

2019–20

Gas and Pipeline Infrastructure Safety

Performance Report

This report has been endorsed by the Victorian Energy Safety Commission.

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2019–20

Key performance data



Audits and inspections

709

field inspections

64

compliance audits

242

pipeline construction, repair audits and inspections



Approvals

13

Construction Safety Management Plans and Repair Plans approved

11

dispensations to construct within 3m of a licensed pipeline granted

15

consent to operate approvals



4

new entrant safety cases

0

deaths

0

serious injuries



32

warning letters issued to third parties

9

infringement notices issued to third parties

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Standards

STANDARD	NAME
AS2832	Cathodic Protection of Metals – Pipes and Cables
AS2885	Pipelines Gas and Liquid Petroleum

Executive summary

Energy Safe Victoria (ESV) is Victoria's independent safety regulator responsible for electricity, gas and pipeline safety. Our vision is for a strong commitment to the safe and efficient supply and use of electricity, gas and pipelines shared between the community, industry and regulators.

As a data-driven, strong and proactive regulator, our role is to monitor industry and ensure compliance with Victoria's energy safety laws, the *Electricity Safety Act 1998*, the *Gas Safety Act 1997* and the *Pipelines Act 2005*.

We work with the community and industry to establish safety standards and encourage compliant performance, so that Victorians can be confident that the energy they rely on is provided and used safely and efficiently.

ESV uses its regulatory approach to ensure compliance and hold duty holders accountable for preventing and minimising safety incidents. ESV's regulatory approach includes, to:

- educate, advise and engage
- license, accept and approve
- monitor energy safety
- order rectification of non-compliances and unsafe circumstances
- enforce compliance.

The *Gas and Pipeline Infrastructure Safety Performance Report* delivers an annual overview of industry regulatory compliance. This report covers the period from 1 July 2019 to 30 June 2020. It summarises integrity management confidence and risk for each of the main modes of failure by objectively assessing ESV's integrity datasets for the three pipeline asset classes:

- licensed pipelines (non-natural gas)
- licensed transmission pipelines (natural gas)
- natural gas distribution.

It is imperative that ESV provides a clear understanding of the status of Victoria's gas and pipeline infrastructure and can highlight areas for prioritisation and focus for the future.

Pipeline integrity management is a continuous process implemented by gas distribution and transmission operators to ensure pipelines safely transport fluids as their design intended. This is achieved by identifying and assessing risk, implementing monitoring activities, planning and completing regular inspections, and intervening and repairing when required.

A number of important observations arose from the three-pipeline asset-class integrity dataset assessments:

- The average age of the pipelines across the three asset-classes is more than 30 years. Consequently, prudent integrity management processes will become more important over the next decade as pipelines come closer to the end of their lives.
- Pipeline cathodic protection (CP) systems protect pipelines from corrosion effectively and ESV will continue to ensure operators have plans in place to complete corrective actions and ensure their systems remain compliant.
- Coating surveys continue to be completed by licensees at intervals agreed in management plans, and ESV will ensure operators complete timely repairs as part of a proactive coating repair program. Most non-natural gas pipelines have older coating systems (such as coal tar enamel coating) that maybe susceptible to disbondment over time. Some operators have internal corrosion management programs in place, while other operators have determined that internal corrosion is not a credible threat due to the transport of dry, sales-quality gas. ESV will continue to monitor the pipeline operators' internal corrosion programs.
- Distribution operators are continuing to replace cast iron, polyvinyl chloride, and unprotected steel pipelines as part of their Gas Mains Replacement Program¹ which will further contribute to the reduction of leaks caused by degrading pipeline integrity. ESV will continue to monitor replacement programs and ensure that assets are constructed as per documented processes and procedures.

Operators continue to complete inspections in the form of either direct or in-line inspections. There is work undertaken by some licensees that own natural gas transmission pipelines to modify non-piggable pipelines² to enable in-line inspection surveys. This program uses a risk-based approach to determine suitability and priority of pipelines.

- As non-natural gas pipelines age, more frequent repairs may be required and operators may need to consider more frequent inspection intervals and the necessary modifications to facilitate in-line inspections (where possible), as a large number of pipelines remain non-piggable. Pipeline licensees should consider a risk-based approach where pipelines in higher-risk areas are prioritised for modification.
- Licensed pipeline third-party encroachments are trending down in comparison to the previous reporting period. The high number of Dial Before You Dig (DBYD) enquiries recorded by operators is indicative of an effective external interference management system.
- Most operators have well-documented Asset Management Plans and Pipeline Integrity Management Plans, and Remaining Life Reviews are in place (as required by AS2885).

Based on the data assessed, the age of the pipelines and the low rates of loss of containment, ESV concludes that the Victorian assets are appropriately managed and being operated as per their license conditions. ESV will continue to work with operators to ensure this record of safe operation is maintained and operators continue to strive for continuous improvement.



Marnie Williams
Commission Chair
June 2021

¹ A five-year program across Victoria to replace old cast iron pipes, unprotected steel, and polyvinyl chloride mains using polyethylene pipes.
² A non-piggable pipeline is one which will not allow a standard inspection tool to negotiate it. Pipelines may effectively be non-piggable for a variety of reasons, including difficult access, insufficient flow to overcome friction, multiple diameters, and other physical barriers.

1

Compliance and reportable incidents

1.1 Overdue management plans and quarterly reports

ESV monitors the activities of four industry groups: licensed transmission pipelines (natural gas), the market operator (Australian Energy Market Operator), licensed pipelines (non-natural gas), and natural gas distribution.

While all industry groups are experiencing overdue Five-year Management Plans³, there are no late or overdue Key Performance Indicator Quarterly Reports (see Table 1 and Table 2). It should be noted that the five-year management plans for SEA Gas, APA, VIVA, Elgas and Mobil Refining were all approved between November 2020 and May 2021. United Terminals, Jemena and AGN have plans in place with ESV to address their overdue submissions.

Table 1 – Five-year Management Plans by industry group

Industry group	Overdue as at June 2020
Licensed transmission pipelines (natural gas), and the market operator	3
Licensed pipelines (non-natural gas)	4
Natural gas distribution	1
TOTAL	8

Table 2 – Late/overdue Key Performance Indicator Quarterly Report submissions by industry group

Industry group	Overdue as at June 2020
Licensed transmission pipelines (natural gas), and the market operator	0
Licensed pipelines (non-natural gas)	0
Natural gas distribution	0
TOTAL	0

3 Submitted compliance documentation might not have been accepted for a range of different reasons.

1.2 Reportable safety incidents by industry group

Pipeline damage is minimised by implementing a number of physical and procedural mitigation measures designed to provide preventative controls. Depth of cover, however, appears to be the most critical physical barrier for successfully preventing third-party damage.

1.2.1 Licensed transmission pipelines (natural gas) incidents

ESV recorded 54 reportable incidents involving licensed transmission pipelines (natural gas) during the reporting period. The 54 reportable incidents were all near misses involving excavation within three meters of a licensed pipeline with no damage reported. In line with its enforcement strategy, ESV issued warning letters and infringement notices to the offending parties.

In terms of contractors using the Dial Before You Dig (DBYD) enquiry system:

- 18 completed an enquiry
- 17 did not complete an enquiry
- 19 remain unconfirmed.

In general, most contractor incidents are from a failure to:

- complete a DBYD enquiry and follow up with the relevant asset owner
- obtain a permit to work or engage an on-site supervisor
- follow conditions of work issued by the licensee.

There were no cases of death, injury, or damage to property or the environment.

1.2.2 Licensed pipelines (non-natural gas) incidents

ESV recorded 17 reportable incidents involving licensed transmission pipelines (non-natural gas) during the reporting period, with the single most significant cause being third-party interference.

As third party interference is the most common cause of pipeline incidents and loss of containment, ESV has implemented an enforcement strategy that is targeted, proportionate, proactive and consistent to educate and take enforcement action against both third parties and duty holders. In line with this enforcement strategy, ESV issued infringement notices and warning letters to the offending parties, as required. Where third-party interference is identified, a review of external interference mitigation measures is required, which includes:

- reviewing patrol frequency to ensure it is appropriate for the pipeline's safe operation
- assessing licensee awareness program effectiveness
- considering land use changes in the pipeline's vicinity.

There were no cases of death, injury, or damage to property or the environment.

1.2.3 Natural gas distribution incidents

ESV recorded 97 reportable incidents involving natural gas distribution during the reporting period, with:

- 77 per cent attributed to third-party works impacting mains and services (the majority were caused by excavations and vehicle damage)
- 17 per cent were integrity failures
- 6 per cent were a combination of nature, non-compliant installations, or unknown.

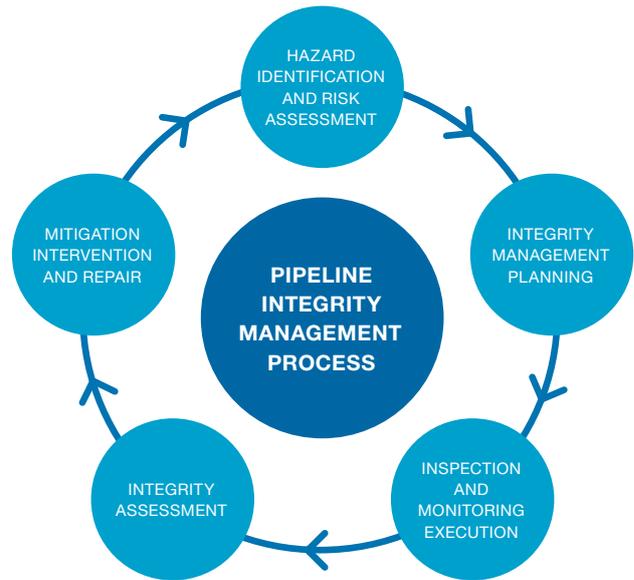
There were no cases of death or damage to property or the environment, but one injury occurred during the disconnection of a gas service.

1.3 The pipeline integrity management process

Pipeline integrity management is a continuous process implemented by operators to ensure that pipelines and associated facilities continue to safely transport fluids as their design intended by:

- identifying, assessing and mitigating hazards through risk assessments
- planning and completing regular inspections
- intervening and repairing when required.

Figure 1 – Pipeline integrity management process



The pipeline integrity management process comprises two management strategies:

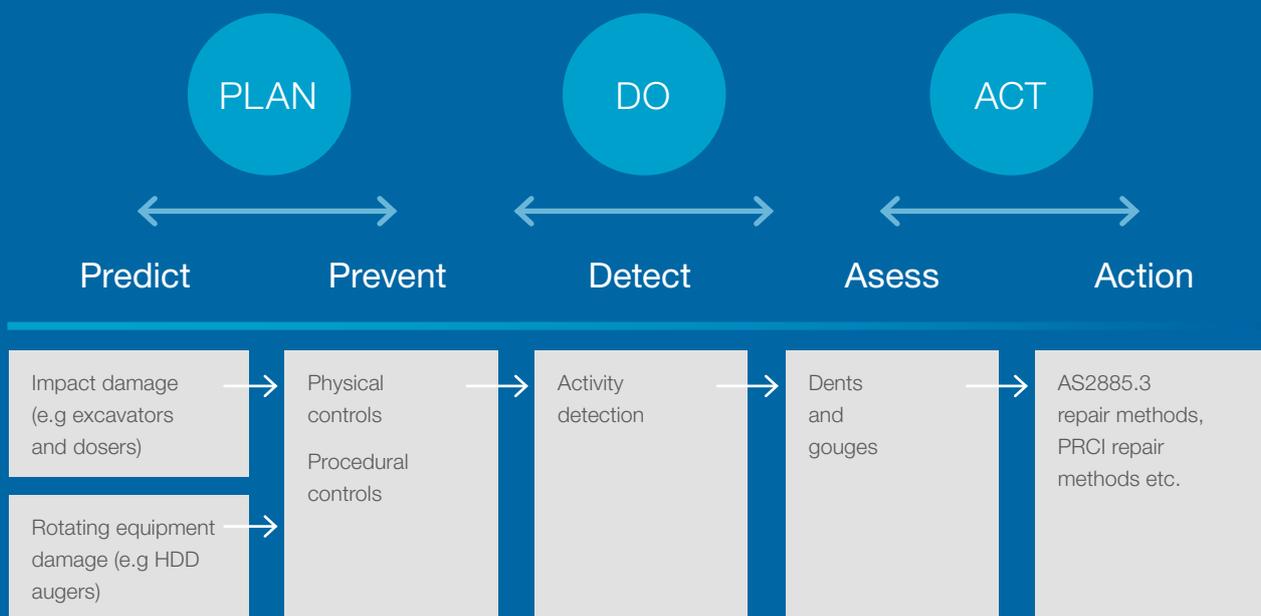
- corrosion management (see Figure 2 – Corrosion management)
- third-party interference management (see Figure 3 – Third-party interference management).

Both strategies detail the threat identification process, prevention and detection measures, assessment processes, and the required rectification action (such as fitness for purpose assessments and repairs).

Figure 2 – Corrosion management



Figure 3 – Third-party interference management



1.3.1 Information analysis for the 2019–20 reporting period

The information analysed and summarised for the 2019–20 reporting period included Asset Profiles, Key Performance Indicator Quarterly reports, Annual Safety and Integrity Reports, Asset Management Plans, Pipeline Integrity Management Plans, Remaining Life Reviews, and Safety Management Plans.

The data was collated for three asset classes operated by regulated entities:

- natural gas distribution (DB) pipelines
- natural gas transmission pipelines
- non-natural gas transmission pipelines.

Each asset class report covers the following topics:

- **overview**—outlining the number of operators and the total length of operating pipelines
- **general information**—outlining the distribution of pipeline materials and overall pipeline age based on the year of construction
- **integrity management performance**—determining the effectiveness of managing integrity threats over the reporting period, and specifically:
 - cathodic protection type and compliance
 - coating type and number of coating surveys including internal corrosion management and the number of right of way leakage surveys
 - the type and number of in-line inspections and/or direct inspections completed, including a distribution of the total number of piggable versus non-piggable pipelines
 - the type and number of pipeline repairs completed.
- **incidents**—including the number of loss of containment and third-party encroachment events
- **asset management records**—assessing whether each pipeline has a valid Pipeline Integrity Management Plan and, if older than 10 years, whether a Remaining Life Review has been completed
- **general observations**—based on the data assessment, identification of gaps, improvement opportunities, and any additional audit target areas.

2

Natural gas distribution

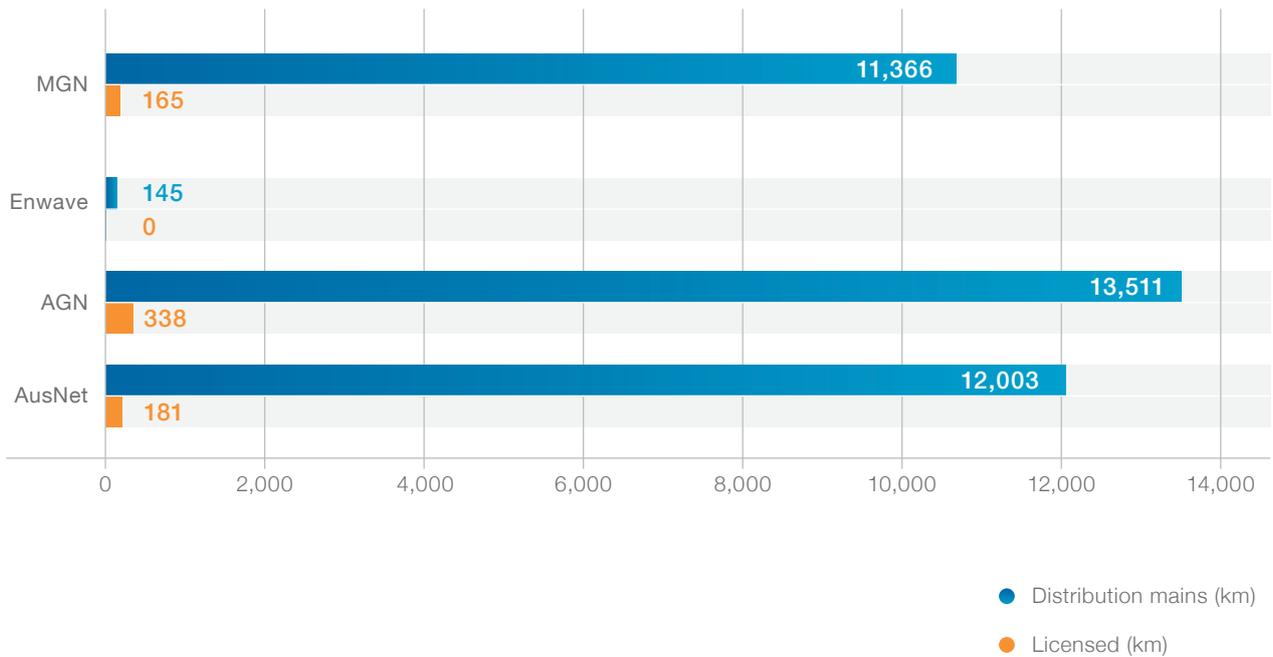
2.1 Overview

The natural gas distribution business pipeline asset-class consists of:

- licensed transmission pipelines with maximum allowable operating pressures of greater than 1,050kPag
- distribution pipelines, comprising mains and services, with maximum allowable operating pressures of less than 1,050kPag.

Four natural gas DB pipeline businesses operate approximately 38,000 kilometres of distribution pipelines and mains (see Figure 4 – Gas distribution by operator). Three distribution businesses – Australian Gas Networks, Multinet Gas, and AusNet Services – operate licensed pipelines and are required to submit Annual Safety and Integrity Compliance Reports. All operators have developed Asset Management Plans that set out each organisation’s decision-making process and considerations for risk management and continuous improvement.

Figure 4 – Gas distribution by operator

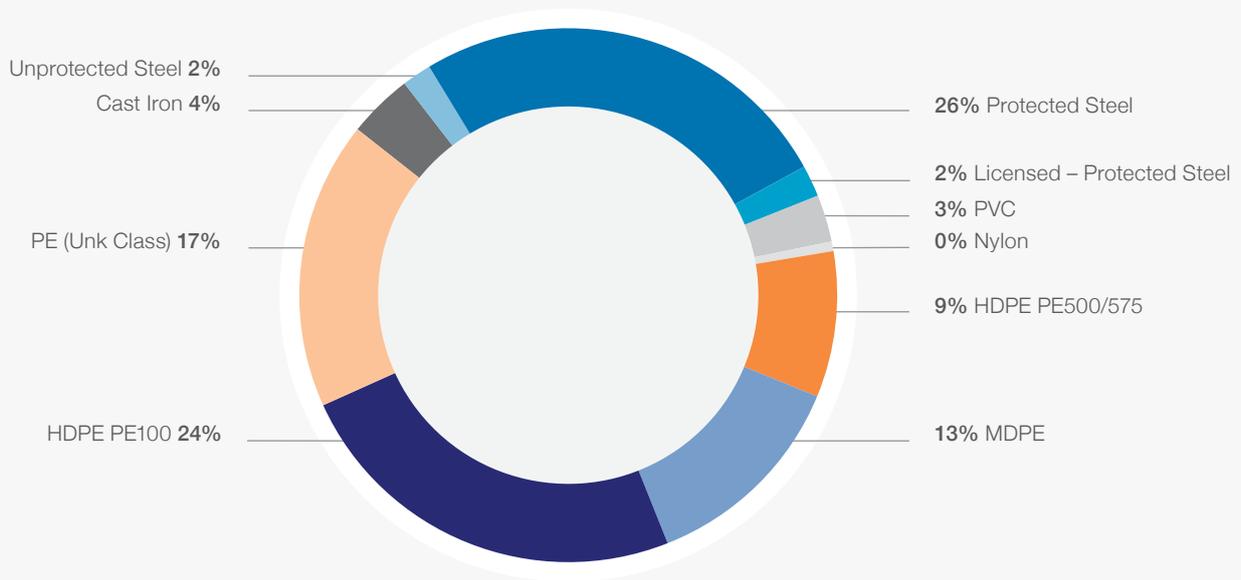


2.2 General information

2.2.1 Materials

Licensed and distribution pipelines are predominantly made from protected steel and high-density polyethylene, followed by other classes of polyethylene (see Figure 5 – Licensed and distribution pipeline materials). Of the pipeline materials currently being replaced with high-density polyethylene as part of the mains replacement program, cast iron and polyvinyl chloride make up 4 per cent and 3 per cent respectively (see Section 2.4.3 for more information).

Figure 5 – Licensed and distribution pipeline materials



- Cast Iron
- Unprotected Steel
- Protected Steel
- Licensed – Protected Steel
- PVC
- Nylon
- HDPE PE500/575
- MDPE
- HDPE PE100
- PE (unknown class)

2.2.2 Network age

More than 80 per cent of pipelines in service were built before 1980, with an average age of approximately 44 years (see Figure 6 for the distribution of licensed pipelines based on the year of construction).

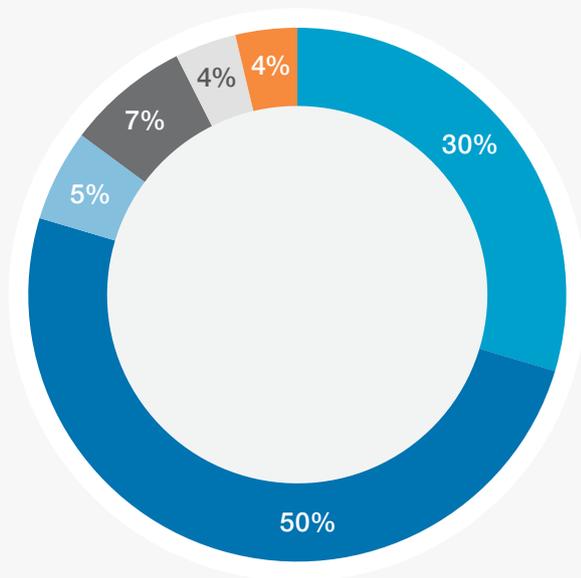
2.3 Integrity management performance

2.3.1 Cathodic protection compliance

2.3.1.1 Licensed pipelines

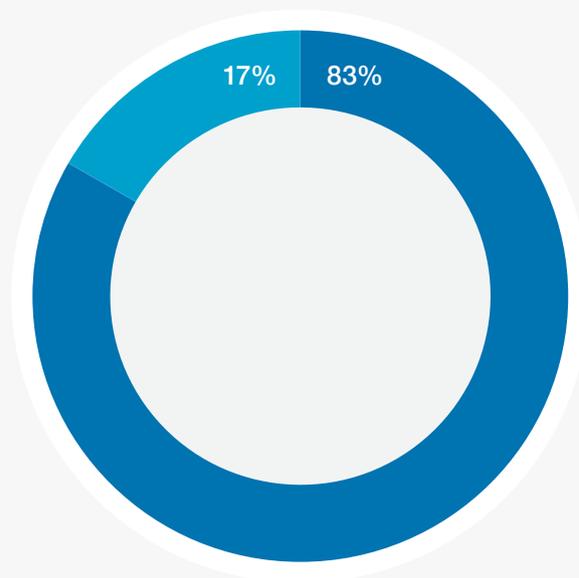
In total, 83 per cent of licensed pipelines comply with current CP requirements in accordance with AS2832. Issues due to non-compliant CP systems were escalated to ESV and operators implemented rectification programs (see Figure 7 for the compliance level of all licensed pipelines during the reporting period). Non-compliant CP systems identified during potential surveys were investigated and rectified to ensure compliance with AS2832.

Figure 6 – Licensed pipelines by year of construction



- Prior to 1970
- 1970–1980
- 1980–1990
- 1990–2000
- 2000–2010
- 2010–2020

Figure 7 – Licensed pipelines CP compliance



- Non-compliant
- Compliant

2.3.2 Coating surveys

Coating surveys generally involve direct current voltage gradient (DCVG) surveys that are completed every five years by operators. Over the reporting period, 10 surveys were scheduled and completed and 111 locations were identified for further assessment. The licensees will investigate and repair coating anomalies above the recommended threshold in accordance with AS4827 and their own internal standards. It is important that coating repairs continue to be completed as compromised coating can lead to a risk of pipeline corrosion.

2.3.3 Internal corrosion management

Pipeline operators do not consider internal corrosion to be a credible threat. This is due to pipeline transport comprising of dry sales quality gas that is monitored through metering stations. This is an acceptable approach, as the threat has been considered and adequately determined as not credible.

2.3.4 Leakage surveys

2.3.4.1 Licensed pipelines

Right of way leakage surveys are conducted at an interval between one to five years depending on population density and location class, with 25 surveys scheduled and completed during the reporting period. The results of the surveys indicate no leaks were detected on the surveyed pipelines. This indicates that the pipeline wall integrity is protected.

2.3.5 Inspections and repairs

2.3.5.1 In-line inspections

In-line inspection is the process of evaluation using 'smart pigs' which use non-destructive examination techniques to detect irregularities in pipelines, such as corrosion, cracks, deformation and so on. During the reporting period, no in-line inspections were scheduled to be conducted by licensed pipeline operators. This is in accordance with ESV expectations based on the inspection frequencies outlined by each licensee for their respective pipelines.

2.3.5.2 Direct assessment (dig-ups)

Licensed pipeline operators completed 134 direct assessments over the reporting period. These dig-ups were initiated to further validate outcomes of the direct current voltage gradient surveys conducted. In previous years, as a result of the assessments, five coating defects were identified and repaired from the 134 assessments conducted.

2.3.5.3 Repairs

During the reporting period, one minor pinhole leak was detected on a licensed pipeline owned by Australian Gas Networks as a result of a direct inspection. An engineering assessment was completed by Australian Gas Networks after the leak was detected to determine a suitable repair method and the pipeline was permanently repaired.

2.4 Incidents

2.4.1 Loss of containment (leaks)

2.4.1.1 Licensed pipelines

There was one licensed pipeline loss of containment incident during the reporting period. This was attributed to a pinhole leak discovered during pipeline recoating. ESV liaised with Australian Gas Networks after the leak was identified to better understand the nature of the leak and its impact on the pipeline and the community. As a result of the information provided to ESV, an Improvement Notice was issued to Australian Gas Networks in August 2020. ESV verified that the improvements sought were satisfactorily rectified and the Improvement Notice was closed in January 2021.

2.4.1.2 Distribution pipelines

There were 1,504 leaks on gas mains over the reporting period. Leaks on gas mains are repaired as they are identified and reported. In addition to the repair works undertaken by distribution businesses a replacement program is currently underway to replace old cast iron, unprotected steel, polyvinyl chloride and polyethylene pipes which will contribute to the reduction of future leaks. These works are scheduled to be completed for the whole of state by 2033. Of the 1,504 leaks, 163 were as a result of third-party asset damage. The distribution businesses

have third-party awareness campaigns in place which continue to educate contractors and landholders about the presence of underground assets and the use of the DBYD enquiry system.

2.4.2 Third-party encroachment

2.4.2.1 Licensed pipeline

Licensed pipeline operators reported 41 encroachment incidents, over the reporting period with no cases of death, injury, or damage to property or the environment. This is a 14.5 per cent decrease compared to the previous reporting period. Of the encroachments that were reported, most encroachment incidents were due to a failure to complete a DBYD, obtain a permit to work or engage an on-site supervisor, or follow conditions of work issued by the licensee. Licensees received 11,500 DBYD enquires and they continue to enhance and deliver educational sessions to third parties to inform them of the requirements when working around licensed assets.

2.4.2.2 Distribution pipelines

Over the reporting period, 3,261 distribution mains and services third-party encroachment incidents were recorded in comparison to 3,487 recorded in the previous year. This is a 6.5 per cent decrease in third-party encroachments. This can be attributed to the increased focus from distribution business on their response to DBYD responses, education campaign and stakeholder liaison.

2.5 Asset management records

2.5.1 Mains Replacement Program

The distribution businesses continue to replace their old cast iron, polyvinyl chloride and unprotected steel mains. During the reporting period, 228 kilometres were replaced.

The program will continue and will contribute to the reduction of future leaks. The program is scheduled to be completed for the whole of Victoria by 2033.

2.6 General observations

2.6.1 Licensed pipelines

Despite the low failure rate of licensed pipelines (which can be credited to the licensees' proactive integrity management), it remains imperative that licensees continue to ensure the ongoing safe operation of their pipelines by:

- ongoing investigation of CP systems for non-compliance due to aged pipeline coatings – protection against external corrosion will be more reliant on CP systems in the future
- ongoing monitoring to ensure operators are completing coating surveys (in accordance with the respective Pipeline Integrity Management Plan) and high percentage IR drop coating anomalies are repaired⁴
- Ensure operators continue to carry out inspection activities (either in-line or direct inspections) to ensure pipeline anomalies are detected, assessed, and repaired where required.
- continue to educate contractors and the public about the DBYD system and ensure contractors are completing stakeholder awareness programs as outlined in the pipeline operator's Pipeline Integrity Management Plan.

2.6.2 Distribution mains and services

Despite the size and age of the Victorian distribution system, distribution businesses continue to focus on minimising leaks from integrity loss and third-party damage. The mains replacement program will continue to be executed as scheduled to replace old mains which have attributed to gas leaks due to asset failure. It is also evident for the comparison data year-on-year that the occurrence of third-party damage to distribution mains is decreasing. However, distribution businesses should continue with their proactive and timely responses to DBYD enquiries, education campaign and stakeholder liaison.

4 Percentage (%) IR is used to rank the risk of coating defects. (Relating to Ohm's law, I is the current through the conductor in amperes, and R is the conductor's resistance in ohms.)

3

Natural gas transmission pipelines

3.1 Overview

Natural gas transmission pipelines transport sale quality, dry gas which is delivered to gas distribution businesses at designated custody points for the distribution of natural gas to end users.

Covering 4,200 kilometres, there are six pipeline licensees APA, Jemena, SEA Gas, Tasmanian Gas Pipeline, Gas Pipelines Victoria, and Loy Yang B. These licensees hold 53 natural gas transmission pipeline licenses in Victoria.

3.2 General information

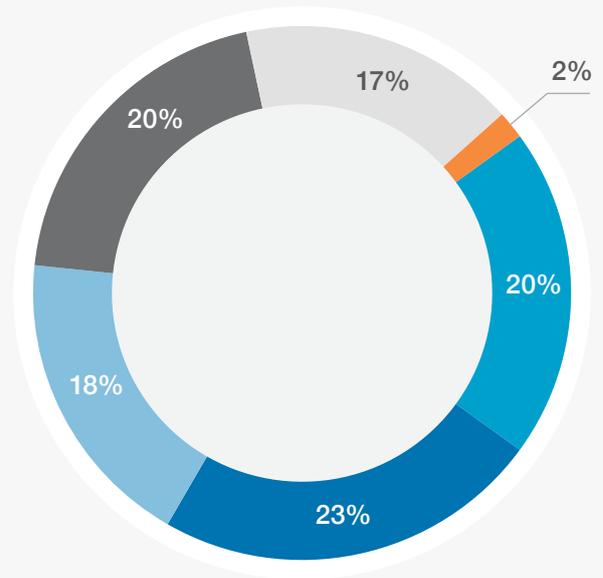
3.2.1 Materials

Carbon steel is the industry wide material used to construct the gas transmission pipelines in Victoria.

3.2.2 Network age

With an average age of 33 years, 61 per cent of Victoria's natural gas transmission pipelines were built before 1990 (see Figure 8 for the distribution of pipelines by year of construction).

Figure 8 – Distribution of natural gas transmission pipelines by year of construction



- Prior to 1970
- 1970–1980
- 1980–1990
- 1990–2000
- 2000–2010
- 2010–2020

3.3 Integrity management performance

3.3.1 Cathodic protection compliance

Impressed current systems protect most of Victoria's natural gas transmission pipelines from corrosion while other pipelines implement sacrificial anodes.

Most transmission pipeline CP systems are surveyed every six months. However, during this reporting period, operators missed 10 cathodic protection surveys due to COVID-19 travel restrictions. ESV is ensuring that all scheduled surveys are completed as soon as travel restrictions in force in Victoria allow.

3.3.2 Coating surveys

DCVG surveys were not scheduled to occur this reporting period. This is in line with commitments and schedules outlined in the licensees approved safety cases. Based on information from previous Annual Safety and Integrity Reports submitted to ESV, asset owners are compliant with coating survey requirements.

3.3.3 Internal corrosion management

Natural gas transmission pipelines predominantly transport dry, sales-quality gas. Gas quality specifications are monitored, at upstream injection points. The threat of internal corrosion is considered a minor risk to pipeline integrity due to the quality of the gas that is transported. Gas quality must meet the requirements of AS4564.

3.3.4 Leakage surveys

Three natural gas transmission network leakage surveys were scheduled and completed during the reporting period, with no leaks reported. Leakage surveys were conducted by:

- Gas Pipeline Victoria (conducted two leakage surveys)
- Loy yang B (conducted one leakage survey).

ESV continues to ensure operators meet their leakage surveys and leak monitoring schedules as outlined in their approved safety cases.



3.3.5 Inspections and Repairs

3.3.5.1 In-line inspections

Piggable pipelines are inspected through in-line inspection tools every 10–15 years. Currently, 76 per cent of pipelines in Victoria are piggable. Piggable pipelines allow licensees to be able to assess loss of pipeline wall thickness resulting from corrosion and mechanical damage. Pipelines that are not piggable rely on other inspection methods such as DCVG surveys, dig-ups and so on to determine pipeline integrity.

Throughout the reporting period, operators completed five in-line inspection surveys:

- APA Group surveyed four pipelines
- Gas Pipeline Victoria surveyed one.

APA have a number of pipelines that are currently non-piggable within the Victorian Transmission System. APA has commenced a program that modifies non-piggable pipelines so that they can be inspected by in line inspection tools. This program uses a risk-based approach to determine suitability and priority.

As pipelines age, more frequent repairs may be required and operators may need to consider more frequent inspection intervals or necessary modifications to facilitate in-line inspections (where possible), as some pipelines remain non-piggable.

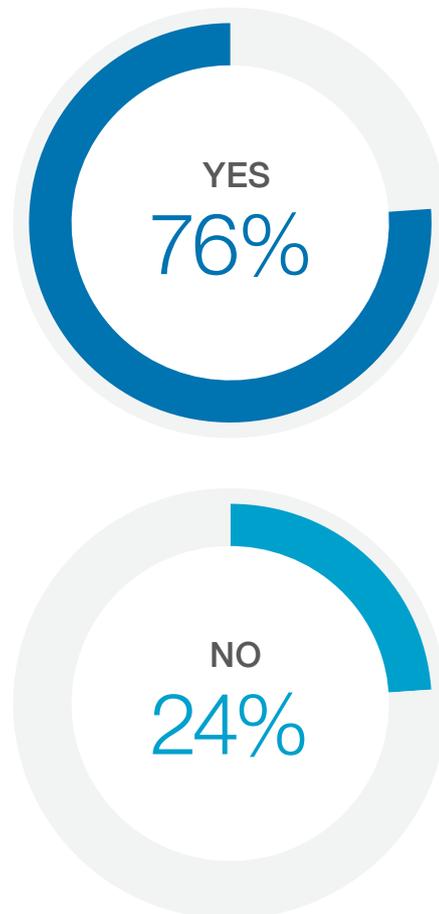
3.3.5.2 Direct assessment (dig ups)

Pipeline operators completed 12 direct assessments of pipelines as a result of in line inspections during the reporting period. All assessments resulted only in recoating works and no repairs on the pipelines were required.

3.3.5.3 Repairs

There were no pipeline repairs during the reporting period.

Figure 9 – Proportion of piggable pipelines



3.4 Incidents

3.4.1 Loss of containment (leaks)

No leaks were reported during the reporting period.

3.4.2 Third-party encroachment

3.4.2.1 Licensed pipelines

There were 13 encroachment incidents due to unauthorised excavation within three metres of a pipeline over the reporting period with no cases of death, injury, or damage to property or the environment. This is a 27.7 per cent decrease compared to the previous reporting period. Of the encroachments that were reported, most encroachment incidents were due to a failure to complete a DBYD, obtain a permit to work or engage an on-site supervisor, or follow conditions of work issued by the licensee. In line with its enforcement strategy, ESV issued warning letters and infringement notices to the offending parties. Licensees received 35,909 DBYD enquires and they continue to enhance and deliver educational sessions to third parties to inform them of the requirements when working around licensed assets. The large number of DBYD enquiries (35,909) compared to the low number of incidents suggests that the pipeline awareness program is effective.

3.5 Asset management records

All natural gas licensed pipeline operators have the required AS2885 documentation in place (as applicable)⁵, which indicates a compliant Asset Management System.

3.6 General observations

Review of the Annual Safety Reports, Remaining Life Reviews, Pipeline Integrity Management Plans and Key Performance Indicator Quarterly Reports indicates that natural gas transmission pipeline integrity management is compliant. This is evidenced by the low number of leaks and incidents during the reporting period.

Pipeline encroachment management systems are operating effectively, with few third-party encroachments given the large number of DBYD enquiries, indicating an effective community awareness program.

⁵ For example, Asset Management Plans, Pipeline Integrity Management Plans, and Remaining Life Reviews.

4

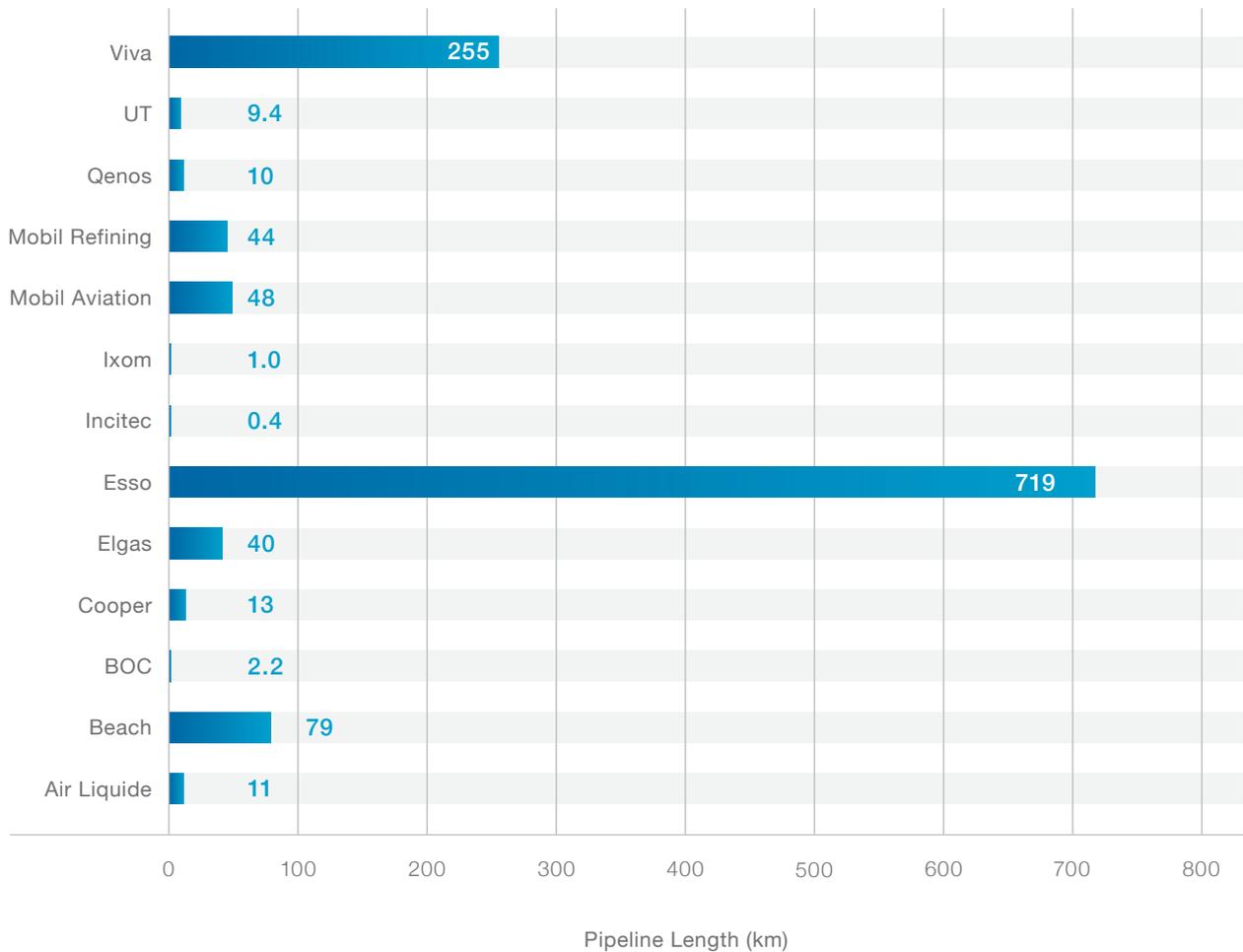
Non-natural gas transmission pipelines

4.1 Overview

Covering approximately 1,600 kilometres, 15 operators hold 70 non-natural gas transmission pipeline licenses in Victoria. This is made up of 55 that are operating and 15 that are decommissioned, suspended, or partially abandoned.⁶

Figure 10 shows the distribution of operators to the number of active pipeline licenses.

Figure 10 – Distribution of non-natural gas transmission pipeline licenses by operator



⁶ Pipelines are generally only unlicensed when they are fully abandoned in-situ or removed.

4.2 General information

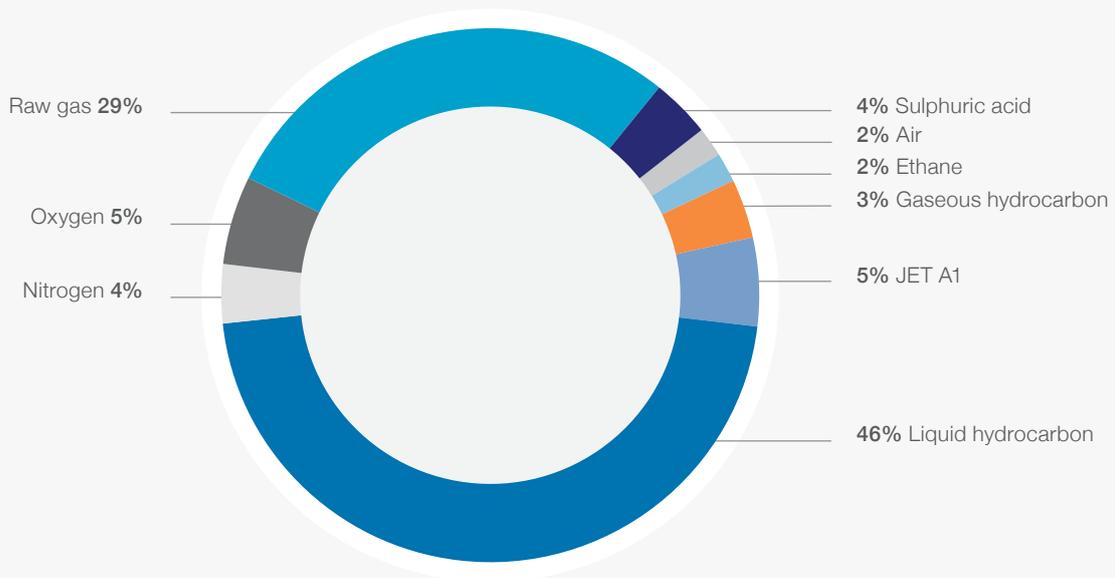
4.2.1 Materials

Carbon steel is the industry-wide material used to construct the transmission pipelines in Victoria.

4.2.2 Service fluid distribution

Non-natural gas transmission pipelines carry many fluid types. Predominantly liquids, these pipelines pose a high environmental risk from spillage and should be regularly inspected as a direct result (see Figure 11 for the distribution of the various service fluids being transported).

Figure 11 – Distribution of pipeline service fluid by licence

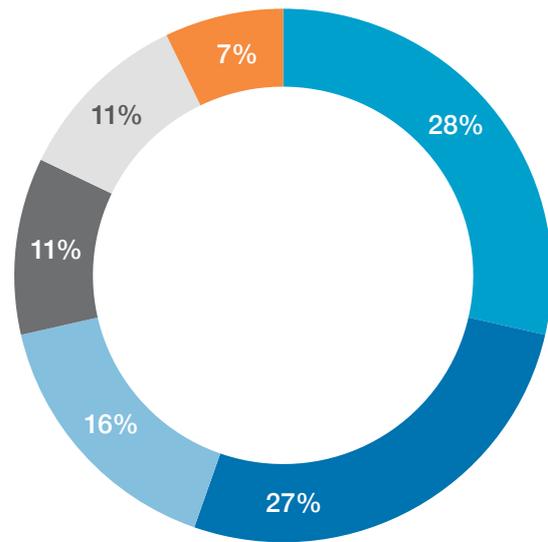


- Air
- Ethane
- Gaseous hydrocarbon
- Jet A1
- Liquid hydrocarbon
- Nitrogen
- Oxygen
- Raw gas
- Sulphuric acid

4.2.3 Pipeline specifications

Of the non-natural gas transmission pipelines in service, 55 per cent were built before 1980. They have an average age of 39 years (see Figure 12 for the distribution of transmission pipelines based on the year of construction).

Figure 12 – Distribution of pipeline construction year



- Prior to 1970
- 1970—1980
- 1980—1990
- 1990—2000
- 2000—2010
- 2010—2020



4.3 Integrity management performance

4.3.1 Cathodic protection compliance

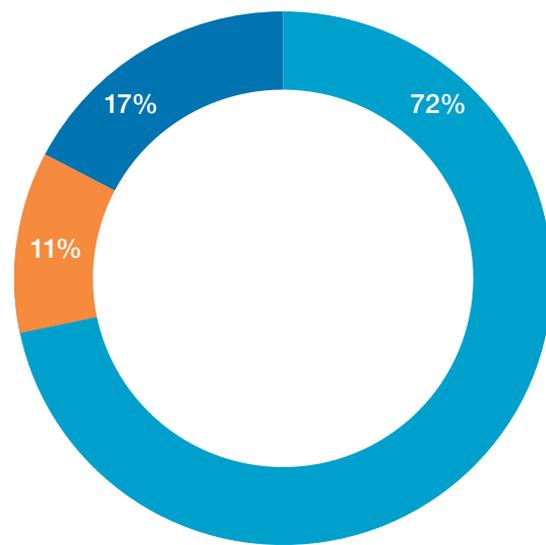
Of the 55 active non-natural gas transmission pipelines assessed over the reporting period:

- 72 per cent use a CP system involving impressed current cathodic protection
- 11 per cent use sacrificial anodes
- 17 per cent, typically above ground, do not use CP systems of any type (see Figure 13 for the distribution of pipelines with and without CP systems).

Of the active pipelines assessed, over 70 percent complied with AS2832, and the operators of the 18 non-complying pipelines will be monitored to ensure they have plans to complete the required rectification works to ensure CP system compliance with AS2832.

For pipelines with non-compliant test points, ESV will ensure operators take necessary rectifications to conform compliance.

Figure 13 – Distribution of cathodic protection compliant pipelines



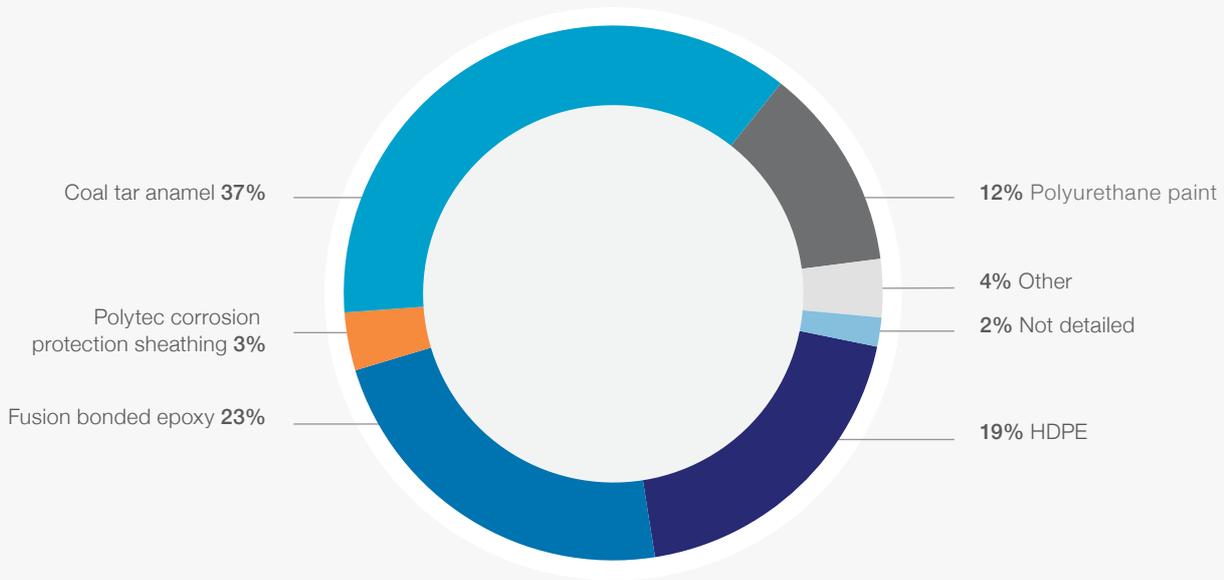
- ICCP (or combination)
- Sacrificial anode
- None

4.3.2 Coating surveys

Operators are expected to carry out coating surveys every five years to ensure coating anomalies are identified. Over the reporting period, three pipeline operators carried out five DCVG surveys, finding 41 coating anomalies. This corresponds to approximately 3.3 coating anomalies per 100 kilometres, which indicates a good overall coating condition. (See Figure 14 for the distribution of external pipeline coatings.)

Given the majority were constructed before 1980, a large proportion of pipelines use coal tar enamel coatings. Generally applied in the field, rigorous quality assurance was not achievable, so the coating tends to lose adhesion over time. Industry is aware of this and those pipelines coated with coal tar enamel have a recoating plan in place to address this issue. These plans are provided to ESV and monitored to ensure these works are conducted.

Figure 14 – Distribution of external pipeline coatings



- HDPE
- Polyurethane paint
- Fusion bonded epoxy
- Other
- Polytec corrosion protection sheathing
- Not detailed
- Coal tar enamel

4.3.3 Internal corrosion management

Of the 55 active pipelines assessed over the reporting period, 31 identified internal corrosion as a threat and their operators have implemented a combination of internal corrosion controls, such as:

- operational pigging and corrosion inhibitors
- fluid sampling.

These controls ensure that the threat of internal corrosion is minimised and that any potential issues are identified and addressed in a timely manner.

4.3.4 Leakage surveys

Of the 55 licensed pipelines assessed over the reporting period, 46 completed leakage surveys and eight minor leaks were found. This is a low leak rate, however, considering the high environmental risk from spillage, leak prevention, detection, and monitoring activities must remain a focus.

ESV continues to ensure operators meet their leakage surveys and leak monitoring schedules as outlined in their approved Safety Management Plans.

4.3.5 Inspections and repairs

4.3.5.1 In-line inspections

Non-natural gas transmission pipelines are expected to receive in-line inspection surveys in 3 to 10-year intervals.⁷

The survey frequency is determined by the:

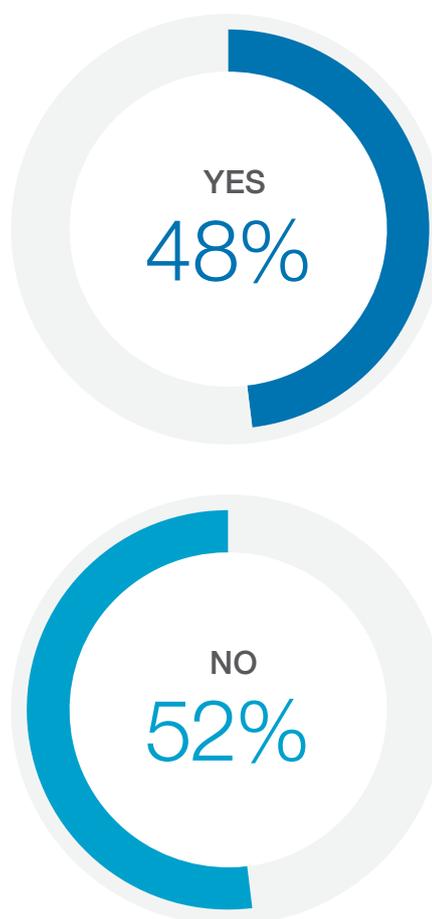
- corrosive nature of the fluid being transported
- pipeline's age, material, and integrity (verified in the most recent in-line inspection survey).

Another reason for short in-line inspection intervals in non-natural gas pipelines is that, due to the properties of product being transported, some licensees own and operate pipelines in both onshore and offshore sections. In these cases, the offshore sections are inspected more frequently. This results in ESV recording more frequent in-line inspection surveys overall for those licensed pipelines.

Five pipelines completed in-line inspections over the reporting period: PL8, PL37, PL38, PL73, and PL74.

Just under half of the active pipelines are piggable. For non-piggable pipelines, DCVG surveys and subsequent pipeline anomaly assessments are adopted to ensure adequate pipeline corrosion management (see Figure 15 for the distribution of piggable to non-piggable pipelines).

Figure 15 – Distribution of piggable pipelines



⁷ Generally, pipelines transporting LPG, crude oil and raw gas are inspected more frequently than dry natural gas pipelines.

4.3.5.2 Direct assessment

Of the 55 licensed pipelines assessed over the reporting period, 17 received 66 direct assessments (coupled with 104 above ground inspections), which corresponds to approximately four direct assessments per 100 kilometres, indicating that operators are implementing a proactive defect assessment program. This is mainly due to the:

- number of pipelines above ground, which are exposed to the environment and require more frequent inspections
- corrosive fluid these pipelines transport and the frequent in-line inspection surveys resulting in higher anomaly detection and increased direct inspections.

4.3.5.3 Repairs

Over the reporting period, 120 repairs to seven pipelines were carried out which included:

- repair clamps and/or sleeves
- cut out and replacements
- grinding and recoating.

A significant number of these repairs consisted of opportunistic recoating works, due to third-party infrastructure projects being conducted within proximity to the pipelines. ESV continues to oversee licensees' proactive repair strategies and ensures that these works are conducted as scheduled.

4.4 Incidents

4.4.1 Loss of containment (leaks)

Eight minor leaks occurred over the reporting period, with all leaks occurring through the main line valves stem packing rather than the pipelines themselves. These minor leaks were all rectified and repaired by the pipeline licensees as soon as they were identified. This low number of leaks can be attributed to the operators' proactive inspection strategies.

4.4.2 Third-party encroachment

4.4.2.1 Licensed pipelines

There were 31,859 DBYD enquiries over the reporting period, and only 13 encroachments reported to ESV involving unauthorised third-party excavations, construction, or boring within three metres of a pipeline.

There were 13 encroachment incidents due to unauthorised excavation within three metres of a pipeline over the reporting period with no cases of death, injury, or damage to property or the environment. This was a slight increase compared to the previous reporting period of 11 encroachments. Of the encroachments that were reported, most encroachment incidents were due to a failure to complete a DBYD, obtain a permit to work or engage an on-site supervisor, or follow conditions of work issued by the licensee. In line with its enforcement strategy, ESV issued warning letters and infringement notices to the offending parties. Licensees received 31,859 DBYD enquires and they continue to enhance and deliver educational sessions to third parties to inform them of the requirements when working around licensed assets.

4.5 Asset management records

Where applicable, AS2885 requires pipeline operators to have Asset Management Plans, Safety Management Plans, Pipeline Integrity Management Plans, and Remaining Life Reviews in place and up to date, which indicates a compliant Asset Management System.

4.5.1 Pipeline Integrity Management Plan

Pipeline integrity management plans are in place for all operational pipelines.

4.6 General observations

A number of observations arose from the information analysed and summarised for the reporting period.

Despite the fact there were some minor leaks during the reporting period, licensees should continue to execute their preventative maintenance programs to ensure asset integrity. This should include, but is not limited to:

- Investigation of non-compliant CP systems should be ongoing to ensure that older pipelines have adequate and functioning cathodic protection.
- As pipelines age, more frequent repairs may be required, and operators may need to consider more frequent inspection intervals and, where possible, carrying out the necessary modifications to facilitate in-line inspection surveys as a large number of pipelines remain unpiggable. A risk-based approach may also be implemented, where pipelines in higher risk areas are prioritised for modification.
- The DBYD program should be maintained to ensure the number of third-party encroachments remains low.



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Acronym/abbreviation	Definition
AGN	Australian Gas Networks
AS	Australian Standard
CIPS	close interval potential survey
CP	cathodic protection – an electrical means of mitigating corrosion on buried and submerged metal structures
DB	distribution business
DBYD	Dial Before You Dig program
DCVG	direct current voltage gradient
disbondment	A loss of adherence between the metal substrates and protective coating.
ER	electrical resistance
ESV	Energy Safe Victoria
FFS	fit for service
HDD	horizontal directional drilling
HDPE	high density polyethylene
ICCP	impressed current cathodic protection
ILI	In-line inspections
kPag	kilopascal gauge
LPG	liquefied petroleum gas
MAOP	maximum allowable operation pressure
MDPE	medium density polyethylene
MGN	MultiNet Gas Networks
non-piggable	A non-piggable pipeline will not allow a standard inspection tool to negotiate it.
PE	Polyethylene
piggable	A piggable pipeline is designed to allow a standard inspection tool to negotiate it.
PRCI	Pipeline Research Council International
PVC	polyvinyl chloride
UT (company)	United Terminals
UT (testing)	ultrasonic transducers



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