Jemena Gas Networks (NSW) Ltd

Facilities Asset Class Strategy

Jemena
bringing energy to life

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Abbreviations

ABS	Asset Business Strategy
AC	Alternating Current
ACS	Asset Class Strategy
AER	Australian Energy Regulator
AIP	Asset Investment Plan
ALARP	As Low As Reasonably Practicable
ALBV	Automatic Line Break Valves
AMS	Asset Management System
APaIR	Asset Performance and Integrity Review
BMS	Bulk Metering Stations
COWP	Capital and Operation Work Plan
CTS	Custody Transfer Station
DC	Direct Current
EEHA	Equipment In Hazardous Areas
EIH	Electrical Insulated Heaters
FOMS	Field Operations and Maintenance Specification
FSA	Formal Safety Assessment
IC&E	Instrumentation, Control and Electrical
JCARS	Jemena Compliance and Risk System
JGN	Jemena Gas Networks
MOMS	Munmorah Off Take Metering Station
NSP	Nominal Set Point
NSW	New South Wales
OMCR	Operations, Monitoring, Control & Response Document
POTS	Packaged Off Take Station
PRS	Primary Regulating Stations
RASCI	Responsible, Accountable, Supportive, Consulted, Informed
RCD	Residual Current Device
[redacted]	
TRS	Trunk Receiving Stations
UAG	Unaccounted for Gas
WBH	Water Bath Heaters
WSHH	Western Sydney Hydrogen Hub

Asset Class Snapshot

Asset sub-classes

- High pressure gas facilities
- Instrumentation, control and electrical
- Renewable gas facilities

Expenditure drivers

For the lowest practicably sustainable cost

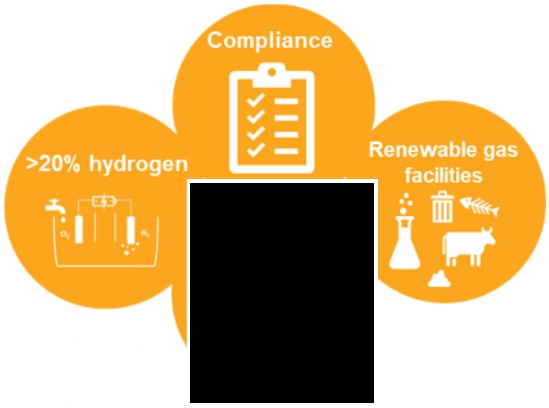
Asset management considerations

- Site criticality
- Holistic IC&E replacements and simplifying design
- Current or upcoming obsolescence
- Contemporary technologies and innovations
- UAG & emissions reduction

Performance

- Ensure facilities instrumentation and equipment is Hazardous Area safety compliant
- Facilities preventative maintenance completed.
- Delivery pressure performance
- Risks identified in the facilities risk register
- Facilities incidents notifiable to technical regulator
- Vandalism reports / occurrences
- Opex budget control
- Facilities assets ready for gas mixes >10% H_2

Emerging risks and opportunities



Key initiatives

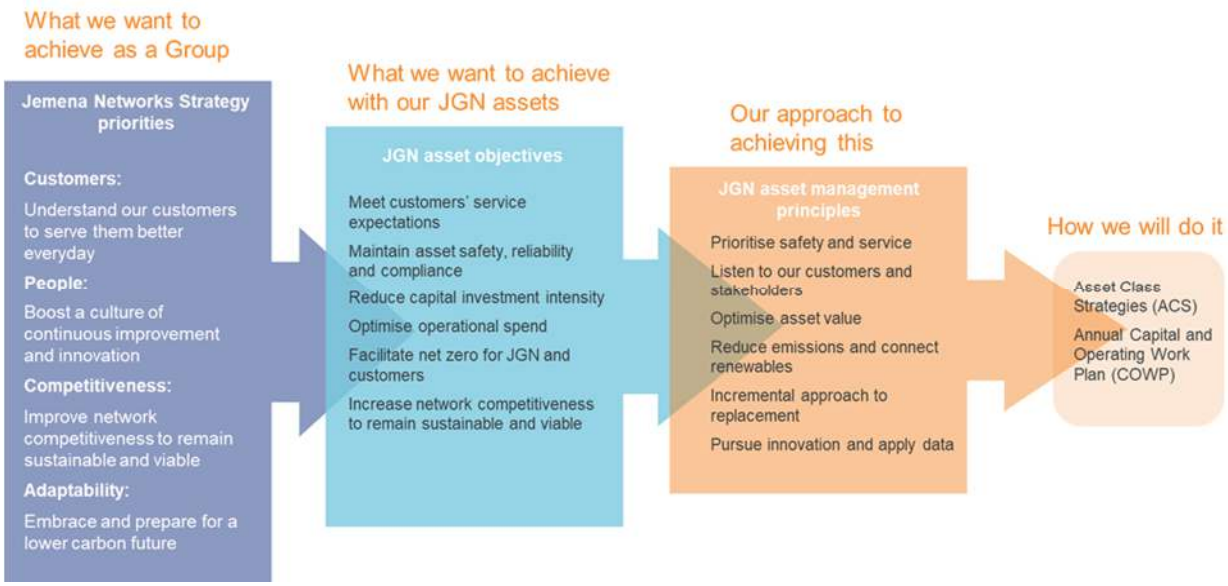
- Refreshed IC&E strategy – holistic IC&E simplification and standardisation
- [redacted]
- Western Sydney Hydrogen Hub facility five-year mission
- Connect new biomethane / hydrogen facilities

PART A: Strategy and Asset Management Principles

1. Purpose of this Document

The purpose of this Facilities Asset Class Strategy (**ACS**) is to explain the approach and principal methods by which the facilities asset class contributes to delivering the Jemena Gas Networks (**JGN**) asset objectives. The JGN asset objectives are defined in the JGN Asset Business Strategy (**ABS**) and driven by the overarching Jemena Networks Strategy. The ACS is reviewed and updated annually and considers up to a 20-year outlook for the asset class.

Figure 1–1: Summary of JGN asset objectives and asset management principles



As shown in Figure 1–1, the Jemena Networks Strategy sets out what we want to achieve with our network assets (both gas and electricity) as a Group. This informs our JGN asset objectives, which outline what we want to achieve with our gas network assets. We then have a set of asset management principles, which inform the approach we will take to achieving our JGN asset objectives.

The role of the ACS is to bring these together and provide a high level explanation of how we will manage the asset class. From here we can develop the various business cases and works programs that form our annual work plan, budgets, and ongoing expenditure forecasts.

The Facilities ACS includes information about each asset sub-class, including:

- **Drivers for expenditure** – the key asset management drivers that inform why and when we invest in our gas distribution facilities.
- **Asset management considerations** – the important factors we consider when determining when and how to invest in our facilities.
- **Asset performance** – information about performance, condition, and service levels.
- **Emerging risks and priorities** – identified threats, opportunities, strengths and weakness that we need to be aware of and factor into our facilities asset management plans.
- **Key initiatives** – taking all the above into consideration, the ACS provides a high level summary of key initiatives / asset management practices we will undertake to ensure our gas distribution facilities meet the JGN asset objectives.

1.1 Structure of this ACS

Main body

The main body of the ACS is structured into three broad parts, to allow the document to be reviewed and updated easily:

- **Part A: Strategy and Asset Management Principles** – this section makes the link between the ACS and the overarching Jemena Network Strategy, summarising the asset class objectives, expenditure drivers and governance process for managing the gas distribution facilities and their component assets.

  The information in Part A should be relatively static, only changing when there is a material change to the overarching Jemena strategies. While Part A should be revisited as part of the annual ACS review, it is unlikely to require significant updates, and should be reserved for a major review every five years.

- **Part B: Asset Performance and APaIR** – this section summarises the current performance and risk associated with the asset class. It also includes as summary of asset quantities as at the end of the last full calendar year. Part B is essentially a summary of the critical information from the annual Asset Performance and Integrity Review (**APaIR**), as well as the relevant asset risk register for each asset class.

  The information in Part B should be high level only, with the finer detail on asset performance and risk available in the related APaIR and risk register. Part B should be reviewed and updated annually, to reflect the critical information from these two documents.

- **Part C: Emerging Risks and Priorities** – this section summarises any risk or opportunities that we need to be aware of when managing the asset class. This may include, for example; technical obsolescence; pending supply or specification changes; government policy; or technical developments/innovation.

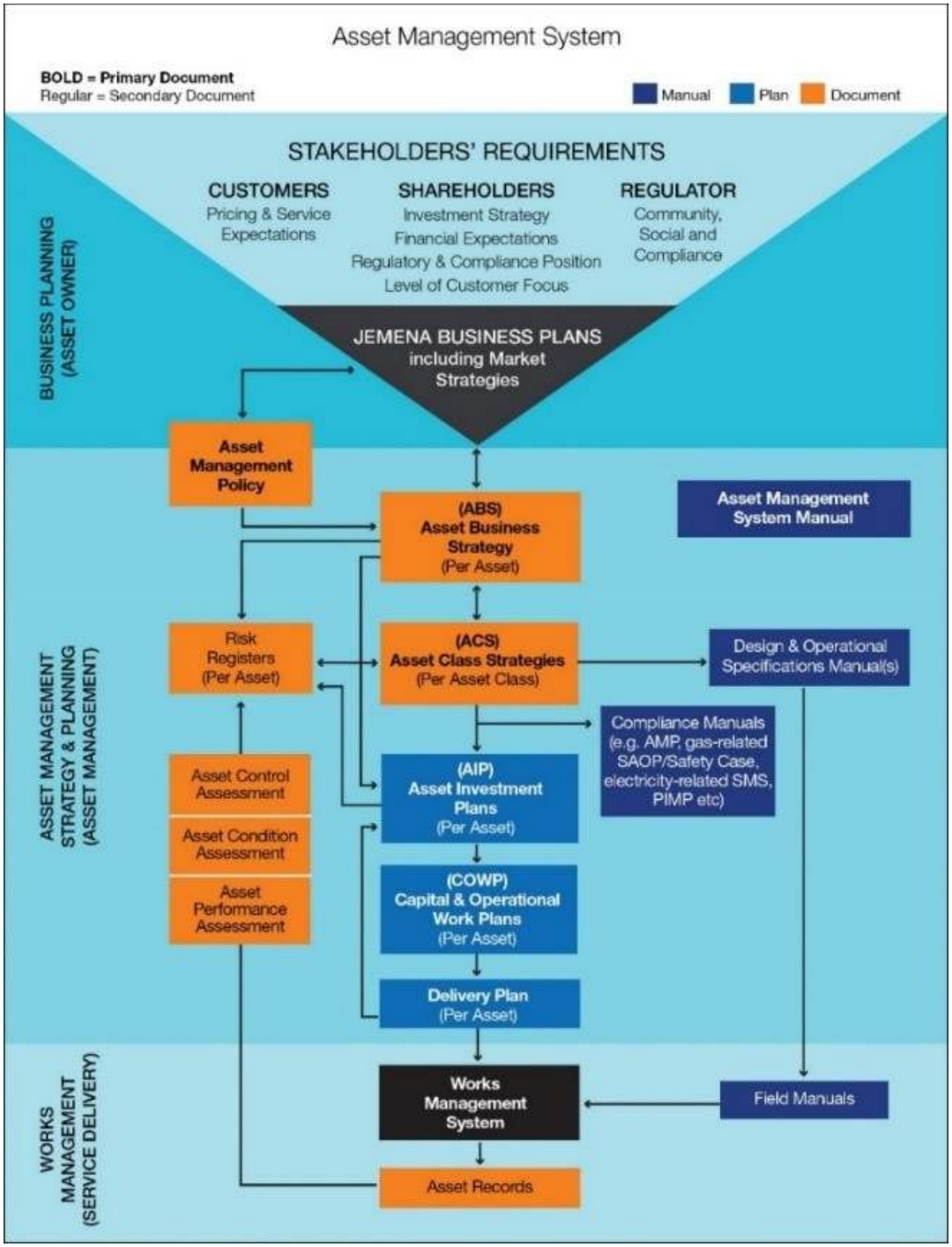
  Part C should also include a high-level summary of the current key initiatives or asset management approach being applied to the asset class. It does not need to go into detail on specific projects or costing (as this information is contained in the individual business cases and Capital and Operating Work Plan (**COWP**)), it just needs to provide the Asset Class Owner a high-level view of the strategies we are undertaking.

  The information in Part C should be reviewed and updated annually, to make sure it still reflects the emerging risks, priorities and current projects.

1.2 Asset Management System

The relationship between the ACS and other documents within JGN's asset management system is illustrated in Figure 1-2.

Figure 1-2: JGN Asset Management System document hierarchy

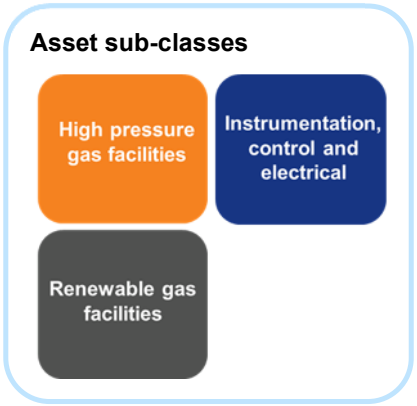


A detailed description of JGN's asset management system and its constituent parts is available in the Jemena Asset Management System Manual[1].

[1] JEM AM MA 001 – Jemena Asset Management Manual Revision 11 (17/03/2023)

2. Description of Assets Covered

JGN owns and operates various AS2885 pipeline offtake gas facilities downstream of the Wilton Custody Transfer Station (**CTS**) as well as various offtake receipt facilities along the APA pipelines that supply the JGN distribution networks in New South Wales (**NSW**).



The Facilities ACS covers the following asset sub-classes:

- high pressure facilities;
- instrumentation, control and electrical; and
- low emission renewable gas facilities.

Table 2-1 summarises each facilities asset sub-class, what the assets do, and the different types of assets.

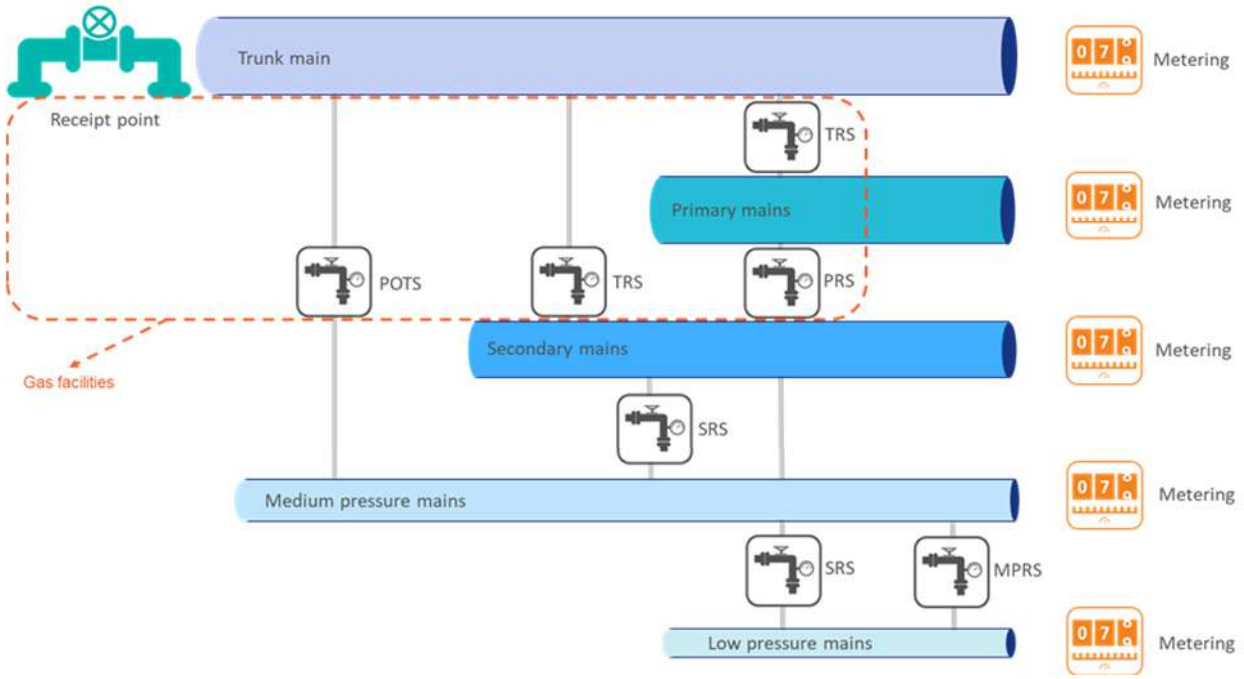
Table 2-1: Summary of key facilities asset types, by sub-class

Asset sub-class / asset	Description
High Pressure Facilities	High pressure facilities are used to measure, filter and reduce the pressure of natural gas to ensure it is being supplied at an appropriate pressure and quality downstream in the network. The asset sub class also includes the concrete pits and buildings that house these facilities.
Custody Transfer Stations (**CTS**)	Gas metering facility designed to accurately measure and transfer the custody of gas from a third party (such as a processing plant) to our gas network at the appropriate network operating pressures.
Trunk Regulating Stations (**TRS**)	Gas pressure reduction and filtration facilities that are supplied at trunk pressure and deliver gas at the appropriate pressure to the downstream network.
Primary Regulating Stations (**PRS**)	Gas pressure reduction and filtration facilities located at each off-take on the primary main. These facilities reduce the pressure from 3,500kPa to 1,050kPa to supply the secondary network or lower metering pressures to a specific customer.
Packaged Offtake Stations (**POTS**)	Generally smaller capacity installations combining or 'packaging' the functions of measurement, filtration and pressure reduction. They are supplied at trunk pressure and deliver gas at the appropriate pressure to the downstream network.
Bulk Metering Stations (**BMS**)	Delivers gas to a single user who is generally large industrial customer. Two bulk metering stations in the Trunk Facilities asset category are Incitec at Kooragang Island and the Munmorah Off Take Metering Station (**MOMS**).
Water bath heaters (**WBH**)	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.
Electrical insulated heaters (**EIH**)	An insulated electrical heat trace system that raises the temperature of the inlet piping to the facility to not adversely affect the downstream components from low temperatures.
Automatic line break valves (**ALBV**)	Devices used to automatically isolate certain segments of a pipeline when a rapid change in system pressure is detected (for example in the event of a pipeline rupture).

Asset sub-class / asset	Description
Instrumentation, Control and Electrical (IC&E)	The instruments, control mechanisms and electrical components within a facility. This asset sub-class covers management of: • electrical earthing systems; • hazardous area classification; • electrical equipment in hazardous areas (**EEHA**); • alternating current (**AC**) and direct current (**DC**) distribution systems; and • facility control philosophies.
Types of IC&E equipment	• Transmitters, all applications • Switches, all types • Intrinsic safe barriers and isolators • Control valves • Control valve positioners • Cabling, panel wiring and glands • Junction boxes • Electrical motors • Light fittings • Surge diverters • Electronic and pneumatic controllers • Main switch boards • Distribution board and sub-boards • Earth electrodes and grids • Batteries
Low Emission Renewable Gas Facilities	Facilities associated with the injection of low emission renewable gases such as biomethane, hydrogen or hydrogen blends into the network. This does not include processing facilities owned and operated by third parties.
Electrolyser	Primary plant, generates hydrogen gas on-demand from mains feed of electricity and water, all hydrogen produced flows into the Buffer Store Pipeline.
Buffer store pipeline	Manages incoming flow of hydrogen gas from the electrolyser for temporary onsite storage and distribution to gas injection, Genset and future hydrogen refuelling station.
Gas control panel	Controls the distribution of hydrogen from the buffer store pipeline to the other equipment (Genset, secondary injection & future refuelling station).
Power grid connection	Interconnection between existing power lines and site transformer, including a 2 way meter.
Transformer	Voltage step down between the facility and mains grid power.
Genset	Hydrogen fuel cell and Natural Gas / Hydrogen microgenerator to provide electricity on demand for site standby power or power grid back up testing.

Figure 2–1 shows how the facilities asset class features within the broader gas distribution network.

Figure 2–1: Schematic of JGN asset classes – facilities assets



The quantity of each type of asset in our network is continually changing. The number of each different type of asset as at the end of the last calendar year is summarised in Part B of this ACS.

3. Strategy and Asset Management Principles

3.1 Alignment of Asset Objectives

The facilities asset class objectives are designed to support the overarching JGN asset objectives. The JGN asset objectives are detailed in the JGN Asset Business Strategy (**ABS**).

The facilities asset class objectives, along with the measures and targeted used to assess performance against these objectives, are presented in Table 3-1.

Table 3-1: Alignment of facilities asset class objectives

JGN asset objective	Facilities asset class objective	Asset class measure	Target
Meet customers' service expectations	Maintain current service levels to customers & compliance to regulatory / legislative requirements.	Ensure facilities instrumentation and equipment is Hazardous Area (HA) safety compliant	90%
		Facilities preventative maintenance completed.	95%
Maintain asset safety, reliability and compliance	Maintain asset integrity and targeted risk levels, only improving risks where efficient to do so.	Delivery pressure performance	Within +/- 1.5% of Set Pressure
		Risks identified in the facilities risk register	All risks at targeted levels
		Facilities incidents notifiable to technical regulator	0
		Vandalism reports / occurrences	<12
Reduce capital investment intensity	Reduce the cost of investing in and maintaining facility assets, without compromising risk.	Opex budget control	Opex costs at or below budget levels.
Optimise operational spend			
Increase network competitiveness to remain sustainable and viable			
Facilitate net zero for JGN and our customers	Renewable gas readiness	Enable connections of renewable gas facilities to the network.	10 current gas facilities to alter their operations to enable renewable facility connections by 2030

3.2 Asset Management Principles

As detailed in the ABS and JGN-10 strategies, the operating environment and stakeholder expectations are crucial inputs into how we operate and invest in the network. External factors, including regulations, technical standards, technological advances, and customer requirements are regularly evolving, which means we must regularly review and monitor the strategic drivers for investment.

The ABS identifies the following principles that influence how we manage our assets. A summary of how these principles relate to the facilities asset class is provided in the table below.

Table 3–2: How the ABS asset management principles apply to the facilities asset class

ABS asset management principles	Summary	Facilities ACS
Prioritise safety and service	Our priority is to make certain our assets are safe, and provide the service or function our customers and staff need.	We design, inspect, replace and refurbish facilities in line with Australian Standards and requirements of various Acts and Regulations. We proactively replace equipment and conduct preventative maintenance to minimise downtime and the potential risk to staff and the public.
Listen to our customers and stakeholders	We will listen to customer feedback and seek to offer them the network services they want, working within the regulatory and legislative framework set by our stakeholders.	We assess the ongoing use case for facilities prior to refurbishing them, ensuring the equipment installed is most suited to support how customers and staff will use that section of the network going forward.
Maximise asset value	Where possible we will seek to change the investment triggers for replacement/rehabilitation of assets such as meters, facilities, pipelines and network pressure mains, with a view to extending asset life where safe and prudent to do so.	We will adopt a whole-of-facility approach to IC&E obsolescence and end of life, removing non-essential components, and simplifying facility operation where practicable. We maximise asset life through effective use of maintenance programs as well as ongoing assessments of repair vs replacement.
Net zero	We will pursue opportunities to use our assets, or connect new assets, to help reduce our own or our customers' emissions, where economically efficient to do so.	We will consider the likelihood of renewable gases, including hydrogen, passing through the facility, and ensure the facility components and hazardous areas can support alternative gases in the timeframes required. We will seek to connect new biomethane and other renewable gas facilities for an efficient cost.
Incremental approach	We will adopt an incremental approach to modernising and adapting the network, introducing new asset types as older assets fall due for replacement, avoiding large-scale, high-cost replacement programs where practicable.	Where prudent and cost effective we will incrementally replace components with >20% hydrogen blend materials. We will install new equipment such that hazardous area expansion issues have been proactively mitigated.
Use data to inform decisions	We will seek to inform our asset management practices with better data, for example using more sophisticated leak detection data to target mains and services replacement.	Ongoing gas quality and measurement data is critical to asset management decisions. This area is under constant review, as network hydraulic modelling evolves with new renewable gas injection points. We will use this data to inform future facilities design and refurb requirements.
Pursue innovation	We will follow technological advancements and investigate how we can apply innovative solutions to ensure the gas network remains valued by customers.	As biomethane and hydrogen becomes more commonplace, renewable ready IC&E equipment and technology is quickly becoming more cost effective. We will seek to utilise this new IC&E where safe prudent and efficient to do so.

3.3 Expenditure Drivers and Asset Management Considerations

The primary function of the facilities asset class is to provide gas pressure reduction and filtration, ensuring gas is delivered to the downstream network at the appropriate pressure. Facilities assets also include valves to isolate certain segments of a network, bulk metering stations to provide single users, and a renewable gas facilities that can inject renewable gases into the distributions system.

Gas distribution facilities assets are necessary for the ongoing operation and safety of the network. Each facility has a specific function. Our role as prudent asset managers is to ensure these assets function safely and continue to provide the service they were designed for, replacing or refurbishing them in a timely manner.

As summarised in Figure 3–1, we generally replace or refurbish facilities when they are no longer safe; they no longer comply with standards; they are at risk of security breach; or when they can no longer be relied upon to provide the service they are required to perform. Our aim is to manage the facilities asset class for the lowest practicable sustainable cost.

Figure 3–1: Drivers of expenditure in facilities asset replacement/refurbishment

These expenditure drivers are described further below:

- **Service reliability and Obsolescence**– Where a facility or IC&E asset can no longer be relied upon to provide the function it was designed for, we will replace, refurbish, or remove that asset as necessary. Service reliability failure could be due to declining asset condition, obsolescence of components, or a change in demand or gas flows meaning the facility is no longer suitable to provide the level of service required. Where asset replacement is necessary, we will substitute the asset with a fit-for-purpose replacement, giving careful consideration to how the facility will be used in the future. If the asset or IC&E component is no longer required, or there is a more simple alternative solution, we will seek to remove the asset and simplify the way the facility operates
- **Safety** – It is vital our facilities assets remain safe. We replace facilities assets when they pose an unacceptable safety risk. This may be due to deterioration in asset condition, or a change in the local environment that increases the risk associated with asset failure and/or gas leaks.
- **Compliance** – Our facilities and IC&E components are installed and maintained in line with Australian Standards and the requirements of the Electricity Act 2004 and the Electricity Regulation 2006. Where facilities or their components do not comply with current standards, we will conduct a safety and integrity risk assessment and look to address any risks identified as ‘Significant’ or higher.

- [redacted]
- .

Cost and affordability are always a factor. When incurring expenditure against these drivers, our aim is always to address the issue at the lowest practicably sustainable cost. Note this may not always mean the cheapest option. In making our investment decisions we look at the longer-term use of the assets in question, along with a suite of additional considerations. For facilities assets, these key considerations are:

- **Site criticality** – Some facilities are critical to ongoing network operation. When investing in facilities we consider how many customers would be affected by a failure at that site, and the level of redundancy in that part of the network. Wherever practicable we seek to design contingency/redundancy into the network to minimise the risk of major interruptions to customers and will always prioritise the most critical facility sites.
- **Holistic IC&E replacement and simplifying design** – When facilities/components are due for replacement/refurb, we will consider the future use of the facility and whether it is more efficient to conduct a whole-of-facility replacement of IC&E rather than partial replacement. Is there opportunity to simplify facility operation or standardise components?
- **Current or upcoming obsolescence** – can we obtain replacement parts, are the assets still supported by the original equipment manufacturer, and if so, for how long?
- **Contemporary technologies and innovations** – is a like-for-like replacement the best option? Is there an alternative technical solution or non-network solution that is a more efficient alternative. What new developments are likely to emerge during the asset's useful life?
- **UAG and emissions reduction** – networks will always leak, vent, or record variances between the amount of gas being distributed and the amount of gas being consumed. Is there a way of reducing UAG at facilities? Is there benefit in introducing lower-emissions gas to the facility, and is the incremental cost of this alternative a prudent and efficient option?

Taking these considerations, our expenditure drivers, and our asset objectives into account, we select the most prudent and efficient strategy for managing each class and sub-class of asset.

3.4 Asset Strategies

3.4.1 High Pressure Facilities and IC&E

Our strategy for high pressure facilities and their components parts (IC&E) is to extend the life of assets where safe and prudent to do so. This is managed through regular performance inspections including:

- pressure checks
- electrical equipment in hazardous areas (**EEHA**) inspections
- switch board inspections
- earth system testing
- residual current device (**RCD**) testing

[2] Documented in JAA LEG PR 0004 – Group Critical Infrastructure Risk Management Plan.

- WBH type B appliance testing

Where components do not meet safety, compliance or integrity requirements – especially those in hazardous areas – we will prioritise these for replacement or refurbishment. When considering the extent of these projects, we look at how the facility is likely to be used in the future. This includes the number of customers dependent on that facility, pressure requirements, network redundancy, and the likelihood that renewable gas (biomethane, hydrogen or hydrogen blends) will pass through the facility within its useful life. Based on these considerations, we will renew the facility with the relevant future-proof components.

Our strategy is also to simplify and standardise our gas facilities, where possible. When components within a facility are obsolete and/or end of life, we assess the entire operability of the facility and look at the most appropriate replacement solution. In doing so we look at whether we can simplify facility design and remove components that are no longer essential. Standardisation and simplification of components across facilities helps us manage ongoing maintenance and future replacement costs. It also helps mitigate obsolescence risk.

Facilities equipment is ready for renewable gas (biomethane or <10% hydrogen blends) in the short term. However, with expected increasing volumes of renewable gas and the potential to have >20% blends hydrogen in the network after 2030, we are taking prudent steps to review the equipment specifications when assets fail or are replaced through end of life programs. If the incremental cost of replacing components with hydrogen ready equipment is marginal, then it is installed in preference to a like for like unit.

[redacted]

3.4.2 Low Emission Renewable Gas Facilities

Our low emission renewable gas facilities are a relatively new asset class, with the first facility – the Western Sydney Hydrogen Hub (**WSHH**) packaged facility – commissioned in 2021. This does not include the processing facilities owned and operated by third parties. . Our strategy for our renewable gas facilities is broadly consistent with other types of facilities, with a focus on EEHA. Hydrogen and other gaseous elements behave differently to natural gas, requiring a bespoke set of risk management controls. We therefore have a low emission renewable specific risk register and develop action plans for all risks identified as significant or higher.

We monitor condition of our renewable gas facilities as per the Operations, Monitoring, Control & Response document (**OMCR**)[3] and Field Operations and Maintenance Specification (**FOMS**)[4], during the annual asset performance reviews. Renewable gas facility assets will only be replaced upon failure or upon identifying performance/compliance issues during periodic inspection and testing, when operational / maintenance solutions are no longer prudent or efficient.

[redacted]

3.5 ACS Planning Horizons

The ACS consider three forecasting horizons when planning, with the two-year COWP being the most accurate. The AIP taking a 7-year view, and a 20-year outlook to ensure planning for the long term benefit of customers.

Over time, planning profiles have been informed by the objectives outlined in the ABS as well as customer expectations, JGN's regulatory and operating environments, asset condition and risk. The forecast beyond two years is more subject to change as these factors evolve, and even more so beyond year seven[5]. Therefore, any

[3] P2G-2099-SP-NC-001 : WSHH Operations, Monitoring, Control & Response Specification

[4] P2G-2099-SP-ME-012 : WSHH AS2885 Field Operations and Maintenance Specification.

[5] Seven years is the planning horizon of the AIP.

forecast is indicative only and represents the projects required for this asset class to continue to support the JGN objectives.

3.6 Governance

This ACS is reviewed to ensure ongoing alignment with the Jemena Network Strategy and the asset objectives outlined in the ABS, and to account for any additional asset performance and risk information. Table 3-3 outlines the **RASCI** for this ACS.

Table 3-3: RASCI Governance Table for ACS

Element	Descriptor	Group/Person
Responsibility	Who is responsible for carrying out the entrusted task?	Asset Management – Gas Distribution
Accountable (Approval)	Who is responsible for the whole task and who is responsible for what has been done?	GM Asset and Operations – Gas
Support	Who provides support during the implementation of the activity / process / service?	Network Services Asset Management – Gas Distribution
Consultation	Who can provide valuable advice or consultation for the task?	Strategy and Commercial Asset Investment Network Services Risk and Assurance
Inform	Who should be informed about the task progress or the decisions in the task?	EGM Networks

PART B: Asset Performance

4. Asset Quantities

The volume of facilities assets in our gas distribution network is continually changing as new facilities are commissioned and IC&E assets are replaced. Table 4–1 provides an overview of facilities asset quantities as at the end of the most recent calendar year prior to developing this version of the ACS.

For the latest information on asset quantities, refer to ECMS. For further information on current asset performance, refer to the Facilities APaIR.

Table 4–1: Facilities asset quantities on 30 June 2023

Asset sub-class	Element	Quantity (2023)
High Pressure Facilities	CTS	1
	TRS	29
	PRS	16
	POTS	26
	BMS	4
	WBH	15
	EIH	2
	Trunk ALBV	11
	Primary ALBV	17
IC&E	Individual IC&E assets are numerous, and volumes vary by facility.	
Low Emission Renewable Gas facilities	WSHH (Horsley Park)	1

5. Asset Performance Against Objectives

Performance across the facilities asset class is a mix of notable successes and identified challenges. We are currently focused on addressing those facility asset performance indicators that are underperforming and have actions in place and a commitment to continuous improvement.

Detailed information on performance in each asset class, including detailed condition assessment is provided in the Facilities APaIR. For the purpose of this ACS, Table 5–1 provides a summary of current performance against indicators.

Table 5–1: Facilities asset class performance against objectives and indicators

Facilities asset class objective	Measure	Target	2022/23 Performance	Status
Maintain current service levels to customers & compliance to regulatory / legislative requirements.	Ensure facilities instrumentation and equipment is Hazardous Area (HA) safety compliant	90%	Over the 2022/23 reporting period, approximately 70% of JGN facilities are compliant with prevailing electrical safety standards. Of the 25 facilities that are potentially non-compliant, a risk based capital program and HA program has been identified to rectify the issues.	
	Facilities preventative maintenance completed.	95%	Over the reporting period, 9 out of the 12 monthly PM compliance figures were > 95%.	
Maintain asset integrity and targeted risk levels, only improving risks where efficient to do so.	Delivery pressure performance	Within +/- 1.5% of Set Pressure	Four (4) facilities operated outside the expected range, with these sites all not utilising the Gorter type regulators. These deviations are still minimal and pose no threat to supply.	
	Risks identified in the facilities risk register	All risks at targeted levels	There are five (5) 'High' and 10 'Significant' rated risks in the risk register above target levels. These risks are being addressed either via Current Capital works or the ECR / TQ process.	
	Facilities incidents notifiable to technical regulator	0	There have been no notifiable incidents to the regulator during the reporting period.	
	Vandalism reports / occurrences	<12	There have been no instances of vandalism during the reporting period.	
Reduce the cost of investing in and maintaining facility assets, without compromising risk.	Opex budget control	Opex at or budget.	The maintenance costs for 2022/23 were slightly over budget.	
Renewable gas readiness	Enable connections of renewable gas facilities to the network.	10 current gas facilities to alter operations.	New measure for 2023. One (1) facility : Banksmeadow PRS has altered operations slightly to enable Malabar Biomethane injections.	 New

6. Current Asset Condition, Risks and Controls

The purpose of this section of the ACS is to provide a high-level overview of asset condition, and to highlight the highest priority risks associated with each sub-class. This section is indicative only and is designed to provide an annual snapshot of the key asset condition and risk issues that need to be managed.

The criticality of any facilities asset is proportional to the volume of gas passing through it and the number of customers dependent on supply from that part of the network. A facility generally contains numerous critical mechanical and IC&E component assets. We monitor this performance to identify any systemic failures that would warrant changes of similar components in other facilities. Where possible we standardise and simplify facility design to help reduce complexity and failure risk.

[redacted]

More detailed information on asset condition is available in the Facilities APaIR. The full suite of asset risks, along with a more contemporary view of the risk status is recorded in the Facilities Asset Class Register.

6.1 High Pressure Facilities

6.1.1 Condition Assessment

The condition of the facilities varies across the network. However, overall structural integrity is satisfactory for pressure containment and reliability of supply. Excessive noise and vibration have been identified at a number of PRS sites, which may cause pipe fatigue and failure downstream in the network. A program of works to address noise/vibration issues is being delivered.

The following table provides a snapshot of the pressure performance over the reporting period (1st July 2022 to 30th June 2023). Given the number of facilities, it highlights the top ten sites with the highest pressure deviations.

Table 6–1: Facility delivery pressure profiles (top ten deviations) 2022-23

Network Section	Site	Q1 (kPag)	Median (kPag)	Q3 (kPag)	NSP (kPag)	Deviation from NSP
Sydney Metro	Wilton PLS	4081	4117	4136	4100	1.36%
	Horsley Park TRS	3351	3439	3439	3420	2.57%
	West Hoxton TRS	3420	3441	3455	3420	1.03%
Country	Dubbo West POTS	202	203	204	200	0.94%
	Cowra TRS	998	1004	1008	1000	0.98%
	Forbes POTS	203	204	205	200	1.04%
	Parkes POTS	199	201	202	200	1.32%
	Goulburn POTS	998	996	1004	1000	1.59%
	Boorowa POTS	198	200	203	200	2.48%
Southern Highlands	Moss Vale TRS	986	994	1003	1000	1.73%

Data samples were taken for each measured point at hourly intervals over the one year period. The resulting datasets have been broken down to give the first, second (median) and third interquartile to showcase the performance of each facility. Delivery pressure performance is acceptable, with all but two facilities operating within +/- 1.5% of the Nominal Set Point (**NSP**). Pneumatic regulator controlled sites have their nominal set points set locally on site in consultation with the control room. Electronically controlled sites are set remotely by the control room dispatchers.

The four facilities (Horsley Park, Goulburn, Boorowa and Moss Vale) that experience the highest deviations do not utilise Gorter regulators. Gorter regulators provide a greater control of the delivery of outlet pressure as than other regulator types. These deviations experienced are still minimal and pose no threat to a loss of supply. Horsley Park TRS required a pressure reduction for the pipeline down to 2800kPa due to the integrity dig project on the Sydney Primary Main, hence the deviation across the yearly statistics.

6.1.1.1 Age Profile

The age profiles of the facilities are shown in the figures below. Note individual components such as filters and regulators are replaced at various times during the life of the facility, which are not reflected in the figures below.

Figure 6–1: TRS age profile

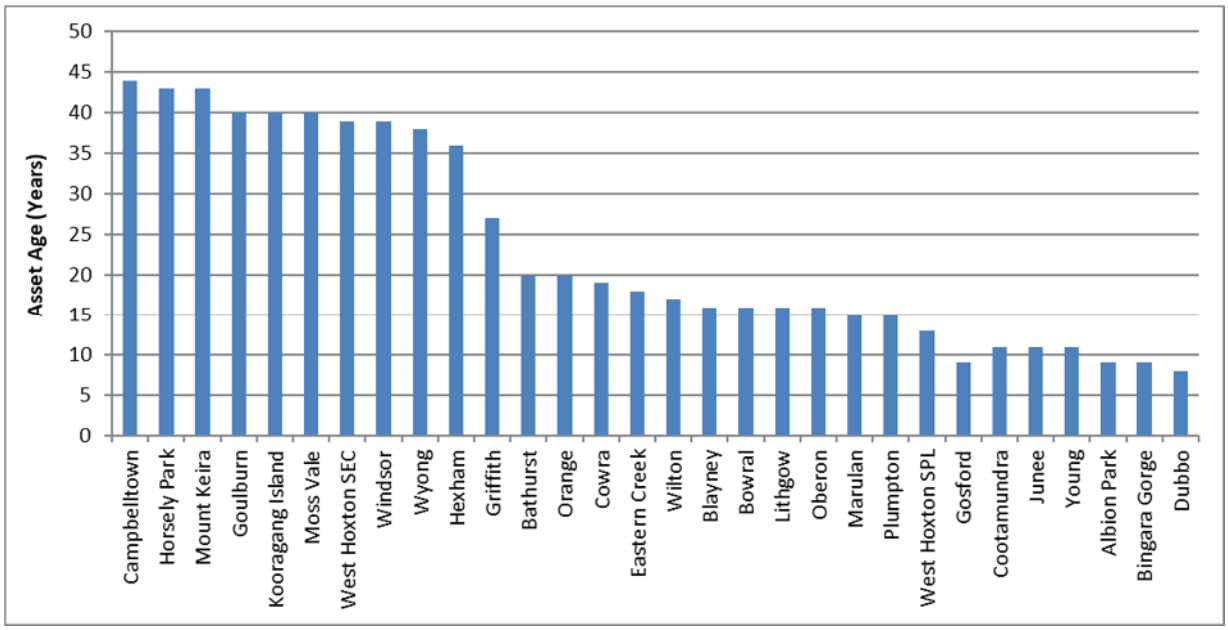


Figure 6–2: POTS age profile

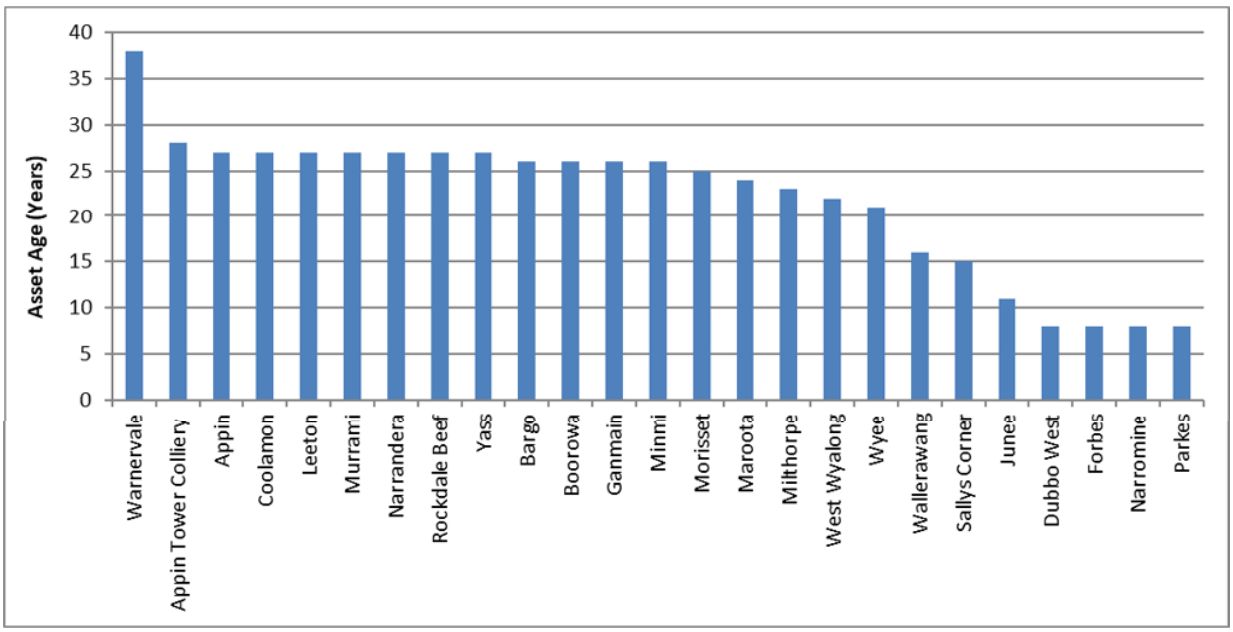


Figure 6–3: PRS / BMS age profile

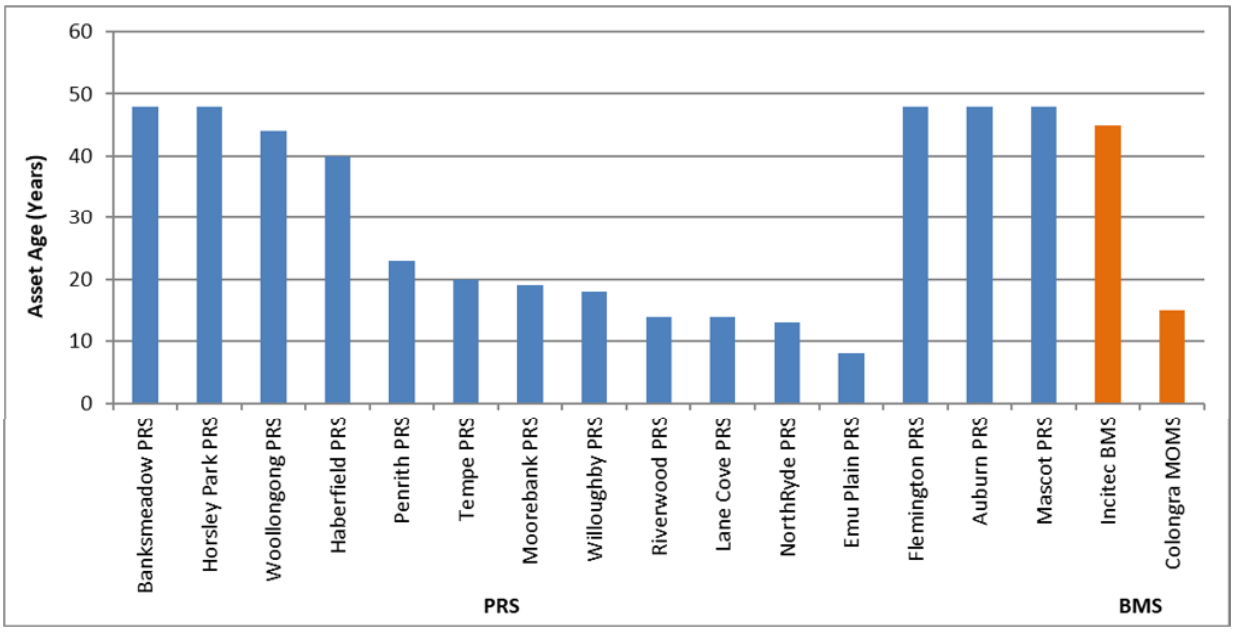


Figure 6–4: ALBV age profile

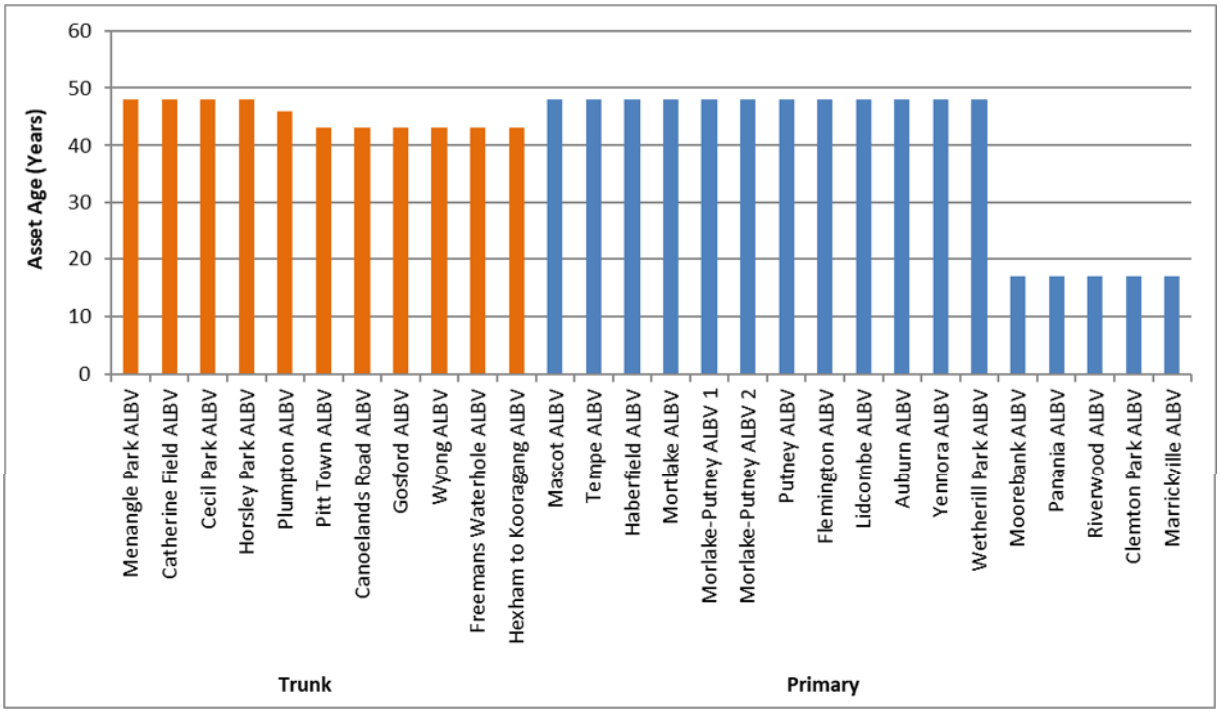
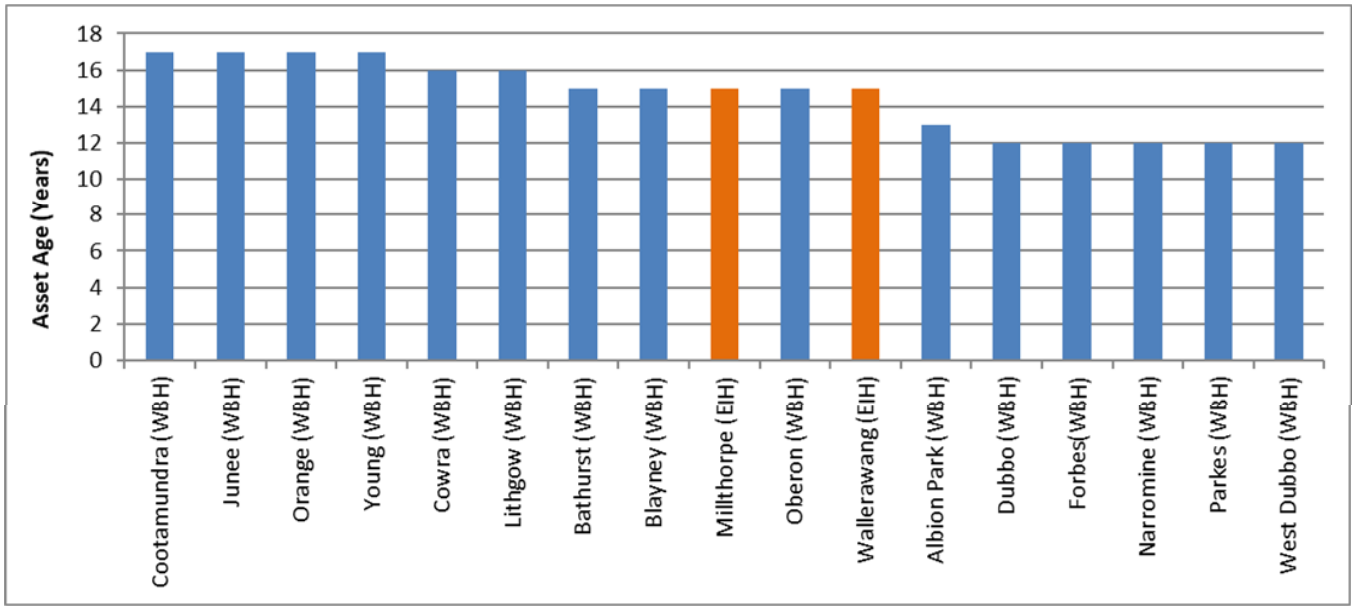


Figure 6–5: WBH age profile



6.1.2 Risks and Controls

Risks related to facilities assets are captured in the risk register in ECMS. The following table summarises the current risks and controls associated with gas distribution facilities equipment that were identified as inadequate/not at target. These risks should be prioritised for mitigation.

Table 6-2: High pressure facilities risks and controls identified as being below target and prioritised for action

Risk identifier	Description of Specific Sub-asset Class Risk	Current		Target		Status / action	Opportunity brief ID (where applicable)
		Jemena risk rating	Control effectiveness	Jemena risk rating	Control effectiveness		
10,15,29,34,80	High noise levels that induce vibration resulting in fatigue of piping downstream	High	Fair	High	Strong	Most of the older PRSs in the network were constructed with V ball control valves. Noise measurements exceed the manufacturer's guidelines. The high noise levels can cause vibration, resulting in fatigue of piping in the downstream. An incident in Auburn PRS was the result of such vibration. A program is in place to replace V balls with silent trim control valves.	OB438 – Haberfield PRS Upgrade OB472 – Banksmeadow PRS Upgrade
17,36,81,31,51	Single point of pressure failure	High	Fair	High	Strong	Potential pressure control failure has been identified at several PRSs if common sense-lines are hit. Planned upgrades of the affected PRS are scheduled. The existing sense lines will be only used for the active control valves and a new sense line will be installed for the monitor control valves.	OB438 – Haberfield PRS Upgrade OB472 – Banksmeadow PRS Upgrade
11,16,30,35,48	Concrete spalling of PRS pits	Significant	Fair	Moderate	Strong	A selected number of PRS pits showed signs of deterioration due to inadequate concrete covering over steel reinforcement. Though structurally they have lost up to 10% design strength it is adequate for their purpose. If untreated, extensive repairs would be required in the near future.	OB552 – Flemington Pipework in PITS OB549 – Mascot Pipework in PITS

Risk identifier	Description of Specific Sub-asset Class Risk	Current		Target		Status / action	Opportunity brief ID (where applicable)
		Jemena risk rating	Control effectiveness	Jemena risk rating	Control effectiveness		
133, 134, 139, 140, 141, 142	Vandalism to high pressure facility assets	Significant	Poor	Moderate	Adequate	[redacted]	[redacted]
494	Air compressor failure	Significant	Adequate	Moderate	Adequate	Majority of PRSs were constructed with Fisher control valves. Compressed air is used with natural gas providing backup as bleeds from the controller creates explosive atmosphere in PRS pits and the smell of gas creates nuisance to the public. Air compressor failures are common occurrences though there are adequate redundancies to ensure that the stations do not shutdown. The failure of air dryers or total flooding of the pits would also result in the closing of control valves when the controllers' pneumatic lines are blocked by liquid.	Risk being incorporated into Facility Obsolescence projects to either replace or remove instrument air compressors.

6.2 Instrumentation, Control and Electrical

6.2.1 Condition Assessment

The condition of the IC&E assets is generally adequate. However, a number of high pressure gas facility sites have been identified where IC&E assets are not compliant with the Electricity Act 2004 and the Electricity Regulation 2006. A program of work is underway to deliver electrically compliant facilities and to confirm process and mechanical integrity of the facilities generally.

Performance requirements, condition, life expectancy and other aspects are detailed in the Design Basis Manual Specification, the Operations and Maintenance Specification, the Operations, Control, Monitoring and Response Specification, and the Facilities APaIR.

6.2.1.1 Age Profile

The existing age profile for IC&E assets is in line with the age profile of all the JGN facilities.

6.2.2 Risks and Controls

Risks related to IC&E assets are captured in the risk register in ECMS. The following table summarises the current risks and controls associated with IC&E identified as inadequate/not at target levels. These risks should be prioritised for mitigation.

Table 6–3: IC&E risks and controls identified as being below target and prioritised for action

Risk identifier	Description of Specific Sub-asset Class Risk	Current		Target		Status / action	Opportunity brief ID (where applicable)
		Jemena risk rating	Control effectiveness	Jemena risk rating	Control effectiveness		
86 to 123	Non-compliant installation in accordance with AS 3000 & AS 60079 leading to an incident.	Significant	Adequate	Moderate	Adequate	The current risk rating is below target, a number of IC&E assets on in-service pressured facilities are not installed in compliance with AS 3000 and AS 60079. A program to identify and address non-compliant instrumentation is under way.	OB537 –Auburn PRS – Facilities Obsolescence OB538 –Tempe PRS- Facilities Obsolescence OB539 –Flemington- Facilities Obsolescence PRS OB540 –Mascot PRS- Facilities Obsolescence OB721 –Horsley Park- Facilities Obsolescence TRS OB723 –Hexham TRS- Facilities Obsolescence
86 to 123	Main earth electrode or main earth conductor failure leading to step and touch potential or electric shock	Significant	Adequate	Moderate	Strong	The current risk rating and control effectiveness is below target, a number of IC&E assets on in-service pressured facilities are not installed in compliance with AS 3000 and AS 60079. A program to identify and address non-compliant instrumentation is under way.	
86 to 123	Electrical spark causing ignition of gas	Significant	Adequate	Moderate	Strong	The current risk rating and control effectiveness is below target, a number of IC&E assets on in-service pressured facilities are not installed in compliance with AS 3000 and AS 60079. A program to identify and address non-compliant instrumentation is under way.	
86 to 123	Incorrect hazardous area classification leading to a hazardous area zone in a public space	Significant	Adequate	Moderate	Adequate	The current risk rating is below target, a number of IC&E assets on in-service pressured facilities are not installed in compliance with AS 3000 and AS 60079. A program to identify and address non-compliant instrumentation is under way.	

6.3 Low Emission Renewable Gas Facilities

6.3.1 Condition Assessment

We currently have one (1) low emission renewable gas facility – the Western Sydney Hydrogen Hub packaged facility at Horsley Park. This does not include process facility at Malabar as this is owned and operated by third parties. The Malabar CTS which connects the processing plant to the Jemena Gas Network is included in the relevant High Pressure Gas Facilities asset class. The condition of renewable assets is monitored and assessed against the specifications as per the Operations, Monitoring, Control & Response document and Field Operations and Maintenance Specification, during the yearly APaIR reviews.

6.3.1.1 Age Profile

The WSHH packaged facility was commissioned in Q3-2021.

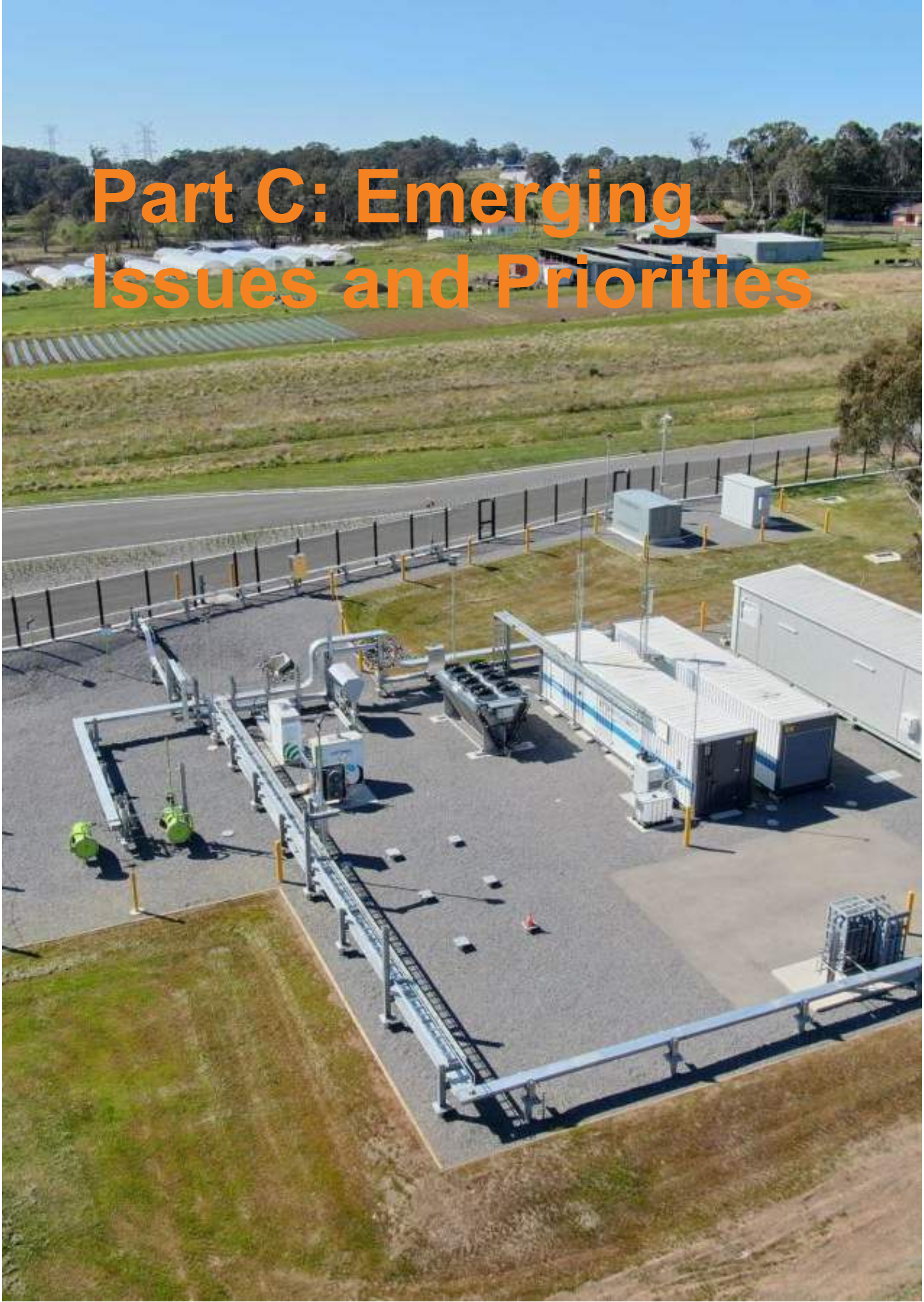
The WSHH facility may be decommissioned following the successful demonstration of the project objectives after an assumed project life of 5 years. Should a suitable case be made at the end of this period, a life extension may be sought.

6.3.2 Risks and Controls

Risks related to renewable facilities assets are captured in the risk register in ECMS. The following table summarises the current risks and controls associated with renewable facilities identified as inadequate/not at target levels. These risks should be prioritised for mitigation.

Table 6-4: Renewable facilities risks and controls identified as being below target and prioritised for action

Risk identifier	Description of Specific Sub-asset Class Risk	Current		Target		Status / action	Opportunity Brief ID (where applicable)
		Jemena risk rating	Control effectiveness	Jemena risk rating	Control effectiveness		
2099.0032.001	Incomplete degassing of break tank leading to explosive mixture of H2 and O2 in both tanks.	Significant	N/A	Moderate	Adequate	• The electrolyser has been turned off as requested by the manufacturer for similar issues abroad. • A new nitrogen purging system will be supplied & installed by the manufacturer.	OB2320 – WSHH Electrolyser DWS Safety Rectification.



Part C: Emerging Issues and Priorities

7. Emerging Risks and Priorities

This section highlights the key emerging and priorities for the facilities asset class. This is not an exhaustive list, and any new risks or priorities that emerge during the year should be captured in the asset class risk register, and then documented in the following year's ACS and captured in the ECMS.

7.1 High Pressure Facilities

Although rare, when high pressure facilities fail, the consequences can be catastrophic including fatalities, loss of assets and long term interruption to supply. Therefore, we have several ongoing programs and mitigation strategies to help ensure facilities remain safe and are operating within performance expectations.

The most significant performance issues and requirements for managing high pressure gas facilities identified over the next seven years are described in Table 7–1.

Table 7–1: Emerging risks and priorities associated with high pressure gas facilities

Emerging risk/priority	Description
[redacted]	[redacted]
Double block and bleed valves	A program has been put in place to install additional double block and bleed valves at facilities considered to be confined spaces. This is required to comply with relevant standards, maintain integrity of the network and safety of service.
Noisy control valves	The majority of the older PRS were constructed with V ball control valves. Noise measurements exceed the manufacturer's guidelines. The high noise levels can cause vibration, resulting in fatigue of piping in the downstream. An incident in Auburn PRS was the result of such vibration. A program is in place to replace V balls with silent trim control valves
Concrete pits	Some concrete pits that house PRS have shown signs of deterioration due to inadequate concrete covering over steel reinforcement. Concrete structures have lost around 10% of structural strength due to spalling (however the strength remains adequate for the duty load). Our strategy is to extend the life of these facilities by another 20 to 30 years by resealing exposed steel reinforcements and implementing five-year inspections and minor repairs. In addition, to mitigate flooding of pits, float switches are to be replaced with level transmitters to allow prioritising of pits pump out service calls. Drainage around pit lids is to be improved to minimise surface runoff into pits.
Hidden corrosion on water bath heaters	Corrosion has been detected under thermal laggings and on process coils inside Water Bath Heaters (WBH). This is due to metal loss found under pipe jacket below ground level at TRS. Inspection of the WBH population for this issue is required.
Solenoid valves on fuel gas trains	There has been a reoccurring failure of solenoid valves installed on fuel gas trains due to water ingress where GASCO water bath heaters are installed. The issue is not with the solenoid itself but with the cable fittings that have been factory installed. A procedure is being developed to provide a universal solution across the network where these solenoids, cable glands and cables are installed.
Replacement of WBH with catalytic heaters	As part of the Asset Management End to End review initiatives for high pressure facilities, the use of catalytic heaters over the traditional water bath heaters will be reviewed and investigated due to the significant ongoing operational costs and issues such as corrosion and pilot flame outages associated with water bath heaters, specifically across all JGN country sites. An assessment is being developed to replace all country water bath heaters with pipe catalytic heaters based on a targeted risk level approach. Also, any new gas facilities that require

	heating will explore the use of catalytic heaters as a first option, no matter the sizing requirements.
Auto Line Brake Valves (ALBV)	We are experiencing more occasions when auto line break valves are not fully sealing, thereby letting gas past when in the closed position. These valves will stop the vast majority of gas in an emergency situation; however some gas will still be passing that must be managed to avoid an unsafe situation. ALBV's are also used to isolate pipeline sections for maintenance purposes, enabling our staff to safely work in gas free environments. If these valves are passing we must use additional and time consuming flow stopping methods, at further expense, to create a safe working environment. We will be conducting a full assessment of these assets to determine a repair and replacement strategy going forward.
Bushfire risk	High pressure facilities located in or near bushfire prone areas are at risk of damage and failure, leading to loss of supply. A program of vegetation management around trunk and primary facilities located near bushland is under way.

7.2 IC&E

The most significant issues and requirements for managing IC&E at facilities identified over the next seven years are described in Table 7–1.

Table 7–2: Emerging risks and priorities associated with high pressure gas facilities

Emerging risk/priority	Description
Non-conforming instrumentation	A number of IC&E assets do not conform with the requirements of the Electricity Act 2004 and the Electricity Regulation 2006. As a result of the IC&E installations being well past their useful life a number of significant and high risks have been identified as part of testing and inspections.
Facility simplification	As technology evolves and the way facilities are used change, some IC&E equipment can become redundant or rationalised into fewer components. A program is underway to simplify IC&E at facilities (where prudent) that have become complex, identifying opportunities to standardise components. Facility simplification is being conducted as part of our ongoing facility/IC&E upgrade program. Where a facility asset is due for replacement (either due to failure or end of life) we will seek to upgrade and simplify the entire suite of IC&E components– where economically efficient to do so.

7.3 Renewable Facilities

The WSHH was commissioned in Q3 2021, and as such there are no current emerging risks or priorities associated with these facilities.

The outcomes of the five-year WSHH mission will be used to inform the case for additional Hydrogen facilities. A decision on the ongoing operation of the WSSG will be made at the end of its mission life.

8. Projects and Asset Management Initiatives

8.1 Ongoing Projects and Initiatives

This section provides a high-level overview of the key asset management and initiatives underway. The full list of projects can be found in the Asset Investment Plan (**AIP**) and the Capital and Operating Work Plan (**COWP**).

Table 8–1 presents a summary of the types of projects that are being undertaken by JGN networks to meet the requirements of the Facilities ACS.

Table 8–1: Summary of ongoing facilities asset class key projects and initiatives

Ongoing project/initiative	Description (what and why)
High pressure facilities and IC&E	
Functional checks and planned maintenance	Undertaking proactive maintenance and functional checks on facilities, valved and IC&E to ensure they are fit for purpose. This is essential to allow us to maintain safety, asset integrity, and performance standards.
Reactive maintenance	Undertaking reactive maintenance in response to faults.
Facility obsolescence	Ongoing upgrade of facilities where facilities and components near end of life or where pressure reduction requirements increase/decrease.
Facility and IC&E simplification	Whole-of-facility approach to standardising IC&E and simplifying facility operation where practicable. This program aims to optimise ongoing asset use, replacement ad maintenance costs.
Replace defective ALBV	Replace damaged parts in panels. This program is necessary to ensure sections of the network can be isolated during a supply event, minimising the number of customers impacted.
Replace defective IC&E	The replacement of IC&E assets that have failed in service. Safety and accuracy are priorities; therefore we must replace any unsafe or underperforming IC&E as soon as reasonably practicable.
Replace non-compliant IC&E	Replacement of IC&E that do not meet requirements such as “Hazardous Areas on Gas Networks AS60079” and requirements of the Electricity Act 2004 and the Electricity Regulation 2006.
Renewable Facilities	
WSSG five-year mission	Assessment of the technical application and commercial viability of producing and transporting hydrogen and hydrogen blends.

8.2 New Projects and Initiatives

This section provides a high-level overview of new initiatives designed to help address emerging risks and meet our asset objectives. Projects/initiatives in this section will commence within the next two years.

Further information on these new/proposed initiatives is available in the COWP and in the individual business cases.

Table 8–2: Summary of new facilities asset class key projects and initiatives

New project / initiative	Description (what and why)
[redacted]	[redacted]
Biomethane connections	10-15 biomethane producers have signalled intent to connected to the gas distribution network. Suitable gas distribution facilities will need to be installed to enable their connection. We will work with biomethane producers to identify the optimal connection design and facilitate connection of these facilities for an efficient cost.

Appendix A Regulatory and Legislative Environment

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A1. Summary of Key Legislative Requirements

This section summarises the key legislative requirements and technical standards relating to facilities assets. These requirements are factored into our asset management strategies and help inform the investments and operating activities we undertake to manage asset performance.

Table A1–1: Summary of key legislative requirements and technical standards relating to gas distribution facilities

Legislative requirement / technical standard	Summary of requirements
Gas Supply Act 1996 No 38 (NSW)	Sets out the overarching objectives to promote the efficient use of gas and deliver a safe and reliable supply of gas. Specifies requirements to facilitate the continuity of supply of natural gas to customers.
Gas Supply (Safety and Network Management) Regulation 2013	Sets out the regulations governing the safe supply of gas and establishes an obligation for network operators to lodge, implement and review safety and operating plans. JGN's key output under this Regulation is the Safety and Operating Plan (**SAOP**), which sets out the strategies for ensuring the continued safe management and operation of the network, and how the business will comply with relevant legislative requirements and Australian Standards.
Pipelines Act 1967 No. 80 (NSW)	Sets out the overarching objectives for licence holders to construct, operate and maintain a pipeline.
Electricity (Consumer Safety) Act 2004	Sets out the overarching objectives to promote the efficient use of electrical installations and deliver a safe and reliable supply of electricity.
Electricity (Consumer Safety) Regulation 2006	Sets out the regulations governing the safe supply of electricity and establishes an obligation for network operators to implement safe electrical installations. JGN's key output under this Regulation is the JGN asset class strategy, which sets out the strategies for ensuring the continued safe management and operation of the electrical installations, and how the business will comply with relevant legislative requirements and Australian Standards.
AS 1210:2010 Fired and un-fired pressure vessels	This standard sets out the minimum requirements for the materials, design, manufacture, testing and inspection of fired and unfired pressure vessels constructed in ferrous or non-ferrous metals by welding, brazing, etc required for safe and proper functioning of pressure vessels.
AS/NZS 3000:2018 Wiring Rules	This Standard specifies the minimum requirements for the design, installation, testing and inspection of electrical distribution and earthing systems.
AS 3788 – pressure equipment in service inspection	This Standard specifies the minimum requirements for the inspection, repair and alteration of in-service boilers, pressure vessels, piping, safety equipment, and associated safety controls (hereafter referred to as pressure equipment), and gives guidance in the execution of such activities.
AS 4041:2006 Pressure piping	This standard specifies the minimum requirements for the materials, design, fabrication, testing, inspection, reports and pre-commissioning of piping subject to internal or external pressure.
AS/NZS 60079 Series	This Standard specifies the minimum requirements for the design, inspection, testing and alteration of electrical equipment in hazardous areas.
AS 2885.0-2018 Pipelines — Gas and liquid petroleum Part 0: General requirements	Provides general requirements and guidance on the scope, purpose, application and other aspects of the AS 2885 series of Standards.
AS 2885.1-2018 Pipelines — Gas and liquid petroleum Part 1: Design and construction	Specifies requirements for design and construction of carbon and carbon-manganese steel pipelines and associated piping and components that are used to transmit single-phase and multi-phase hydrocarbon fluids, such as natural and manufactured gas, liquefied petroleum gas, natural gasoline, crude oil, natural gas liquids and liquid petroleum products.

Legislative requirement / technical standard	Summary of requirements
AS 2885.2-2016 Pipelines — Gas and liquid petroleum Part 2: Welding	Specifies the minimum requirements for materials, welding consumables, welding processes, weld preparations, qualifications of welding procedures and personnel, and fabrication and inspection requirements for the construction and maintenance welding of carbon and carbon-manganese steel pipelines down to 3.2 mm wall thickness, designed and constructed in accordance with AS 2885.1-2007.
AS 2885.3:2012 Pipelines – Gas and Liquid Petroleum Part 3: Operation and Maintenance	Specifies the minimum requirements for the operation and maintenance of pipelines (and facilities) complying with AS2885.1 and AS2885.2.
AS/NZS 2885.5:2002 Pipelines — Gas and liquid petroleum Part 5: Field pressure testing	Sets out methods for the hydrostatic testing of petroleum pipelines, which are a mandatory requirement of AS 2885.1 and AS 2885.3. It may also be used for testing other pipelines including pipelines designed to, or operated to, AS 1697.
AS/NZS 2885.6:2018 Pipelines — Gas and liquid petroleum Part 6: Pipeline Safety Management	This Standard specifies the SAFETY MANAGEMENT PROCESS for PIPELINE SYSTEMS and covers all elements of the system designed, constructed or operated under the AS(/NZS) 2885 series of Standards, including MAINLINE PIPE and PIPELINE ASSEMBLIES, STATIONS and control systems. As safety management is a continuous process, this Standard applies throughout the life cycle of a PIPELINE SYSTEM from design to abandonment.
AS 4564:2011 Specification for general purpose natural gas	This Standard sets out requirements for the safe composition, transportation and supply of general purpose natural gas for use in natural gas appliances and equipment, and for use as fuel in natural gas vehicles.
Network Operator Rules	These rules are issues of the Safety and Operating Plan (SAOP) for its Networks. The SAOP and these rules are prepared in accordance with the Gas Supply Regulation.
Safety Case	This Safety Case describes the operation and maintenance of gas assets in a safe and reliable manner. The arguments and evidence for safety is assured by an appropriate Asset Management System operating under a controlled environment in accordance with the applicable gas legislation and regulatory instruments across various Australian jurisdictions.
National Gas Rules	National Gas Rules governs access to natural gas pipeline services and elements of broader natural gas markets. It includes economic value tests (specifically Rules 79 and 91) that set requirements for efficient capital and operating expenditure.
National Greenhouse and Energy Reporting Act 2007	Covers the obligations for reporting and disseminating company information about greenhouse gas emissions, energy production, energy consumption and other information, and includes the obligations to reduce emissions under the safeguard mechanism.

Table A1–2: Summary of key International Hydrogen technical standards relating to the WSHH facility.

Technical standard	Summary of requirements
ISO 22734 – Hydrogen Generators using water electrolysis process.	This standard defines the construction, safety and performance requirements of packaged or factory matched hydrogen gas generation appliances, herein referred to as hydrogen generators, using electrochemical reactions to electrolyse water to produce hydrogen and oxygen gas.
ISO 14687 – Hydrogen Fuel Quality	This standard specifies the minimum quality characteristics of hydrogen fuel as distributed for utilisation in vehicular and stationary applications.
NFPA 2 - Hydrogen Technologies Code	This code provides fundamental safeguards for the generation, installation, storage, piping, use, and handling of hydrogen in compressed gas form.
IGA 15/96 – Gaseous Hydrogen Stations	This standard covers gaseous hydrogen, compression, purification, transfilling and storage installations at consumer and manufacturing sites.
ISO 19884 – Gaseous Hydrogen (Cylinders & tubes for stationary storage)	This standard defines the minimum design, installation, commissioning, operation, inspection and maintenance requirements, for the safety and performance for storing hydrogen in cylinders and tubes.
ASME B31.12 – Hydrogen Piping and Pipelines	This standard defines the requirements for piping in gaseous and liquid hydrogen service and pipelines in gaseous hydrogen service. It is applicable up to and including the joints connecting the piping to associated pressure vessels and equipment but not the vessels and equipment themselves.
AIGA 033/14 – Hydrogen Pipeline Systems	This standard defines the safe design, operation and maintenance of metallic transmission and distribution systems carrying pure hydrogen and hydrogen mixtures.
ISO 19880 – Gaseous Hydrogen Fuelling Stations	This standard defines the minimum design, installation, commissioning, operation, inspection and maintenance requirements, for the safety, and where appropriate, for the performance for public and non-public fuelling stations that dispense gaseous hydrogen to light duty road vehicles (e.g. fuel cell electric vehicles).
AIGA 087/14 – Standard for Hydrogen Piping Systems at user locations.	This standard describes the specifications and general principles recommended for piping systems for gaseous or liquid hydrogen. It addresses both low and high pressure hydrogen piping systems onsite from the point where hydrogen enters the distribution piping to the point of use.

Appendix B Information Requirements

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B1. Information Requirements

Jemena's AMS provides a hierarchical approach to understanding the information requirement to achieve Jemena's business objectives at the asset class. In summary, the combination of Jemena's Business Plan, the ABS and various ACSs all provide the context for and determine the information required to deliver the JGN asset objectives and the facilities asset class objectives.

From these business objectives, it is possible to identify at a high-level the business information systems' content required to support these objectives (Table B1–1).

Error! Reference source not found. identifies the current and future information requirements to support the asset class's critical decisions and their value to the asset class.

Table B1–2: provides the information initiatives required to provide the future information requirements. Included within this table is the risk to the asset class from not completing the initiative.

All of the information required by the facilities asset class is available within Jemena's current business systems.

Table B1–1: Facilities assets critical decisions business information requirements

Critical business decision	Current information usage (Data – equipment usage & key attributes)	Future information	Value to asset class (High, Medium, Low with justification)
When to replace critical High Pressure Facilities & supporting IC&E equipment. Equipment included: - Dry Gas Filter - Monitor Regulator - Active Regulator - Slam Shut - Meter - Instrument Air System	**SAP –** Functional Location (F.Loc). Equipment Type Object Type Location / Address Manufacturer Model Number (For Minimal Sites) Work Codes **Business Objects –** Functional Location (F.Loc). Legacy Data Work Codes Location / Address **ECMS –** Electrical and Mechanical Inspection/testing reports. Defect Notices against work codes **SharePoint –** Change Management System	1) Current SAP data captures hours spent on work codes. SAP was developed based on financial drivers and as such, detailed technical information on equipment conditions is not captured. SAP data allows for basic information e.g., hours spent, number of jobs for work codes. Require capabilities to allow maintenance information for individual equipment level to be recorded such as Regulator, Filter, Valves etc. All maintenance activities are recorded against Run 1, Run 2, Run 3 of a station and not the equipment associated with these Runs: Installation Date Model number Meter serial number 2) Overhaul of BO report (R10 Service Order Report) to remove duplicates and include Issue Instructions (why Technicians have been sent to site). 3) Digital reports from the field should populate SAP fields directly to enable data analysis (rather than attaching forms to individual service orders). E.g., Electrical inspection reports and defect reports.	High – Though the likelihood of a major risk event associated with high pressure facilities and its supporting IC&E equipment is low, the potential consequences are severe. Having more granular information available on these conditions recorded in SAP and capable of being interrogated, will aid investment/asset replacement decisions. Limited in the data of what we can analyse effectively and in a timely fashion to support the replacement decision.

Critical business decision	Current information usage (Data – equipment usage & key attributes)	Future information	Value to asset class (High, Medium, Low with justification)
Effectiveness of maintenance strategies	**SAP –** Functional Location Equipment Type Object Type Manufacturer Model Number Work Codes Maintenance schedules **Business Objects –** Functional Location Legacy Data Work Codes Location / Address **ECMS –** Electrical and Mechanical Inspection/testing reports. Defect Notices against work codes	Current data available does not provide timely information on whether maintenance strategies are effective. Installation Date Required Issue Instructions within Service Order (Why Technicians sent to site). SAP Transaction ZLMMTC409 used to provide contractor costs for maintenance jobs, no longer available. Digital reports from the field should populate SAP fields directly to enable data analysis (rather than attaching forms to individual service orders). E.g., Electrical inspection reports and defect reports.	Medium – given the focus on operational solutions rather than capex solutions, having more information on the effectiveness of maintenance strategies will help inform asset management decisions. Limited in the data of IC&E equipment and issue instructions within SAP.
Effectiveness of design philosophy	**SAP –** Equipment Type Object Type Manufacturer Model Number **ECMS –** Design and manufacturing manuals **SharePoint –** Change Management System	More information as specified above is required on the performance of individual facilities and IC&E components, with a clear link to design specifications. Digital reports from the field should populate SAP fields directly to enable data analysis (rather than attaching forms to individual service orders). E.g., Electrical inspection reports and defect reports.	Medium – better information on the relationship between component performance and design will aid asset management and procurement decisions.
Performance of various types/brands of equipment	**SAP –** Equipment Type Object Type Manufacturer Model Number **ECMS –** Electrical and Mechanical Inspection/testing reports. Defect Notices against work codes	More information is required on the performance of individual facilities and IC&E components to allow Jemena to better discern the quality/effectiveness of these components	Medium – better information on the relationship between component performance and brand will aid asset management and procurement decision.

Table B1–2: Information initiatives to support business information requirements

Information initiative	Use case description	Asset class risk in not completing	Data quality requirement
Include technical information for individual equipment in SAP	Having technical information on individual components will provide a more complete picture of gas facilities' asset management requirements and enable the Facilities Asset Management Function to identify and monitor asset risk. This information can then be used to inform the most appropriate maintenance routines.	Medium	Technical data recorded in SAP for **all classes** of facilities and IC&E assets
Field failure reports upload into SAP directly from Field Services	Failure reports will be available in a timelier manner and in a format that is searchable and can be interrogated. This will enable faster and potentially more efficient asset management/maintenance decisions.	Medium	Failure reports uploaded into SAP within five working days of the failure being identified
SAP database expanded to show ID for specific equipment and links to failure modes	Linking failure modes to specific IC&E assets will allow greater insight into the causes of asset failure and allow Jemena to assess the performance of component designs/brands.	Medium	Failure mode data recorded in SAP for **all classes** of facilities and IC&E assets