energysafe VICTORIA

2020–21

Gas and Pipeline Infrastructure Safety Performance Report

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

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June 2022

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2020–21
key performance data

589
field inspections

46
compliance audits

53
pipeline construction, repair audits and inspections

3
Construction Safety Management Plans and Repair Plans approved

23
dispensations to construct within 3m of a licensed pipeline granted

17
consent to operate approvals

0
deaths

0
serious injuries

12
official warning letters
Issued to third parties

10
infringement notices
issued to third-party
and landowners

Figure list

Table list

Standards

Standard	Name
AS2832	Cathodic Protection of Metals – Pipes and Cables
AS2885	Pipelines - Gas and Liquid Petroleum
AS4564	General-purpose natural gas
AS4645	Gas Distribution Networks
AS4041	Pressure piping
AS4827	Coating defect surveys for buried pipelines

Foreword

On 1 January 2021, Energy Safe Victoria became the Victorian Energy Safety Commission, although will continue to be known as Energy Safe Victoria (ESV).

The Commission is responsible for providing leadership and strategic guidance and leading ESV's transformation as a safety first, data driven, customer centric regulator, capable of effective, best practice regulation to achieve the highest standard energy safety outcomes for Victorians.

In relation to Victoria's gas and pipeline industry, the Commission has statutory responsibilities to achieve the objectives and functions as specified in the *Gas Safety Act 1997* and the *Pipelines Act 2005*. These include certain statutory objectives that ESV must fulfil to prevent serious gas and pipeline safety incidents.

ESV's core purpose is to prevent harm. New priorities and initiatives are being pursued this year that will increase ESV's transparent and visible use of compliance and enforcement powers. We will also provide compliance guidance for the gas companies, pipeline licensees and other responsible persons with duties associated with gas and pipeline infrastructure safety.

ESV will strengthen stakeholder and community engagement by ensuring we have constructive relationships with our stakeholders that provide opportunities for greater collaboration and have a clear process in place to manage any stakeholder concerns. This will be supported with advice from statutory committees involving safety and technical regulatory matters, workforce electrical and gas safety, and future energy trends.

ESV is pleased to report that there were no fatalities or serious injuries reported in relation to gas and pipeline infrastructure.

We will continue to work with the community and encourage compliant performance so that Victorians can be confident that the energy they rely on is provided and used safely and efficiently.

ESV will also continue to work with government to ensure community safety through ESV's continuing focus on reducing gas network strikes and pipeline encroachments which in turn lead to better safety outcomes and results.

Marnie Williams
Commissioner Chairperson
Energy Safe Victoria
June 2022

Executive summary

Energy Safe Victoria (ESV) is Victoria's independent safety regulator responsible for electricity, gas and pipeline safety.

ESV is, once again, pleased to report that there were no fatalities or injuries associated with gas and pipeline infrastructure. Victoria has not observed a major adverse event associated with gas and pipeline infrastructure since the 1998 Longford disaster. We have a strong regulatory framework and a good safety record. However, we must remain vigilant, both of our regulatory practices and of industry performance.

The *Gas and Pipeline Infrastructure Safety Performance Report* delivers an annual overview of industry regulatory compliance. This report covers the period from 1 July 2020 to 30 June 2021. ESV uses data and intelligence gathered to objectively summarise integrity management confidence and risk for each of the main modes of failure for the three pipeline asset classes:

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

Pipeline integrity management is a continuous process implemented by gas distribution and transmission operators to ensure pipelines safely transport fluids as their design intended. Pipeline leaks were not identified across the licensed pipelines sectors and this can be credited to pipeline licensees identifying and assessing risk, implementing monitoring activities, planning and completing regular inspections, and intervening and repairing when required.

Despite the low failure rate, it remains imperative that licensees continue to ensure the ongoing safe operation of their pipelines by:

- ongoing investigation of cathodic protection systems for non-compliance due to aged pipeline coatings—protection against external corrosion will be more reliant on cathodic protection systems in the future
- ongoing monitoring to ensure licensees are completing coating surveys (in accordance with the corresponding Pipeline Integrity Management Plan) and that coating anomalies are repaired
- carrying 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 Dial Before You Dig[1] system and ensure contractors are completing stakeholder awareness programs as outlined in the pipeline licensee's Pipeline Integrity Management Plan.

1 Dial Before You Dig is a free national community services that aims to help avoid damage to the underground pipes and cables that distribute essential services. It helps people stay safe and observe the law when digging near services, including gas pipelines.

Licensed pipeline third-party encroachments have decreased in comparison to 2019–20. The high number of Dial Before You Dig enquiries recorded by operators indicates the external interference management system is effective and ESV continues to encourage licensees to continue with their community awareness program.

Despite the size and age of the Victorian distribution system, gas companies continue to focus on minimising leaks from integrity loss and third-party damage. The mains replacement program continues to be executed as scheduled to replace old mains which have contributed 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 and services is decreasing. This continues to be a primary focus for both gas companies and ESV and we will continue to work with asset owners, third party contractors, Dial Before You Dig and the Future fuels Cooperative Research Centre to ensure that third-party strikes continue to decrease.

ESV's audit and compliance activities conducted 46 audits across the three industry sectors and all safety management systems audited were found to be robust. All corrective actions were implemented, and objective evidence was gathered to finalise the audit findings. This is another indication of a mature industry that uses audit activities to further enhance its management systems.

This report provides an overview of the safety performance of gas and pipeline infrastructure. Based on the data available and the analysis conducted, ESV concludes that the Victorian assets continue to be appropriately managed and operated in accordance with their license conditions. I commend this report and invite public feedback on its content and suggestions for what could be done to improve it to better meet the needs of the community.

Leanne Hughson
Chief Executive Officer
Energy Safe Victoria
June 2022

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 [AEMO])
- licensed pipelines (Pipelines Act only)
- natural gas distribution.

Although all industry groups had overdue Five-year Management Plans[2], all plans were submitted to ESV within the five-year review period. ESV had experienced delays in reviewing and accepting the submissions.

The Five-Year Management Plan for United Terminals was accepted by ESV in August 2021. ESV is working towards finalising the AGN and AEMO safety cases by September 2022.

APA Group was the only licensee that submitted late Key Performance Indicator Quarterly Reports (see Table 1 and Table 2). ESV worked with APA to ensure that future reports are submitted on time. Delays in submitting the reports was attributed to the impact of COVID-19.

Table 1 – Five-year Management Plans by industry group

Industry group	Overdue as at June 2021
Licensed transmission pipelines (natural gas) and the market operator	1
Licensed pipelines (Pipelines Act only)	1
Natural gas distribution	1
TOTAL	**3**

Note: There are a total of 36 Five-year management plans.

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

Industry group	Number of late submissions
Licensed transmission pipelines (natural gas) and the market operator	1
Licensed pipelines (Pipelines Act only)	0
Natural gas distribution	0
TOTAL	**1**

2 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 physical and procedural mitigation measures which provide preventative controls. Depth of cover 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 41 reportable incidents involving licensed transmission pipelines (natural gas) during the reporting period. A total of 40 of the reportable incidents were near misses involving excavation within three meters of a licensed pipeline with no damage reported. Of those 40 incidents, only eight contractors completed a Dial Before You Dig enquiry. However, one reportable incident involved an excavator making contact with the pipeline which resulted in coating damage. The pipeline coating was repaired and ESV issued four warning letters and infringement notices to the offending parties. This is in-line with ESV's enforcement strategy.

Contractors and third-party incidents were due to a failure to:

- complete a Dial Before You Dig
- 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 (Pipelines Act only) incidents

ESV recorded 13 reportable incidents involving licensed transmission pipelines (non-natural gas) during the reporting period, with the most common cause being third-party interference.

When third-party interference is identified, a review of external interference mitigation measures may be needed and includes:

- reviewing patrol frequency to ensure it is appropriate for the pipeline's safe operation
- assessing licensees' community 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 119 reportable incidents involving natural gas distribution during the reporting period, with:

- 65 per cent attributed to third-party works impacting mains and services—the majority were caused by excavations and vehicle damage
- 8 per cent caused by augers and directional drills.
- 27 per cent occurred at the consumer service meter.

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

In line with its enforcement strategy, ESV issued eight warning letters to the offending parties.

1.3 The pipeline integrity management process

Pipeline integrity management is a continuous process implemented by licensees 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.

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 1 - Pipeline integrity management process

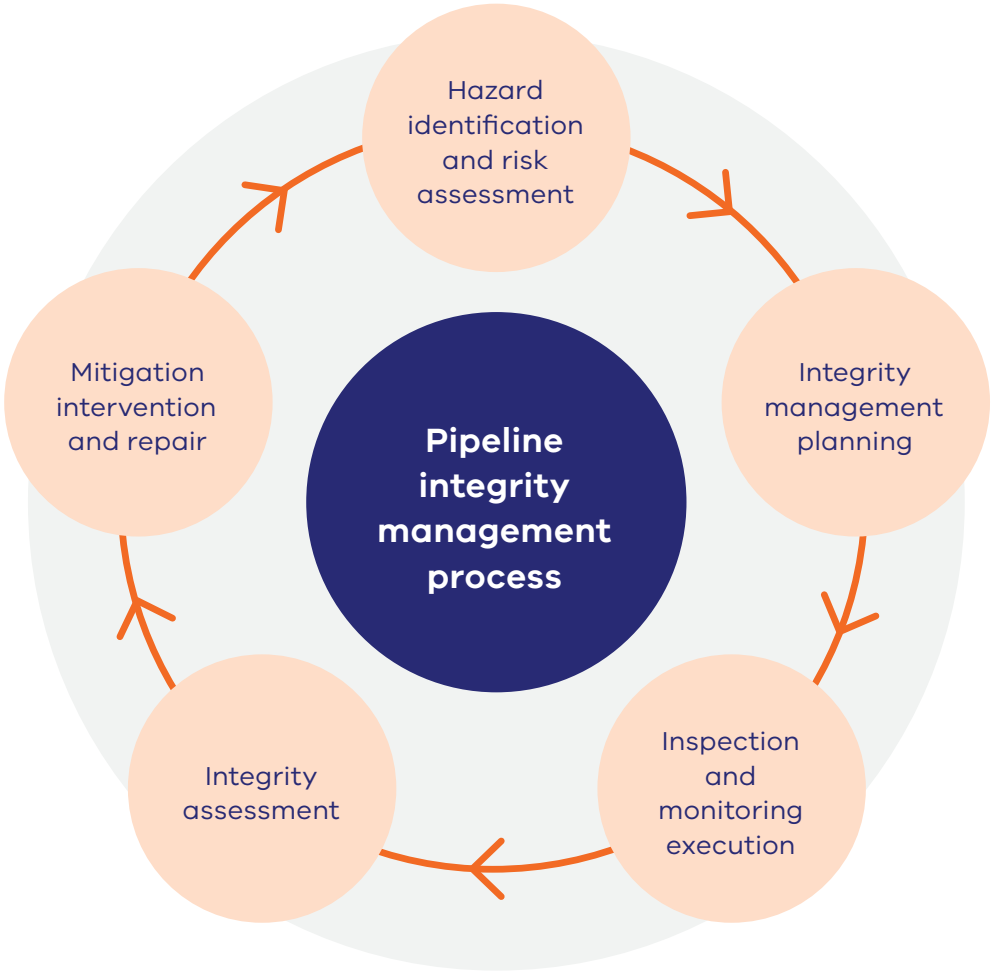


Figure 2 - Corrosion management

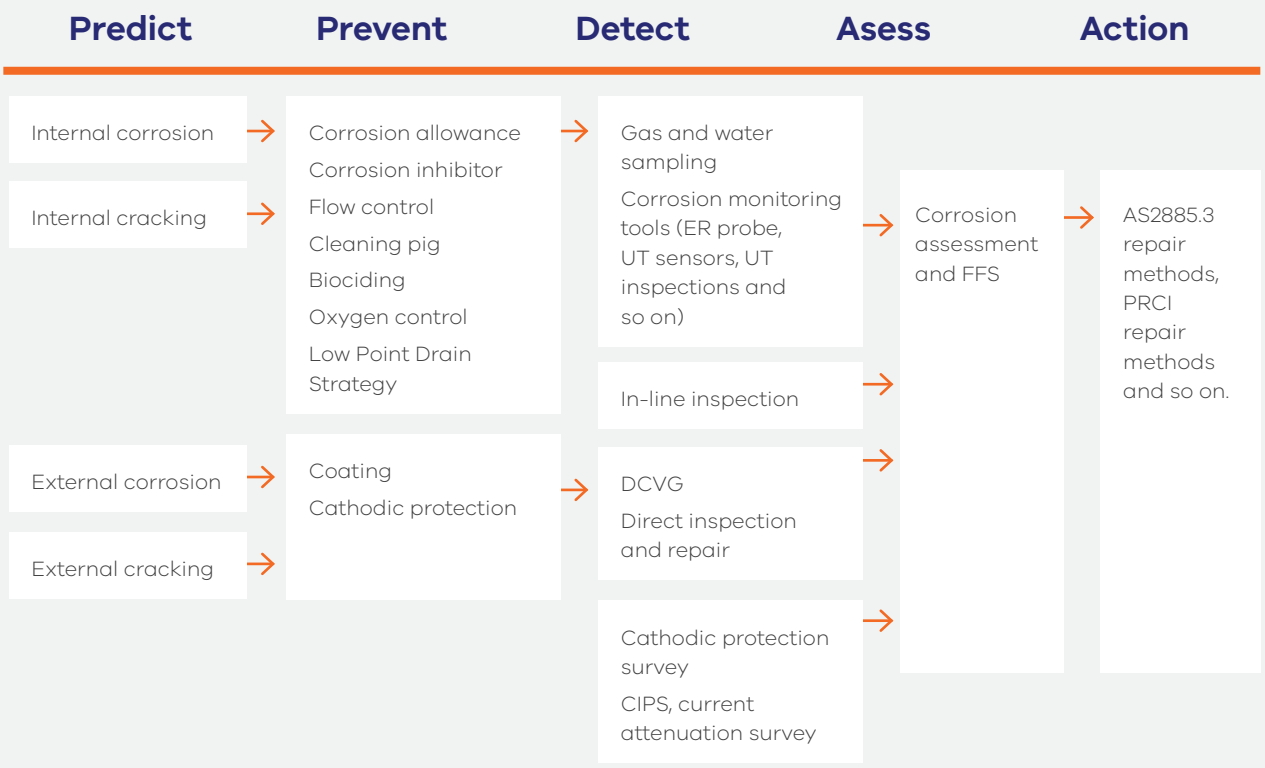
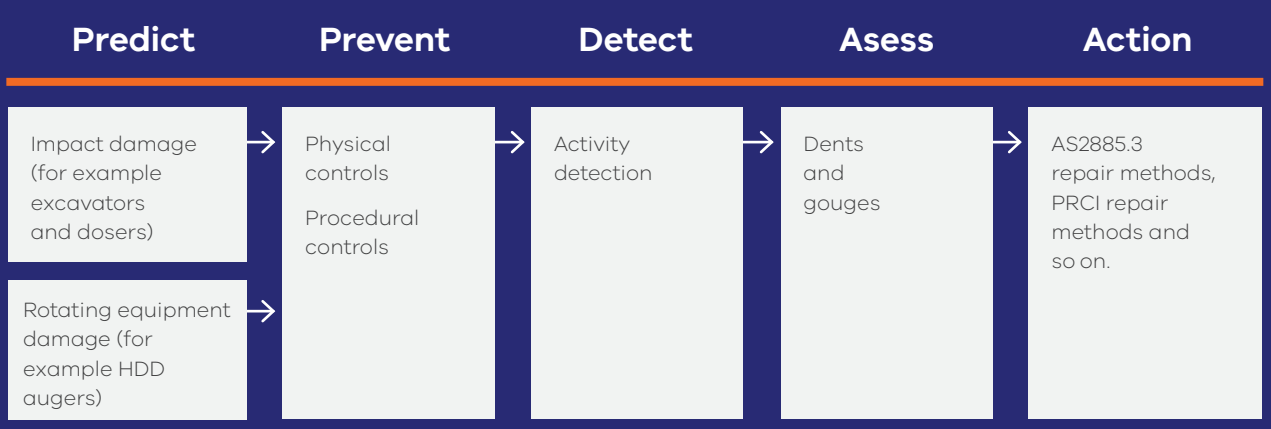


Figure 3 – Third-party interference management



1.3.1 Information analysis for the 2020–21 reporting period

The information analysed and summarised for the 2020–21 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 within the natural gas distribution, licensed transmission pipelines (natural gas), and licensed pipelines industry groups.

Each asset class report covers the following topics:

- **overview**—outlining the number of licensees 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 and non-piggable pipelines[3]
  - 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.

3 A piggable pipeline is one which will allow a standard inspection tool to negotiate it. The tool cannot access or inspect a non-piggable pipeline.

2 Natural gas distribution

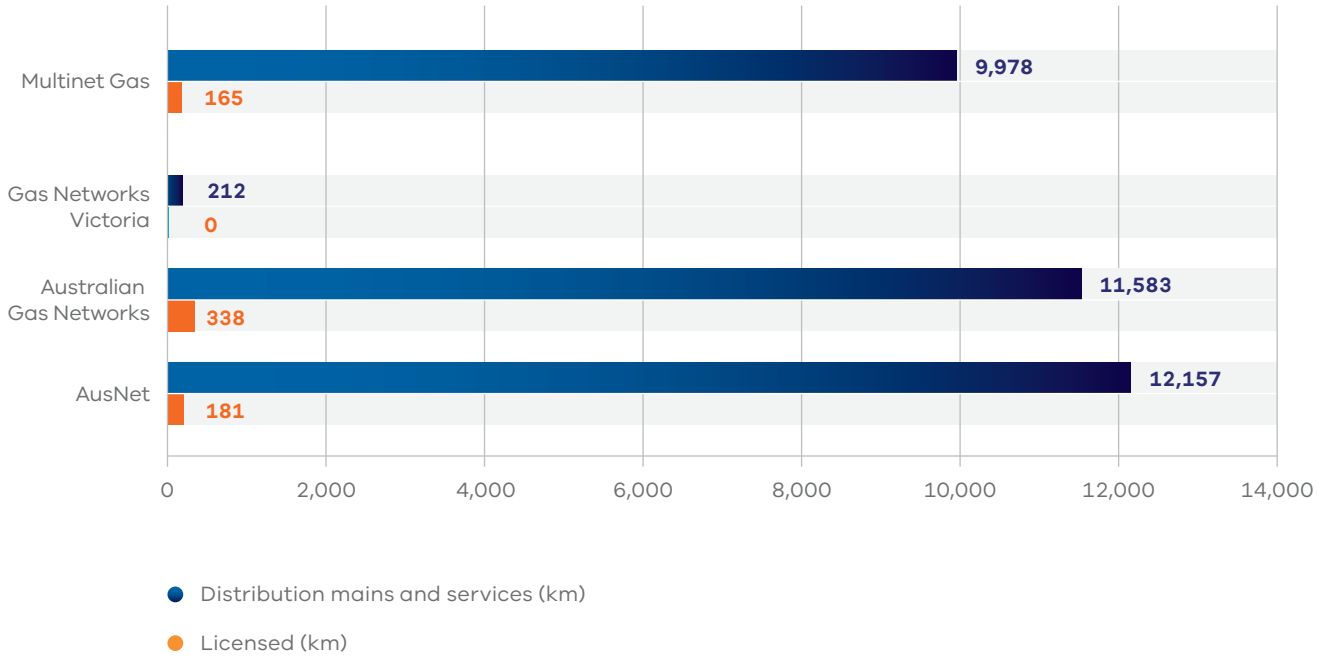
2.1 Overview

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

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

Four natural gas distribution businesses operate approximately 34,500 kilometres of licensed pipelines, mains, and services (see Figure 4 – Gas distribution by Licensee). Three distribution businesses—Australian Gas Networks, Multinet Gas Networks, and AusNet Services—operate licensed pipelines and are required to submit Annual Safety and Integrity Compliance Reports. All licensees have Asset Management Plans that set out each organisation's decision-making process and considerations for risk management and continuous improvement.

Figure 4 - Asset distribution by licensee



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).

2.2.2 Network age

Approximately 80 per cent of pipelines in service were built before 1980, The average age of pipelines is approximately 45 years (see Figure 6 for the distribution of licensed pipelines based on the year of construction).

Figure 5 - Licensed and distribution pipeline materials

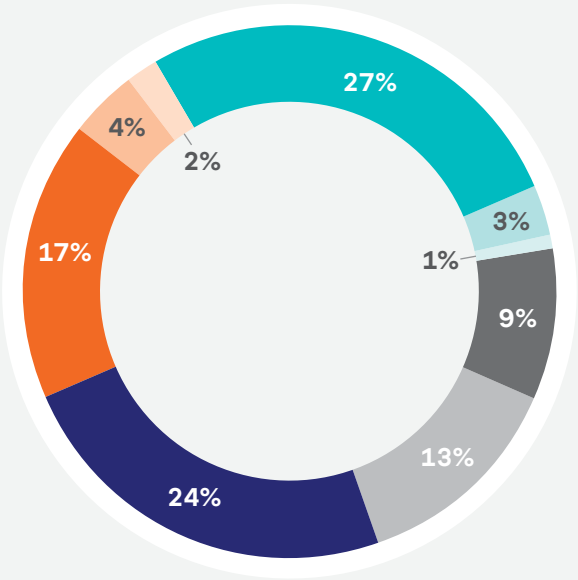
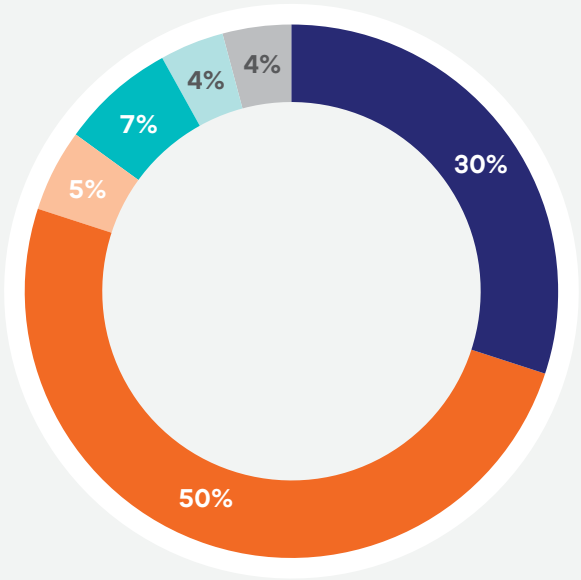


Figure 6 - Licensed pipelines by year of construction



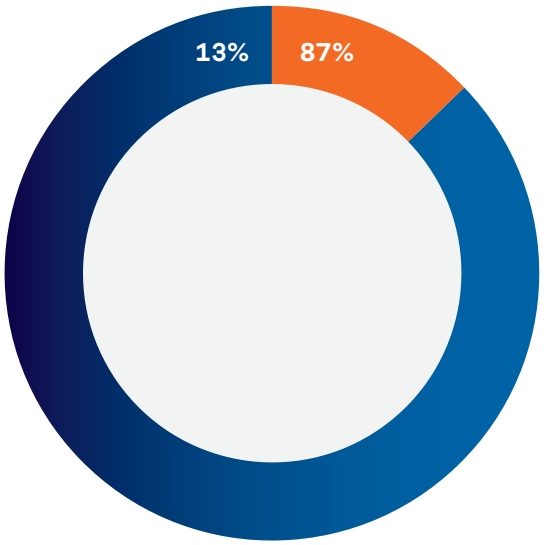
2.3 Integrity management performance

2.3.1 Cathodic protection compliance

2.3.1.1 Licensed pipelines

In total, 87 per cent of licensed pipelines comply with current cathodic protection requirements in accordance with *AS2832 Cathodic Protection of Metals – Pipes and Cables*. Non compliances identified with cathodic protection systems were reported to ESV by licensees and accompanied with rectification plans for our review. (see Figure 7 for the compliance level of all licensed pipelines during 2020–21). Non-compliant cathodic protection systems identified during potential surveys were investigated and rectified to ensure compliance with AS2832.

Figure 7 - Licensed pipelines cathodic protection compliance



2.3.2 Coating surveys

Coating surveys generally involve direct current voltage gradient (DCVG) surveys that are completed every five to ten years by licensees. During 2020–21, DCVG surveys were performed on eight licensed pipelines and 232 locations were identified for further assessment. The licensees will investigate and repair coating anomalies exceeding the recommended threshold in accordance with *AS4827 Coating defect surveys for buried pipelines* 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 licensees 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 because the threat has been considered and adequately determined that it is not credible. It should be noted, that external corrosion is a credible risk and the pipeline licensees have implemented controls to mitigate the external corrosion risks.

2.3.4 Leakage surveys

2.3.4.1 Licensed pipelines

Right-of-way leakage surveys are conducted at a frequency between yearly and five-yearly depending on pipeline geographical location. During 2020–21, 38 pipelines were surveyed. There were no leaks on the surveyed pipelines, indicating that the pipeline wall integrity was protected.

2.3.5 Inspections and repairs

2.3.5.1 In-line inspections

In-line inspection use 'smart pigs', a technology which uses non-destructive examination techniques to detect irregularities in pipelines, such as corrosion, cracks, deformation. Although internal corrosion is not considered credible, licensees continue to undertake in-line inspections as they are considered the most efficient method to identify pipeline defects and enable a targeted repair campaign. It is the industry preferred method for confirming pipeline integrity.

During the reporting period, five pipelines were inspected using in-line inspection methods and 108 anomalies were identified. The majority of the defects were related to corrosion, milling defects and pipe wall loss of less than 20 per cent. There were no major integrity threats identified through these inspections and pipeline licensees further assessed the anomalies. The licensees will conduct dig ups to physically verify the pipe wall and coating condition and determine any repair requirements. This approach 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)

Licensees completed 140 direct assessments over the reporting period. These dig-ups were initiated to further validate outcomes of the director current voltage gradient surveys and in-line inspections conducted.in previous years. As a result of the assessments:

- 13 coating defects were identified
- 10 defects were repaired
- 3 defects are under review for repair.

2.3.5.3 Repairs

During the reporting period, there were no reportable incidents that needed the pipeline to be repaired due to third-party damage to the pipeline or integrity failure. All repairs were related to pipeline coating repairs.

2.4 Incidents

2.4.1 Loss of containment (leaks)

2.4.1.1 Licensed pipelines

No pipeline leaks were identified during the leakage surveys or reported by public and third parties.

2.4.1.2 Distribution pipelines

There were 1,278 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 1,278 leaks, 152 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 Dial Before You Dig enquiry system.

2.4.2 Third-party encroachment

2.4.2.1 Licensed pipeline

Pipeline licensees reported 41 encroachment incidents, over the reporting period with no cases of death, injury, or damage to property or the environment. Four warning letters were issued to third parties for encroachment within three meters of a licensed pipeline as a result of ESV investigations. Of the encroachments that were reported, these were due to third-party failure to complete a Dial Before You Dig, obtain a permit to work or engage an on-site supervisor, or follow conditions of work issued by the licensee. Licensees received 16,797 Dial Before You Dig 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

During 2020–21, 3,107 distribution pipeline third party encroachment incidents were recorded in comparison to 3,261 recorded in the previous year. This is a decrease of 154 third party encroachment incidents. This result demonstrates that the increased focus from distribution business on their response to Dial Before You Dig responses, education campaign and stakeholder liaison is reducing third-party incidents on the distribution network.

2.5 Asset management compliance

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, 234 kilometres were replaced compared to 228 km in previous year

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 is 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 cathodic protection systems for non-compliance due to aged pipeline coatings—protection against external corrosion will be more reliant on cathodic protection systems in the future
- ongoing monitoring to ensure licensees are completing coating surveys (in accordance with the respective Pipeline Integrity Management Plan) and high percentage IR drop coating anomalies are repaired[4]
- Ensure licensees 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 Dial Before You Dig system and ensure contractors are completing stakeholder awareness programs as outlined in the pipeline licensee'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 Dial Before You Dig 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 sales quality, dry gas which is delivered to gas distribution businesses at designated custody points for the distribution of natural gas to end users.

Covering approximately 3,700 kilometres in Victoria, there are seven pipeline licensees; APA, Jemena, SEAGas, Tasmanian Gas Pipeline, Gas Pipelines Victoria, Beach Energy and Loy Yang B. These licensees hold 53 natural gas transmission pipeline licenses in Victoria.

3.2 General information

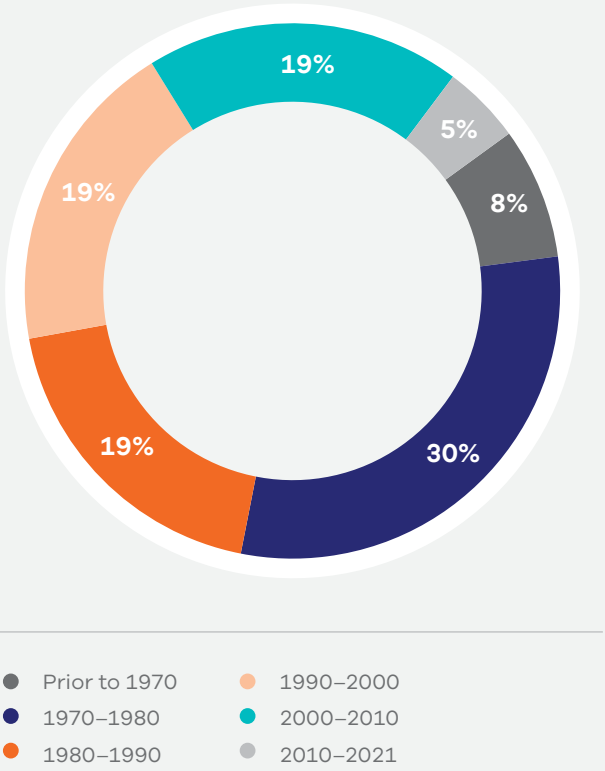
3.2.1 Materials

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 34 years, 57 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



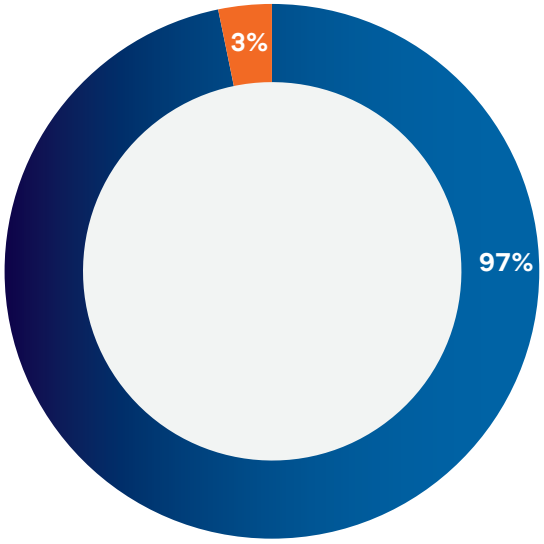
3.3 Integrity management performance

3.3.1 Cathodic protection compliance

Impressed current systems protect 97 per cent of Victoria's natural gas transmission pipelines from corrosion while other pipelines implement sacrificial anodes (see Figure 9 for the distribution of cathodic protection systems by type).

Most transmission pipeline cathodic protection systems are surveyed annually. During this reporting period, one cathodic protection survey was not conducted due to data logger issues. This is not considered material as the transformer rectifier units (TRUs) are also monitored through supervisory control and data acquisition systems which still provides remote access to the required data. The data logger issues have since been rectified.

Figure 9 - Natural gas transmission pipeline cathodic protection systems by type



3.3.2 Coating surveys

One DCVG was completed during the reporting period. The survey identified seven coating defects. These defects will be re-assessed in 2021 following an in-line inspection. This is in accordance 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 General-purpose natural gas*.

3.3.4 Leakage surveys

Five 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 (one leakage survey)
- Loy yang B (two leakage surveys)
- Beach Energy (one leakage survey)
- Tasmanian Gas Pipeline (one leakage survey).

ESV continues to ensure licensees 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 5–10 years. A total of 79 per cent of pipelines in Victoria are currently 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 and dig-ups to determine pipeline integrity.

Throughout the reporting period, licensees completed four in-line inspections:

- APA surveyed three pipelines
- Tasmanian Gas Pipeline surveyed one pipeline.

APA have a number of pipelines that are currently non-piggable within the Victorian transmission system. APA has started 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 licensees may need to consider more frequent inspection intervals or necessary modifications to facilitate in-line inspections (where possible) to ensure that pipeline integrity is maintained, as well as the safety of the community.

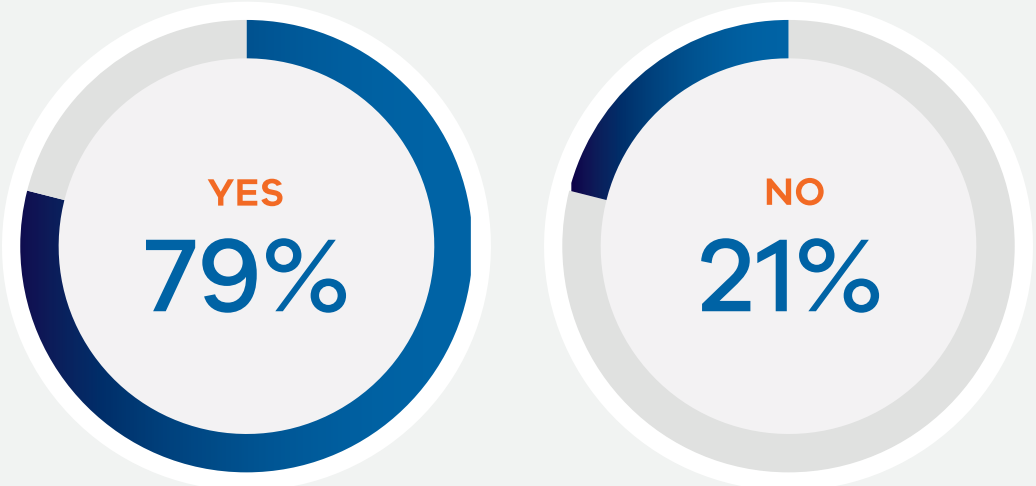
3.3.5.2 Direct assessment (dig ups)

Pipeline licensees completed 29 direct assessments of pipelines as a result of in line inspections and DCVG surveys during the reporting period. The direct assessments resulted in the installation of a type B sleeve and other minor recoating work.

3.3.5.3 Repairs

There was one pipeline repair conducted during the reporting period which was the installation of a type B sleeve to address pipeline wall loss.

Figure 10 - 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

During 2020–21, there were five encroachment incidents due to unauthorised excavation within three metres of a pipeline with no cases of death, injury, or damage to property or the environment. This is a 38.5 per cent decrease compared to the previous reporting period. Of the encroachments that were reported, most encroachment incidents were due to a failure of third parties to complete a Dial Before You Dig, obtain a permit to work or engage an on-site supervisor, or follow conditions of work issued by the licensee.

Licensees received 41,372 Dial Before You Dig 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 Dial Before You Dig enquiries compared to the low number of encroachments indicates that the pipeline awareness program is effective.

3.5 Asset management records

All natural gas licensed pipeline licensees have a complaint Asset Management System as required by the Australian Standard *AS2885 Pipelines – Gas and Liquid Petroleum*.

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 encroachments and incidents of leaks (there were no leaks) during the reporting period.

Pipeline encroachment management systems are operating effectively, with few third-party encroachments given the large number of Dial Before You Dig enquiries, indicating the community awareness program is effective.

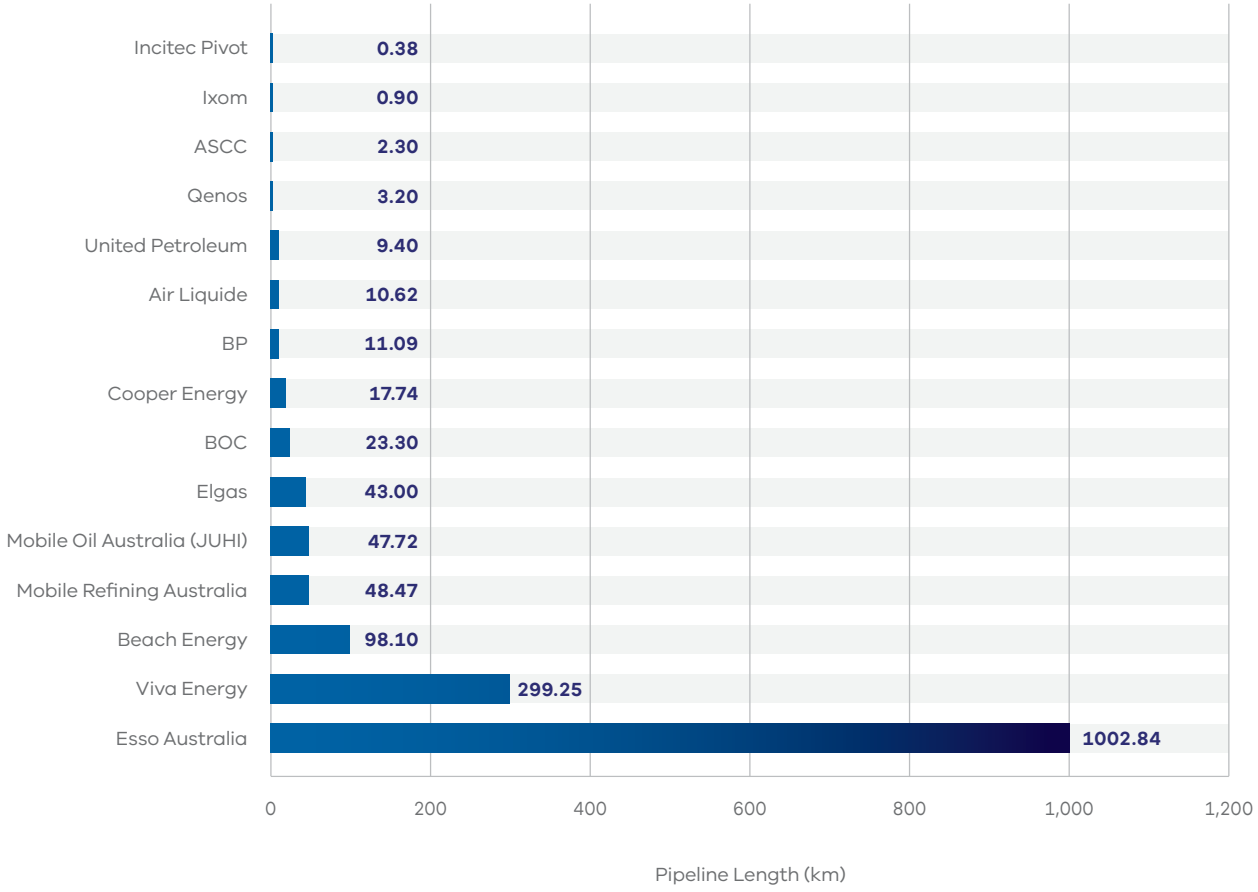
4 Licensed pipelines (Pipelines Act only)

4.1 Overview

In Victoria, 15 licensees hold 70 pipeline licenses which cover approximately 1,600 kilometres of pipeline. The comprises 52 pipelines that are operating and 18 that are decommissioned, suspended, or partially abandoned.[5]

Figure 11 shows the distribution of licensees to the cumulative lengths of licensed pipelines.

Figure 11 - Distribution of the length of licensed pipeline by licensee



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

4.2 General information

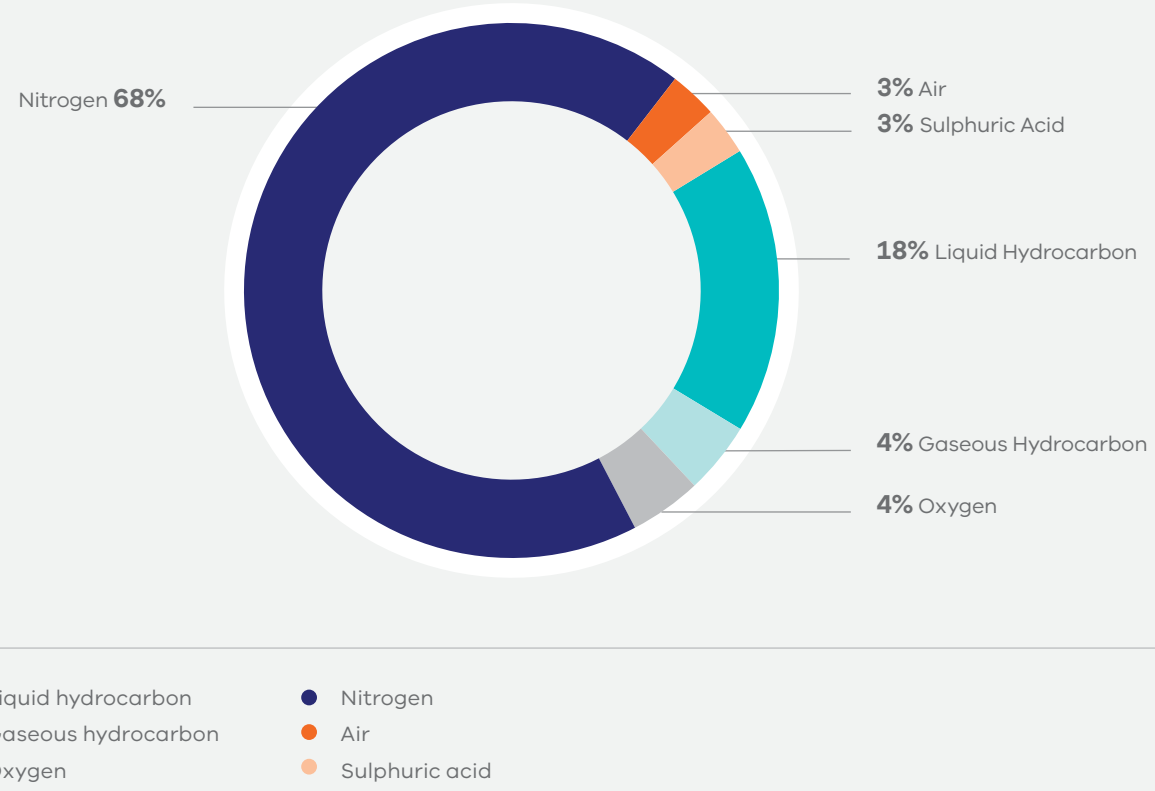
4.2.1 Materials

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

4.2.2 Product distribution

Licensed pipelines carry many product types but predominantly carry liquids. These pipelines pose an environmental risk from spillage and should be regularly inspected as a direct result (see Figure 12 for the distribution of the various service fluids being transported).

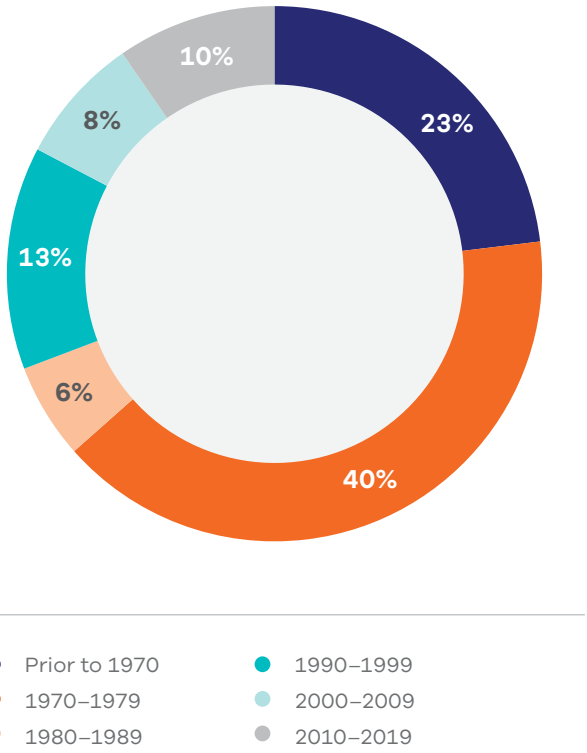
Figure 12 - Distribution of pipeline by product



4.2.3 Pipeline specifications

Of the licensed pipelines in service, 63 per cent were built before 1980. They have an average age of 40 years (see Figure 13 for the distribution of transmission pipelines based on the year of construction).

Figure 13 - Distribution of pipeline construction year



4.3 Integrity management performance

4.3.1 Cathodic protection compliance

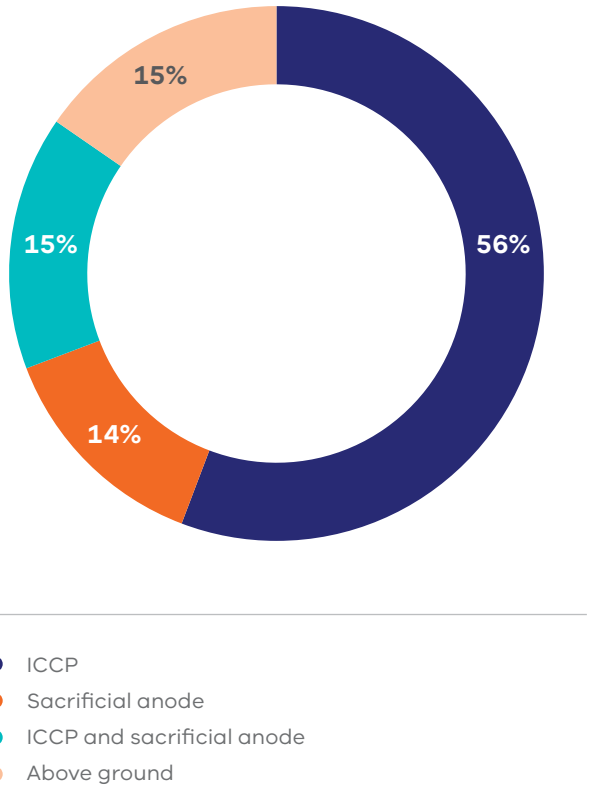
Of the 52 active licensed pipelines assessed over the reporting period:

- 56 per cent use a cathodic protection system involving impressed current cathodic protection
- 14 per cent use sacrificial anodes
- 15 per cent use a combination of ICCP and sacrificial anodes
- 15 per cent, typically above ground, do not use cathodic protection systems of any type (see Figure 14 for the distribution of pipelines with cathodic protection systems).

All buried pipelines are surveyed twice a year to verify that the test points are compliant to AS2832 criteria. In addition to the six-monthly surveys, monthly TRU checks are completed to ensure that the cathodic protection systems are working effectively. A detailed report for pipelines with non-compliant test points is submitted to ESV (reporting by exception).

During the reporting period, a total of 197 non-compliant test points were reported, linked to 20 operative licensed pipelines. Pipeline licensees submitted rectification plans to address the non-compliant test points, which ensured compliance to AS2832 requirements was established.

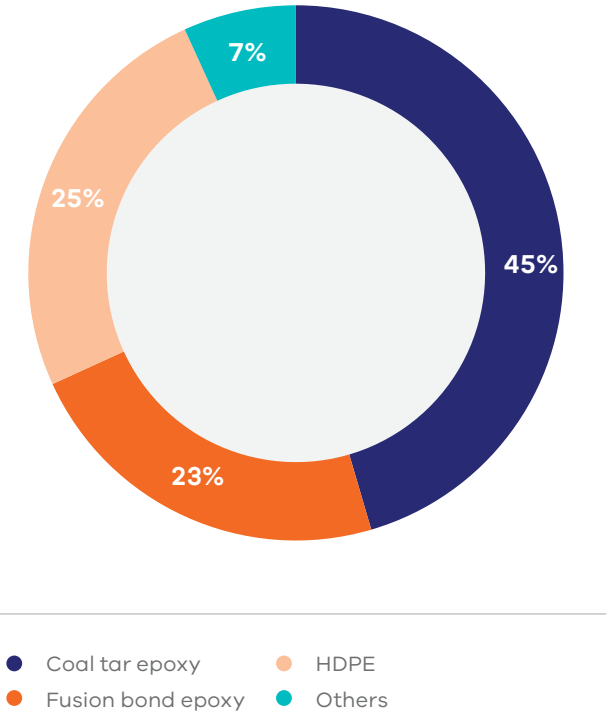
Figure 14 - Distribution of cathodic protection systems



4.3.2 Coating surveys

Licensees are expected to carry out coating surveys every five years to ensure coating anomalies are identified. Over the reporting period, three pipeline licensees carried out four DCVG surveys for the buried pipelines. The reported defects from DCVG surveys will be evaluated further in accordance with AS4827 and internal standards of the licensees to assess the requirements of dig-ups and coating repairs.

Figure 15 - Distribution of external pipeline coatings



Given the majority of pipelines were built before 1980, a large proportion of pipelines use coal tar epoxy coatings. This coating tends to lose adhesion over time. Pipeline licensees are aware of this and those pipelines coated with coal tar epoxy have a recoating plan in place to address this issue. These plans are provided to ESV and were monitored to ensure these works were conducted.

Above-ground pipelines are painted using multi-coat paint systems to prevent corrosion. Visual inspections are conducted for these pipelines to ensure that the paint is in a good condition. As a minimum, this is monitored during yearly route inspections.

4.3.3 Leakage surveys

Annual leakage surveys are conducted on the licensed pipelines conveying gaseous hydrocarbon. Pipelines transporting other gaseous fluids are monitored during routine patrols for any indication of leak such as ground disturbance. Of the 37 pipelines carrying liquid hydrocarbon, 21 are equipped with an active leak detection system which will raise alarms in control rooms when it senses imbalance in flow. The remaining liquid hydrocarbon pipelines are monitored for leakage by product metering at both ends of the pipelines. In addition, any visible signs of leak such as dead vegetation are monitored during the routine pipeline patrols. No major leak has been reported from the pipeline assets, however, two minor weep incidents from the valve stem packing were reported.

Pressures of the pipelines suspended on gas are monitored to confirm leakage while the pipelines suspended on inhibited water are monitored during patrol for any for any visible indication of leak. One incident of leak was reported for a suspended pipeline during this period. The leak was attributed to the external corrosion and was repaired by the installation of a sleeve.

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

4.3.4 Inspections and repairs

4.3.4.1 In-line inspections

Non-natural gas transmission pipelines are expected to receive in-line inspection surveys in three- to 10-year intervals.[6] The survey frequency is determined by the corrosive nature of the:

- fluid being transported
- pipeline 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. One in-line inspection for one pipeline was deferred due to issues faced in mobilisation of contractors amid COVID restrictions. A formal risk assessment was conducted to establish that the risks are managed as far as reasonably practicable (AFARP).

Around 70 per cent of the operating pipelines are piggable. In addition, about 93 per cent of the total operative kilometres of pipelines are piggable. In line inspections were not conducted on about 84 kilometres of licensed pipelines. The main reason for this was that a tool to pig smaller diameter pipelines was not available.

Asset owners are in constant consultation with the industry to explore the possibility of pigging these pipelines. Other controls such as DCVG surveys, direct assessments and subsequent pipeline anomaly assessments were adopted to ensure adequate pipeline integrity management.

4.3.4.2 Direct assessment

During 2020–21, pipeline licensees completed 44 direct assessments based on the results from in-line inspections and DCVG surveys.

4.3.4.3 Repairs

Over the reporting period, 28 repairs to nine pipelines were carried out which included:

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

A significant number of these repairs pipelines were conducted based on the indications from the inline inspection results. 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)

Two minor weeps occurred over the reporting period with both occurring though the main line valves stem packing (due to a loose valve) rather than the pipelines themselves. The low number of leaks was attributed to the licensees' proactive inspection strategies.

4.4.2 Third party encroachment

4.4.2.1 Licensed pipelines

There were 33,973 Dial Before You Dig enquiries over the reporting period, and only 10 incidents reported to ESV involving unauthorised third-party excavations, construction or boring within three metres of a pipeline.

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

There were 10 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 decrease compared to the previous reporting period of 13 encroachments. Of the encroachments that were reported, most encroachment incidents were due to a failure to complete a Dial Before You Dig, obtain a permit to work or engage an on-site supervisor, or follow conditions of work issued by the licensee.

Licensees received 33,973 Dial Before You Dig 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

All non-natural gas licensed pipeline licensees have a complaint Asset Management System as required by the Australian Standard *AS2885 Pipelines – Gas and Liquid Petroleum*.

4.6 General observations

A number of observations arose from the information analysed and summarised for 2020–21.

Encroachments on licensed pipelines decreased from the previous year, which indicates that the awareness and patrolling programs were effective.

Despite the fact there were two minor weeps during the reporting period, licensees preventative maintenance programs ensured pipeline integrity was maintained.

Licensees should continue to execute their preventative maintenance programs to ensure asset integrity continues to be maintained.

This should include, but is not limited to:

- Investigation of non-compliant cathodic protection systems should be ongoing to ensure older pipelines have adequate and functioning cathodic protection.
- As pipelines age, more frequent repairs may be required. Licensees 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 Dial Before You Dig program should be maintained to ensure the number of third-party encroachments remains low.

5 Audit and compliance

5.1 Introduction

5.1.1 ESV Audit and Compliance Team

The ESV Audit and Compliance Team is responsible for conducting acceptance and compliance audits across the industry. Audits are conducted to verify the continued compliance of duty holders with their respective accepted Safety Cases and Safety Management Plans in accordance with section 44 of the Gas Safety Act and section 129 of the Pipelines Act. In addition to verifying compliance, the audits aid the organisations in identifying areas of improvement.

The Audit and Compliance Team develops and executes an Audit Plan, which includes Safety Case and Safety Management Plans acceptance audits and compliance audits into several management systems across the industry.

The 2020–21 Annual Audit Plan topics were selected based on the results of data analysis of the ESV Critical Control Performance System inputs. These inputs included the bow-tie risk assessments, incidents and incident reports, regulatory correspondence between ESV and regulated entities, quarterly key performance indicator reports, consultative forums, and the Annual Safety and Integrity Report.

All audit findings are pursued to ensure appropriate measures are implemented to avoid reoccurrence and improve the management systems.

5.2 Audits in 2020–21

The Audit and Compliance Team conducted 46 audits across the distribution businesses and licensed pipelines industry groups. Table 3 shows the number of audits planned and conducted for each industry group.

In some instances, Safety Case and Safety Management Plan audits were conducted, which evaluated the entire Management System. In these cases, the compliance audits were incorporated into the acceptance audits. In addition, the BP and ASCC pipelines were suspended and the audits were not conducted.

Table 3 – Number of audits by industry group

Audits in 2020–21

Industry group	Audits planned	Audits conducted	% Completed	Comments
Natural gas licensed pipelines	16	17	106%	• APA, VTS and SESA audits conducted concurrently • SEAGas and Mortlake Safety Case acceptance audit
Licensed pipelines (Pipelines Act only)	30	22	73%	• BP and ASCC suspended (four audits) • Safety Management Plan acceptance audits (entire Management System) — BOC — United Terminals — Viva Energy — Elgas
Distribution businesses	6	7	117%	• Additional investigation audit
TOTAL	**52**	**46**	**88%**	• In the licensed pipelines area, four Safety Management Plan audits were conducted in lieu of compliance audits. Because the BP and ASCC pipelines were suspended, compliance audits were not conducted.

5.2.1 Management system deficiencies

The audit findings are associated to the section of the management system that could potentially be affected. Table 4 describes the four management systems that were evaluated and their definition.

Table 4 – Management system deficiency definitions

Management system deficiency	Definition
Inadequate documentation	Processes and procedures are not formally documented
Inadequate implementation	Processes and procedures not adequately followed, which could lead to a safety risk or interruption to supply
Inadequate records	Failure to store, maintain, or retrieve records
Inadequate review/ monitoring	Inadequate process to measure the effectiveness of implementation

Overall, the audits identified 151 audit findings. These findings were not critical in nature and were mainly due to documentation or records not being available during the audits. Action plans were requested for all audit findings to ensure appropriate measures were implemented to improve the management systems. Details of the audit findings and the management systems for each industry group are shown in the next section of the report.

5.3 Audit findings by industry

In this section of the report, details of the audits scope and findings for the licensed pipelines and distribution businesses industry groups are described.

5.3.1 Audit scope and findings - natural gas transmission pipelines

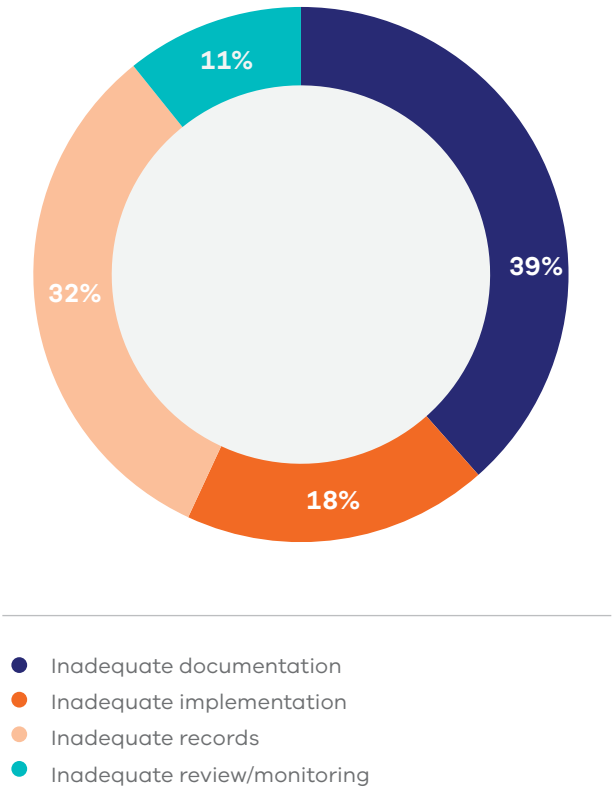
ESV conducted 17 audits across the natural gas transmission pipeline sector during the 2020–21. The scope of these audits included:

- **Competence and Training Compliance Audits**—Gain assurance that the training management system is effectively implemented to manage both staff and contractors, including minimum levels of skills and qualifications and training delivery. (Gas Safety Case Regulations R38)
- **Patrolling Compliance Audits**—Ensure that the pipeline patrolling systems and processes are effectively implemented to identify and manage external interference threats to the pipeline. (AS2885.3 S7.4)
- **Project Lifecycle Compliance Audits**—Evaluate that the project management and execution systems are effective, including those processes referenced in the Construction Safety Management Plan. (AS2885 and *AS4041 Pressure piping*)
- **Safety Case Acceptance Audits**—Gain assurance that the Safety Case documentation adequately represents the business, the organisation meets the minimum requirements of the relevant legislation, Australian standards and relevant procedures, and performance monitoring and risk control measures are being adequately implemented. (Gas Safety Act S44)

Overall, 65 non-compliances were identified during these audits. It should be noted that the findings were not critical in nature, and were due to inadequate documentation and records as shown in Figure 16. Examples of findings include field personnel training records not being signed, pipeline patrols conducted but not recorded in the correct format, and purchasing documentation overdue for review.

ESV received corrective action plans from all regulated entities that were audited. Objective evidence, such as updated work instructions and procedures, was requested and received by ESV as part of the corrective actions.

Figure 16 - Management system deficiency - natural gas licensed pipelines



5.3.2 Audit scope and findings - licensed pipelines (Pipelines Act only)

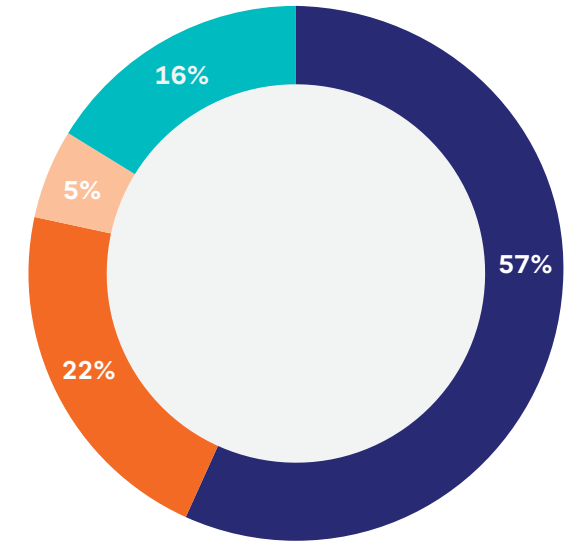
ESV conducted 22 audits across the licensed pipeline sector during 2020–21. The scope of these audits included:

- **Competence and training compliance audits**—Gain assurance that the training management system is effectively implemented to manage both staff and contractors, including minimum levels of skills and qualifications and training delivery. (Pipelines Regulations 2017 R39)
- **Third-party works management compliance audits**—Evaluate and determine the adequacy of the systems and controls in place to ensure that licensee is aware of third-party works in the vicinity of the pipeline and implement necessary assessment, monitoring and supervision of controls to manage the works. (AS2885.3 S7.4)
- **Safety Management Plan acceptance audits**—Gain assurance that the Safety Management Plan documentation adequately represents the business, the organisation meet the minimum requirements of the relevant legislation, Australian standards and relevant procedures, and performance monitoring and risk control measures are being adequately implemented. (Pipelines Act R128)

Overall, 74 non-compliances were identified during these audits. It should be noted that the findings were not critical in nature, and were due to inadequate documentation as shown in Figure 17. Examples include coating procedures not available at the time of the audit, procedures not reflecting the latest practices, and overdue refresher training delayed.

ESV received corrective action plans from all regulated entities that were audited. Objective evidence, such as reviewed procedures and implementation of new systems, was requested and received by ESV as part of the corrective actions.

Figure 17 - Management system deficiency - non-natural gas licensed pipelines



5.3.3 Audit scope and findings - Distribution businesses

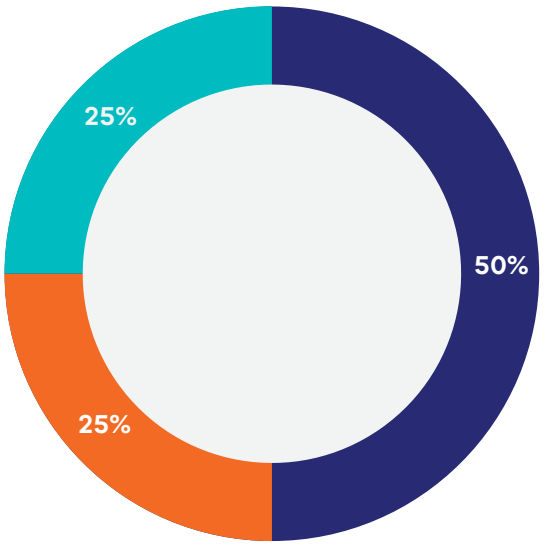
ESV conducted seven audits to distribution businesses during 2020–21. The scope of these audits included:

- **Competence and training compliance audits**—Gain assurance that the training management system is effectively implemented to manage both staff and contractors, including minimum levels of skills and qualifications and training delivery. (Gas Safety Case Regulations R38)
- **Contractor competency and selection compliance audits**—Ensure the adequacy of the processes for contractor selection and review, evaluation of contractor performance, competency of supervisors and workers, and quality control. (*AS4645 Gas Distribution Networks* S2.5)
- **Project lifecycle compliance audits**—Evaluate that the project management and execution systems are effective, including those processes referenced in the Construction Safety Management Plan. (AS2885 and AS4041)
- **Incident Investigation Audits**—Gain assurance of the adequacy of the safety systems in place to safeguard the public and facilities. (Gas Safety Act S32)

Overall, 12 non-compliances were identified during these audits. It should be noted that the findings were not critical in nature, and were due to inadequate documentation and records as shown in Figure 18. Examples include discrepancies between different checklists, responsible personnel not listed in procedures, and documentation overdue for review.

ESV received corrective action plans from all regulated entities that were audited. Objective evidence, such as reviewed procedures, checklists, and training plans, was requested and received by ESV as part of the corrective actions.

Figure 18 - Management system deficiency - distribution businesses



- Inadequate documentation
- Inadequate implementation
- Inadequate records

5.4 Audits closure

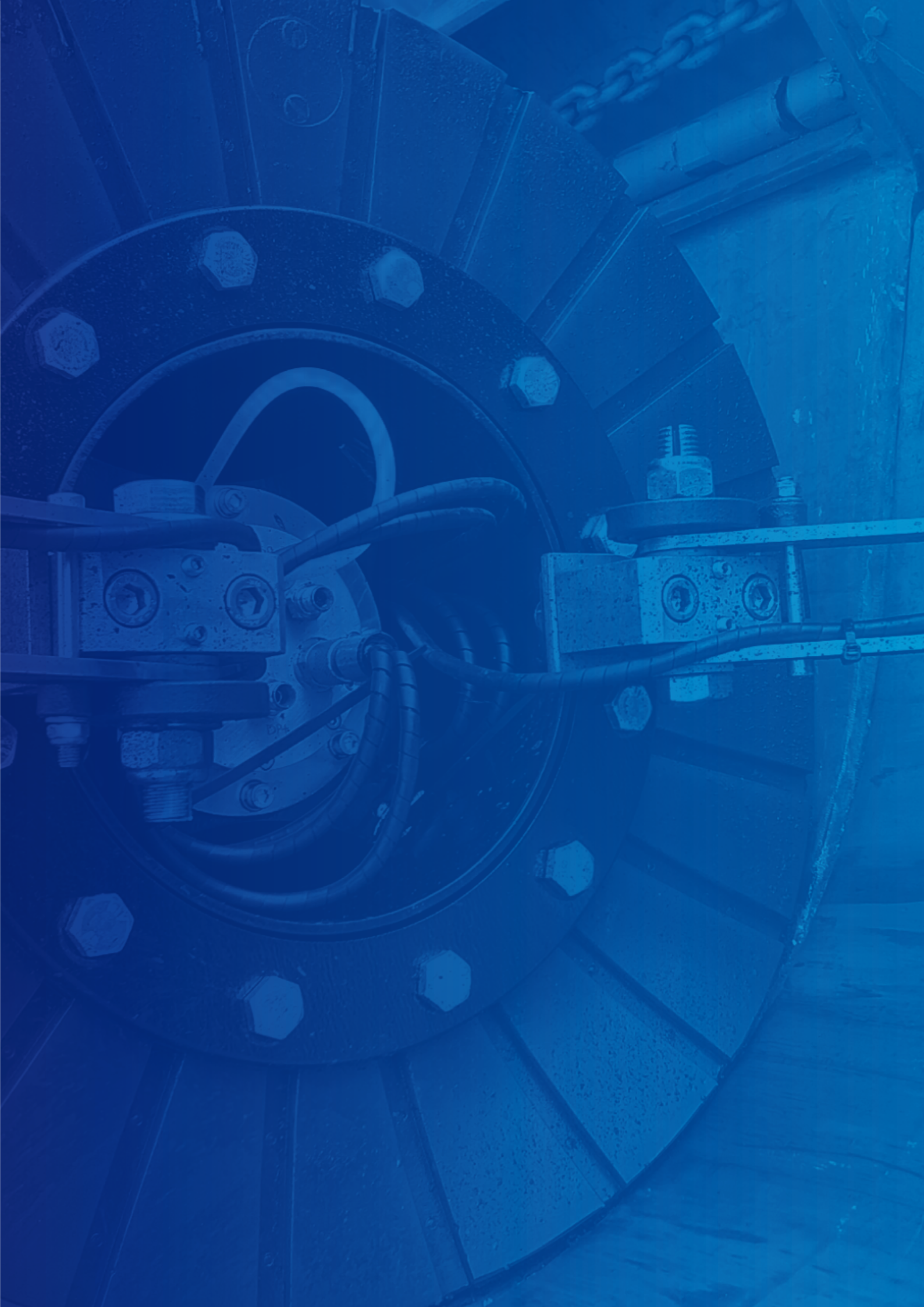
Following the identification of findings during an audit, all auditees are requested to submit an action plan that addresses the audit findings. The action plan includes rectification measures as well as preventative measures to ensure the identified issues do not reoccur.

Table 3 details the action plans received and audits closed per industry group. As it can be observed, all audit findings were addressed. This ensured that the management systems remain robust, and in addition, continuous improvement across the industry is implemented.

Table 5 – Action plans and audits closure

Audits in 2020–21

Industry group	Audits conducted	% Action Plans received	% Audits closed out
Distribution businesses	7	100%	100%
Natural gas licensed pipelines	17	100%	100%
Non-gas licensed pipelines	22	100%	100%
TOTAL	**46**	**100%**	**100%**



Index

Acronym/abbreviation	Definition
AEMO	Australian Energy Market Operator
AFARP	as far as reasonably practicable
AGN	Australian Gas Networks
AS	Australian Standard
ASCC	Australasian Solvents and Chemicals Company
BOC	formerly British Oxygen Company
BP	British Petroleum
CP	cathodic protection – an electrical means of mitigating corrosion on buried and submerged metal structures
Dial Before You Dig	Dial Before You Dig – a free national community services that aims to help avoid damage to the underground pipes and cables that distribute essential services.
DCVG	direct current voltage gradient
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
JUHI	Joint User Hydrant Installation
kPag	kilopascal gauge
LPG	liquid petroleum gas
MGN	MultiNet Gas Networks
non-piggable	A non-piggable pipeline will not allow a standard inspection tool to negotiate it.
piggable	A piggable pipeline is designed to allow a standard inspection tool to negotiate it.
SESA	South East South Australia Pipeline
TRU	transformer rectifier unit
VTS	Victorian Transmission System

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