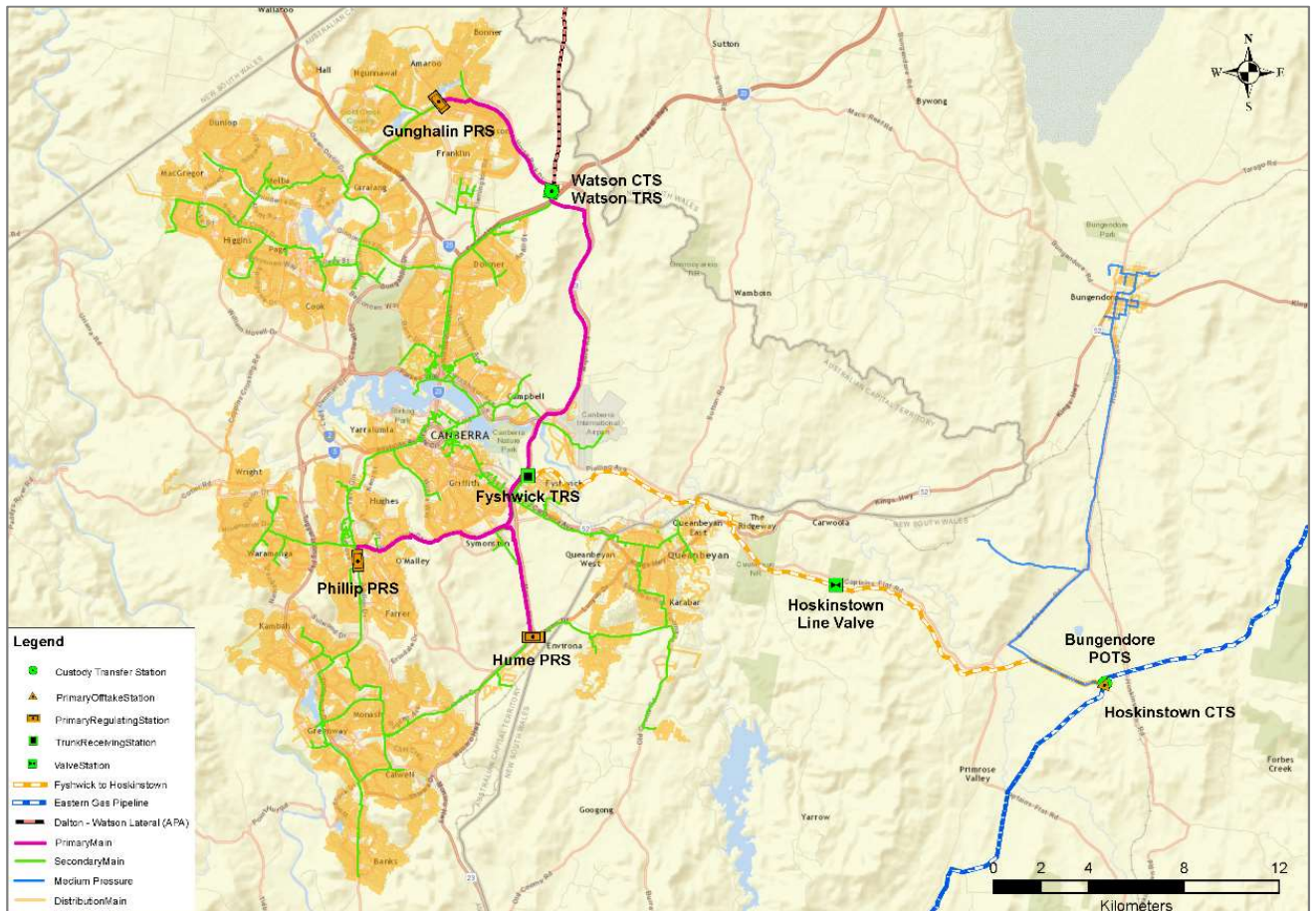
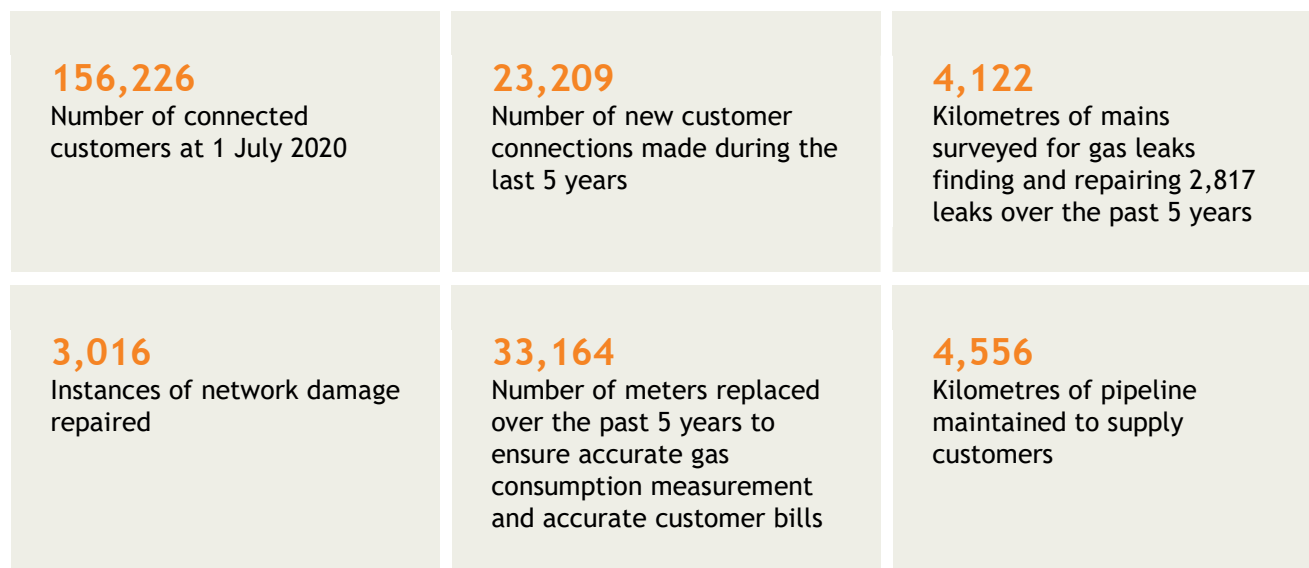


Table 1-1: Key ACT Gas Networks asset statistics

Network	Quantity
Trunk mains (km)	30
Primary mains (km)	37
Secondary mains $\geq 1,050\text{kPa}$ (km)	233
Medium pressure mains $< 1,050\text{kPa}$ (km)	4,353
Custody transfer stations (CTS)	1
Trunk receiving stations (TRS)	2
Primary regulating stations (PRS)	4
Secondary district regulator sets (SDRS)	95

In addition to transporting gas through our network, we also undertake a range of other activities for our customers (see Figure 1–2).

Figure 1-2: Delivering for our customers



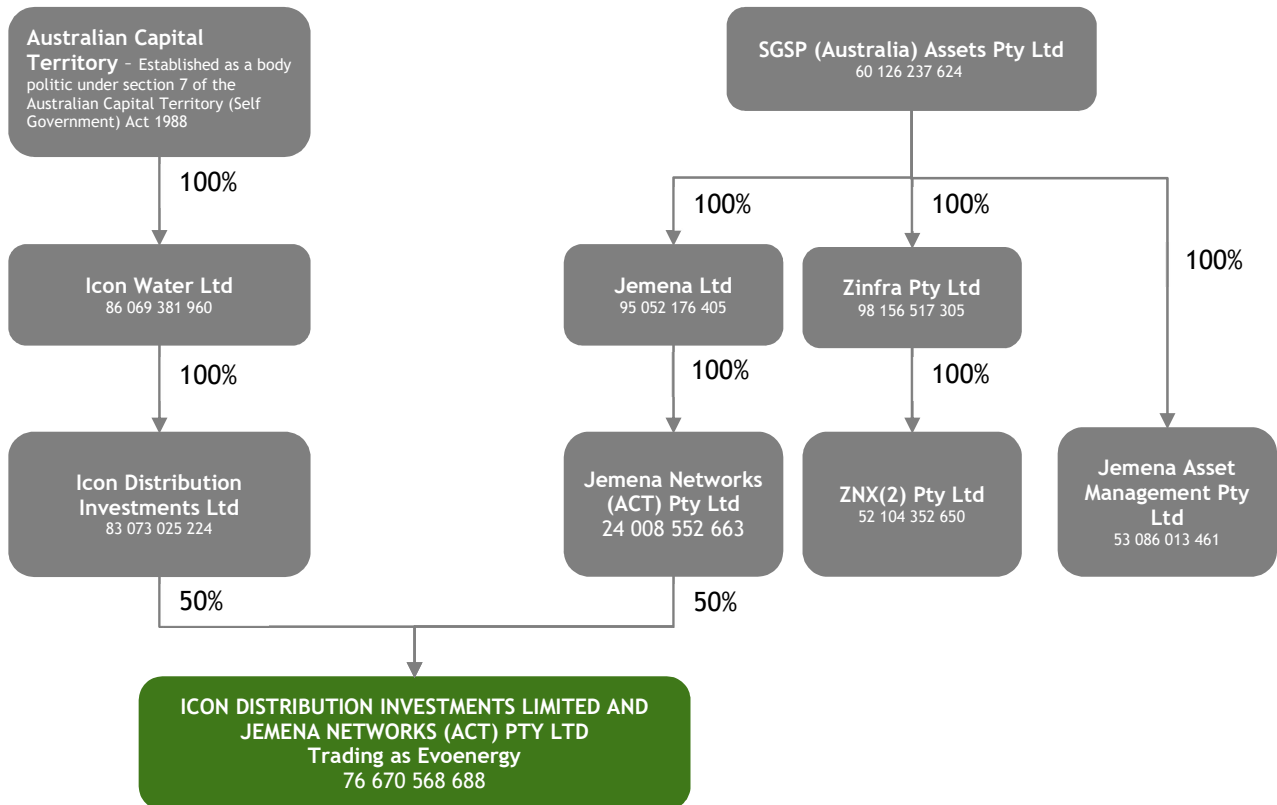
1.2.1 EVOENERGY OWNERSHIP

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

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

The partnership approach leverages Jemena's significant expertise in managing gas assets. Jemena builds, owns and manages a portfolio of major electricity, gas and water assets. With over 1,300 employees across the country, Jemena manages more than \$11 billion worth of Australian utilities assets and specialises in gas transmission and distribution as well as electricity distribution.

Figure 1-3: Evoenergy Distribution Partnership-Ownership Structure



1.3 OPERATING ENVIRONMENT

The operating environment and stakeholder expectations are crucial inputs into how Evoenergy operates and invests in the network. The Australian energy market is changing with the onset of technology and the increasing competitiveness of renewable energy resources. As a result, the way customers use natural gas and the gas network are evolving and will continue to do so over the coming decades.

We constantly monitor changes and emerging trends in the energy sector to help shape our investments and services. This allows Evoenergy to remain a commercial and competitive business that provides customers with products they want and value, and provides reasonable returns for shareholders seeking long term stable cashflows.

External factors that impact our business are:

- market trends and competitive position;
- consumer and community expectations;
- regulatory and legislative environments;
- expectations for return on investment; and
- innovation and technology.

The following sections summarise current and emerging trends across these categories. These trends inform our asset management activities.

1.3.1 MARKET TRENDS AND COMPETITIVE POSITION

Demand for natural gas in the ACT has been strong for many years, particularly within the residential market. Continued housing growth and ongoing residential high rise development, coupled with the natural gas' position as a competitive alternative to electricity, means the natural gas network provides an important and valued service to customers.

While natural gas remains commercially competitive and desired by customers, the economic advantage natural gas has over electricity in the residential sector has reduced in recent years. The following key trends are impacting the ACT gas market:

- **Increasing liquified natural gas (LNG) export demand** – A growing LNG export market continues to put pressure on east-coast supply and domestic gas wholesale prices.
- **Constrained supply** – Moratoriums on natural gas exploration in NSW and Victoria are putting pressure on domestic gas supplies.
- **Environmental policy** – The ACT Government has legislated for the ACT to achieve net zero greenhouse gas emissions across all sectors by 2045, with several interim targets.¹ At this time, the ACT is the only jurisdiction in Australia with such targets in legislation.
- **Increasing need to support renewables** – Gas plays an important role in providing inter-seasonal storage to support increasingly intermittent renewable electricity generation. There are increasing opportunities for renewable gas projects, gas powered electricity generation, co-generation and potential alternative growth initiatives.
- **Lower consumption per household** – Although overall demand is growing, residential gas customers are using less gas as households decrease in size, appliances become more efficient and some customers switch to non-gas appliances.
- **Building Regulations** – Changes to the Gas Network Boundary Code² and Gas Service and Installation Rules³ affecting both existing and new high-rise developments and shopping centres;
- **Estate Development Codes** – The previous mandatory requirements for gas connections in new suburbs has been removed and become optional, to encourage a shift from gas to electricity in new suburbs supporting all-electric builds and electric appliance upgrades.
- **Alternative energy sources** – Energy embedders are now active in the ACT and looking to push for their model to be used in new high-rise residential developments.

We factored in these emerging trends by adjusting forecast average consumption and new home connection rates into our investments and business decisions, and are investigating how natural gas, alternative fuels and the gas network might be used in the future.

¹ Climate Change and Greenhouse Gas Reduction Act 2010 (ACT)

² Refer Utilities (Technical Regulation) (Gas Network Boundary Code) Approval 2018

³ Refer ACT Gas Service & Installation Rules [<https://www.evoenergy.com.au/developers/service-and-installation-rules>]

1.3.2 CUSTOMER AND COMMUNITY EXPECTATIONS

Customers' needs are central to our investments and business decisions. We undertake regular customer and community engagement to understand how the way customers use our network is changing and what their future expectations are. Feedback from consumer engagement is used to:

- provide insights on customer expectations and their energy needs, which helps us develop product growth objectives;
- guide investment in our capabilities, process and systems; and
- assess the Evoenergy customers' experience.

The Evoenergy consumer engagement program for the 2021 Access Arrangement Proposal commenced in 2019 with a range of customers to understand what topics were important to them, and how we should shape our services and investment over the coming Access Arrangement period given the uncertainty of the gas network into the future. As well as directly seeking the views of customers, views of gas retailers and stakeholders such as customer advocate groups were also sought.

Consumer groups engaged:

- **Household Consumers** – there are over 150,000 residential consumers connected to the gas network and drive the majority of the gas demand;
- **Small-to-Medium Businesses** – make up a significant portion of the gas network's 3,000 commercial (and contract) customers with regular interactions during expo's and trade shows;
- **Major Customers** – although relatively small industrial sector in the Canberra region, changes to the gas network will have significant impact in this space;
- **Energy Consumer Reference Council (ECRC)** – Evoenergy's peak engagement body stakeholder, that is an independent forum providing representatives of the community;
- **Vulnerable Consumers** – Evoenergy partnered with ACT Council of Social Service (ACTCOSS) to support the delivery of a consumer advocate workshop and reach vulnerable communities through their membership base;
- **Government** – as Evoenergy's gas network extends into NSW, representatives of both the ACT and local NSW governments were briefed and involved in key stages of the plan development.
- **Energy Retailers** – there are many existing energy retailers in the ACT and NSW, and more emerging retailers entering the market, hence Evoenergy keeping them informed;
- **Culturally and Linguistically Diverse Community** – the community is becoming more culturally diverse and the consumer engagement process included nearly 30% of culturally diverse participants.

Key themes are summarised below⁴:

- Supporting environmental sustainability is a key driver for many consumers. This includes some support for halting the expansion of the gas network in new ACT suburbs;
- Consumers want to gain a better understanding of the costs associated with various future energy options and how to transition to them. Consumers want Evoenergy to undertake research and invest in what the future energy options are;

⁴ For more detail see Attachment 1 Consumer Engagement of the 2021 Access Arrangement Proposal.

- Consumers are concerned about the impacts that a transition away from natural gas would have on their appliances and costs that would be incurred in replacing or upgrading these appliances. They want continuing reliable services during the transition;
- Affordability remains a major concern for all consumers and they are seeking reduced network charges. These views were often coupled with feedback that consumers seek price stability and certainty related to their gas supply.
- Consumers advocate support for vulnerable consumers and want to be kept informed through all elements of a transition roadmap.

Despite the uncertainty surrounding natural gas over the longer term, consumers indicate they value natural gas and will continue to use it for the foreseeable future. While consumers believe steps should be taken to avoid significant price increases, they also support investment in the research, planning and transition towards a net zero emissions future, where prudent to do so.

The views we capture from customers are factored into our asset management activities. Customer feedback, along with other considerations such as asset performance, cost, risk and long-term sustainability, then inform the asset management strategies and ultimately the work program we deliver. Detail of our engagement approach and the findings from our most recent consumer engagement activities are provided in Attachment 1 of the 2021 Access Arrangement Proposal.

1.3.3 EXPECTATIONS FOR RETURN ON INVESTMENT

It is vital Evoenergy has a long-term sustainable cost structure and a pathway to achieving net zero greenhouse emissions in the ACT by 2045. This will ensure the business remains commercially viable and can attract the capital investment that will enable us to continue to invest in and operate the network safely and efficiently into the future.

Strategies for expenditure in the Evoenergy gas network include:

- shortening the investment horizon where supported by customers, with a focus on reducing capital expenditure and minimising Evoenergy's asset base;
- reducing cost intensity of current investments, and incorporating changes in design standards or deferring spend (where it is safe and prudent to do so).
- accelerating the recovery of new investment for some asset categories with the aim of reducing the stranding risk associated with the ACT Government's climate change strategy;
- pursuing innovative network solutions by transitioning to renewable gas such as using hydrogen, bio-methane and renewable methane.

1.3.4 INNOVATION AND TECHNOLOGY

Australia is moving towards a low carbon future and the ACT is the first state or territory to legislate achieving net zero greenhouse gas emissions across all sectors by 2045. Digital technologies also provide customers access to more data and control over their energy usage. With this in mind, two of the key strategies we are pursuing are summarised below:

- **Innovating for low carbon gas** – Evoenergy is looking into opportunities to position gas as a viable energy source in the low carbon future and believe that ‘renewable gas’, supplied over the existing gas network, could play an important role in achieving the required net zero emissions. Evoenergy is currently working in partnership with the Canberra Institute of Technology (CIT), the Australian National University (ANU) and Deakin University to research and test the use of hydrogen and bio-methane in the existing gas network. Other network distributors around Australia, such as the Australian Gas Infrastructure Group and Jemena, are investing in large-scale hydrogen and bio-methane projects and sharing their research findings—all aimed at transforming Australia’s energy economy in the shortest possible timeframe.
- **Establishing customer-focused technologies** – Access to energy usage data and the physical meters themselves is one of the key areas Jemena on behalf of Evoenergy, is seeking to apply technology to improve the customers experience. For example, Evoenergy is considering smart metering technology to allow remote data acquisition, and providing customers access to their data via a smart app.

1.3.5 REGULATORY AND LEGISLATIVE ENVIRONMENT

Evoenergy is governed by a range of technical, safety, economic and environmental regulations and legislative instruments. It must also comply with its gas distribution licence requirements. Regulatory compliance is an important investment driver, not only from a safety and operational excellence perspective, but also in terms of reputational risk. Compliance with various regulatory obligations has a direct impact on corporate reputation and our ability to attract investment. We therefore factor shareholder’s compliance expectations into our reputational risk threshold and asset management strategies accordingly.

An overview of the key regulatory obligations affecting investment in the ACT gas network is provided below.

- **Technical and safety** – The ACT gas network is governed by both ACT and NSW technical regulations. The ACT Environment and Planning Directorate (**EPD**) regulate operation and maintenance of the gas distribution network in the ACT and empower the EPD to regulate technical compliance to the Utilities Act 2000 and Utilities (Technical Regulation) Act 2014.

The NSW Department of Industry (**DPI**) regulates the design, construction, operation and maintenance of the gas distribution network and transmission pipelines in NSW. It empowers the DPI to regulate technical compliance to the Gas Supply Act 1996, Gas Supply Regulation 2013, Pipelines Act 1967 and Pipelines Regulation 2013.

These regulations impose a significant number of obligations on Evoenergy relating to metering, asset safety, compliance and reporting. To remain commercially competitive, we must continue exploring opportunities to meet the minimum specifications and standards without compromising economic, environmental or customer requirements. We will work within the safety and technical framework to reduce costs to customers through efficient asset lifecycle management.

- **Economic** – Evoenergy operates under the National Gas Law (**NGL**) and the National Gas Rules (**NGR**). Satisfaction of the National Gas Objective in the NGL, and the NGR tests for conforming capital expenditure under rule 79 and efficient operating expenditure under rule 91, are key considerations in all its investment planning.
- **Legislative Compliance** – Compliance with legislation is managed using a compliance management system operated by the Asset Risk & Assurance Group. The compliance management system comprises of Safety and Operating Planning, Pipeline Management Plan, regulatory audit planning and implementation, internal audit planning and assurance activities, audit action tracking, regulatory reporting and compliance and risk management.

2. EVOENERGY BUSINESS STRATEGY AND OBJECTIVES

2.1 EVOENERGY BUSINESS STRATEGY

The ActewAGL Joint Venture has developed a Net Zero by 2045 Strategy to guide the partnership including Evoenergy towards a sustainable, net zero carbon emissions future in the ACT by 2045. In turn, Evoenergy's business strategy is to prudently prepare and progress a customer centric, net zero transition road map for our energy networks that delivers safe, reliable and affordable energy.

2.2 EVOENERGY'S OBJECTIVES

The Evoenergy Business Objectives are:

- To deliver safe, reliable and affordable gas distribution services;
- To work our existing network smarter and harder;
- To deliver better outcomes for our customers; and
- To proactively be part of future energy solutions.

3. ASSET MANAGEMENT SYSTEM OVERVIEW

As outlined previously, Evoenergy has engaged Jemena to provide management and operational services for the gas network. As part of this engagement, Jemena develops in consultation with Evoenergy an Asset Management Plan (AMP) and supporting Asset Class Strategies (ACS), utilising Jemena’s asset management system (**AMS**). The AMS describes the inter-linked processes that support decision making throughout the asset life cycle. The AMS is the framework for our structured and systematic asset management approach. The AMS creates line of sight from Evoenergy’s Objectives, asset class strategies to the program of works detailed in Evoenergy’s Access Arrangement Proposal.

We take direction from the Evoenergy Business Plan and combine it with feedback and insights from customer expectations. These inform our asset objectives and shape how we aim to manage the network in an evolving energy market. Asset objectives are then used to develop asset class strategies, which define how we will manage each type of asset in the ACT Gas Network.

ISO 55000 accreditation

Our AMS has been externally audited and accredited as conforming to the requirements outlined in the international standard ISO 55000. The ISO 55000 series of standards (55000, 55001 and 55002) defines an asset as an item, thing or entity that has potential or actual value to an organisation. Asset management is defined as the co-ordinated activity of an organisation to realise value from assets.

In keeping with ISO 55000, our asset management approach focuses on the value the asset can provide to Evoenergy and its customers. The value of an asset (which can be tangible or intangible, financial or non-financial and include risks and liabilities) is defined by the organisation (Evoenergy) and its stakeholders (customers, investors, shareholders).

Stakeholders can have very different and potentially conflicting expectations. We therefore make trade-offs to maximise the value of assets within the bounds of customer service performance, technical performance, funding availability, and regulatory constraints. These trade-offs include the difference between short and long-term goals, and, the balance between risk, cost and performance. We also consider the conflict between procurement costs for new capital items versus ongoing operational and maintenance costs.

As per the requirements of ISO 55000, we also build continual improvement practices into our AMS and decision-making process. We do this by regularly reviewing the asset data available to us and identifying how we can improve the quality of our data, the systems that hold our data, and the way we apply that data in our investment decisions. As a result, we are continually refining and enhancing our asset management capabilities, which in turn leads to more fully informed and prudent expenditure forecasts.

The AMS is a consolidation of key internal documents, drafted and presented in a way that can be used by external stakeholders to understand how our capital and operating plans conform to our obligations and requirements.

Our AMS is designed on the principles of continuous improvement and adopts the method of Plan, Do, Check and Act (see Table 3–1). This is in line with good asset management practice as defined in ISO 55000.

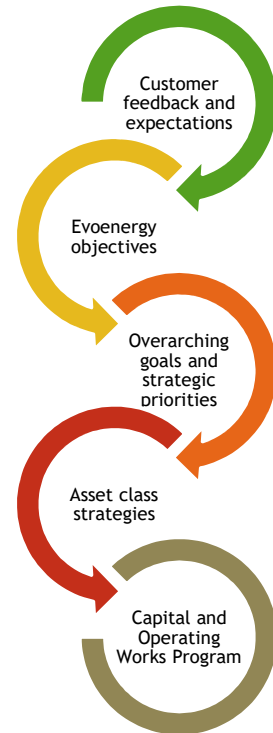


Table 3-1: Asset management method

Phase	Description
Plan	Two-year, seven-year and 10-year capital and expenditure horizons are developed based on assessment of performance, reliability, condition, risk and cost.
Do	Projects and programs are approved in accordance to investment planning and governance processes. Approved works are executed in accordance with approved budgets and controlled and monitored using formal project management methodology.
Check	Key performance indicators are reviewed monthly and reported to Evoenergy and Jemena senior management.
Act	Asset management issues and risks are assessed and prioritised to inform the scope of projects and programs for the development of the next iteration of the AMP/COWP and various asset class strategies.

In addition to ISO 55000, Jemena's systems for safety, environmental, quality and risk management comply with good industry practice. We maintain accreditations for AS/NZS 4801 Occupational Health and Safety Management Systems, ISO 14001:2015 Environmental management systems, ISO 9001:2015 Quality Management Systems, and AS/NZS ISO 31000:2009 Risk Management Standard.

Compliance with good industry practice helps confirm that our asset management activities achieve a high standard and provides assurance that expenditure programs are efficient.

3.1 ASSET MANAGEMENT POLICY

Jemena produces several key policy statement documents, one of which is the Asset Management Policy. This document provides a statement about Jemena's intentions and the principals for asset management as they are applied throughout the business and on behalf of Evoenergy.

3.2 ASSET MANAGEMENT PLAN

The AMP provides strategic direction for managing the ACT Gas Network assets to deliver requirements. It details the ACT Gas Network's strategy and objectives, expenditure drivers, and network service levels (involving reliability, customer service and quality), which considers the existing performance and condition of the asset management system and assets.

The AMP establishes the linkages between Evoenergy's requirements, our Asset Management Policy and our Asset Class Strategies. It provides a guide to the ACT Gas Network's strategies, which consider existing asset utilisation, demand growth, new customer connections, existing asset performance and condition management, asset maintenance, refurbishment and replacement, and network safety and environmental risk management.

The AMP aims to:

- Identify the ACT Gas Network's strategies and objectives based on the overarching business drivers, the Evoenergy's requirements and compliance requirements; and
- Provide governance within the business by providing the relevant plans with strategic direction.

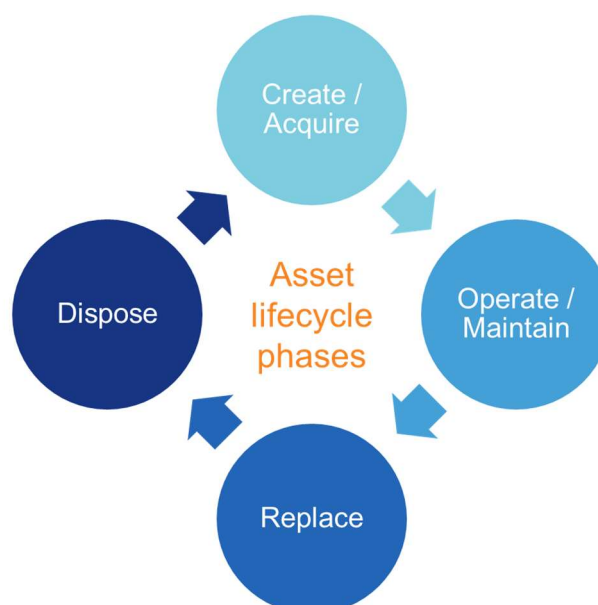
The AMP is used to inform key stakeholders about the asset management strategy for the ACT Gas Network and also facilitate the development of:

- Asset Class Strategies;
- Network Development Strategies; and
- The Capital and Operational Work Plan.

3.3 ASSET LIFECYCLE ACTIVITIES

We take a whole-of-lifecycle approach to managing assets, modifying and refining the way we manage each asset depending on the lifecycle phase the asset is in. The phases of the asset lifecycle are illustrated in Figure 3–1 and described below.

Figure 3-1: Asset lifecycle phases



- **Create/Acquire** – asset creation/acquisition involves ensuring all the specification, design, construction, procurement, commissioning and handover activities have been planned and executed, resulting in a new asset. This is typically the phase where asset installation and capacity augmentation projects are developed.
- **Operate/Maintain** – assets are used in the business to produce a range of outputs within strict quality, environmental and safety requirements and obligations. As assets deteriorate or fail, maintenance activities are conducted to keep the asset at – or bring it back – to desired levels of operational performance. Maintenance is conducted in full consideration of the asset life cycle to ensure excessive maintenance spend is avoided.
- **Replacement** – once maintenance activities are no longer sufficient to keep assets operating within an acceptable performance level or tolerable risk threshold, replacement of that asset (if the asset is still required) is considered. Like-for-like asset replacement or substitutes are considered as part of options analysis. Efficiency savings may also be an asset replacement trigger.
- **Disposal:** At the end of a project, or in the case of worn-out assets at the end of their lives, assets are disposed of safely, with no damage to the environment or to the communities in which Evoenergy operates.

We manage assets throughout their lifecycle in accordance with the following principles:

- define and approve asset solutions based on whole-of life costs;
- select, create, and commission assets that are fit for purpose;
- modify or upgrade assets to increase capability and/or reduce lifecycle costs;
- operate assets to sustainable levels of performance, cost and risk;
- maintain asset costs effectively to defined performance levels;
- monitor assets to maintain their expected levels of service;
- dispose of assets in a sustainable and compliant manner;
- comply with any statutory and regulatory asset management requirements;
- focus on the continuous improvement of asset and AMS performance; and
- identify, assess, and manage asset-related risk.

4. GOVERNANCE

Governance arrangements help us deliver services efficiently and make sure we comply with legal and regulatory obligations. They ensure the regulated and unregulated parts of our business remain disparate, with no cross-subsidisation. Our governance framework, and in particular our investment framework, helps ensure our investments are consistent with the requirements of the NGR, in that:

...investments are consistent with those of a prudent service provider, acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.⁵

The Investment Framework helps us prioritise investments. The framework offers a consistent method of analysing investment options against four criteria: risk mitigation, customer benefits, strategic benefits and financial benefits.

Key questions posed by the Investment Framework are:

- Risk mitigation – what regulatory, safety, operational or other risks identified could be reduced?
- Customer benefits – what are the benefits for our customers?
- Strategic benefits – how does it support the Evoenergy Business Plan?
- Financial benefits – what are the financial impacts?

In terms of workflow, the four key components of the investment framework are:

- **Set capex program and budget** – the overall capex program and budget, taking into consideration the current business plan, market, financial and asset business strategies;
- **Project evaluation** – project initiators evaluate new investment options using defined criteria including risk mitigation, customer, strategic and financial benefits. They are also assessed against future potential market scenarios to help determine if we should progress the option any further;
- **Prioritise asset investment programs** – asset investment options are reviewed, prioritised and where appropriate; and
- **Prioritise corporate investment programs** – corporate investment options are reviewed, prioritised and where appropriate, approved by a prioritisation committee.

By taking this consistent approach to investment (and asset creation), we can help ensure our capex program is well balanced and subject to sufficient top-down and bottom-up rigour, which in turn promotes prudent investment decisions.

⁵ NGR 79.

4.1 DEVELOPING ASSET MANAGEMENT ACTIVITIES AND WORK PROGRAMS

We review and update asset strategies annually to reflect any changes to the Evoenergy Business Plan and external (customer or market-driven) factors. This annual review considers:

- changes arising from the asset class strategies;
- responsibility for developing and implementing the asset class strategies and their continual improvement, including resource requirements;
- input and review processes, which stakeholders need to be considered, and what information is required for which stakeholders;
- delivery of the current program of work and any slippages or potential reprioritisation;
- interdependencies with other asset management strategies;
- levels of resources and funding available; and
- other matters, such as applicable standards or codes.

Expenditure forecasts are reviewed and approved through our budgeting process, and ultimately endorsed by the Board.

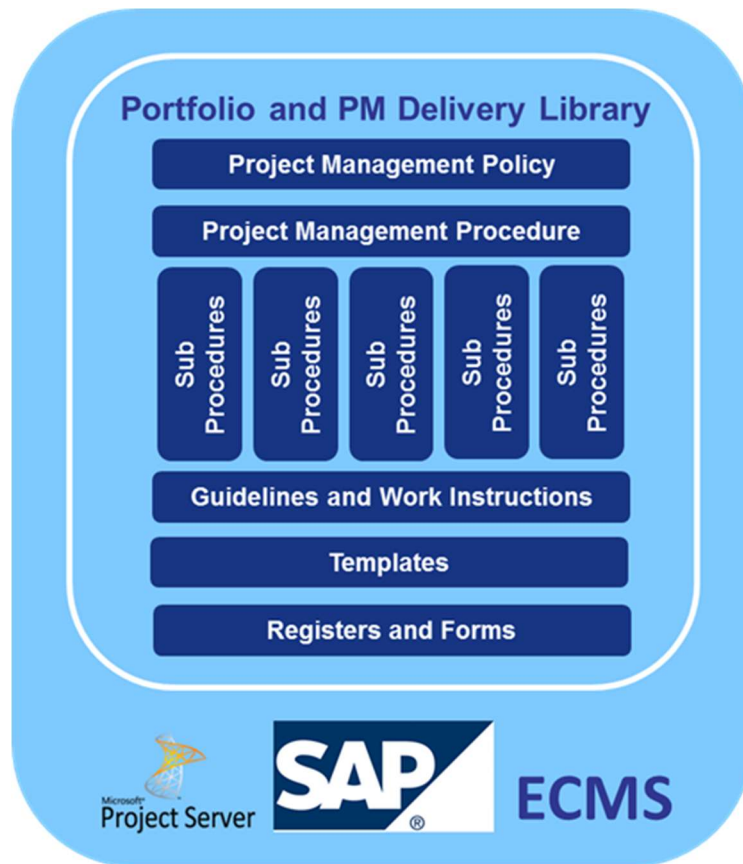
4.2 PROJECT MANAGEMENT METHODOLOGY

We adopt a standardised approach to project management across all our asset businesses. We use SAP as the repository for our project management documentation suite. This approach helps ensure a consistent level of quality and cost control when delivering projects involving Evoenergy assets.

Our Project Management Methodology (**PMM**) framework, illustrated in

Figure 4-1, consists of Jemena policies, processes, procedures, templates and tools to support efficient and effective project delivery. We adapt the PMM to accommodate projects of varying complexity.

Figure 4-1: Jemena Project Management Methodology framework



The PMM has a stage-gate process to ensure investment scrutiny and promote efficient outcomes. All projects are controlled through the sequential gate process, which is summarised in Figure 4-2 and a more detailed outline is provided in Table 4-1.

Figure 4-2: Investment Framework Governance Gates

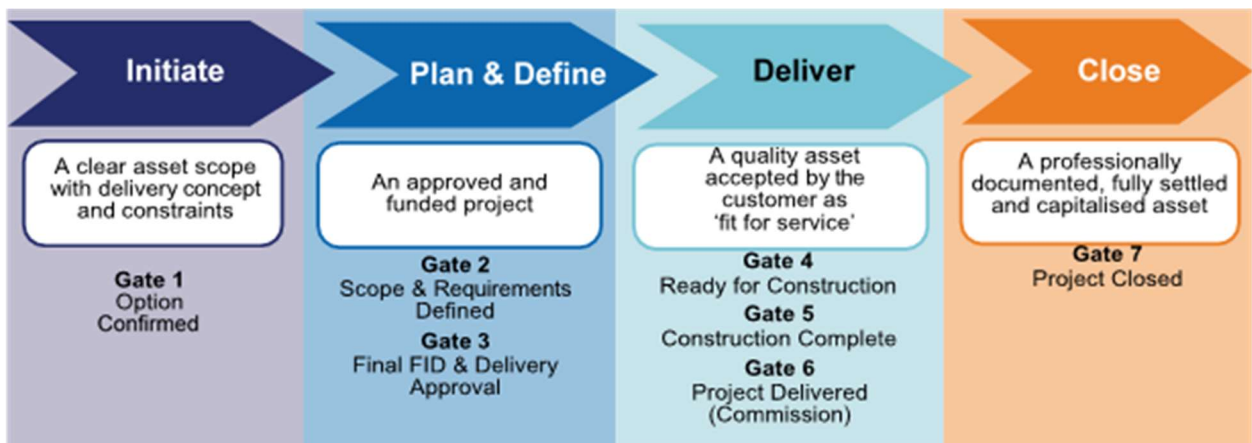


Table 4-1: PMM stage gate process and requirements

Stage gate	Description	Requirement to pass PMM gate
Project mandate	Pre gate 1 – initial options development	Issue is identified and information gathered.
Gate 1	Option confirmed	The requirement to pass gate 1 is to establish project requirements and agree on the preferred delivery option. This includes completion of an asset scope with delivery concepts and constraints.
Gate 2	Scope and requirements defined	The requirement to pass gate 2 is to conduct the relevant Front End Engineering Design (FEED) including scope feasibility confirmation and solution design. An Additional Service Request (ASR) is an approval mechanism used to seek approval of funds from Evoenergy for Jemena to continue to develop project estimates such as developing documentation or manuals and purchase of long lead items.
Gate 3	Final financial investment decision and delivery approved	<p>The requirement to pass gate 3 is to develop designs, costings and project delivery plans to support the scope. This also involves obtaining stakeholder acceptance of designs and the cost estimate.</p> <p>The key output from gate 3 is the approved Business case or customer offer. The approval of these documents will identify the preferred option to be pursued and the scope of how the work will be delivered. Business case approval within Jemena and Evoenergy is via the relevant Delegated Financial Authority Policy.</p>
Gate 4	Ready for construction	The requirement to pass gate 4 is to finalise designs, costings and project plans to align with the scope and budget. This involves establishing project management, administration and logistics.
Gate 5	Construction complete	<p>The requirement to pass gate 5 is to complete construction of the project, including testing. Site demobilisation will commence at this point in time.</p> <p>Key activities are delivery, monitoring and reporting of the construction work. The key outcome of the gate 5 review process is that all relevant documentation has been adhered to and that the project is ready for commissioning and handover.</p>
Gate 6	Project delivered (commissioned)	<p>The requirement to pass gate 6 is to commission the asset or equipment via placing into service and handing it over to the customer. The customer must confirm that all the necessary gate requirements have been satisfied during the delivery phase of the project.</p> <p>The key deliverable is the commissioning and handover of the project. The approval of these documents will deem the project to be commissioned, recognising that project finalisation activities will continue until the project is formally closed at gate 7.</p>
Gate 7	Project closed	The requirement to pass gate 7 is to confirm that all the necessary gate requirements have been satisfied and to verify that the project has been formally closed. Key deliverables include the financial settlement of the project, post implementation review and a Client Acceptance Report (CAR) that confirms Evoenergy's acceptance and delivery of the project from Jemena.

4.3 PROJECT AND PROGRAM COST ESTIMATING PROCESS

In delivering cost estimates for Evoenergy, Jemena uses four key inputs to estimate project costs:

1. Actual costs of completed projects that are of a similar scope;
2. Cost estimations developed by providing a design brief and functional scope which is developed by project managers, engineering and other relevant personnel;
3. Quotations from external service providers; and
4. Industry standard benchmarks.

During the development of the Capital and Operating Works Program (**COWP**), for large non-routine/more complex projects, specific project estimates are developed. The estimated costs are developed by providing a design brief and functional scope which is developed by project managers, engineering and other relevant personnel. For routine or less complex projects, estimated costs are developed off previous year costs. Some of the projects are costed by obtaining quotations from external service providers (however they are mainly for projects that fall within the COWP).

These approaches ensure that various alternative options are investigated with the same rigour and transparency, in order to arrive at a recommendation for the preferred investment decision.

To maximise efficiency of resources, Jemena tries to align projects at the same location or during the same outage periods or during the same duration of time.

Jemena and Evoenergy are committed to early and rigorous community and stakeholder engagement to provide transparency and to reinforce the need for and benefits of the proposed new projects. The Capital & Operational Works Program will be continuously upgraded to be optimised using the risk ranking process and input from the community as appropriate.

4.4 DELIVERABILITY

When delivering works, we aim to keep our staff, suppliers and the public safe. This is our number one priority. While our aim is always to complete work on time and within budget, we will not compromise safety.

Our capex and opex work programs are assessed against available resources as part of the investment approvals process. This is done together with our maintenance programs to identify opportunities to align similar and sequential works in the same area, which can reduce customer disruption and potentially result in lower costs.

When we assess our works programs, we consider two main constraints:

- deliverability – we adjust workloads by asset class to account for potential deliverability constraints. This allows us allocate resources across portfolios more effectively; and
- available resources – we forecast the resource requirements of the works plan and adjust it as necessary to ensure efficient use of internal capacity and available funding.

For more information please refer to JEM PMM-PR-2542 Jemena Infrastructure Cost Estimation Methodology.

5. SAFETY

Jemena and Evoenergy do not compromise on the safety of our customers, the public, or our employees. We are committed to ensuring all operations are conducted in worksites that are safe from harm. Safety is the most important consideration when developing asset management strategies and associated capital investment forecasts.

We take a risk-based approach to asset management, and wherever possible ensure we are managing safety risk to as low as reasonably practicable (**ALARP**), at the lowest sustainable cost. We will not compromise safety over cost or service performance, and are committed to maintaining and replacing risky assets within timeframes that minimise the risk of safety or supply incidents.

5.1 HEALTH AND SAFETY (EMPLOYEES & CONTRACTORS)

We apply the following key principles in the management of the health and safety performance of employees and contractors:

- every contractor must complete a gas network induction and have a signed contract that includes provisions that cover the currency of mandatory training and occupational health and safety (**OHS**);
- every person employed by a contractor that works on the gas network must have suitable training for the task and must have completed an induction; and
- audits are conducted to ensure compliance with industry codes and regulations.

We are committed to supporting employee health and wellbeing. Our work plan for health and wellbeing focuses on building resilience and looking at what we can do to embed healthier ways of working into day-to-day business practices.

5.1.1 REGULATORY OBLIGATIONS

Legislative obligations and internal requirements around employee and contractor health and safety are managed by line managers and supported by the HSEQ Team. Applicable legislation in this area is ACT Work Health and Safety Act 2011 and Work Health and Safety Regulation 2011 both of which are incorporated into the Jemena standards, processes and related requirements outlined in the Jemena Health, Safety and Environment Management System.

5.2 ASSET AND PUBLIC SAFETY

This section is relevant to the AMP in that all relevant lifecycle activities are designed to ensure compliance to the health and safety system and covers all Jemena employees and contractors working in/for Evoenergy and Jemena and discusses the work of the HSEQ Group and their activities around health and safety.

Asset and public safety performance for Evoenergy is monitored by Jemena's Asset and Public Safety committee.

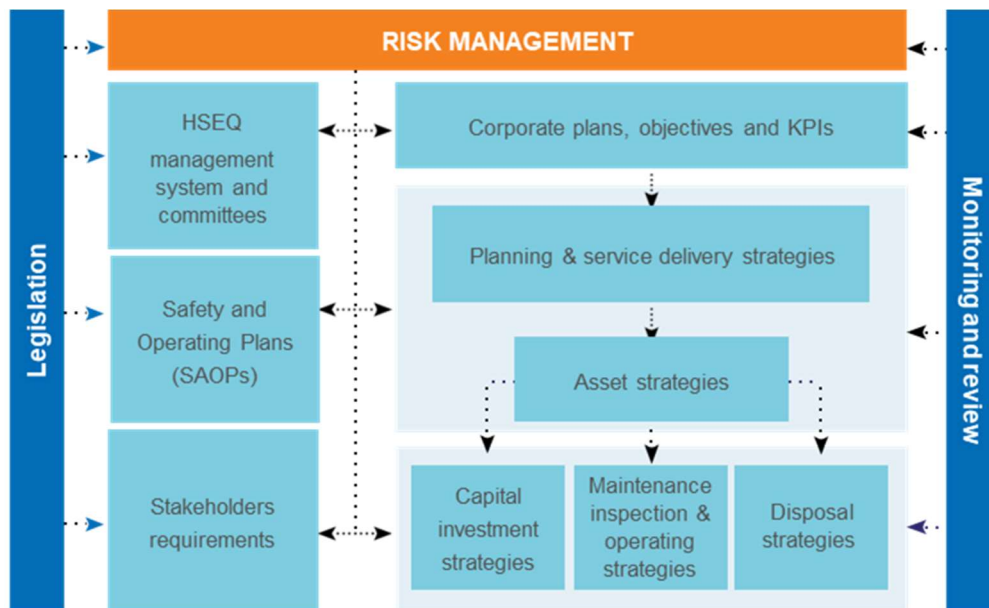
The committee will assure appropriate governance and management review over the gas asset safety cases is performed efficiently and effectively and as far as possible support 'One Jemena' method or procedure for completing common tasks.

5.3 SAFETY MANAGEMENT SYSTEM

Jemena has a detailed safety management system that describes the processes required to ensure Jemena focuses on critical HSE needs, forecasts and allocation of resources. The safety management system sets the direction for HSEQ activities and consistently delivers improved HSEQ performance across the Evoenergy gas distribution business.

Figure 5-1 illustrates the interrelationship between legislative requirements, risk management and our asset management strategies.

Figure 5-1: Safety management system



5.3.1 SAFETY MANAGEMENT SYSTEM COMMITTEES

An important component of our safety management system are the various committees, which are designed to provide oversight of our asset management practices, while facilitating engagement with key stakeholders such as shareholders and the technical regulator. The responsibilities of our key safety committees are summarised below.

- Asset Management Review Committee (**AMSRC**) – The AMSRC has responsibility for the asset management system across Jemena with the purpose of strengthening the Jemena asset management system by providing governance, alignment and review across Jemena.
- Asset Public Safety Committee (**APSC**) – The APSC monitors and reports on the effectiveness of strategies and practices to manage risks associated with the safe operation across Jemena’s portfolio of asset businesses, including Evoenergy.
- Gas Safety Management Review Committee (**GSMRC**) – The GSMRC assists the APSC by monitoring and reporting on the effectiveness of strategies and practices to manage risks associated with the safe operation of Jemena’s and Evoenergy’s gas network and pipeline assets. The GSMRC:
 - monitors the performance of gas network asset and public safety-related KPIs;
 - monitors the health of the safety management system and strength of controls as they apply to the gas network;

- makes decisions on the operation and structure of the safety management system as it applies to the gas network;
- responds to regulatory initiatives or directives;
- reviews the impact of legislative changes affecting the safety requirements of the gas network;
- reviews safety audit recommendations;
- reviews the program of work for audits, safety management studies and formal safety assessments (**FSAs**); and
- reviews incidents and incident investigations on the gas network and ensures earnings are captured and embedded; and
- drives continual improvement by critiquing the quality of data and practices available to address risk associated with the gas network.
- Standardisation committees – The AS 2885 Assets Technical Code Committee (**AS 2885 ATCC**) and the AS 4645 Assets Technical Code Committee (**AS 4645 ATCC**) each focus on implementing the requirements of their respective standards. The standardisation committees provide oversight on operational excellence across all gas infrastructure assets governed by the respective suite of standards for gas pipelines and facilities. Each committee is responsible for developing, aligning and implementing good practice and consistent procedures across the business.

5.3.2 SAFETY AND OPERATING PLAN

In the ACT jurisdiction, under the Gas Safety and Operating Plan Code 2000, it is a requirement to perform periodical audits on the SAOP by a nominated competent and independent auditor with audit reports submitted to the ACT's UTR Group.

In the NSW jurisdiction under the Gas Supply (Safety and Network Management) Regulation 2013 and the Pipelines Regulation 2013, it is a requirement to perform periodical audits on the Safety Case by nominated competent and independent auditor with audit reports submitted to the Department of Planning & Environment.

6. ENVIRONMENT

The Jemena Environmental Management System (**EMS**) provides the framework to manage Evoenergy's environmental risks. Environmental risks are managed through the individual asset Environmental Management Plan (**EMP**). In addition to EMPs, we have a range of environmental procedures that must be complied with when undertaking work for Jemena.

Our environmental objectives are to:

- be recognised as an environmentally responsible company;
- demonstrate responsible and diligent governance of operations in the environment in which we operate; and
- limit adverse environmental effects in providing for the efficient, safe, and reliable distribution and supply of energy and energy related services.

Our drivers for environmental management are to:

- comply with all applicable laws and regulations;
- safeguard the environment for communities within which Jemena operates through prevention of environmental impact and the considered risk management of all activities;
- continuously improve the EMS;
- identify innovative environmental solutions for services delivered;
- ensure all significant environmental hazards and risks are identified, assessed and controlled; and
- ensure employees and contractors understand their responsibility for the environmental performance of their activities.

6.1 JEMENA ENVIRONMENTAL POLICY

Jemena maintains a company-wide Environmental Policy, which outlines our goals and responsibilities for environmental performance. We are committed to reducing our environmental footprint. Our policy promotes reducing, recycling and reusing materials wherever we can, and the protection and revitalisation of natural habitats around our operations. Our EMS is consistent with the principles of ISO 14001, meaning we monitor and aim to reduce our environmental footprint and continuously improve our performance.

6.2 ENVIRONMENTAL MANAGEMENT PLANS

Operational Environmental Management Plans (**OEMPs**) have been developed to support our environmental performance. The plans help ensure activities are undertaken consistently and with minimal impact on the environment.

The OEMP is prepared with reference to Jemena procedures and the Australian Pipeline and Gas Association **APGA's** Code of Environmental Practice – Onshore Pipelines (as revised October 2013). The OEMP is updated every three years and contains the following information:

- the Jemena Environmental Policy;
- environmental performance objectives;
- divisional structure and responsibility;
- environmental risk (aspects and impacts) register, environmental procedures and environmental mitigation measures;
- legal requirements and the environmental assessment process;
- incident and emergency procedures;
- monitoring, inspection and auditing regimes;
- reporting processes;
- rectification/improvement processes; and
- processes for the dissemination of information.

All personnel associated with the ACT gas distribution network are required to understand and adhere to environmental requirements and their responsibilities in the OEMP.

6.2.1 IMPACT ASSESSMENTS

Environmental assessments are undertaken during the planning stages of new projects. They may also be performed if there are changes to operations that may impact on the environment.

The level of assessment is dependent upon the nature of the activities and their potential impact on the environment i.e. Environmental Impact Assessment (EIA) or Review of Environmental Factors (REF) for NSW or Code, Merit or Impact Tract assessment for the ACT. Generally, an environmental assessment covers the impact of our activities, assets and materials on the environment, as well as the need for environmental approvals, permits or licences. Mitigation measures are identified in construction environmental management plans and are implemented prior to works commencing.

6.3 ENVIRONMENTAL PERFORMANCE

Environmental performance criteria for ACT Gas Network is detailed in Section 1.3 of the Evoenergy OEMP.

6.3.1 REGULATORY REPORTING

6.3.1.1 *National Greenhouse and Energy Reporting Scheme*

The NGER Act is a Federal Government regulatory program which enforces mandatory reporting of industry greenhouse gas (GHG) emissions and energy data. Evoenergy gas emissions predominately result from fugitive emissions, leakage of natural gas from pipelines. NGER reporting is carried out by the Evoenergy Environment Team for Icon Water. The data collected is also provided to Jemena for reporting in the SGSPAA NGER submission to the Clean Energy Regulator due to neither Icon Water or Jemena having greater operational control.

6.3.1.2 *Safeguard mechanism*

The safeguard mechanism is a component of the Commonwealth Department of the Environment and Energy's Direct Action Plan to cut emissions to five per cent below 2000 levels by 2020 and to 26 to 28 per cent below

2005 levels by 2030. It is designed to prevent companies from allowing their emissions to creep up in the absence of a price on carbon. The safeguard mechanism took effect from July 2016 and is set at the highest emissions level for a facility over the last five years. This mechanism applies to facilities emitting over 100,000 tCO₂e. As the ACT Gas Network has no facilities over this threshold so it is not captured.

6.3.2 ENVIRONMENTAL PERFORMANCE

Corporate environmental objectives and targets have been established in the OEMP. An example of these objectives and targets is detailed in Table 6–1

Table 6-1: Corporate environmental objectives and targets

Area	Objective	Target
Compliance	To conduct operational activities in compliance with environmental legislation and licence requirements.	Receive no penalties for non-compliance on an annual basis.
Environmental management system	Operational personnel to be involved in the review and improvement of the Environmental Management System.	A hierarchy of EMS documentation to be prepared with a schedule of documents to reviewed and updated bi-annually.
Environmental training	Jemena personnel who perform operational activities on gas infrastructure to receive appropriate environmental training.	Operational personnel to receive environmental training periodically.
Environmental performance	Environmental performance indicators relevant to and reflective of operational activities in the natural environment will be developed and reported on.	Monthly reporting of environmental performance indicators with an annual target of 100% performance.
Environmental incidents	To minimise the occurrence and severity of environmental incidents during operational activities.	All environmental incidents to be recorded in EMS and investigated appropriately.

In addition to these corporate asset targets, there are environmental performance indexes (**EPis**) which are tracked monthly. EPis drive environmental performance improvement at an asset level.

7. RISK

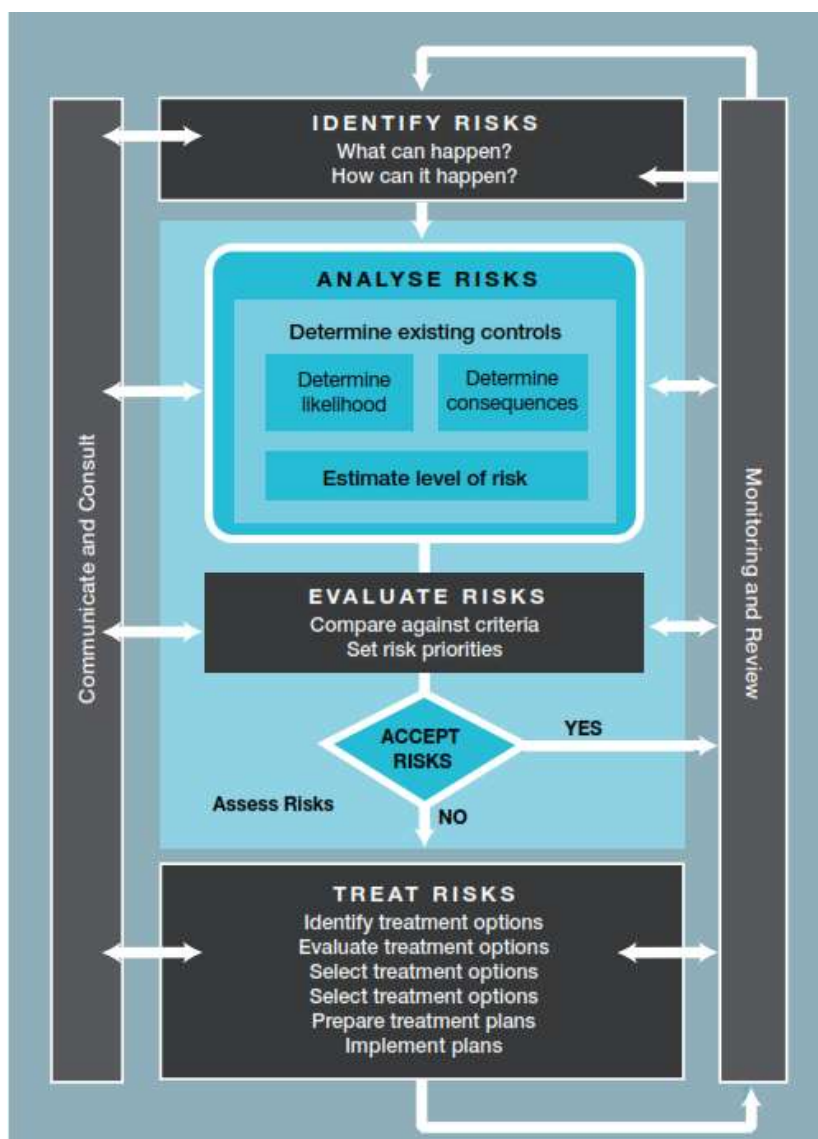
All asset management decisions are linked, in various degrees, to managing risk. For a gas distributor this includes safety risks, avoiding capacity constraints, managing asset failure risk through maintenance and renewals, or managing procurement and delivery to ensure financial prudence.

We recognise risk management is a fundamental driver of effective corporate governance and operational efficiency. We adopt a proactive approach to risk management and build consideration of risk into our day-to-day activities in order to:

- enhance the likelihood of achieving Evoenergy's business objectives, hence improving business performance;
- provide a source of competitive advantage;
- provide a structured basis for strategic planning;
- enhance the effectiveness and efficiency of Evoenergy's operations;
- encourage proactive rather than reactive management;
- improve the quality of decision making throughout Jemena and Evoenergy;
- protect Jemena's and Evoenergy's reputation, value and integrity;
- aid compliance with relevant legal and regulatory requirements and international norms;
- safeguard the network assets, personnel, finance and property (and the assets, personnel and property of the assets managed under contract); and
- safeguard our customers and the community.

To promote effective risk management across the organisation, we have a Risk Management Policy and Risk Management Manual. Both documents are approved by the Risk, Health, Safety and Environment Committee, which is a sub-committee of the Board. Our risk management approach (as outlined in Figure 7-1) is consistent with the risk management standard, AS/NZS ISO 31000:2009.

Figure 7-1: Jemena risk management approach



The key elements of our risk management approach are summarised below.

- **Identify risks** – we identify and document asset risks as part of FSAs required by AS 4645 and AS 2885. Risks are captured in various asset class risk registers, and managed/monitored via the Jemena Compliance and Risk System **JCARS**.
- **Analyse risks** – our risk analysis includes considering what risk controls are in place and the consequence and likelihood of risks eventuating. We apply this qualitative risk assessment using the matrices in the Jemena Group Risk Management Manual.
- **Evaluate risk** – where a risk is assessed as extreme or high, we develop action plans to reduce risk to intermediate or lower. Intermediate risk must be assessed to investigate whether there are any reasonably practicable measures available to reduce the likelihood or consequence, thereby reducing the risk to low or negligible. Where no reasonable measures can be identified, a risk may be deemed to be ALARP. A risk ranked as low or negligible is tolerable and there is no requirement to reduce risk further.

- **Treat risks** – where risk action plans require implementation of capital projects, we assess these plans against risk priorities, availability of capital funds, resource availability, deliverability, project management and timing. Our project and program cost estimating processes are designed to ensure options analysis is undertaken, and that the solution with the lowest sustainable cost is selected.
- **Monitor and review** – to ensure risk management and asset lifecycle processes are robust and being adhered to by the business, Jemena has a suite of internal and external reporting and audit processes. This helps evaluate the effectiveness of the overall asset management approach and allows improvements to be identified and implemented.

7.1 MANAGING RISK TO ALARP

We recognise complete elimination of risks is neither practical nor gives the best outcome to the business and customers. However, it remains important for risks to be identified, evaluated and managed to ALARP. The first stage of ALARP assessment is to identify additional or alternative controls that could be applied to further reduce risk. The hierarchy of effectiveness of controls is considered as part of this process. Where additional controls are identified, the feasibility of these options is assessed in terms of practicability and risk reduction benefit.

An intermediate risk may be deemed ALARP when no additional reasonable controls have been identified, or assessment of potential additional controls has deemed them unreasonable (i.e. the cost is grossly disproportionate to the benefit gained).

7.2 RISK REPORTING

We make a conscious effort to integrate risk management into the culture of the organisation. Workshops are conducted on a regular basis to identify and assess risks and determine action plans. For each planned action, the responsibility for implementation is allocated to a member of staff. Progress on these is monitored at six-monthly intervals and more frequently in the case of critical tasks.

We also conduct risk assessments when there are significant changes to processes, equipment or materials. All significant projects undergo a risk assessment phase. Field-based activities completed by contractors are monitored through targeted, risk-based audits.

Risk management reporting includes:

- ad-hoc reports such as those written to serve a specific purpose at a point in time;
- scheduled or automated reports (e.g. monthly or annual reports); and
- graphical reports available on the JCARS user dashboard, which allows users to drill down to obtain more detail if required.
- Risk reporting is provided to Evoenergy and Risk Management Committee of the Board.

7.3 ASSET RISK REGISTER

We have a JCARS asset risk register, which is drawn upon from the various asset class risk registers. The register covers risks associated with the gas infrastructure assets which are currently owned by Evoenergy and managed by Jemena.

The asset risk register was developed in line with the Jemena Group Risk Management Manual using the approved consequence materiality and risk likelihood tables. The scope of the asset risk register is limited to risks with the potential to prevent the achievement of Evoenergy’s Business Objectives. Risks associated with specific assets are captured in the asset class (and sub-class) risk registers, which are owned and maintained by each relevant Asset Manager.

7.4 RISK PROFILE

All risks included in the asset risk register are monitored in JCARS. We regularly reassess the current risk profile as work programs are completed and more up-to-date asset data is collected. Risks with a significant, high or extreme severity rating are assessed more frequently than low and moderate risks.

Of the risks included in asset risk register, none are currently rated as extreme. The risk profile based on the current residual risk rating severity is shown in Table 7–1.

Table 7-1: Evoenergy asset risk register risk profile⁶

Residual risk rating	Number of risks
Extreme	0
High	1
Significant	13
Moderate	6
Low	3
Total	23

⁶ Data obtained from the JCARS Risk Register report (June 2020)

8. LEVELS OF SERVICE

8.1 BUSINESS PERFORMANCE

Business performance measures include customer expectation measures and asset performance measures. Management Services Key Performance Indicators (KPIs) are outlined by the Distribution Asset Management Services (DAMS) agreement. These KPIs are summarised in Customer Expectation and Engagement Section. Asset performance KPIs are outlined in the Asset Performance Section, were the business analyses both annual results and trending against prior year's results. The 'Year to Date' (YTD) performance of these KPIs are also measured and reported monthly.

8.2 CUSTOMER EXPECTATION

The following table summarises the year-to-date results of Management Services KPIs for the ACT Gas Networks for the period 1 July 2018 to 30 June 2019. The following Management Services KPIs are reported monthly according to the DAMS agreement. The following KPIs are a combined ACT and Nowra Gas Network measure, with the exception of Unaccounted for Gas (UAG) which is asset specific.

Table 8-1: KPI Performance Results

Activity	KPI	Measure	RY19		
			Actual	Target	Status
Management	1	Annual Safety & Environmental Management System Audit	●	4	●
	2	Penalised Environmental Breach	●	5	●
	3	Notices from Authority to do works due to JAM Breach	●	5	●
	4	Emergency Response Preparedness	●	4	●
	5	Reliability of Supply	●	5	●
	6	Annual Safety & Operating Plan Audits	●	5	●
	7	Comply with Technical Codes & Standards	●	5	●
	8	Comply with Acts and Codes and the Access Arrangement	●	5	●
	9	Network Planning & Engineering	●	2	●
	10	Asset Management & Network Planning Services	●	0	●
UAFG ACT	11	ACT/Queanbeyan UAFG Rolling 12 months % (4 months lag)	2.11%	1.96%	●
Back Office/Market Interface	12	Contract Billing – Monthly read of the Daily Read Sites (months below 98% target)	100%	98%	●
	13	Tariff Reading – Quarterly/Monthly/MDL within +/- two working days of the scheduled read date (months below 98% target)	100%	98%	●
	14	Service Order Delivery – within the specified time frame of activity (months below 98% target)	96.2%	98%	●

Activity	KPI	Measure	RY19		
			Actual	Target	Status
	15	Billing Data Quality – % of errors resolved within five business days (months below 95% target)	97.5%	95%	●
Field Maintenance	16	Cathodic Protection - % of time CP systems are operational	100%	95%	●
Capital Management	17	Close out of Major Capital Projects (days)	N/A	90	●
	18	Close out of Minor & Medium Capital Projects (days)	N/A	60	●

(1) KPI 11: UAG increased as a billing reversal was applied for large customers that had persistent meter access issues (construction site).

(2) KPI 14: Service Order Delivery only measured special meter reading. Asset Investments are going to redevelop this KPI to include service orders made from retailers in relation to connections and disconnections.

Table 8-2: Management Services KPIs

Performance metrics	Status
KPI Target Met	●
Corrective Level	●
Actions in Hand- Between Target and Corrective Levels	●

8.3 ASSET PERFORMANCE

Asset performance KPIs cover inherent asset characteristics and focus on supply reliability, asset integrity, and emergency management. The following asset performance measures are as per the year end (June 2019) DAMS Service Performance Report. All asset performance measures were met except UAG which is currently under investigation to review metering and billing performance issues.

Table 8-3: Asset Performance Measures

Measure	RY19			
	Actual ACT	Actual QBN	Target	Status
Major Unplanned Outages > Five Customers	0	0	500	●
CHOS per 1000 Customers	0	0	N/A	●
Hits to the Network	146	19	240	●
% Unaccounted for Gas	2.11%	2.11%	1.96%	●
% Response within 30 minutes	97%	84.20%	85%	●
% Response within 60 minutes	100%	94.70%	95%	●
Planned Maintenance Completion to Schedule (%)	99.40%	100.00%	90%	●
Pipeline Patrol Compliance (%)	100%	100%	99.50%	●

9. CUSTOMER INITIATED PROJECTS

Customer initiated projects comprise:

- routine and non-routine new customer connections; and
- unregulated customer-driven works.

New connection (routine and non-routine) projects comprise a significantly larger proportion of our forecast capital works program than unregulated customer-driven work. It should also be noted that the capital costs associated with unregulated works are not added to Evoenergy's regulated asset base, nor funded from regulated revenue.

The volume of new connections is largely outside of our control and can vary significantly from forecast based on market trends, building/dwelling growth and decisions made by individual customers.

We use recent historical data to predict short-term requirements, complemented by long-term estimates developed by economic forecasting experts. For the current Access Arrangement period, and again for the forecast Access Arrangement period, we have used forecasts developed by expert consultants CIE. The forecast of new connections declines over the forecast period with the ACT Government's announcement that gas connections in new estates will no longer be mandatory.⁷ This is an excellent example of why the number of new connections is outside our control. Customers may choose to ignore the ACT Government's announcement and continue to connect to the network suggesting a change in Government may override this.

Connecting new customers makes up the largest part of the capex program in Evoenergy's Access Arrangement Proposal. Connections forecast capex in Evoenergy's Access Arrangement Proposal covers the cost of new mains along streets, services to homes and businesses, and meters to measure how much gas is used. Connections capex is driven by two market types:

- volume market (annual consumption <10 TJ/pa); and
- demand market (annual consumption >10 TJ/pa).

The volume market comprises of the following customer types:

- residential electricity-to-gas (**E2G**) – customers currently not using gas, generally converting from electricity and/or LPG appliances;
- residential new homes – customers connected in new home developments and knock-down rebuilds in established areas;
- residential medium – customers in medium-density villa-type housing or small high-rise developments (generally up to three floors in height);
- residential high-rise apartments – customers in high density developments (generally over 3 floors in height with centralised facilities); and
- industrial and commercial volume market – small-scale commercial and industrial customers.

⁷ https://www.cmtedd.act.gov.au/open_government/inform/act_government_media_releases/rattenbury/2020/now-were-cooking-with-electricity!-gas-no-longer-a-requirement-in-canberra-suburbs#:~:text=Released%2017%2F01%2F2020,gas%20connections%20to%20new%20suburbs.

The demand market is made up of major industrial and commercial customers that individually consume more than 10 TJ of gas per annum.

9.1 UNREGULATED CUSTOMER INITIATED RELOCATION WORKS

Unregulated customer-initiated relocation work involves relocation of Evoenergy assets mainly due to road upgrades and expansion of the transport infrastructure. These projects are externally funded and directly managed by Jemena.

These projects are outside the Services Plan. However, communications to Evoenergy of these projects are undertaken via a number of avenues including the monthly capital meetings and reports.

9.2 FORECASTING METHODOLOGY

The Connection Capex forecast is based on projecting connection volumes for future years and current unit rates. The forecast capex is primarily based on:

1. Forecast number of connections for the relevant connection type from CIE was used to determine the quantity of mains, services and meters that will be required to connect the new customers;
2. The historical average unit rate for mains laid, service pipes laid, and meters (both gas and water) forecast to be installed for the relevant connection type.

The Capex forecast for the Contract Market is based on historical average Capex.

9.2.1 FORECAST UNIT RATES FOR VOLUME MARKET

The forecast unit rates used are 'blended' rates based on the four years historical volume mix and actual cost incurred by Evoenergy, which is effectively a weighted average of the DAMS units rates that accounts for the mix of unit types.

9.2.2 NEW CONNECTION VOLUMES

The forecast numbers of new connections are from the **CIE** forecast data that reflect a range of macro factors that affect annual energy, demand and connections. The connection forecasts are shown below.

Table 9-1: Forecast Number of New Customer Connections

	RY21	RY22	RY23	RY24	RY25	RY26
Electricity to Gas	68	47	34	25	19	15
New Estates	1,214	680	676	675	702	716
Medium Density/High Rise	2,670	1,141	1,201	1,133	1,179	1,244
Industrial & Commercial Tariff	68	65	66	66	66	67
Industrial & Commercial Contract	1	1	1	1	1	1
Total Connection Numbers	4,021	1,935	1,977	1,900	1,967	2,042

Ratios of forecast activity volumes are historical averages derived from historical data for mains, services and meters installed for each connection type. These ratios are used to forecast the volumes of metres of mains, number of services, number of meters and associated equipment required to be installed for the forecast connection numbers. The forecast volumes for mains, services, meters and associated equipment to be installed are shown below.

Table 9-2: Forecast of mains, services and meters to be installed for new connections

	RY21	RY22	RY23	RY24	RY25	RY26
Distribution Mains (km)	34,372	19,541	19,570	19,392	20,068	20,517
Inlet service pipes (number)	2,223	1,155	1,157	1,121	1,156	1,188
Meters (number)	2,263	1,162	1,167	1,129	1,164	1,198

10. CAPACITY AUGMENTATION

10.1 OVERVIEW

Capacity augmentation projects are identified as part of the annual capacity planning cycle and are directly impacted by changes in forecast demand. Augmentation projects typically involve installing additional or higher capacity mains, and/or new regulator sets. Capacity augmentation is needed to:

- cater for higher levels of demand when peak demand grows;
- enable new customers to connect to the network; and
- improve the integrity of our network or reduce the risks borne by our customers, employees and the general public.

The network is designed to ensure gas is available to customers during peak times – typically on cold winter days. Each year, the utilisation of winter peak gas demand for the network is assessed. This is done by comparing annual pressure gauges and telemetry information alongside network model validations. Peak gas demand forecasts are developed based on the number of new connections and historical growth, and these forecasts are added to the network model to predict where and when a potential loss of gas supply is likely to occur.

When a section of the network is identified as being at risk of loss of supply, we look at network augmentation options to eliminate that risk. These options are then analysed as part of our investment governance process, and business case for the augmentation project will commence.

10.2 AUGMENTATION PLANNING METHODOLOGY

When developing augmentation projects, we consider the following factors:

- **Network configuration and condition** – the network configuration, its topology, geography, location and physical state are critical considerations. For example, crossing a river, railway line or major highway can prove to be difficult and costly, so alternative routes would be assessed to minimise these types of crossings.
- **Cost effectiveness of potential options** – to promote efficient investment, the capacity assessment process requires development of several options that balance the benefit to customers with the cost of implementation.
- **Timing** – as a general principle, we implement augmentation projects as late as possible. This extends the life of existing assets where prudent and safe to do so, but not so late as to create an unacceptable risk of loss of supply. We balance the expected timing of loss of pressure with the time to implement the option. We do this by running network optimisation software and simulations to model peak network flows. Simulations are updated for the most recent demand and growth forecasts. The year in which gas pressures are simulated to decline significantly below the minimum pressures is typically chosen as the year by which the project must be completed.

10.3 CAPACITY PLANNING CRITERIA

Capacity planning is driven by increases in peak demand that are forecast to reduce network pressures below critical thresholds. In most cases, increases in peak demand occur incrementally as customer numbers increase in parts of the network.

We have also used the changing demand profile to modify our investment approach. Previously, at the medium pressure level (100-400kPa) we installed additional capacity whenever network pressures fell below 70kPa. With slower peak demand growth, we are able to continue monitoring our network and only install capacity when pressures drop below 40kPa.⁸ To facilitate this, we have upgraded our network monitoring systems from ~20 mechanical gauges to ~40 newer electronic gauges for the Evoenergy gas network, which allow us to monitor more locations with greater data granularity.

We are confident this change in approach will not result in supply issues, as slower peak growth provides us more time to monitor network performance and respond by installing additional capacity. Further, a smaller number of capacity projects reduces the risk we cannot mobilise at short notice to install additional capacity.

10.4 CAPACITY AUGMENTATION PROJECTS

Capacity Augmentation projects are generally grouped into three categories:

- **Existing customer demand growth (organic growth)** – augmentation projects are required as a result of peak demand rising in established areas, typically due to customers installing higher capacity appliances or household behavioural changes.
- **Medium density and high-rise developments** – augmentation projects are required to connect new (typically residential) developments, where there is a concentrated gas load with a single service connection. If several medium density/high rise buildings are being developed in one area, we consider the capacity requirements of subsequent/concurrent projects and plan accordingly. Medium density/high rise residential developments may have commercial tenants at ground level, which adds to peak demand.
- **New estate growth areas** – these developments are generally in greenfield areas that have minimal or no gas infrastructure and require feeder mains and/or regulators to extend the gas network to service the proposed new estate. It should be noted that the ACT Government has abolished the requirement that all new developments must have a gas connection and this has been reflected in our demand forecast.

10.5 EXTERNAL FACTORS

The key external factors that affect Capacity Augmentation include:

- **ACT Government policies** – the introduction of the legislative targets to achieve zero net emissions by 2045 via the ACT Governments Climate Change Strategy, has seen the mandatory requirement that gas mains infrastructure is rolled out in new estate areas has been removed. Hence, the expenditure forecast in this category has been reduced with the remaining amount focused on supporting the medium density and high rise developments, as gas demand is expected to significantly slow across the whole network until the real impacts of our consumers and their gas appetites are realised.

⁸ This is only possible on a case-by-case basis depending the location of our larger customers.

- **ACT Planning authority** – the Territory Plan provides a policy framework where gas mains may be installed (as a function of the zoning of areas through which they are laid) meaning specific routes cannot be established until planning subdivisions are complete. Also changes to the Territory Plan have removed the mandatory gas requirement, as per the policies above, meaning developers have the option to install full-electric new suburbs.
- **Market Development** - changes in usage patterns occur such as :
 - Conversion of a large residential block to townhouses or high rise development;
 - Installation of higher efficiency appliances; and
 - Household behavioural changes.
- **Weather** – seasonal severity of winter weather patterns are predicted based on historical trends and experience, hence a winter severity factor is applied to account for a '1 in 20 year' scenario.
- **Technical Regulator** – expectations and the governing framework of the Utilities Technical Regulator (UTR) must be met.
- **Australian Energy Regulator (AER)** – prudent expenditure in this category is determined by the AER via the Access Arrangement submission.

11. NETWORK ASSET REPLACEMENT

This section provides an overview of asset management activities and key asset replacement/rehabilitation projects expected to be required during the Access Arrangement period. The section is designed to be high level only. For detail on specific asset management practices and forecast investments, refer to the asset class strategies and the expenditure forecasts provided in the Access Arrangement Proposal.

Our overall approach for asset replacement is informed by the individual asset class strategies prepared for each of the network asset classes. Our gas network asset classes⁹ are:

- Distribution network;
- Pipelines;
- Gas facilities; and
- Measurement (metering).

Our asset class strategies are intended to cover a minimum period of 20 years and seek to ensure reliable performance and prudent risk management. The asset class strategies help ensure an appropriate balance of capex and opex through the consideration of total lifecycle management costs. Our aim is to ensure assets are managed optimally to the benefit of our customers.

When developing asset class strategies, we consider the following information:

- asset class profile, which includes information about the type, specifications, life expectancy and age profile;
- asset class objectives, which define what we want to achieve with each class of asset in order to achieve the broader asset objectives detailed in the ABS;
- asset risk, which includes identifying threats, opportunities, strengths and weakness. This includes asset performance objectives and measures, criticality and condition. Risks and opportunities are then documented and compared against asset objectives to develop a ranking/prioritisation;
- asset performance, which includes information about current performance against asset indicators, objectives, drivers, and service levels;
- asset strategy, which includes the Jemena Business Plan, asset management policy, and ABS;
- scenario analysis, which considers variables such as time, capital and maintenance costs to confirm risk tolerance and opportunities for efficiency improvements or investment deferral;
- growth and capacity analysis, either directly or through capacity, regional or development strategies and plans;
- asset expenditure assessments, which include information about historical and forecast operating and capital requirements and the impact on prices to gas consumers.

⁹ Non-network assets are discussed in chapter 12 of this AMP.

11.1 KEY ISSUES

The overall condition of the network assets is generally good. Other than specific pockets of the network where assets are nearing the end of their technical life, or require replacement in order to reduce risk (or manage it to ALARP), the overall risk associated with the gas network is within tolerable levels.

Subject to the current controls being maintained, plus execution of the expenditure proposed for the forthcoming Access Arrangement period, we expect the gas network to remain safe and to continue to provide a reliable gas supply to customers.

The primary types of risk that impact Evoenergy network assets are:

- asset failure (e.g. corrosion);
- operational risks (e.g. human error);
- third party hits and urban encroachment of high pressure pipelines;
- failure or reduction in control effectiveness (e.g. inadequate signage or shallow cover);
- regulatory or compliance risks (e.g. change in mandatory compliance/standards); and
- asset lifecycle risks (obsolescence of equipment).

Key network asset replacement programs required in the next seven years to help mitigate these risks include:

- **Inlet Piping Rectification at the Woden, Belconnen and Tuggeranong shopping centres** – These projects are needed to ensure all shopping centres in the ACT Gas network region that are fitted with a ring main that complies with relevant safety and compliance requirements.
- **Installation of contingency valves** – the Evoenergy Network Contingency Plan requires additional valves to be installed for Network Risk Mitigation (3x Medium Pressure Valves & 2 x Secondary Pressure Valves).
- **SDRS Integrity and Safety Replacement** – there are two SDRS's, each located in the median strip of a six-lane major arterial road with a speed limit of 80km/hr. There are no traffic lights nearby, making it difficult for field staff to access and maintain. Traffic control is required to close at least one lane in each direction so the DRS can be safely accessed. There are also integrity issues within the underground boxes and to be relocated to a suitable location. Applicable to DR51 and DR26.
- **Minor Capital Works (Pipes)** – This program is for projects on the high-pressure steel networks that are small in size and low complexity for which no process of individual identification or assessment is made in advance for reasons of efficiency and practicality. These projects are often identified during the year and also typically for projects required to meet current service and supply standards. Projects may include installation of new valves, cathodic protection, concrete capping and integrity management.
- **Minor Capital Works (HP Facilities)** – This program is for projects within the high-pressure gas facilities that are low complexity for which no process of individual identification or assessment is made in advance for reasons of efficiency and practicality. These projects are often identified during the year and also typically for projects required to meet current service and supply standards. Projects may include replacement of minor components, work safety and security items within and around the facility.
- **Hume Primary Main Extension (PME) Pigging Facilities** – There are no permanent pigging facilities on the Hume PME. To install temporary pigging facilities at Hume and Narrabundah to enable ILI of the Hume PME.

- **HP Facilities E&I Compliance (FEED)** – The Project addresses the rectification of the earthing systems and non-compliant electrical installations/equipment at the Canberra facilities.
- **Watson Pressure Limiting Station** – De-rate the current MAOP of the Canberra Primary Main pressure from 6,895kPa to 4,500kPa by installing a pressure limiting station at Watson to comply with AS2885. Includes Meter Installation at Watson TRS.
- **Installation of Odorant Analyser at Watson TRS** – Install a Gas Chromatograph at Watson TRS to monitor odorant from the gas received from APA.
- **Flow Measurement at Phillip PRS, Gungahlin PRS and Fyshwick TRS** – Gas flow measurement through Phillip PRS, Gungahlin PRS and Fyshwick TRS is unknown and out of the five AS2885 pressure regulating stations in the ACT, only Hume PRS functional gas flow metering on the duty run. The installation of a meter will assist in facility shutdowns, pigging activities, contingency planning and regulatory reporting of flows.
- **Yarralumla Secondary Relocation** – There is a 350mm secondary main that encroaches within the property of the Chinese Embassy with no existing easement or permissions and must be relocated from the private property.
- **Meter Replacement** – replacing almost 55,000 residential and I&C gas and water meters.

The above list represents the current planned program of works. However, the asset replacement requirements are continually reviewed and will likely change over the course of program delivery. Our works program also includes ongoing maintenance, provision for reactive asset replacement, and other minor works not included in the list above.

For full details of forecast expenditure and the works program scheduled for the coming years, refer to the expenditure forecast provided in Evoenergy's Access Arrangement Proposal.

11.2 DISTRIBUTION NETWORK

The distribution network asset sub-classes are:

- secondary network (mains and services operating up to 1050 kPa);
- medium and low pressure mains and services;
- network pressure control (district regulator stations); and
- consumer pressure control (boundary regulators).

Asset management strategies for each of these sub-classes are summarised below. For more detail, refer to the Networks Asset Class Strategy.

11.2.1 SECONDARY NETWORK

Evoenergy's secondary mains asset category consist of 233km 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. The secondary mains have an MAOP of 1,050kPa.

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

11.2.1.1 Performance and requirements

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

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

New estate development areas are generally located along the fringes of established areas. The secondary network is expanded into these new estates as land is released. Currently expansion activity is concentrated in the growth areas near Gungahlin and Molonglo. However, with the ACT Government's removal of mandatory gas mains in new suburbs and the legislative targets on achieving net zero emissions by 2045, it is forecast that these areas growth will be halted and new suburbs start becoming fully electric.

Secondary Mains are operated and maintained in accordance with the Safety and Operating Plan and the requirements of AS 4645. This includes providing cathodic protection to the network and maintaining it, CP surveys, leakage surveys and conducting Formal Safety Assessments (**FSA**).

11.2.2 MEDIUM PRESSURE MAINS AND SERVICES

The medium and low pressure mains and services supply natural gas to domestic and Industrial & Commercial customers. The network comprises of mains, services, valves, boundary regulators and exposed mains.

The mains and services are predominantly plastic (polyethylene and nylon). The medium and low pressure mains make up the majority of the Evoenergy ACT network length with 4,353km of mains.

Valves are devices used to stop the flow of natural gas. This includes both standard sector isolation valves and high-risk sector valves.

Boundary regulators are used to reduce the medium pressure at the property boundary to low pressure. The low-pressure end user service then supplies high-density housing such as units or townhouses.

Exposed mains are those mains that are not directly buried in the ground. Typically, exposed mains are located in or under bridges, culverts and across storm water channels, etc.

11.2.2.1 Performance and requirements

The medium pressure network is complex and continuously expanding into new growth areas. Jemena assesses and confirms the condition of the mains in accordance with Australian Standard AS 4645. The network is generally in good condition and this assessment is supported by numerous integrity assessments, including:

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

Leakage surveys are a maintenance strategy employed 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 AS 4645). More frequent surveys are undertaken in high-risk areas and where previous surveys indicated an excessive level of leaks. All gas leaks located are assessed.

Network incidents are another indicator of network integrity and performance. An incident can be caused by a component failure. Failed components (pipe and fittings) are sent to a laboratory for analysis. A common cause of failure is poor joint quality, an issue that occurred during network construction. Significant work has been undertaken to improve construction quality for polyethylene mains.

11.2.3 NETWORK PRESSURE CONTROL

A Secondary District Regulator (SDRS) Set is the generic term used to describe Regulators Sets that supply the medium pressure networks. The SDRS' reduce the pressure from the secondary network to supply the medium pressure networks and most are located on public land and are installed in underground pits. There are currently 95 SDRS' in the Evoenergy ACT gas network.

11.2.3.1 Performance and requirements

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

In the past, SDRS integrity issues have existed and have almost all been addressed. Flaws in the design of the existing boxes result in numerous issues such as water ingress, maintainability issues, traffic hazards, ergonomics issues, etc. Mitigations included fitting of vent pipes, drainage, removal of corrosion and painting. Hence, there are two proposed SDRS' remaining to be relocated (SDRS 26 and SDRS 51), not only due to integrity issues but located in unsafe locations in medium strips of major arterial roads for field personnel when they are carrying out maintenance.

A Formal Safety Assessment (FSA) was conducted for Secondary District Regulator Sets. The FSA demonstrated that the SDRS asset class is generally operating safely. The majority of the risks identified during the FSA were low or negligible. The FSA identified numerous opportunities for conducting maintenance activities in a safe manner but also identified the two SDRS' mentioned above, located in unsuitable locations.

Expenditure on SDRS' is driven by demand growth (Market Expansion or Capacity Development). However, due to the ACT Governments net zero emissions targets, there are no new SDRS forecast to be installed for the next 10 years. SDRS' that are retired from service are inspected for serviceable components. The components are then reconditioned and re-stocked for future use to support the legacy population of SDRS' and any unserviceable SDRS' are scrapped.

Secondary District Regulator Sets are operated and maintained in accordance with the Safety and Operating Plan, Technical Policies and AS4645 (Gas Distribution Network Management).

The Capital Plan provides the entire program detail for this asset class. The material projects will be identified through market expansion projects as they arise or when an existing regulator is expected to not be adequate for the capacity requirements.

11.2.4 BOUNDARY REGULATORS

Boundary regulators are used to reduce the secondary or medium pressure at the property boundary to low pressure. The low-pressure end-user service then supplies medium or high-density housing, such as units, townhouses or villa complexes, shopping centres and some I&C customers.

Boundary regulators are installed to:

- reduce gas pressure to a safe minimal level before delivery into the customer's premises. Lowering the pressure reduces the consequences from the threat of a gas escape;
- protect the customers' (building) piping services from the threat of over pressurisation that can cause a gas leak within a building;
- protect the customer's appliances from the threat of over pressurisation that causes poor combustion and "lift off" of the flame; and
- avoid the need for over pressurisation management on internal meter sets. This eliminates the need for vent lines.

The volume of residential regulators is directly related to the number of customer connections. There are also approximately 5,000 internally installed I&C gas meter sets operating at <15kPa.

11.2.4.1 Performance and requirements

Overall, the consumer pressure control asset class is in good condition. All boundary regulators installed after 2000 have over pressure shut off (**OPSO**) valves, which will operate if the regulator fails. However, some older boundary regulators in the network only have a relief valve, which poses a safety risk.

We are monitoring the risk associated with these older regulators via annual service checks, and are undertaking a boundary regulator replacement program, targeting regulators without OPSOs.

11.3 PIPELINES

11.3.1 TRUNKS

The ACT Gas Network trunk pipeline system comprises of the Hoskinstown-Fyshwick Pipeline, CP systems, and pig launcher and receiver.

The Hoskinstown-Fyshwick pipeline falls under two jurisdictions:

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

The Hoskinstown-Fyshwick pipeline was commissioned in June 2001. It was designed, constructed, tested, and operated in accordance with the requirements of AS 2885. The MAOP of the pipeline is 14,900kPa.

The pipeline is 30km long and has a nominal diameter of 250mm. The pipeline is constructed of high strength steel and is externally protected against corrosion by an anti-corrosion pipe coating and has internal lining for flow efficiency. Additional external protection is also achieved with a CP system.

11.3.1.1 Performance and requirements

The trunk pipeline integrity is maintained for the MAOP and is considered fit for purpose. The pipeline conditions are assessed and confirmed based on:

- Jemena Safety and Operating Plan (**SaOP**);
- Australian AS 2885 standards; and
- Jemena Pipeline Integrity Management Plan (**PIMP**).

The PIMP provides an integrated and structured pipeline operation and maintenance management system and outlines key processes, assessment methodologies to maintain pipe integrity. Integrity validation based on pipe conditions derived from data by inspection and testing includes:

- Inline inspection (ILI), also referred to as 'Pigging', assesses metal loss and mechanical damage;
- CP Monitoring provides additional pipe protection against corrosion at location of damaged pipe coating;
- Direct Current Voltage Gradient (DCVG) measurement provides indication of coating defects which may lead to potential corrosion;
- Integrity Digs provide direct measured pipe data at selected locations based on indirect measured integrity data; and
- Safety Management Studies (SMS) enables pipeline safety and risk assessments which identify threats, review controls and implement additional protection measures where existing controls are inadequate. The SMS considers all relevant data obtained from the inspection and testing to determine the pipeline integrity for the pipeline MAOP.

The most recent SMS for the trunk pipelines was conducted in 2016 and identified:

- No unauthorised landowner activities near the trunk pipelines;
- No metal loss from corrosion was reported via pigging data;
- No other events have occurred that have affected the pipeline integrity; and
- all control measures, procedural and physical, were implemented and remain effective.

There have been no failures of trunk pipelines. There are no reported incidents, either operational or external, that have affected the integrity of the trunk pipeline. The next SMS is planned for 2021-2022.

The Maintenance Plan for trunks includes routine and planned activities; and non-routine plus ad-hoc activities. Non-routine maintenance activities are initiated from actions required by the integrity review or arising from pipeline risk management of external activities and/or encroachment

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

- Surveys are completed every ten years with the last survey undertaken in RY15, so the next survey is expected to be completed in RY25; and
- Exposed mains inspection to enable a physical close-up inspection to support integrity management.

There are currently no plans to construct any new trunk pipelines or augment the existing trunk pipeline. The key capital works for the trunk pipeline are related to the integrity management of the pipeline.

11.3.2 PRIMARY MAINS

The Canberra Primary Main consists of 37 km of high-strength steel pipe with a MAOP of 6,895kPa. The pipes are externally protected against corrosion by an anti-corrosion pipe coating and internal lining for flow efficiency. Additional protection is also achieved with a CP system. The Primary Mains were predominantly constructed in the mid-1990s and early 2000s with the new Hume Primary Main Extension being completed in 2015 and are summarised below.

11.3.2.1 Performance and requirements

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 and/or integrity digs;
- Corrosion Protection: CP monitoring (planned activity) and DCVG;
- Operation Controls: pressure, temperature and gas quality monitoring; and
- Maintenance Activities: planned work to the approved procedures and work methods.

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

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

To mitigate the risk of failure, the performance of mains pipelines is managed through a condition monitoring and inspection program to identify potential issues before they lead to a degradation of performance.

Pipeline operation complies with AS 2885 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 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 most recent SMS for the primary mains was conducted in 2016 and identified:

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

- Urban encroachment has increased around the primary mains and a number of sensitive developments were identified (Childcare centre) within close proximity of the pipeline.

Inspections and integrity digs are inputs 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; and
- Integrity digs provide supplement information of the pipeline condition between two successive ILI's. The nominal ILI interval for a well-managed pipeline is 10 years.

11.4 FACILITIES

The ACT Gas Network consists of a number of Trunk and Primary Facilities as described below.

Table 11-1: Trunk and Primary Facilities Description

Facility	Pipeline	Quantity	Description
Trunk Receiving Station (TRS) <i>Fyshwick TRS</i> <i>Watson TRS</i>	Trunk	2	Gas pressure reduction and filtration facilities that are supplied at trunk pressure and deliver gas at appropriate pressure to downstream network.
Packaged Off-Take Station (POTS) <i>Bungendore POTS</i>	Trunk	1	Smaller capacity gas pressure reduction and filtration facilities that are supplied at trunk pressure and deliver gas at the appropriate pressure to the downstream network.
Custody Transfer Station (CTS) <i>Hoskinstown CTS</i> <i>Watson CTS</i>	Trunk	2	Installations equipped with metering facilities to accurately measure gas transfer through the CTS. These meters are used for billing purposes and are calibrated in accordance with appropriate measurement standards.
Water Bath Heaters (WBH) Located at: <i>Hoskinstown CTS</i> <i>Bungendore POTS</i>	Trunk	2	Heat exchangers used to preheat gas to ensure that the temperature reduction (Joule Thompson Effect) caused by large pressure drops through regulators does not adversely affect the facility and downstream pipeline.
Boilers and Heat Exchangers Located at: <i>Fyshwick TRS</i>	Trunk	2	Heat exchangers used to preheat gas to ensure that the temperature reduction (Joule Thompson Effect) caused by large pressure drops through regulators does not adversely affect the facility and downstream pipeline.
Primary Regulating Stations (PRS) <i>Hume PRS</i> <i>Phillip PRS</i> <i>Gungahlin PRS</i>	Primary	3	Gas pressure reduction and filtration facilities located at each off-take on the primary main. These facilities reduce the pressure from 6,895kPa to 1,050kPa to supply the secondary network or lower metering pressures to specific customer.

The age profile and key statistics of these facilities is depicted below.

Note that individual components of the stations such as filters and regulators are replaced at various times during the life of the facility which are not reflected in the figure below, however an allowance has been included in the Capital Plan for such items.

Table 11-2: Trunk and Primary Facilities Age Profile

Facility	Year Commissioned/ Last Upgraded	Age
Fyshwick TRS	2013	7
Bungendore POTS	2007	13
Hoskinstown CTS	2007	13
Hume PRS	2015	5
Philip PRS	1999	21
Gungahlin PRS	2006	14
Watson PRS	1995	25

11.4.1 STRATEGY

The asset strategy for trunk and primary facilities over the AMP period is to ensure the safety, functionality and compliance of assets, which meet regulatory requirements, and cater for growth of the network.

Amongst other things, the Asset Class Strategy document 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 Asset Class Strategy will also:

- Provide an integrated and structured plan for design, construction, commissioning, operation and maintenance of the facilities;
- Incorporate the requirements of AS 1200 and AS 2885 suite of Standards, which will provide the assurance of the integrity of the facilities; and
- Outline the key processes, assessment methodologies, and recommendations of activities/practises for managing the integrity of the facilities.

The following activities are currently undertaken to assess, validate and manage the asset integrity:

- Planned Maintenance Inspections and audits, which include corrosion monitoring and visual inspections; and
- 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:

- The condition of the stations (TRS/POTS/CTS/PRS) and equipment (WBH/Boilers and Heat Exchangers) vary across the network. Overall structural integrity is satisfactory for containment and reliability of supply;

- Requirement to upgrade non-conforming E&I components to ensure safety and meet regulatory requirements; and
- Corrosion of piping within trunk and primary facilities resulting in loss of containment is emerging as a key integrity issue. The action arising is to introduce additional maintenance projects to expose and inspect pipe under thermal lagging and pipe coating.

11.4.2 PERFORMANCE

The assets are performing in line with expectations. Plans are in place for regular and noted issues.

11.4.3 RISKS AND ISSUES

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

Jemena is undertaking a facilities E&I compliance upgrade program across the Evoenergy high pressure (HP) gas stations. Electrical and instrumentation (**E&I**) equipment within these gas stations need to comply with the requirements of the Electricity Safety Act 1971 and the Electricity Regulation 2004. Each facility consists of the following E&I equipment that enables the facility to safely and reliably supply gas to its customers:

- Transmitters, switches, control valves, controllers, cables etc; and
- Electrical motors, lights, electrical switchboards, batteries, etc.

Risks have been identified via various inspections, testing and maintenance activities and logged into the Asset Risk Register. These risks may lead to a loss of supply as well as personnel and public injuries leading to reputational and legislative implications. Many risks are being managed through short term mitigation but as the assets age, a more sensible and prudent approach would be to replace the non-conforming equipment thus enabling a compliance baseline to better manage the asset.

The facilities E&I compliance program includes the following high pressure sites:

- Hoskinstown CTS;
- Bungendore POTS;
- Gungahlin PRS;
- Phillip PRS; and
- Watson TRS.

Hume PRS and Fyshwick TRS are not included, due to its recent construction upgrades. The overall end state objective of this program is to deliver electrically compliant facilities.

11.4.4 ACTIVITIES

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

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

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

- Review of costs and impacts of the upgrade to Facilities to meet current standards such as the E&I works to replace non-conforming electrical equipment as mentioned above (ACT High Pressure Facilities E&I Compliance Upgrades);
- Installation of a pressure limiting station (**PLS**) at Watson CTS to de-rate the current Maximum Operating Pressure (MOP) of the Canberra Primary Main to reduce the potential threat to the surrounding dwellings and Child Care centres encroaching the pipeline;
- Flow Meter installations at Phillip PRS, Gungahlin PRS and Fyshwick TRS, to provide accurate quantitative gas for maintenance and emergency works, assist with UAG investigations, and meet our reporting obligations with recent changes to the National Gas Rules (NGR) .

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

11.5 MEASUREMENT

The measurement asset sub-classes are:

- Gas measurement equipment;
- Water measurement equipment;
- Data collection equipment; and
- Gas quality measurement equipment.

Metering errors and timing difference constitutes the majority of UAG contribution for the Evoenergy network. The accuracy and reliable performance of the measurements equipment is critical to ensuring UAG is minimised.

11.5.1 GAS MEASUREMENT EQUIPMENT

Gas measurement equipment includes:

- **diaphragm meters** – each customer has a gas meter installed when they are connected to the network. Evoenergy has about 140,000 meters. Typically, diaphragm meters are installed for standard domestic and commercial and industrial customer connections.
- **rotary and turbine meters** – rotary and turbine meters are installed to provide data on high demand gas consumption. There are about 330 turbine and rotary meters.

- **regulators** – regulators provide pressure control at the point of gas delivery from the network to the customer, ensuring safety of the downstream customer installation and correct billing. They are installed in contract customers, single dwellings, medium density and high-rise developments.

11.5.1.1 Performance and requirements

Gas meters are operated and maintained in accordance with Metering Equipment Maintenance, Service and Disposal, technical regulatory requirements and Jemena's Integrity Management Plans. However, the internal components of meters wear over time and become inaccurate or simply stop working. We replace these meters so that we can continue to ensure customer bills are correct.

Diaphragm, Rotary and Turbine meters are replaced after 15, 10 and 5 years, respectively. Where commercially and technically feasible turbine meters are refurbished and reused. The current age for diaphragm meter replacement is 15 years. However, in accordance with the requirements of AS 4944, life extension can be justified where supported by a testing program. The integrity and technical compliance of residential gas meters 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. This drives future renewal and upgrade planning activities.

The amount of new assets installed is driven by customer-initiated connections or market expansion. Meter selection is based on the capacity requirement of the customer.

Residential gas meters have lasted longer than expected and over the next Access Arrangement period we take into account the improved performance of the gas meters, in the absence of statistical testing results, assumes our meters will be replaced at 25 years.

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.

11.5.2 WATER MEASUREMENT EQUIPMENT

Water meters provide measurement of water usage by the customer or hot water system. Typically, installations consist of a master cold water meter and individual customer hot water meters. The meters are used to apportion the use of gas usage by the centralised hot water system to the individual customers on the basis of hot water consumption. Evoenergy has 17,500 water meters installed in the gas network.

11.5.2.1 Performance and requirements

Water meters overall are in good condition. However, some families of mechanical hot water meters have experienced high failure rates. These meters have been the subject of legal and commercial negotiations on costs associated with rectifying the high failure rates. We are actively monitoring the performance of these meters and will not be using this particular brand going forward. Hot water meters typically do not last as long due to the life of the inbuilt battery. Over the past five years a significant amount of water meters have not been replaced at their nominal replacement age and should be replaced. We will continue to undertake replacement of water meters at a manageable rate where it is safe and prudent to do so.

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.

Water meters are replaced when they become operationally deficient. This is driven by sizing requirements or critical failure. The planned replacement program for water meter populations is driven by the results of the

integrity activities. Implementing a policy for aged water meter replacement aims to reduce the volume of corrective maintenance.

11.5.3 DATA COLLECTION EQUIPMENT

We utilise data collection equipment to record and transmit metering and gas quality data across the network. Data collection equipment includes:

- **gas volume correctors** – these are remote electronic devices installed to measure and record pressure and temperature via pulsed signals from the meter and calculate a correction factor to convert actual volumes recorded by the meter to the standard billing volume. They are normally installed on sites with consumption greater than 27 TJ or where meters are upstream of gas regulators such as POTS meters; and
- **meter data loggers (MDL)** – these are remote electronic devices installed to measure and record actual gas and water consumption volumes via pulsed signals from the meter and are installed on sites with consumption below 27 TJ. Data is accumulated in the data loggers and transmitted to a server through a communications system for use in billing systems, where temperature and pressure correction is then applied to convert to standard billing volumes.

11.5.3.1 Performance and requirements

Data collection equipment is in good condition. However, there is a need to replace some assets due to obsolescence risk.

The current strategy for lifecycle management of volume correctors and MDLs is to operate to failure and replace, in accordance with technical regulatory requirements and Jemena Policy – Metering Equipment Maintenance, Service and Disposal. Jemena is reviewing this strategy due to the cost of failures and maintenance, the rollout of the National Broadband Network (**NBN**), the age of the units and the improvements in Radio Frequency (RF) technologies.

The plan is to:

- Continue replacing equipment as they fail;
- Replace all obsolete communications equipment within the next two to three years;
- Research and introduce competition;
- Upgrade data collection servers every three to five years; and
- Continue replacing Mercury Correctors every ten years.
- Analysis of failure modes and rates will continue to be undertaken to ensure that maintenance and replacement programs are optimised to ensure the reliable operation of this system.

Plan for obsolescence

The NBN rollout is replacing Copper telephone lines with Fibre Optical cables. Therefore, we will be integrating the modems/loggers with the cables. To facilitate the integration of the legacy system, NBN has an adaptor, which requires 240V. This will require 240V installed to the meter sets.

In addition, the current analogue equipment will no longer be supplied and supported by the supplier. This is a serious issue and we have commenced testing a wireless device with an IP address. This solution requires

coordination with Jemena IT to develop VPN for the loggers to dial in to the Metretek Server. This activity will be ongoing until the completion of NBN rollout.

11.5.4 GAS QUALITY MEASUREMENT EQUIPMENT

Jemena installs and maintains gas quality measuring equipment and associated communications in the distribution network. This is to ensure that gas quality meets contractual requirements and gas standards. Gas quality measuring equipment includes:

- **gas chromatographs (GCs-6)** – these instruments analyse the components of gas and measure gas composition ranging from methane to hexane. We use this equipment to calculate gas composition properties. These are important for billing and for UAG and in particular when there are different sources of gas supplied into a pipeline and/or network; and
- **hydrocarbon and water dewpoint analysers** – these instruments analyse the hydrocarbon and water content of gas. Gas that does not meet specifications could lead to water and liquid hydrocarbons dropping out of the gas into the pipeline. This could lead to corrosion, blockage of regulators and pipes and interruption of gas supply to townships and end users.

11.5.4.1 Performance and requirements

Gas quality measurement equipment is in good condition. The only project required in this category is the installation of an odorant analyser at Watson TRS to monitor the odorant levels in the gas delivered via the APA Dalton – Watson Lateral pipeline entering the Evoenergy gas network.

Table 11-3: New Meters required due to Customer Initiated New Connections

Market type	RY21	RY22	RY23	RY24	RY25	RY26
Electricity to Gas	80	56	40	30	23	18
New Estates	1,043	585	581	580	603	615
Medium Density/High-rise	1,076	460	484	457	475	501
Industrial and Commercial	64	62	62	62	63	63
Total Meters	2,263	1,162	1,167	1,129	1,164	1,198

(1) The expenditure associated with these new meters is included in the Customer Initiated works.

The table below sets out the planned volume replacement, renewal and upgrade over the AMP period.

Table 11-4: Replacement Meter Program Volumes

Program	RY21	RY22	RY23	RY24	RY25	RY26
Planned replacement of residential aged gas meters	4,078	3,966	3,805	8,666	2,687	6,223
Planned statistical sampling of residential gas meters	305	380	260	655	515	305
Planned replacement of residential hot water meters	1,807	1,678	115	44	26	32
Planned I&C Turbine meters	1	6	1	2	-	1
Planned I&C Rotary meters & regulators	1	28	3	39	29	87

Program	RY21	RY22	RY23	RY24	RY25	RY26
Planned replacement I&C Diaphragm meters & regulators	5	66	16	127	160	111
Planned statistical sampling I&C Diaphragm meters	125	170	215	235	220	225
Meters upgrade non-residential	43	43	43	43	43	43
Defective replacement of residential gas meters	271	271	271	271	271	271
Defective replacement of residential hot water meters	169	169	169	169	169	169
Defective – I&C Turbine meters	0.33	0.33	0.33	0.33	0.33	0.33
Defective – I&C Rotary meters	6	6	6	6	6	6
Defective – I&C Diaphragm meters	21	21	21	21	21	21

12. NON-NETWORK ASSETS (SCADA & RTS)

12.1 OVERVIEW

The ACT Gas Network Supervisory Control and Data Acquisition (SCADA) and Real Time System (RTS) assets are infrastructure put in place by Jemena to enable safe and efficient delivery of gas to ACT gas network customers, and timely business and operational management decisions to be made. The ACT network leverages the wider Jemena SCADA and RTS assets such as:

- 24/7 'real time' monitoring and control of gas transportation, distribution operations and processes demand forecasting;
- Supply/demand imbalance identification;
- Demand management; and
- Identifying unaccounted for gas issues.

The ease with which real time information can be extracted from the SCADA and RTS assets:-

- Improves the quality of management of ACT Gas Network assets;
- Optimises the reliability and safety of the ACT gas transportation and distribution operations; and
- Optimises the gas network infrastructure asset life and operational costs.

12.2 DESCRIPTION

The ACT SCADA and RTS assets comprise of:

- Purpose Built software that runs on the Jemena Gas Network's Open System International (**OSI**) SCADA system and OSIsoft Pi Data Historian system;
- A number of Remote Telemetry Units (**RTU**) and Dataloggers connected to field control and instrumentation facilities (flow, pressure, and temperature monitoring and control equipment installations) located at strategic locations (gas stations) throughout the ACT Gas Network; and
- A SCADA telecommunications network that ensures that information acquired from strategic locations throughout the ACT Gas Network (via the RTUs and associated flow, pressure, temperature monitoring devices etc) and supervisory and control information from the SCADA master station can be moved from their point of origin or safekeeping at the RTUs or the SCADA master station to a point of consumption (RTUs or SCADA master station ends).

12.3 SCADA SOFTWARE AND NETWORK OPERATION DATA

The software has been purposely designed and configured to meet the ACT Gas Network's specific gas transmission and distribution business and operational needs. Dissemination of the ACT Gas Network's real-time operation data is managed by the OSIsoft Pi Data Historian System. This includes management of the operational data to assist the business with analytical long term decision making in gas network operations, maintenance, reporting and asset management.

12.4 NETWORK CONTROL AND MONITORING ASSETS

Network Control and Monitoring Assets consist of RTUs located at each Trunk Receiving Station (TRS), Primary Regulating Station (PRS), and some Pressure Monitoring Station (PMS) sites together with their respective field instrumentation and control equipment at each site. A summary of the ACT network control and monitoring assets are shown below.

Table 12-1: Network Control and Monitoring Assets

Site	RTU Type E Series 586	RTU Type Serck 386	RTU Type PT-II	RTU Type ERX	Transmission Company Equipment	CTS data transfer	RTU Type Smart Max
Watson TRS	1					1-APA	
Hoskinstown CTS		1			1-EGP		
Bungendore POTS	1						
Fyshwick TRS	3						
Gungahlin TRS	1						
Hume PRS	1						
Phillip PRS		1					
Hawker (Aranda) PMS							1
Banks PMS							1
Dunlop PMS							1
Farrer PMS							1
Jerrabomberra PMS							1
MacArthur PMS							1
Ngunnawal PMS							1
Hall On Demand			1				
McKellar On Demand				1			
O'Connor On Demand				1			
Red Hill On Demand				1			
Curtin On Demand			1				
Duffy On Demand			1				
Wanniassa On Demand			1				
Theodore On Demand			1				
Queanbeyan OD				1			
Jerrabomberra SRS OD				1			
Weetalabah On Demand				1			
Total	7	2	5	6	1	1¹⁰	7

¹⁰ Jemena receives CTS information at Watson via SCADA Link to APA

12.5 STRATEGY

The asset strategy for SCADA and RTS 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 including Cyber Security threats; and
- Enhancements to improve the efficiency and effectiveness of SCADA operations.

The SCADA and RTS assets lifecycle management plans apply the SCADA and RTS Asset Class Strategy on the known existing assets to identify capital plans and to track risks within the assets.

The lifecycle management plan for each SCADA and RTS asset class is reviewed on an annual basis or whenever there is any significant change implementation to the asset class as a result of any business, facility, system or functionality change.

12.6 PERFORMANCE

The overall condition is considered satisfactory. Conditions of all ACT Gas Network SCADA and RTS assets are detailed in the SCADA and RTS Asset Class 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.

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

The nature of the SCADA and communications asset and environment it operates in, drives the current strategy of 'operate to failure and replace' while being supported by the vendors and telecommunication carriers. 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.

12.7 RISKS AND ISSUES

Business impacts of SCADA and RTS assets failures range from the ACT Gas Networks assets and gas supply becoming unsafe through to minor inconveniences or use of sub-contractors to provide required services while failed services are repaired. The current risk that impacts all businesses is cyber security.

Within the last ten years, fundamental changes have occurred in the very fabric of the information and communications technologies and infrastructures which has made the SCADA network more open to 'outside' connectivity security risks. This issue is being managed under the SCADA security program.

12.8 ACTIVITIES

Assets are scheduled for daily, weekly and monthly operational checks. The types of inspections and tests vary for the different SCADA and RTS asset classes. The key objectives for these scheduled operational checks are to establish if:

- The agreed asset availability and operating pattern are achieved;
- The asset's ability to facilitate transportation of the required quantity and quality of gas within the gas network is operating to the designed conditions and safety standards

Operational replacement of assets on failure will be covered off by Operational Expenditure budgets.

The only Capital Expenditure requirements in the next 7 years for SCADA and RTS, will be the addition of five new RTU ERX telemeters.