

UPSTREAM PIPELINES IN ALBERTA



LENGTH OF PIPELINES IN ALBERTA

The AER regulates more than 430,000 km of pipelines. Put end-to-end, the pipeline network would overtake the moon from Earth by 46,000 km. For comparison, the National Energy Board regulates about 73,000 km of pipelines, or about 10 per cent of the total length (825,000 km) of licensed pipelines in Canada. These are pipelines that cross provincial or federal borders.



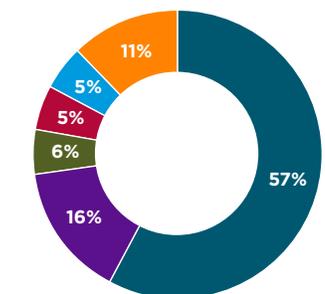
PIPELINE REGULATIONS

The AER regulates pipelines operating within Alberta. Every phase of a pipeline's full life-cycle, starting with the application and construction, and ending with abandonment and reclamation - is regulated to ensure the public and environment are protected. Most of the pipelines the AER regulates are smaller lines (gathering and feeder lines) that connect individual wells to gathering facilities for treatment or processing (gathering pipelines), which then connect to feeder pipelines. Legislation, regulations and requirements that apply to the full life-cycle of pipelines licensed in Alberta include:

- **Pipeline Act**
- **Pipeline Rules**
- **Directive 077: Pipelines - Requirements and Reference Tools and**
- **Canadian Standards Association (CSA) Z662-19: Oil and Gas Pipeline Systems**

The National Energy Board (NEB) regulates pipelines that cross provincial or federal borders.

WHAT DO PIPELINES LICENSED BY THE AER CARRY?



- Natural gas
- Oil effluent (mixture of oil, gas and water from an oil well)
- Sour gas (natural gas with hydrogen sulphide - concentration greater than one per cent)
- Fuel Gas
- Salt water
- Other (fresh water, and low-vapour pressure products)

Source: AER

PIPELINE INCIDENT REPORTING

In Alberta, all pipeline incidents, such as loss of containment and pipeline hits during ground disturbance not resulting in release, must be reported to the AER. Even if only a thimble-full of liquid is spilled, it must be reported to the regulator.

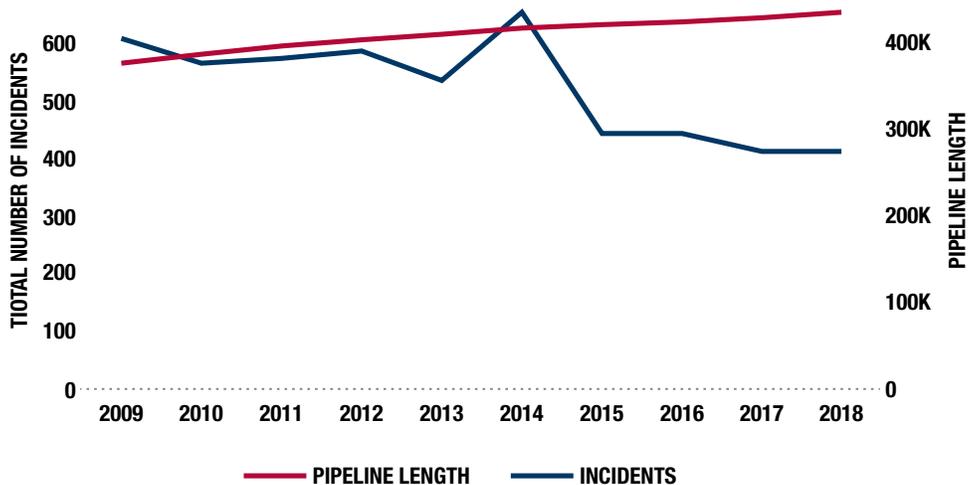
The Canadian Standards Association (CSA), through CSA standard Z662-19 (Oil and Gas Pipeline Systems), establishes the Canadian standard for design, construction, operation and maintenance of oil and natural gas pipeline systems. CSA standard Z260-19 (Pipeline System Safety Metrics) provides requirements to establish common pipeline system safety metrics that can be used by industry and regulators. Industry is mandated by regulation to conform to CSA Z662-19 requirements.

PIPELINE PERFORMANCE IN ALBERTA

Pipeline performance in Alberta is continuously improving. A common indicator of overall pipeline performance is a ratio of incidents per 1,000 km of pipeline length.

AER data shows that over the past decade, the number of pipeline incidents declined by 32 per cent while the length of pipelines grew by 15 per cent. Over the same period, the pipeline failure rate decreased to 0.96 incidents per 1,000 km in 2018 from 1.62 incidents per 1,000 km in 2009. This is a vast improvement compared to 1990, where AER data shows that while industry had nearly five incidents per 1,000 km, it now has only slightly less than one incident per 1,000 km. Cumulative pipeline length, meanwhile, nearly tripled since 1990.

PROVINCIAL PIPELINE INCIDENTS AND INVENTORY

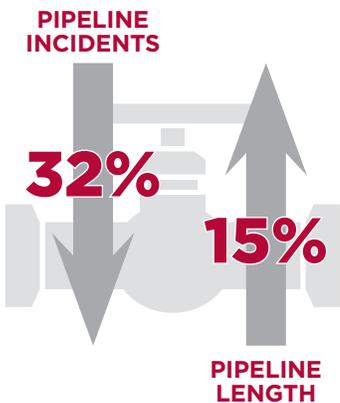


Over the past 10 years, cumulative pipeline length grew by 15 per cent while pipeline incidents dropped by 32 per cent. As a result, the incident ratio, which measures incidents per 1,000 km of pipeline length, declined to 0.96 from 1.62.

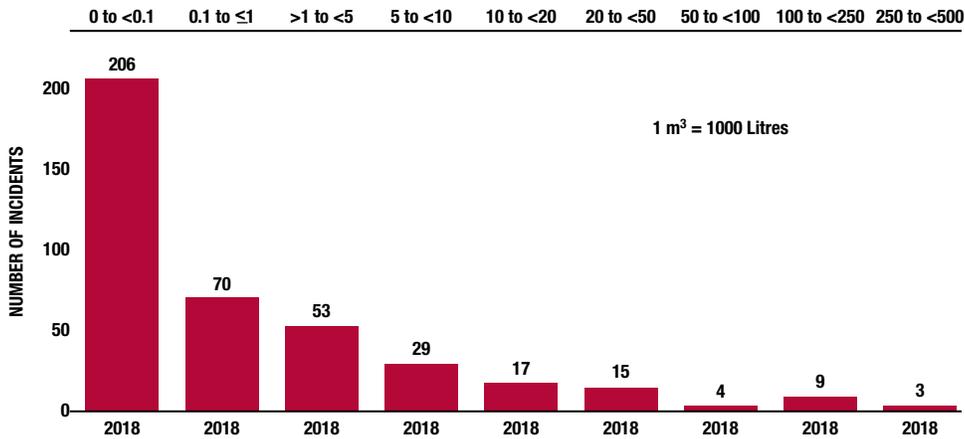
Source: AER 2019

Over 90 per cent of pipeline incidents that occurred in Alberta in 2018 are classified by the AER as having low or medium consequences in terms of impacts on the public, environment and wildlife. About 68 per cent of all 2018 incidents resulted in less than one cubic metre of substance released. Operators are responsible for the cost of the cleanup following a pipeline incident.

SINCE 2009



PIPELINE INCIDENT LIQUID RELEASE VOLUMES (M³)



Source: AER 2019

CAUSE OF PIPELINE INCIDENTS

Pipeline incidents can have a variety of causes. The most common causes are:

- **Internal corrosion (38 per cent)**
- **External corrosion (9 per cent)**
- **Construction deficiency (6 per cent)**

Other causes include valve or fitting failure, operator error, mechanical failure and damage by others.

PREVENTING PIPELINE FAILURES

More than 85 per cent of the pipelines licensed by the AER are made of steel. While polyethylene, polyvinyl chloride, fiberglass, composite and aluminum are less common pipeline materials, their use is gradually increasing. While steel is subject to corrosion, there are a number of ways to mitigate corrosion.

WAYS TO MITIGATE AND MONITOR INTERNAL CORROSION:

INLINE INSPECTIONS: Use of sophisticated instruments to measure pipelines for defects and detect metal loss or other anomalies. Devices called smart pigs (pig stands for pipeline inspection gauge) are used to push stagnant fluids, slush and buildup out of pipelines on a regular basis to prevent internal corrosion damage.

TREATMENT WITH CHEMICALS: Chemicals are used to provide protective barriers inside a pipeline or to neutralize the corrosivity of fluids.

CORROSION COUPONS: Strips of steel are inserted into the pipeline and exposed to the transported substance for a specified period to determine weight loss due to corrosion.

WAYS TO MITIGATE AND MONITOR EXTERNAL CORROSION:

EXTERNAL PIPELINE COATINGS: Use of special coatings, such as expanded polyethylene, to prevent oxygen and water from coming into contact with the external steel surface of pipelines and causing corrosion.

CATHODIC PROTECTION: A process to reduce the corrosion rate of a pipeline's external metal surface using an electrical current to neutralize corrosion.

PIPELINE INSPECTION GAUGES (PIGS)



Smart pigs are used to push stagnant fluids, slush and buildup out of pipelines.

MORE THAN 85 PER CENT OF THE PIPELINES LICENSED BY THE AER ARE MADE OF STEEL.



PIPELINES ARE
A RELIABLE
AND SAFE WAY
TO TRANSPORT
LIQUIDS SUCH
AS OIL AND
WATER, AND
NATURAL GAS.

PIPELINE INSPECTIONS: Frequent inspections ensure operators follow rules and regulations, and that any safety hazards are identified and addressed. Operators also use a variety of inspection and monitoring techniques to ensure pipelines are running properly and that leaks are detected quickly.



BEST MANAGEMENT PRACTICES

In addition to regulations, CAPP member companies regularly develop best management practices to improve industry performance. While voluntary, best management practices are widely used by operators.

CAPP best management practices specific to upstream pipelines deal with several areas, including:

CORROSION:

Corrosion is a main cause of pipeline incidents. To address this issue, CAPP's best management practices outline measures companies can take to reduce the likelihood of internal and external corrosion, and thus maintain and improve the mechanical integrity of upstream pipelines.

The best management practices identify factors that cause corrosion, and recommend techniques to operators to mitigate, monitor and detect corrosion.

OPERATING IN HIGH-IMPACT AREAS:

High-impact areas are locations where a pipeline incident could result in significant impacts to people, infrastructure or the environment. Proximity to populated areas, crossings of water bodies and primary highways, and significant environmental areas such as National Parks are some of the factors used in assessing the potential impact of a pipeline incident.

Recognizing the sensitivity of such areas, CAPP's best management practice, Guide for Designated Pipeline Sections in High-impact Areas, outlines measures operators can take - in addition to adhering to regulations and CSA industry standards - to ensure high-impact areas are protected or that impacts are minimized should an incident occur. These measures include selecting routes to avoid high-impact areas where practical, enhanced leak-detection techniques, use of non-metallic materials or use of special valves on either side of a high-impact area to allow a rapid response and shutdown should an incident occur.